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U.S. NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE EVALUATION: CUMMINS NH-220G AND DETROIT DIESEL 6V-53N

INTERIM REPORT
TFLRF No. 304

By

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For

Naval Surface Warfare Center
Annapolis Detachment
Shipboard Energy R&D Office
Annapolis, Maryland

Under Contract to

U.S. Army TACOM
TARDEC Petroleum and Water Business Area
Warren, Michigan

Contract No. DAAK70-92-C-0059

Approved for public release; distribution unlimited

November 2000

Form SF298 Citation Data

Report Date *("DD MON YYYY")* 00082000	**Report Type** N/A	**Dates Covered (from... to)** *("DD MON YYYY")*

Title and Subtitle U.S. Navy High-Speed Diesel Engine Performance Evaluation: Cummins NH-220G and Detroit Diesel 6V-53N	**Contract or Grant Number**
	Program Element Number
Authors Yost, Douglas M.	**Project Number**
	Task Number
	Work Unit Number
Performing Organization Name(s) and Address(es) U.S. Army TARDEC Fuels and Lubricants Research Facility (SWRI) Southwest Research Institute P.O. Drawer 28510 San Antonio, TX 78228-0510	**Performing Organization Number(s)**
Sponsoring/Monitoring Agency Name(s) and Address(es)	**Monitoring Agency Acronym**
	Monitoring Agency Report Number(s)
Distribution/Availability Statement Approved for public release, distribution unlimited	
Supplementary Notes	
Abstract	
Subject Terms	
Document Classification unclassified	**Classification of SF298** unclassified
Classification of Abstract unclassified	**Limitation of Abstract** unlimited
Number of Pages 1554	

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Approved by:

E. C. Owens, Director
U.S. Army TARDEC Fuels and Lubricants
Research Facility (SwRI)

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	August 2000	Interim, December 1993 – August 2000

4. TITLE AND SUBTITLE
U.S. Navy High-Speed Diesel Engine Performance Evaluation: Cummins NH-220G and Detroit Diesel 6V-53N

5. FUNDING NUMBERS
DAAK70-92-C-0059; WD 24

6. AUTHOR(S)
Yost, Douglas M.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army TARDEC Fuels and Lubricants Research Facility (SwRI)
Southwest Research Institute
P.O. Drawer 28510
San Antonio, Texas 78228-0510

8. PERFORMING ORGANIZATION REPORT NUMBER
TFLRF No. 304

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army TACOM
TARDEC Petroleum and Water Business Area
Warren, MI 48397-5000

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

This report documents the performance evaluations of Detroit Diesel Corporation 6V-53N and Cummins NH-220G engines operating largely on broadened military specification fuels, MIL-F-16884H. The performance evaluations also included a fundamental study of the relationship of fuel properties to various combustion phenomena measured in one cylinder of each test engine. Included are engine and test fuel specifications, engine performance analysis, engine operating data, and test fuel data.

Fuel property correlations with engine combustion variables were developed using a multivariate analysis of fuel properties with engine performance variables. The power production and fuel consumption correlations were dominated by the test point variables speed and load included as independent variables. Additional multivariate analysis performed utilizing a transformation of the independent variable load, revealed acceptable fuel property correlations for power and fuel consumption. Kinematic viscosity, net heat of combustion, specific gravity, and hydrogen content influenced the power and fuel consumption of the Cummins NH-220G. The power and fuel consumption of the Detroit Diesel Corporation 6V-53N was influenced by kinematic viscosity, net heat of combustion, specific gravity, hydrogen content, aniline point, and boiling point distribution.

14. SUBJECT TERMS

Cummins NH-220G	Combustion	Specific Gravity	Detroit Diesel 6V-53N
High-Speed Diesel	Power	Hydrogen Content	Net Heat of Combustion
Performance	Fuel	Viscosity	Aniline Point

15. NUMBER OF PAGES
97

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18
298-102

EXECUTIVE SUMMARY

A major goal of the Shipboard Mobility Fuels Research and Development program is to broaden the fuel procurement specifications for MIL-F-16884H to utilize all petroleum fuel sources and fuel refining processes. The Fuel Qualification Procedure project will define an overall approach for qualifying fuels and determine the necessary fuel property revisions to expand the MIL-F-16884H fuel specification to include a broader range of distillate fuels.

The High-Speed Diesel Engine Test Plan objective was to determine fuel property limitations on the performance and durability of Navy high-speed diesel engines (HSDE). The test plan was divided into five areas of study: fuel injection, cold startability, durability, thermal stability, and performance.

The objective of the HSDE performance evaluations was to determine the limits of fuel properties that will provide fuels of acceptable performance in Navy HSDEs in terms of an engine's ability to dependably produce the necessary level of power required to accomplish its mission. The HSDE test plan was developed based on the following criteria:

- Engine selection – equipment surveys
- Test fuels – worldwide fuel availability and property variations
- Lubricating oil – military specifications
- Test cycles – Navy equipment mission profiles

Based on the population of high-speed diesel engines in the Navy's inventory, the five engines (or engine families) included in the test plan were the Detroit Diesel Corporation 53, 71, and 149 series engines, the Westerbeke 4-108, and the Cummins NH-220G. The injection/combustion systems on these engines are representative of approximately 94-percent of all Navy high-speed diesel engines.

This report documents the performance evaluations of Detroit Diesel Corporation 6V-53N and Cummins NH-220G engines operating largely on broadened specification military diesel fuel, MIL-F-16884H. The performance evaluations also included a fundamental study of the relationship of fuel properties to various combustion phenomena measured in one cylinder of each test engine. Included are engine and test fuel specifications, engine performance analysis, engine operating data, and test fuel data. A multivariate analysis of fuel properties with engine performance variables revealed acceptable fuel property correlations with engine combustion variables. The power production and fuel consumption correlations were dominated by the test point variables' speed and load included as independent variables. Additional multivariate analyses performed utilizing a transformation of the independent variable load revealed acceptable fuel property correlations for power and fuel consumption. Kinematic viscosity, net heat of combustion, specific gravity, and hydrogen content influenced the power and fuel consumption of the Cummins NH-220G. The power and fuel consumption of the Detroit Diesel Corporation 6V-53N was influenced by kinematic viscosity, net heat of combustion, specific gravity, hydrogen content, aniline point, and boiling point distribution.

FOREWORD/ACKNOWLEDGMENTS

This work was performed by the U. S. Army TARDEC Fuels and Lubricants Research Facility (TFLRF) located at Southwest Research Institute (SwRI), San Antonio, Texas, during the period December 1993 through August 2000 under Contract No. DAAK70-92-C-0059. This work was performed for the Naval Surface Warfare Center in Annapolis, Maryland under the supervision of R. M. Giannini. The work was funded and administered by the U. S. Army Tank-Automotive RD&E Center, Petroleum and Water Business Area, Warren, Michigan with Mr. Luis Villahermosa (AMSTA TR-D/210) serving as the TARDEC contracting officer's representative and project technical monitor.

TABLE OF CONTENTS

Section Page

1.0 INTRODUCTION 1
1.1 Shipboard Mobility Fuels R&D Program Overview 1
1.1.1 Fuel Qualification Procedure Project 1
1.1.2 High-Speed Diesel Engine Test Plan 2
1.2 High-Speed Diesel Engine Performance Evaluation Objectives 3
1.3 Overview 4
1.3.1 Diesel Engines Evaluated 4
1.3.2 Test Fuels 5
1.3.3 Lube Oil 5
1.3.4 Test Cycle 5

2.0 TECHNICAL APPROACH 5
2.1 Test Plan 5
2.1.1 Engines 6
2.1.2 Test Fuels 12
2.1.3 Test Lube 15
2.1.4 Test Cycle & Protocol 16
2.1.5 Engine Coolant 27
2.1.6 Air Intake System 27
2.1.7 Engine Coolant Systems 28
2.1.8 Fuel Systems 28
2.1.9 Lubricant Systems 28
2.1.10 Starting Systems 29
2.1.11 Dynamometers 29
2.1.12 Engine Speed Measurements 29
2.1.13 Engine Load Measurements 29
2.1.14 Temperature Measurements 30
2.1.15 Pressure Measurements 31
2.1.16 Exhaust Opacity Measurements 32
2.1.17 High-Speed Data Acquisition System 32
2.1.18 Instrumentation 33
2.1.19 Instrumentation Calibration 36
2.2 Performance Data 36
2.2.1 Power 36
2.2.2 Speed 37
2.2.3 Brake Specific Fuel Consumption 37
2.2.4 Smoke Opacity 37
2.2.5 Cylinder Pressure Histories 38
2.2.6 Heat Release Rate 38
2.2.7 Cumulative Heat Release 39
2.2.8 Relative Ignition Delay Time 39
2.2.9 Apparent Combustion Efficiency 39
2.2.10 Brake Thermal Efficiency 39

TABLE OF CONTENTS (cont'd)

Section Page

2.3 Performance Data Analysis 39
2.3.1 Overview of HSDE Performance Evaluation Data Analysis 41
2.3.2 HSDE Performance Evaluation Scatter Plots/Outlier Identification 42
2.3.3 HSDE Performance Evaluation Data Uncertainty Analysis 42
2.3.4 Statistical Analysis - Multiple-Variable Analysis 43
2.3.5 Fuel Property Versus Engine Performance Model Development Process 43
2.4 Checklists 43
2.5 Deviations From Test Plan 45
2.5.1 DDC 6V-53N Fuel Temperature 45
2.5.2 Cummins NH-220G Lubricant Pre-heater 45
2.5.3 Ambient Temperature Recording 45
2.5.4 Smokemeter Lens Cleaning 46
2.5.5 Test Fuel Run Order 46

3.0 RESULTS 46
3.1 Power-Making Ability 46
3.2 Fuel Consumption 51
3.3 Smoke Opacity 51
3.4 Other Performance Parameters 56
3.4.1 Maximum Cylinder Pressure 56
3.4.2 Maximum Rate of Pressure Rise 56
3.4.3 Heat Release Rate 59
3.4.4 Ignition Delay Time 59
3.4.5 Cumulative Heat Release 59
3.4.6 Combustion Efficiency 60
3.4.7 Brake Thermal Efficiency 60
3.5 Performance Data Analysis Results 66
3.5.1 Correlation Equations 69
3.6 Test Fuel Analysis 75
3.6.1 Production Protocol 75
3.6.2 Characterization Protocol 75
3.6.3 Key Property Protocol 76
3.6.4 Contamination/Degradation Protocol 76
3.7 Lube Oil Analysis 83

4. PROBLEMS 85
4.1 Overview 85
4.2 Low Pressure Transducer Signal 85
4.3 Erroneous Analog-to-Digital Voltage Conversion 86
4.4 Instrumentation Failure 88

5. QUALITY ASSURANCE/QUALITY CONTROL 89
5.1 Pre-test 89
5.1.1 Test Plan 89
5.1.2 Training 89
5.1.3 Coordination Efforts 89
5.1.4 Engine Rebuilders 89
5.1.5 Navy Qualified Parts 90

TABLE OF CONTENTS (cont'd)

Figure Page

5.2 Test Operation 90
5.2.1 Engine Operation Data 90
5.2.2 Checklists 91
5.2.3 Fuel Monitoring 91
5.2.4 Coordination Efforts 91
5.2.5 Photographs 91
5.3 Post-test 91
5.3.1 Data Review 91
5.3.2 Coordination Efforts 92

6. CONCLUSIONS AND RECOMMENDATIONS 92
6.1 Conclusions 92
6.2 Recommendations 93

7.0 REFERENCES 94

APPENIDICES
A. Test Engine Configurations
B. Data Summary Sheets
C. DTRC Regression Analysis Results
D. Fuel Analysis
E. Photographs
F. DDC 6V-53N Data Sheets
G. Cummins NH-220G Data Sheets

LIST OF FIGURES

Figure		Page
1	DDC 6V-53N Full Rack Performance Curves	7
2	Cummins NH-220G Full Rack Performance Curves	11
3	DDC 6V-53N Operator Log Sheet	22
4	Cummins NH-220G Operator Log Sheet	23
5	Engine Inlet Air Temperature Control System Schematic	27
6	DDC 6V-53N Exhaust Port Thermocouple Installation Diagram	30
7	Cummins NH-220G Exhaust Port Thermocouple Installation Diagram	31
8	HSDE Operational Sequence Protocol Checklist	44
9	DDC 6V-53N Full Rack Brake Horsepower of Test Fuels	48
10	Cummins NH-220G Full Rack Brake Horsepower of Test Fuels	48
11	DDC 6V-53N Maximum Power Fuel Flow of Test Fuels	49
12	Cummins NH-220G Maximum Power Fuel Flow of Test Fuels	49
13	DDC 6V-53N Maximum Power Brake Thermal Efficiency of Test Fuels	50
14	Cummins NH-220G Maximum Power Brake Thermal Efficiency of Test Fuels	50
15	DDC 6V-53N Full Rack Fuel Flow of Test Fuels	52
16	Cummins NH-220G Full Rack Fuel Flow of Test Fuels	52
17	DDC 6V-53N Full Rack Brake Specific Fuel Consumption of Test Fuels	53
18	Cummins NH-220G Full Rack Brake Specific Fuel Consumption of Test Fuels	53
19	DDC 6V-53N Maximum Power Volumetric Fuel Flow vs. Viscosity @ 40C	54
20	Cummins NH-220G Maximum Power Volumetric Fuel Flow vs. Viscosity @ 40C	54
21	DDC 6V-53N Full Rack Smoke Opacity of Test Fuels	55
22	Cummins NH-220G Full Rack Smoke Opacity of Test Fuels	55
23	DDC 6V-53N Full Rack Maximum Cylinder Pressure of Test Fuels	57
24	Cummins NH-220G Full Rack Maximum Cylinder Pressure of Test Fuels	57
25	DDC 6V-53N Full Rack Maximum Cylinder Pressure Rise of Test Fuels	58
26	Cummins NH-220G Full Rack Maximum Cylinder Pressure Rise of Test Fuels	58
27	DDC 6V-53N Full Rack Maximum Heat Release Rate of Test Fuels	61
28	Cummins NH-220G Full Rack Maximum Heat Release Rate of Test Fuels	61
29	DDC 6V-53N Full Rack Ignition Delay of Test Fuels	62
30	Cummins NH-220G Full Rack Ignition Delay of Test Fuels	62
31	DDC 6V-53N Full Rack Cumulative Heat Release of Test Fuels	63
32	Cummins NH-220G Full Rack Cumulative Heat Release of Test Fuels	63
33	DDC 6V-53N Full Rack Apparent Combustion Efficiency of Test Fuels	64
34	Cummins NH-220G Full Rack Apparent Combustion Efficiency of Test Fuels	64
35	DDC 6V-53N Full Rack Brake Thermal Efficiency of Test Fuels	65
36	Cummins NH-220G Full Rack Brake Thermal Efficiency of Test Fuels	65

LIST OF TABLES

Table		Page
1	Navy High-Speed Diesel Engine Inventory	4
2	DDC 6V-53N Model 5062-7000 Engine Specifications	6
3	Engine Break-In Schedules	8
4	DDC N50 Fuel Injector Specifications	9
5	Cummins NH-220G Engine Specifications	11
6	High-Speed Diesel Engine Performance Test Fuel Descriptions	12
7	Composition of High-Speed Diesel Engine Performance Test Fuels	13
8	Targeted & Expected Primary Fuel Properties of High-Speed Diesel Engine Performance Test Fuels	13
9	Test Fuels Common to High-Speed Diesel Engine Performance and Fuel Injection Studies	13
10	MIL-L-9000G Lubricant Specification Properties	16
11	Independent & Dependent Variables for Combustion Analysis	17
12	Independent & Dependent Variables for Power Production Analysis	17
13	DDC 6V-53N Speed-Power Test Points	17
14	Cummins NH-220G Speed-Power Test Points	18
15	Speed-Power Points for Full Rack Power Check	19
16	High-Speed Data Acquisition System Specifications	33
17	DDC 6V-53N Instrumentation	34
18	Cummins NH-220G Instrumentation	35
19	Fuel Property Correlation Matrix	66
20	Cummins NH-220G Performance Variable Correlation Matrix	68
21	DDC 6V-53N Performance Variable Correlation Matrix	68
22	Cummins NH-220G Fuel Property vs. Performance Variable Correlation Matrix	70
23	DDC 6V-53N Fuel Property vs. Performance Variable Correlation Matrix	70
24	Acceptability Test of DTRC Performance Variable vs. Fuel Property Analysis	71
25	Cummins NH-220G Regression Analysis Results	72
26	DDC 6V-53N Regression Analysis Results	73
27	Test Fuel Properties Determined by Characterization Protocol	77
28	Key Fuel Properties Protocol	78
29	Key Fuel Properties Inspection Form	79
30	Contamination/Degradation Protocol Form	80
31	High-Speed Diesel Engine Fuel Inventory Form	81
32	Contamination/Degradation Protocol and Tolerances	83
33	Specification and Inspection Properties for MIL-L-90006 Lubricant	84

LIST OF ABBREVIATIONS

In Order of Appearance

FQP	Fuel Qualification Procedure
SMFR&D	Shipboard Mobility Fuels Research & Development
HSDE	High-Speed Diesel Engine
DDC	Detroit Diesel Corporation
NIPER	National Institute for Petroleum and Energy Research
NAVSSES	Naval Ship Systems Engineering Station
BFLRF	Belvoir Fuels and Lubricants Research Facility
SwRI	Southwest Research Institute
DTRC	David Taylor Research Center
SAE	Society of Automotive Engineers
RPM	Revolutions-Per-Minute
BSFC	Brake Specific Fuel Consumption
APL	Approved Parts List
BTDC	Before Top Dead Center
Bhp	Brake horsepower
PT	Pressure-Time fuel Injection
psig	pounds-per-inch^2, gage pressure
ET	Evaporation Temperature
QPL	Qualified Products List
PP	Propeller Power
K	Propeller Constant
N	Engine Speed, revolutions-per-minute
kPa	Pressure in kilopascals
°C	Degrees Centigrade
mm	Length in millimeters
kg	Mass in kilograms
hr	Hour(s)
VDC	Volts-Direct Current
cm	Length in centimeters
TDC	Top Dead Center
A/D	Analog-to-Digital
NBS	National Bureau of Standards
Q	Heat Release, joules
θ	Crank angle, degrees
A	Mechanical equivalent of heat
k	Ratio of specific heats
V	Cylinder Volume
P	Cylinder Pressure
∂	Partial derivative
U	Uncertainty
ASTM	American Society for Testing of Materials
R	Correlation coefficient
VAC	Volts-Alternating Current
VIS40C	Kinematic viscosity at 40C
VIS100C	Kinematic viscosity at 100C
H2	Hydrogen content of fuel
SPGR	Specific Gravity of Fuel at 15.6C
D8610	ASTM D 86 10% boiling point temperature
D8650	ASTM D 86 50% boiling point
D8690	ASTM D 86 90% boiling point temperature
NHC	Net Heat of Combustion, mass basis
ST	Surface Tension
AP	Aniline Point
CN	Cetane Number
OBHP	Observed Brake Horsepower
LOAD	Engine Torque
BMEP	Brake Mean Effective Pressure
FFlo	Fuel Flow
MCP	Maximum Cylinder Pressure
MPR	Maximum Cylinder Pressure Rise
ID	Ignition Delay
SMOKE	Exhaust Smoke Opacity
MHR	Maximum Heat Release Rate
CHR	Cumulative Heat Release
ACE	Apparent Combustion Efficiency
BTE	Brake Thermal Efficiency
cSt	Centistoke, m^2/s
GC	Gas Chromatography
ppm	Parts -Per-Million
IC	Integrated Circuit
FFT	Fast Fourier Transform

1.0 INTRODUCTION

1.1 Shipboard Mobility Fuels R&D Program Overview

The Shipboard Mobility Fuels Research and Development (1) program's overall goal is to provide the technology base for future fuel-usage strategies to ensure that the Navy has access to sufficient quantities of adequate-quality fuel to perform the surface fleet mission. The initial goals are to revise the fuel procurement specifications to satisfy the current fleet. A near-term goal is to develop emergency fuel-usage guidelines. An eventual goal is to broaden the fuel procurement specifications for MIL-F-16884H (2) (NATO F-76) to utilize as many petroleum fuel sources and fuel-refining processes as possible.

1.1.1 Fuel Qualification Procedure Project

The Fuel Qualification Procedure (FQP)(3) project was developed as part of the U.S. Navy's overall Shipboard Mobility Fuels Research and Development (SMFR&D) program. The broad purpose of the FQP project is to establish a protocol for accepting non-specification fuels. The FQP will define an overall approach for qualifying fuels and determine the necessary fuel-property revisions to expand the MIL-F-16884H Navy fuel specification to include a broader range of distillate fuels. Inputs to the FQP include fuel-availability surveys, fuel-characterization studies, Navy equipment surveys, and studies of Navy equipment/fuel tolerance. The naval equipment/fuel tolerance portion of the FQP project outlines test plans for the characterization of equipment/fuel property tolerance for the following classes of shipboard naval equipment:

- Fuel Handling Systems
- Gas Turbine Engines
- High-Speed Diesel Engines
- Medium-Speed Diesel Engines

The emphasis of this document is the performance evaluation portion of the High-Speed Diesel Engine test plan outlined in the FQP project.

*Underscored numbers in parentheses indicate references listed at the end of the report.

1.1.2 High-Speed Diesel Engine Test Plan

The High-Speed Diesel Engine (HSDE) (4) test plan objective was to determine fuel property limitations on the performance and durability of Navy high-speed diesel engines. The HSDE test plan was outlined to evaluate fuel property impacts on diesel engine performance, utilizing a multi-faceted approach. The test plan was divided into five areas of study: fuel injection, cold startability, durability, thermal stability, and performance.

1.1.2.1 Fuel Injection Evaluations

The injection of fuel into the combustion chamber of a diesel engine is of primary importance in determining the performance of the engine. The density, viscosity, and surface tension of the fuel affect the atomization, and thus the combustion efficiency, in the engine. The injection study addresses the injection performance of a wide range of distillate fuels in the fuel injection systems prevalent in the Navy fleet.

1.1.2.2 Cold Startability Evaluations

The Navy's requirement to start engines at low ambient temperatures places minimum cetane number requirements on future fuels. The viscosities of candidate fuels must be sufficiently low to allow filling of the injector/injection pump and provide adequate spray formation. The study addresses the roles of cetane number, viscosity, and volatility on low-temperature starting.

1.1.2.3 Durability Evaluations

Diesel engine durability problems are, by their nature, difficult to predict and quantify. Wear in an engine is unavoidable, and rapid wear may be tolerable if the condition does not lead to failure or unacceptable performance degradation prior to the normal rebuild interval. Off-specification fuels can be expected to cause many durability problems. Among these are fuel-injection-system sticking and wear, piston-ring and cylinder-liner wear, valve erosion/corrosion, excessive lubricating-oil degradation, fuel-injector tip plugging, and combustion-chamber deposits. Fuel properties such as sulfur content, trace metals, end boiling point, thermal stability, carbon residue, total acid number, and ash content all play a role in determining the expected life of a fuel/engine combination. The study will evaluate the durability of high-speed diesel engines on fuels with off-specification, fuel-property variation extremes with respect to a baseline durability evaluation.

1.1.2.4 Thermal Stability Evaluations

Poor thermal stability in a diesel engine results in the formation of deposits on hot surfaces that are in contact with the fuel. The net result is poor fueling, which causes power loss and degraded performance. The extremely close tolerances within the fuel-injection system are sensitive to thermal stability. The study will first address the formation of deposits that will result in bench-test failure, then relate these results to full-scale engine tests.

1.1.2.5 Performance Evaluations

Adequate performance of a diesel engine may be defined as the ability to start and run under load as required to satisfy the equipment's mission requirement. The cetane number, viscosity, specific gravity, volatility, and aromatic content of the fuels must be in the correct range to ensure startability, burn efficiently, and provide the required power. The performance evaluations address combustion, full-load, and mission-load performance.

1.2 High-Speed Diesel Engine Performance Evaluation Objectives

The objective of the performance evaluations was to determine the limits of fuel properties that will provide fuels of acceptable performance in Navy high-speed diesel engines in terms of an engine's ability to dependably produce the necessary level of power required to accomplish its mission. The test conditions included in the performance tests will provide simulations of generator set loads and speeds, propulsion loads and speeds, and determinations of maximum and full-rack power over the entire engine-speed range. In addition, the performance testing will include a more fundamental study of the relationship of fuel properties to various combustion phenomena measured in one cylinder of each test engine.

1.3 Overview

The high-speed diesel engine test plan was developed based on the following criteria:

- Test Engine Selection – equipment surveys
- Test Fuels – worldwide availability and property variations
- Lubricating Oil – military specifications
- Test Cycles – Navy equipment mission profiles.

1.3.1 Diesel Engines Evaluated

Based on the population of high-speed diesel engines in the Navy's inventory (Table 1), the five engines (or engine families) included in the test plan were the Detroit Diesel Corporation (DDC) 53, 71, and 149 series engines, the Westerbeke 4-108, and the Cummins NH-220G. The injection/combustion systems on these engines are representative of approximately 94 percent of all Navy high-speed diesel engines.

The performance evaluations for the DDC 8V-149TI were conducted by the National Institute for Petroleum and Energy Research (NIPER) in Bartlesville, Oklahoma. The DDC 4-71N and Westerbeke 4-108 engines were evaluated by the Naval Ship Systems Engineering Station (NAVSSES) in Philadelphia, PA. The DDC 6V-53N and the Cummins NH-220G were evaluated at the U.S. Army TARDEC Fuels and Lubricants Research Facility (TFLRF) at Southwest Research Institute (SwRI) in San Antonio, Texas. The results of the performance evaluations for the DDC 6V-53N and Cummins NH-220G are the subject of this document.

TABLE 1. Navy High-Speed Diesel Engines

Engine Type	Total Population (Units)*	Injection Type
DDA/71 series	1028	DDA
DDA/149 series	82	DDA
DDA/53 series	135	DDA
Waukesha/L1616DSIN	21	Modified DDA
Waukesha/L1616DN	2	Modified DDA
Hercules/DFXD	35	Bosch APE, Pintle
Hercules/DFXE	2	Bosch APE, Pintle
Cummins/NH220	52	Cummins PT
Cummins/VA3000M	2	Cummins PT
MTU/8V331TC80	12	ND
Buda/6LD468	2	ND
Westerbeke 4-107/108**	351	CAV,Pintle
Gray/4D129	8	ND
Gray/6D427	6	ND

*Taken from "Navy Shipboard Fuels Flexibility Program Task A," Tables 3-1 and 3-2 (both tables as of 9/30/81)
**The Westerbeke 4-107 uses a wet cylinder liner while the 4-108 uses a dry cylinder liner

1.3.2 Test Fuels

Engine power and combustion performance were evaluated using nine different test fuels to determine the limits of fuel properties that would provide acceptable performance in high-speed diesel engines. The variations in the selected fuel properties were based on the experimental results from a 1983 U.S. Army distillate fuel property/engine performance study (5). Viscosity, aromatic hydrocarbons, specific gravity, and volatility were the primary properties of interest.

The special test fuels were blended and distributed by NIPER, along with the JP-5 fuel included in the fuels matrix. The baseline fuel was a MIL-F-16884H, Naval Distillate (NATO F-76), which was procured and supplied by the David Taylor Research Center (DTRC).

1.3.3 Lube Oil

MIL-L-9000G (Amendment 4) (6) crankcase lubricant was used in all performance evaluations. SAE 30 grade was the viscosity classification of the performance lubricant that was used for all high-speed diesel engine tasks.

1.3.4 Test Cycle

The test cycle for the five Navy engines evaluated for performance depended upon the engine's service application in the fleet. Engines with generator and/or propulsion service had operating conditions selected to reflect their mission. All engines underwent evaluations at full rack at speeds across the engine operating range.

2.0 TECHNICAL APPROACH

2.1 Test Plan

The High-Speed Diesel Engine Performance test plan (7) was developed to define a procedure with representative high-speed diesel engines in order to determine fuel property relationships as a function of performance parameters. The key fuel properties were examined for their effects on power level, fuel consumption, and combustion variables. The test plan was written to enable the three performing

organizations to follow the same test protocols. This section describes the details of the testing performed by TFLRF.

2.1.1 Engines

TFLRF examined the Detroit Diesel Corporation 6V-53N and the Cummins NH-220G engines. Each engine's performance was analyzed at speed and load points significant to their respective duty cycles and at full-rack power conditions.

2.1.1.1 DDC 6V-53N

The Detroit Diesel Corporation 6V-53N engine Model 5062-7000 is a two-stroke cycle, uni-flow scavenged, quiescent chamber, direct-injection diesel engine used by the Navy as a generator set and a main propulsion unit. Typical engine technical specifications are shown in Table 2. For generator service simulations, the engine was operated at 1800 RPM, full rack, and 20 to 75 percent loads. For propulsion simulations, the engine was operated at the propeller loads that corresponded with engine speeds of 1400, 1800, 2200, 2500, and 2800 RPM. The tests were also conducted at full rack for these five speeds.

Figure 1 details the full-rack brake horsepower, brake torque, and brake specific fuel consumption (BSFC) for the DDC 6V-53N across its speed range, utilizing the Navy distillate base fuel. All performance values shown are observed values, i.e. not corrected to standard atmospheric conditions.

Table 2. - DDC 6V-53N Model 5062-7000 Engine Specifications

Cycle	2
Configuration	90°V
Number of Cylinders	6
Bore, inches	3.875
Stroke, inches	4.5
Displacement, in^3	318
Compression Ratio	21:1
Combustion	Uni-flow Scavenged, Quiescent Chamber, Direct Injector
Fuel Injection	N50 Unit Injector
Injection Timing (static)	18°BTDC
Rated Output (corrected)	197 Bhp @ 2800 RPM

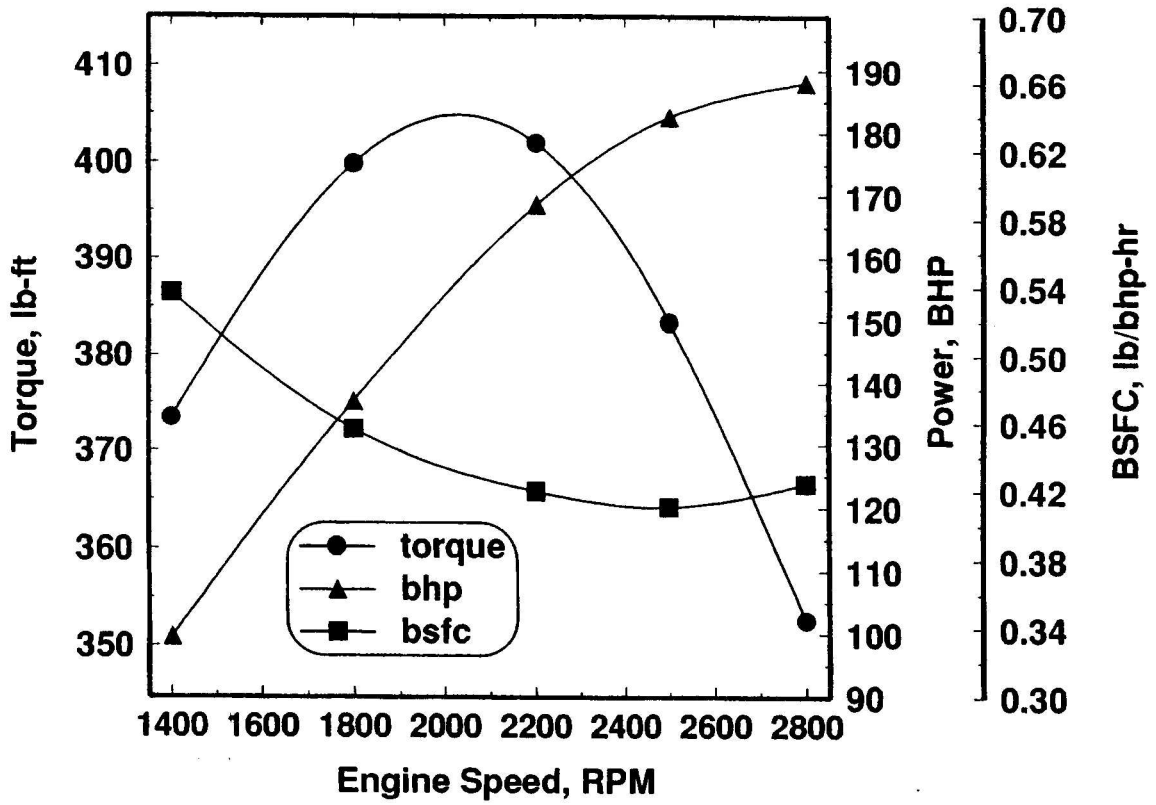

Figure 1. DDC 6V-53N Full-Rack Performance Curves

The Detroit Diesel family of diesel engines is unique due to the two-stroke cycle, high-rated engine speed, and high power density. The combination of the two-stroke cycle and high-rated engine speed results in severe duty for the fuel injection system. The unit injector fuel system in a two-stroke engine must inject fuel in each cylinder on every crankshaft revolution, which is 2800 injections/minute per injector for the DDC 6V-53N at rated speed. This would be analogous to a four-stroke diesel engine fuel injection system operating at 5600 RPM. The DDC 53 series engines in U.S. Army service have shown a sensitivity to lubricants and fuels (8). This fuel sensitivity impacts exhaust valve durability, injector life, and engine deposits.

To ensure that the proper engine configuration was used for the performance evaluations, the engine component part numbers from the Navy APL for the DDC 6V-53N model 5062-7000 were obtained. Only the part numbers specified on the APL were utilized for the engine build-up prior to the performance evaluations. Only original Detroit Diesel parts were used in the engine build, along with all procedures and practices specified in the Detroit Diesel 53 Series technical and service manuals (9). The break-in procedure

for the DDC 6V-53N detailed in Table 3 was followed before the initiation of performance testing. The severe duty of the unit injector fuel system on the two-stoke diesel engine warranted the development of a protocol for verifying unit injector performance.

TABLE 3. Engine Break-In Schedules

DDA 6V-53N			Cummins NH-220G		
Time,min	**Speed,rpm**	**Power,bhp**	**Time,min**	**Speed,rpm**	**Power,bhp**
15	1500	30	10	800	0
30	2200	130	To temp	1575	110
30	2800	171	15	2100	166
			15	2100	188
			15	2100	198
			15	2100	220

DDC has developed a series of tests to: 1) determine the need for rebuilding a fuel injector, 2) calibrate injector fuel delivery rate, and 3) evaluate the quality of the fuel atomization and spray pattern. These tests were used in the injector checkout phase of this performance evaluation program. These tests, and the apparatus used to conduct them, are fully described in the technical and service manuals. Wherever possible, the procedure and apparatus specified in these manuals were used. The tests are described below:

- Calibration - measures the volumetric fuel output of the injector per 1,000 strokes.
- Unit Hold Time - measures the pressure leak down rate of the injector.
- Pop Condition - qualitatively assesses the injector valve opening and spray pattern.
- Pop Pressure - measures the pressure at which the needle valve opens and fuel is injected.
- Tip Dryness - assesses spray tip leakage or "dribble."
- Needle Travel - measures the needle valve lift.

Calibration, Unit Hold Time, Pop Pressure, Tip Dryness, and Needle Travel tests evaluate whether or not the injector is within operating specifications. The specifications for the DDC N50 injectors used at TFLRF are shown in Table 4.

TABLE 4. DDC N50 Fuel Injector Specifications

	DDC N50	Units
Series Number	53	--
Parts Catalog Type	74	--
Assembly Part Number	5228783	--
Plunger Design	5N	--
New P&B Part Number	5228749	--
New Tip Part Number	5229034	--
Spray Tip Designation	6-.006-165°A	--
Minimum Thickness:		
Spray Tip (shoulder)	0.199	In.
Check Valve Cage	0.163-0.165	In.
Check Valve	0.022	In.
Valve Spring Cage	0.602	In.
Filter Cap Torque	65-75	Ft-lb
Injector Nut Torque	75-85	Ft-lb
Calibration (fuel output rate)	53-58[a]	Cc/1000 strokes
Unit Hold Time (time to leak down from high to lower pressure)	>15 from 450 psi to 250 psi	Sec.
Pop Pressure (valve open)	2200-3200	Psi
Tip Dryness	Should be no fuel droplets, slight wetting is permissible	In.
Needle Travel (valve lift)	0.008-0.018	In.
Pop condition	Beginning and end of spray should be sharp and fuel well-atomized	

[a]Stewart & Stevenson, and some versions of the 53 Series manual report this value as 50-55 cc/1000 strokes

All injector inspections conducted at TFLRF (except as noted) were performed using DDC-suggested test procedures and test equipment. The injector flow calibrations were performed at Stewart & Stevenson because that test apparatus was not available at SwRI. A Millers Falls depth micrometer fitted with a hollow spindle was used to measure injector needle travel. The depth micrometer was used in place of the DDC-suggested Kent Moore J9462-02 tool. The depth micrometer was placed on a flat surface and a reading was taken. The micrometer is then held tightly against the spray tip and needle valve assembly, with the quill of the needle valve inside the hollow spindle. The depth micrometer was then adjusted and a second reading taken; the difference between the two micrometer readings equals the needle valve travel. The Detroit Diesel injector inspections are in Appendix A.

2.1.1.2 Cummins NH-220G

The Cummins Engine Company Model NH-220G engine is a four-stroke cycle, direct injected diesel engine that operates in Navy service as a generator set. Typical engine technical specifications are shown in Table 5. The generator simulations were performed at 1800 RPM, with full rack and 20 to 75 percent loads. Full rack performance tests were also conducted at speeds of 1100, 1300, 1500, 1800, and 2100 RPM. Figure 2 details the full-rack brake horsepower, brake torque, and brake specific fuel consumption (BSFC) for the Cummins NH-220G across its speed range, utilizing the Navy distillate base fuel.

Cummins diesel engines are unique due to their Pressure-Time (PT) fuel injection systems. The PT-system uses a governed fuel pump to supply a regulated fuel pressure to the common fuel rail that supplies the injectors for each cylinder. The regulated fuel rail pressure is a function of the load demand on the engine, with full-rack fuel pressures on the order of 145 psig at 2100 RPM. The fuel injectors are an open-cup design, which contains a metering orifice to control the fuel quantity in the injector cup. After the fuel metering stroke, the injector plunger forces the fuel from the cup into the cylinder at extremely high pressures, then the plunger seals the injector cup from the combustion chamber. The fuel metering and injection process are controlled by the fuel-injection cam-lobe profile, rail pressure, and engine speed. The fuel injection volume depends on the cam profile, rail pressure, metering orifice, and the pressure in the injector cup during the metering interval. These variables result in a start of injection that varies with engine load. Prior to testing, the PT-system fuel pump was calibrated to Navy nameplate specifications by a certified Cummins distributor.

To ensure the proper engine configuration was utilized for the performance evaluations, the engine component part numbers from the Navy APL for the Cummins model NH-220G were obtained. Only part numbers specified on the APL were to be utilized for the engine build-up prior to the performance evaluations. Due to the product age of the Cummins NH-220G, several of the Navy APL part numbers were obsolete. The replacement part numbers were obtained and are shown in Appendix A. All other parts matched the APL numbers. Only original Cummins parts were used in the engine build, along with all procedures/practices as specified in the Cummins NH Series technical and service manual (10). The break-in procedure for the Cummins NH-220G detailed in Table 3 was followed before the initiation of performance testing.

TABLE 5. - Cummins NH-220G Engine Specifications

Cycle	4
Configuration	In-line
Number of Cylinders	6
Bore, inches	5.125
Stroke, inches	6.0
Displacement, in^3	743
Compression Ratio	15.5:1
Combustion	Naturally Aspirated, Quiescent Chamber, Direct Injection
Fuel Injection	Common Rail, Pressure-Time (PT) Injector
Injection Timing (static)	19°BTDC
Rated Output (corrected)	200 Bhp @ 2100 RPM

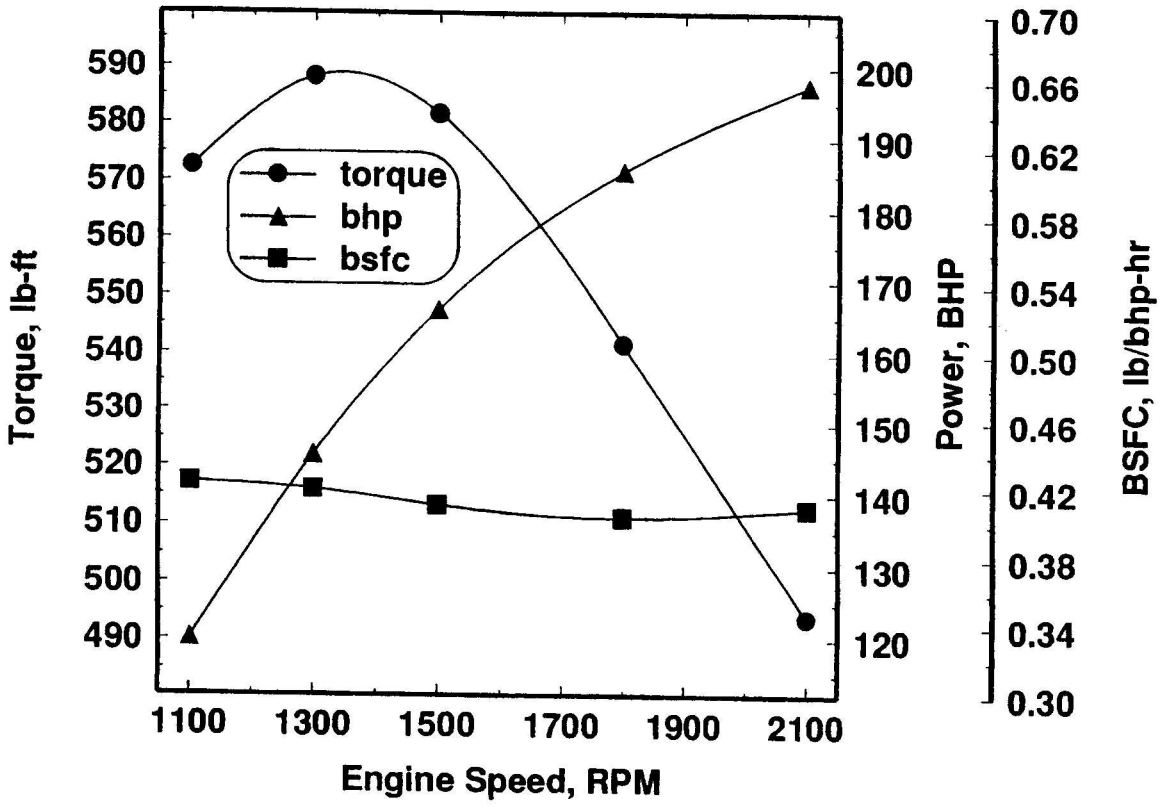

Figure 2. Cummins NH-220G Full-Rack Performance Curves

2.1.2 Test Fuels

Table 6, Table 7, and Table 8 set forth the descriptions, volume compositions, and targeted values of the properties that constitute the primary fuel variables for the nine test fuels included in the performance evaluation. Both combustion and power production evaluations were carried out using these fuels.

F-76 is included in these combustion and performance evaluations to provide a baseline of current Navy fuel as well as to provide continuity throughout the remainder of the FQP High-Speed Diesel Engine program.

HD-1 represents a fuel with a high 90% evaporated distillation temperature (90% ET), a low viscosity and a high hydrogen (low aromatics) level. Fuels having low volatility tend to reduce power output and fuel economy as a result of poor atomization, while those having high volatility may reduce power output and fuel economy through vapor lock in the fuel system or inadequate droplet penetration from injector nozzles. HD-1 represents a fuel that exceeds distillation and viscosity limits for F-76 but is still a true distillate fuel. Many hydrocarbon liquids undergo cracking reactions around 316°C. Only the most stable hydrocarbons can withstand temperatures above 370°C and therefore be classified as distillate.

Test fuels HD-4, -6, -7, and -10 were selected from the injection studies matrix to aid in the understanding of possible differences in performance among the fuels tested. Viscosity and hydrogen levels for the test fuels common to both injection and performance testing are shown in Table 9.

TABLE 6. High-speed Diesel Engine Performance Test Fuel Descriptions

Test Fuel No.	Description
BF-2 (BF02)	Base fuel (NATO F-76/MIL-F-16884H)
HD-1 (TF01)	High 90% evaporated distillation temperature
HD-4 (TF07)	Low Viscosity, low hydrogen
HD-6 (TF08)	Medium viscosity, high hydrogen
HD-7 (TF09)	Medium viscosity, medium hydrogen
HD-10 (TF02)	High viscosity, high hydrogen
HD-13 (TF10)	Low viscosity, low hydrogen
HD-14 (TF26)	JP-5
HD-21 (TF34)	High viscosity, low hydrogen

TABLE 7. Composition of High-Speed Diesel Engine Performance Test Fuels

Test Fuel No.	Test Fuel Specification	Estimated concentration, Percent by Volume							
		Base Fuel BF-2	Telura 126	Telura 415	Telura 521	Telura 619	Heavy Aromatic Naphtha	Jp-5	Total
BF-2	Baseline (NATO F-76)	100	--	--	--	--	--	--	100
HD-1	TF-1	28.41	16.11	41.27	--	--	--	14.21	100
HD-4	TF-2	25.32	46.34	3.15	--	--	--	25.19	100
HD-6	TF-7	--	7.35	--	--	80.25	12.40	--	100
HD-7	TF-8	--	25.10	--	--	62.80	12.10	--	100
HD-10	TF-9	1.64	16.08	--	82.28	--	--	--	100
HD-13	TF-10	49.01	34.13	--	--	--	16.86	--	100
HD-14	TF-26	--	--	--	--	--	--	100	100
HD-21	TF-34	4.70	78.80	--	16.50	--	--	--	100

Table 8. Targeted and Expected Primary Fuel Properties of High-Speed Diesel Engine Performance Test Fuels

Property	BF-2	HD-1	HD-4	HD-6	HD-7	HD-10	HD-13	HD-14	HD-21
Specific Gravity	(0.8376)[1]	0.87	0.89	0.87	0.89	0.89	(0.89)	(0.8168)	0.94
Kinematic viscosity, mm2/sec @40°C	(3.27)	6	5	12	12	19	(4.18)	(1.52)	19
Total aromatics, % by weight	(20)	(30)	(45)	(30)	(40)	(30)	(50)	(16)	(64)
Total Hydrogen % by weight	(13.56)	13.07	12.34	13.07	12.58	13.07	12.10	(13.77)	11.4
Distillation:									
10% evap, °C	(250)	(225)	(228)	(228)	(285)	(345)	(235)	(200)	(332)
90% evap, °C	(315)	(390)	(370)	(396)	(396)	(405)	(360)	(234)	(401)

[1] Value shown in parentheses are not targets. They are representative of the properties expected for those fuels and are included to provide an indication of the relationship of blended fuel properties to base fuel properties.

Table 9. Test Fuels Common to High Speed Diesel Engine Performance and Fuel Injection Studies

Test Fuel No.	Description	Viscosity at 40°C Mm^2/sec	Hydrogen, weight percent
HD-4 (TF07)	Low viscosity, low Hydrogen	5.0	12.34
HD-6 (TF08)	Medium viscosity, high hydrogen	12.0	13.07
HD-7 (TF09)	Medium viscosity, medium hydrogen	12.0	12.58
HD-10 (TF02)	High viscosity, high hydrogen	19.0	13.07

A comparison of test fuels HD-1, -7, and -10 indicated that they are all high 90-percent point fuels with an extremely wide range of viscosities. This variation occurs because HD-1 is nearly a full-range distillate while HD-7 and HD-10 contain substantial concentrations of blending components obtained as narrow distillation fractions selected for their particular blending characteristics with respect to viscosity and hydrogen level.

The variations in fuel properties chosen for the high-speed diesel test program were based on the experimental results of the aforementioned U.S. Army engines/fuels test program (4). In that program, four military engines were tested to determine the effect of fuel properties on engine performance. These engines were the Detroit Diesel Corporation (DDC) 4-53T, Continental Motors LDT-465-1C, Cummins NTC-350, and Caterpillar 3208T. For that program, 18 fuels were blended to attain wide variations in kinematic viscosity, cetane number, 10-percent evaporated temperature (10-percent ET), and aromatic content. Each of the 18 fuels was run at the same relative speed and energy levels in each engine. Loads from the given speed/energy points were analyzed using multiple regression analysis, yielding a stable load prediction equation for each engine with energy, speed, aromatic content, kinematic viscosity, and 10-percent ET as the independent variables. Two additional fuel blends were cross-validated. Predicted loads agreed well with observed loads for these fuels, except at low speed-energy points in some engines.

Highly aromatic fuels adversely affected the performance of the 4-53T engine. Low 10-percent ET fuels adversely affected the performance of the LDT-465-1C engine. Neither the NTC-350 nor the 3208T engines was significantly affected by changes in fuel properties over the ranges tested. In general, the 3208T engine produced the highest load per unit of energy input, primarily because the engine was derated as a result of the mis-calibration of the injection system by the manufacturer. The 3208T was operated significantly below its rated power, and the results obtained are considered a subset of total engine performance. This series of Army tests did not address maximum power availability, cold weather operation, or long-term operational problems that could arise from operation with off-specification fuels.

The study cited above and others conducted by various investigators have shown that high-aromatic content diesel fuels tend to be associated with low cetane number and poor combustion efficiency, which can lead to soot and carbon deposits as well as excessive smoke. Analytical procedures for the routine measurement of the aromatic content of diesel fuels are not currently well developed. This is particularly true with respect to fuels that vary in properties as widely as those selected for the performance test plan. Thus, a small study was performed at NIPER to correlate the total aromatics and total hydrogen content of pilot fuel blends. The study, discussed in detail in the test plan, indicated fuel aromatics could be predicted to a high degree of accuracy

by the easily measured fuel hydrogen content. The fuel aromatic targets for the test blends were replaced with fuel hydrogen targets.

Test fuels HD-1, -4, -6, -7, and -10 provide variations in viscosity and hydrogen content covering low, medium, and high levels of each of these variables, while HD-13 provides an extremely low viscosity with very low hydrogen content and HD-21 provides high viscosity and very low hydrogen content. Most commercial distillate fuels have an aromatics content in the range of 30 to 35 percent (corresponding to 12.8 to 13.1 percent hydrogen). An extreme test fuel case of 64 percent aromatics (11.40 percent hydrogen) was selected as an increase of 100 percent over the median of 30 to 35 volume percent.

Test fuel HD-14, a JP-5 grade fuel, has a maximum allowable 10-percent ET of 205°C (per MIL-T-5624L, Amendment 1) (11) and was included because it is a readily available emergency fuel for both the Navy and Marines that is used aboard ships for fueling aircraft.

All blended test fuels were produced at NIPER and made available to all test participants in the quantities needed for testing. TFLRF received 275 gallons of each test fuel in five, 55-gallon drums that were kept in covered storage until utilized.

2.1.3 Test Lube

The crankcase lubricant utilized for all performance evaluations at TFLRF was a qualified MIL-L-9000G (Amendment 4) product. TFLRF also supplied the same MIL-L-9000G lubricant to NAVSSES for the DDC 4-71N and Westerbeke 4-108 evaluations. Table 10 shows the specification properties of the MIL-L-9000G lubricant utilized for testing, which was selected from the QPL-9000 qualified product list, with a manufacturer's designation of Motrex 651.

Table 10. MIL-L-9000G Lubricant Specification Properties

Lubricant Property	ASTM Test Method	Specification Requirement
Gravity, °API	D 287	Report
Sulfur, wt%	D 129	Report
Kinematic Viscosity at 100°C, cSt	D 445	11.9 – 14.5
Viscosity Index	---	Report
Flash Point, °C, min.	D 92	199
Pour Point, °C, max.	D 97	-12
Sulfated Ash, wt%	D 874	Report
Contamination, mg/gal	---	10
Zinc, wt%	D 811	Report
Phosphorus, wt%	D 1091	Report
Barium, wt%	D 811	Report
Magnesium, wt%	D 811	Report
Nitrogen, wt%	(Kjeldahl method)	Report
Calcium, wt%	D 811	Report
Chlorine, wt%	D 808	report

2.1.4 Test Cycle & Protocol

Table 11 summarizes the independent and dependent variables included in the combustion portion of the performance evaluations, while Table 12 summarizes independent and dependent variables in the power production portion. The performance evaluations will be conducted with each engine using the speed-power points summarized in Table 13 and Table 14. The full-rack conditions will identify any power loss problems that might accrue with the test fuels. In addition, fuel consumption data will be taken under the part and full load conditions, as a means of describing overall engine performance changes in terms of brake specific fuel consumption (BSFC). Under part-load conditions, the injector rack will be advanced until the desired horsepower is achieved. In these cases, since comparisons among fuels will not be possible on a power basis, BSFC will be the dependent variable.

Table 11. Independent & Dependent Variables for Combustion Analysis

Independent	Dependent
Speed	Maximum cylinder pressure
Load	Maximum rate of cylinder pressure rise
Fuel Properties	Maximum Instantaneous heat release rate
	Cumulative heat release
	Relative (to base fuel) ignition delay
	Smoke opacity
	Apparent combustion efficiency
	Observed brake thermal efficiency

Table 12. Independent and Dependent Variables for Power Production Analysis

Independent	Dependent
Full-Rack (Full Load):	
Speed	Load
Fuel Properties	Brake specific fuel consumption (BSFC)
Part Load:	
Speed	Brake specific fuel consumption (BSFC)
Fuel Properties	

TABLE 13. DDC 6V-53N Engine Speed-Power Points

		Description of Speed/Power Point Simulation or Application		
		Type of Load Simulated		
RPM	BHP	Generator Set	Propeller	Maximum Power Point
2800	Full-Rack	–	X	X
2500	Full-Rack	–	–	X
2500	146	–	X	–
2200	Full-Rack	–	–	X
2200	100	–	X	–
1800	Full-Rack	X	–	X
1800	100	X	–	–
1800	54	X	X	–
1800	29	X	–	–
1400	Full-Rack	–	–	X
1400	27	–	X	–

TABLE 14. Cummins NH-220G Speed-Power Points

		Description of Speed/Power Point Simulation or Application		
		Type of Load Simulated		
RPM	BHP	Generator Set	Propeller	Maximum Power Point
2100	Full-Rack	–	–	X
1800	Full-Rack	X	–	X
1800	133	X	–	–
1800	100	X	–	–
1800	48	X	–	–
1800	16	X	–	–
1500	Full-Rack	–	–	X
1300	Full-Rack	–	–	X
1100	Full-Rack	–	–	X

The speed-power points shown in Tables 13 and 14 were chosen on the basis of the application of each engine model in Navy service and include conditions that represent both full and part-load operation in generator service, as well as conditions that represent the way the engine might be operated in service as a propulsion engine (propeller loaded).

Maximum power points were derived from maximum power versus speed curves for each engine at each laboratory. Propeller loads were calculated using the relationship:

$$PP = K \bullet N^3$$

Where: PP = horsepower absorbed by the propeller

N = propeller speed, revolutions/minute

K = propeller constant

The propeller constant, K, was derived using the assumption that propellers are typically designed to absorb maximum engine power at rated engine speed. Therefore, K was readily derivable from a knowledge of rated speed and maximum power from which power absorption at lower speeds could be calculated. The value of K utilized for calculating propeller loads was 8.97e-09 Bhp/RPM for the DDC 6V-53N.

Generator set loads were selected to cover a range from minimum to maximum power at synchronous speed (1800 RPM), with intermediates at intervals of 20-75 percent of maximum power. In the case of the DDC 6V-53N where the propeller load at 1800 RPM and a generator load point were reasonably close, the generator load was made equivalent to the propeller load.

2.1.4.1 Full-Rack Power Check

The full-rack power check is defined as the engine fuel rack opened to the rack position that obtains 100-percent rated power using Navy reference fuel BF-2. The power check is to be performed at selected engine speed across the engine operating speed range. The engine speed ranges were defined by Navy nameplate speed and load, duty cycle, propeller loads, or manufacturer's specification.

The 100-percent power level will be the rack position at which the Navy nameplate speed and engine rating are obtained using Navy reference fuel. The rack on the fuel injection pump was blocked (stopped) at the position at which the 100-percent power level was obtained, and defined as full rack. At all engine speeds during the full-rack power check, the fuel rack was opened up against the previously determined full-rack stop. The engine speeds for the full rack power check are shown in Table 15.

TABLE 15. Speed-Power Points For Full-Rack Power Check*

DDA 6V-53N	Cummins NH220G
2800	2100
2500	1800
2200	1500
1800	1300
1400	1100

*Entries represent the engine speeds (rpm) at which observed brake horsepower and cylinder pressure measurements are to be determined while the injector rack is at full travel. Care will be taken to ensure that the engine is stabilized at the desired conditions before taking a set of readings. These full-rack power checks are to be carried out using only the BF-2 (NATO F-76) base fuel.

All the horsepower operating points for the DDC 6V-53N and Cummins NH-220G were set as corrected brake horsepower. The observed power readings at ambient temperature, humidity, and barometric pressure were corrected to standard conditions of 101.03535 kPa (dry) and 37.8°C. The dry barometric pressure was adjusted for the partial pressure of water vapor in the air utilizing the methods of Code of Federal Regulations, Title 40, Part 86.344-79.(12) The power correction was performed utilizing the Navy correction equation from MIL-E-24455.(13)

2.1.4.2 Protocol

A strict protocol, as outlined in the HSDE performance evaluation test plan, was followed in order to ensure the quality of the test data. The protocol outlined the procedures for each test fuel evaluation with each engine.

2.1.4.2.1 Preparation for Testing

Prior to initiation of the performance evaluations of each fuel, efforts were made to assure that only the desired test fuel was in the engine fuel system. Preparations were initiated by draining the filter housings to remove any previous fuel. The fuel supply line was disconnected at both ends, purged of any previous fuel, and flushed thoroughly by twice the total volume of the fuel supply line system, then reconnected at the engine and the new fuel source. All volumes in the supply system were flushed. The fuel return line was disconnected at the engine and at the fuel day tank, and thoroughly purged of the previous fuel. A temporary return line was then connected to the return system at the engine and its open end placed into a waste fuel container. The engines were started and operated for 15 minutes under idling conditions to assure that all previous fuel in the pump, injectors, lines, etc., were consumed by the engine and that the system was filled with the new fuel. The engine was then shut down, the temporary return line and waste fuel container removed, and the permanent return line connected at the engine and the fuel system day tank.

2.1.4.2.2 Warm-up

Prior to starting the engine for warm-up, the dipstick was checked to ensure that the engine contained sufficient lubricant. If necessary, the lubricant level was adjusted utilizing MIL-L-9000G engine oil. Using the desired test fuel, the engine was started and idled. The coolant outlet temperature was brought up to and maintained at 77° ± 2°C, the fuel temperature at 32° ± 2°C, and the inlet air supply at 38° ± 2°C.

2.1.4.2.3 Smokemeter Lens Cleaning and Adjustment of Purge Air

Smokemeter lenses were cleaned using a lens airbrush followed by a thorough cleaning with optical lens tissues and lens cleaning solution. With either the detector or emitter assembly removed from the smoke meter and the engine operating at rated speed and minimum load, the purge air pressure was adjusted upward until the outward flow of exhaust gas from the smoke sampling cross reverses to an inward flow of air into the cross. When this flow reversal was achieved, the purge air pressure regulator was fixed.

2.1.4.2.4 Operating Conditions

The engine was thoroughly warmed up on the proper fuel as described in the warm-up section above. Coolant, fuel, and inlet air temperatures were be controlled to fall within the following ranges:

	Control Point, °C
Fuel Temperature	32 ± 2
Inlet Air Temperature	38 ± 2
Coolant Out Temperature	77 ± 2

The exhaust back pressure under full-rack conditions at rated speed was adjusted to 50 ± 2 mm of mercury gage by use of a butterfly restriction in the exhaust pipe. The restriction remained at the one position for all test conditions.

The engine tests were performed starting at the highest speed and load, working toward the lowest. At each test point in the matrix, the operator would monitor the stability of the engine by checking the oil sump temperature. The oil sump temperature was chosen because it typically has the slowest response to a test point change. Prior to data acquisition, the exhaust pressure and fuel, inlet air, and coolant temperatures were checked for conformance to the above specifications. After the engine stabilized, the operator completed the log sheets, Figures 3 and 4, and initiated both the low- and high-speed computer data acquisition. Upon completion of the cylinder pressure acquisition, the pressure histories were reviewed to ensure that the data acquisition system performed properly. When the matrix for each test fuel was completed, the data were transferred across a computer link to a larger machine for the heat release, combustion analysis, and storage. These procedures were followed for each fuel/engine combination.

2.1.4.2.5 Order of Testing of Performance Fuels

The performance test fuels were to be tested in the following order:

1. BF-2 (BF02)
2. HD-14 (TF26)
3. HD-13 (TF10)
4. HD-10 (TF02)
5. HD-4 (TF07)
6. HD-6 (TF08)
7. HD-7 (TF09)
8. HD-1 (TF34)
9. HD-21 (TF01)

DETROIT DIESEL ALLISON 6V-53N LOG SHEET						
LABORATORY						
TEST NO.	**FUEL**		**DATE**		**PAGE**	
Operator						
Time (24-hour clock)						
Test Hour						
Speed, RPM						
Load, lb-ft						
Fuel flow, lb/hr						
Exh. Opacity,%						
TEMPERATURE, DEG.F						
Water In						
Water Out						
Oil Sump						
Fuel						
Inlet Air						
Airbox						
Wet Bulb						
Dry Bulb						
Exhaust Port 1L						
Exhaust Port 2L						
Exhaust Port 3L						
Exhaust Port 1R						
Exhaust Port 2R						
Exhaust Port 3R						
Exhaust Common						
PRESSURES, PSIG						
Air After Blower						
Fuel Transfer						
Oil Gallery						
LOW PRESSURES						
Intake Vac, in. water						
Exh. Comm, in. water						
Blowby, in. water						
Barometer, in. Hg						

Figure 3. DDC 6V-53N Operator Log Sheet

CUMMINS NH-220 LOG SHEET						
LABORATORY						
TEST NO.	**FUEL**		**DATE**		**PAGE**	
Operator						
Time (24-hour clock)						
Test Hour						
Speed, RPM						
Load, lb-ft						
Fuel flow, lb/hr						
Exh. Opacity,%						
TEMPERATURE, DEG.F						
Water In						
Water Out						
Oil Sump						
Fuel						
Inlet Air						
Wet Bulb						
Dry Bulb						
Exhaust Port 1						
Exhaust Port 2						
Exhaust Port 3						
Exhaust Port 4						
Exhaust Port 5						
Exhaust Port 6						
Exhaust Common						
PRESSURES, PSIG						
Fuel Pump						
Oil Gallery						
LOW PRESSURES						
Intake Vac, in. water						
Exh. Comm, in. water						
Blowby, in. water						
Barometer, in. Hg						

Figure 4. Cummins NH-220G Operator Log Sheet

2.1.4.2.6 Operational Sequence

All performance fuels were tested in duplicate by performing two successive performance evaluations on each test fuel. Each individual performance evaluation on a test fuel was preceded by a full-rack power check using BF-2 base fuel over the entire speed range of the engine as a means for detecting any changes in the engine and its systems while holding the fuel constant. The following detailed sequence defines the steps that were followed in completing duplicate performance tests on each test fuel:

1. Carry out the steps included in section 2.1.4.2.1 - "Preparation for Testing." The system is to be prepared to run the Full-Rack Power Check on BF-2 base fuel.
2. Warm up the engine as described in section 2.1.4.2.2 - "Warm up."
3. Bring the engine to rated speed and minimum load and maintain this condition until equilibrium is achieved. Carry out the operations included in section 2.1.4.2.3 - "Smokemeter Lens Cleaning and Adjustment of Purge Air."
4. Refer to the Full-Rack Power Check conditions contained in Table 15 and the "Operating Conditions" in section 2.1.4.2.4. Conduct the Full-Rack Power Check sequence starting at the highest speed and proceed in order of descending speed while maintaining the fuel air and coolant temperatures specified. The Full-Rack Power Check must always be conducted using BF-2 base fuel. Adequate time to achieve equilibrium must be allowed at each condition. All data shown on the forms in Figures 3 and 4, plus all combustion data, will be recorded for each point in the Full-Rack Power Check.
5. Compute the corrected and observed brake horsepower for each speed level from the Full-Rack Power Check data obtained in step 4.
6. The corrected full-rack power and maximum pressure data obtained in steps 4 and 5 above should be compared to the 95-percent confidence bands for these measurements as computed from available data from Full-Rack Power Checks and the full-rack power points in the performance evaluation sequence. The confidence band computation must await, at minimum, the availability of data from the Full-Rack Power Check on BF-2 base fuel preceding the performance sequence on BF-2 plus the full-rack data from the first BF-2 performance run. As each new and valid Full-Rack Power Check and/or performance run is completed, the 95-percent confidence bands for power and maximum cylinder pressure are to be re-computed utilizing all available full-rack power data on BF-2.

7. If the Full-Rack Power Check data fall within the computed repeatability band, proceed to the next step in this Operations Sequence. If not, an attempt should be made to determine the reason(s) and correct the situation. Any extended difficulty in restoring the engine to full-rack power or maximum cylinder-pressure levels lying within the established repeatability band should be reported to the Project Officer at DTRC together with a recommended approach to solving the problem.

8. Repeat the "Preparation for Testing," section 2.1.4.2.1. This preparation will be for the first performance test on the next test fuel in the "Order of Testing of Performance Fuels" set forth in section 2.1.4.2.5.

9. Warm up the engine on the test fuel as described in section 2.1.4.2.2 - "Warm up."

10. Bring the engine to rated speed and minimum load, maintaining this condition until equilibrium is achieved. Then carry out the operations described in section 2.1.4.2.3 - "Smokemeter Lens Cleaning and Adjustment of Purge Air."

11. Refer to the performance evaluation speed/power Tables 13 and 14 and run the first complete load-speed series on the test fuel. Data acquisition is to proceed from the highest speed toward the lowest speed in order of descending load at each speed. The smokemeter lenses are to be cleaned with lens brush, lens cleaning solution and tissue upon completion of data acquisition at each load-speed point. However, if the smokemeter's opacity reading returns to zero + 1 percent without adjustment of the smokemeter amplifier gain when the engine is brought to idle speed, cleaning of the lenses may be omitted. All of the operating conditions previously cited are to be met during the traverse of the performance evaluation load-speed points. The data called for in the data sheets (Figures 3 and 4) are to be recorded completely and cylinder pressure data will be acquired at each point and saved to the applicable long-term storage device.

12. Complete "Preparation for Testing," section 2.1.4.2.1, switching back to BF-2 base fuel in preparation for the full-Rack Power Check.

13. Warm up the engine as per section 2.1.4.2.2 - "Warm up."

14. Bring the engine to rated speed and minimum load and maintain this condition until equilibrium is achieved. Then carry out "Smokemeter Lens Cleaning and Adjustment of Purge Air", section 2.1.4.2.3.

15. Refer to Table 15 and conduct the Full-Rack Power Check sequence in order of descending speed while maintaining the fuel, air and coolant temperatures specified. The Full-Rack Power Check is always carried out with BF-2 base fuel. Allow adequate time to achieve equilibrium at each condition. All of the data called for in Figures 3 and 4, plus all combustion data, are to be recorded for each point in the Full-Rack Power Check.

16. Compute the corrected and observed brake horsepower for each speed level from the Full-Rack Power Check data obtained in step 15.

17. The corrected full-rack power and maximum pressure data obtained in steps 15 and 16 should be compared to the most recently updated 95-percent confidence bands for repeatability of these measurements on BF-2 base fuel.

18. If the Full-Rack Power Check data fall within the computed repeatability band, proceed with the next step in this Operations Sequence. If not, attempt to determine the reason(s) and to correct the situation. Any extended difficulty in restoring the engine to power and cylinder pressure levels lying within the established repeatability band should be reported to the DTRC Project Office together with recommendations for solving the problem.

19. Repeat the "Preparations for Testing", section 2.1.4.2.1 This preparation will be for the second performance evaluation on the test fuel.

20. Warm up the engine on the test fuel as described in section 2.1.4.2.2 - "Warm-up."

21. Bring the engine to rated speed and minimum load, maintaining this condition until equilibrium is achieved. Carry out the operations described in section 2.1.4.2.3 - "Smokemeter Lens Cleaning and Adjustment of Purge Air."

22. Refer to the performance evaluation speed-power Tables 13 and 14 and run the second complete speed-power series on the test fuel. Data acquisition is to proceed from the highest speed toward the lowest speed in order of descending load at each speed. The smokemeter lenses are to be cleaned with lens brush, lens cleaning solution, and tissue upon completion of data acquisition at each load-speed point. However, if the smokemeter's opacity reading returns to zero + 1% without adjustment of the smokemeter amplifier gain when the engine is brought to idle speed, cleaning of the lenses may be omitted. All of the operating conditions previously cited are to be met during the traverse of the performance evaluation speed-power points. The data called for in the data sheets (Figures 3 and 4) are to be recorded completely and cylinder-pressure data will be acquired at each point and saved to long-term storage.

2.1.5 Engine Coolant

The engine coolant utilized was a 50/50 volumetric blend of ethylene glycol-based antifreeze and potable water.

2.1.6 Air Intake System

The normal engine-mounted, air-filter system assembly supplied with each engine was utilized. The airbox heaters on the DDC 6V-53N were left in place but not utilized for the evaluations.

The apparatus illustrated schematically in Figure 5 was employed to control the engine inlet air temperature. The coolant and air heat exchanger were sized appropriately to supply each test engine with inlet air controlled to 38° ± 2°C.

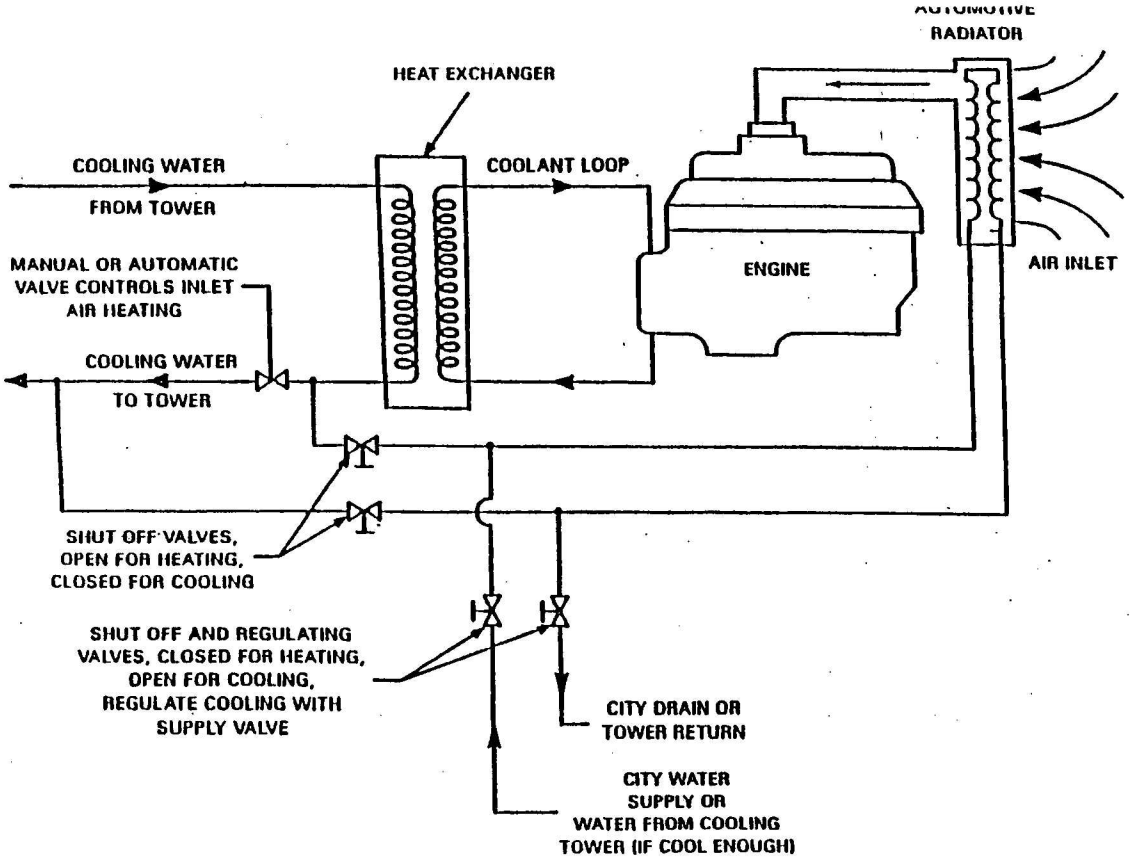

Figure 5. Engine Inlet air Temperature Control system Schematic

2.1.7 Engine Coolant Systems

The engine thermostats on both test engines were blocked in the open position for all performance evaluations. Each engine was filled with a 50/50 volumetric blend of ethylene-glycol-based antifreeze and potable water. The engine-mounted coolant pumps were plumbed to circulate coolant through an external heat exchanger. The external heat exchanger and temperature-control systems were sized such that the engine coolant outlet temperature was maintained at 77° ± 2°C for all load conditions.

2.1.8 Fuel Systems

The normal engine-mounted fuel lines, pumps, and filters were utilized for the testing. The fuel temperature was controlled to 32° ± 2°C utilizing external heat exchanger. The test cell fuel supply and measurement system consisted of the 55-gallon fuel drum, a fuel transfer pump, a fuel mass flow meter, a constant-level day tank, and a heat exchanger. The constant-level day tank had an outlet that supplied fuel to the test engine through the heat exchanger, and an inlet that was connected to the fuel return from the engine. The difference between the fuel supply and the fuel return flows is the fuel consumed by the engine. The day tank contained a float that maintained a constant level by allowing a make-up flow of fuel into the tank. The make-up flow of fuel, which was measured by the fuel mass flow meter, is equal to the fuel consumption rate of the engine. The mass fuel flow was accurate within .5 kg/hr.

2.1.9 Lubricant Systems

Each test engine utilized the lubricating oil system (including oil filters) and oil coolers specified for the particular engine model on the Navy APL. All evaluations were performed utilizing an MIL-L-9000G (Amendment 4), QPL-9000, Motrex 651 lubricant.

For testing with the Cummins NH-220G, an oil pre-heater was added to the lubricating system. The preheater was installed to decrease the warm-up time of the sump oil in order to conserve test fuel.

2.1.10 Starting Systems

A 24-VDC, electric-starting motor was utilized to start each engine. A 24-volt battery cart with a manual, momentary-type contactor was used to energize the starter solenoid and starter.

2.1.11 Dynamometers

A 300-brake horsepower absorption, 50-brake horsepower motoring, water-cooled, universal-eddy current dynamometer was utilized to load the test engines. The motoring capability of the universal dynamometer was used to obtain the hot motoring traces for ensuring proper Crank angle phasing for the shaft encoder clock pulses for the high-speed data acquisition system.

The engines were mated to the dynamometer by a slightly splayed drive shaft with cardan-type universal joints on each end.

2.1.12 Engine Speed Measurements

The engine speed was measured utilizing a 60-tooth gear mounted to the dynamometer tailshaft, a magnetic pick-up, a frequency-to-voltage converter, and a digital readout. The speed measuring circuit was part of the Digalog dynamometer controller, which utilized the RPM signal as feedback for closed loop control of the dynamometer when operating in speed-control mode. In speed-control mode the Digalog controller pulsed the current to the dynamometer coils in order to maintain the engine speed within 10 RPM of the test point.

2.1.13 Engine Load Measurements

The engine load measurements were taken with a full-bridge, strain gage-type load cell, and a precisely measured dynamometer load arm. The load cell measured the scale pull on the dynamometer by the engine, and the load arm was used to calculate the dynamometer constant for converting to torque. The resolution of the load-measuring system was less than 10 Newton-meters.

2.1.14 Temperature Measurements

Engine temperature measurements were taken utilizing calibrated temperature measuring sensors (Type J thermocouple except where noted) with an accuracy of 1°C at the following locations:

- inlet air stream
- intake manifold (NH-220G only)
- oil sump drain plug, 2.5-cm insertion
- airbox hand hole cover, 3.8-cm insertion (DDC 6V-53N only)
- exhaust ports per Figure 6 and Figure 7 (Type K thermocouple)
- exhaust pipe common (Type K thermocouple)
- fuel inlet
- fuel return (NH-220G only)
- cooling water inlet
- cooling water outlet
- air dry bulb (thermistor)
- air wet bulb (thermistor)

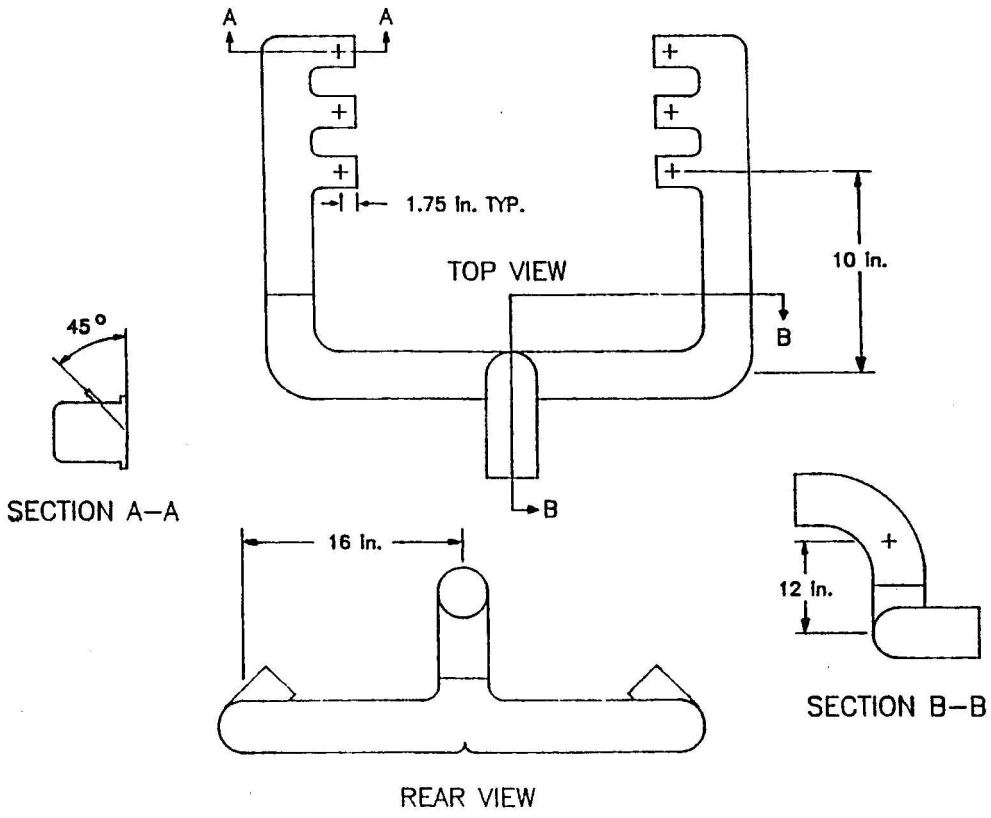

Figure 6. DDA 6V-53N Exhaust Port Thermocouple Installation Diagram

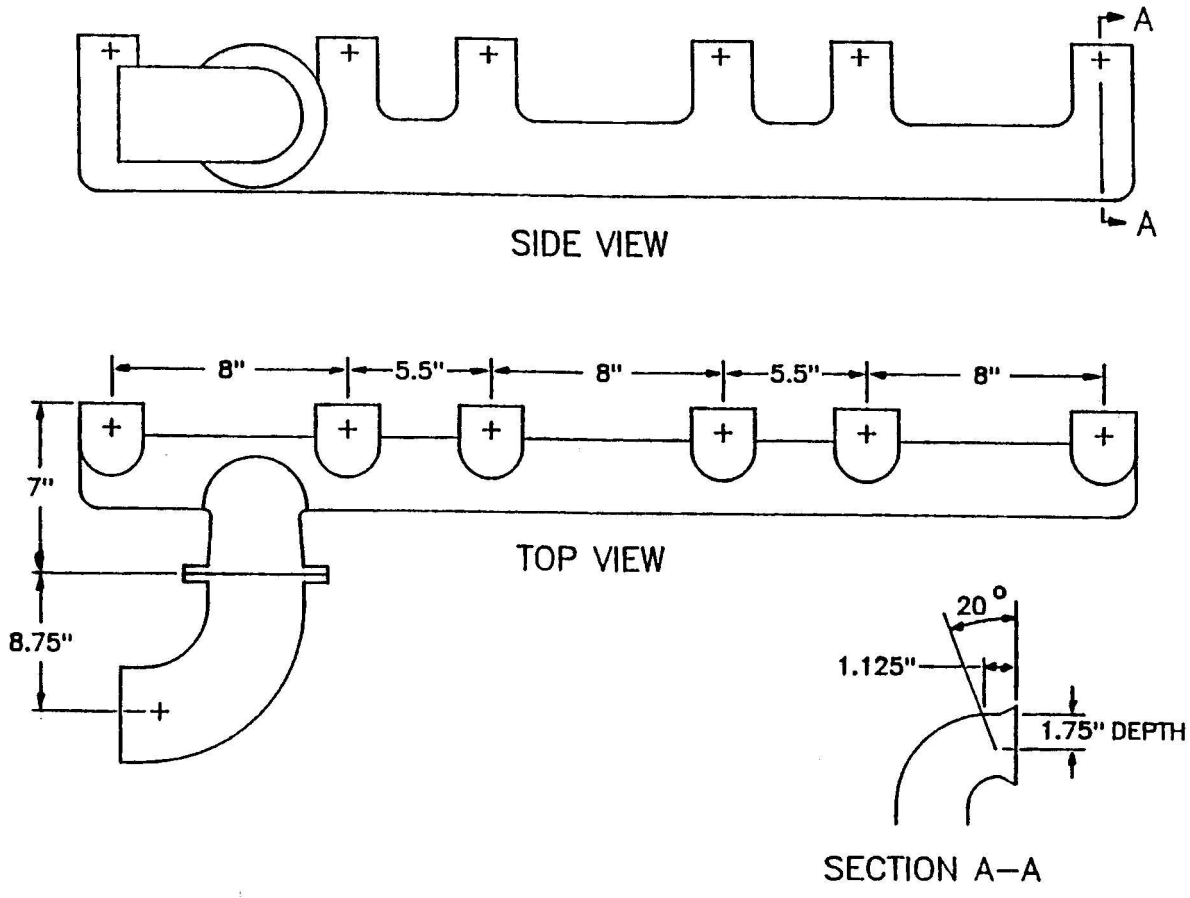

Figure 7. Cummins NH-220G Exhaust Port Thermocouple Diagram

2.1.15 Pressure Measurements

Provisions were made for measuring pressures using calibrated gauges and calibrated electronic transducers to an accuracy of 1percent of full-scale. Pressures were measured at the following locations:

- cylinder pressure (NH-220G cylinder 1, DDC 6V-53N cylinder 2-Left)
- intake air vacuum after air filter assembly
- exhaust common back pressure
- airbox hand hole cover (DDC 6V-53N only)
- oil gallery
- fuel transfer pump outlet (DDC 6V-53N only)
- common rail fuel pressure (NH-220G only)
- barometric pressure
- blowby pressure

2.1.16 Exhaust Opacity Measurements

A Wager Model P-6 smoke opacity meter was utilized in the engine exhaust ducting. The accuracy of this meter is 2 percent from 0-100 percent opacity. The exhaust smoke meter was installed ten exhaust-duct diameters downstream of the exhaust back pressure butterfly, and five duct diameters before the exhaust silencer. The smoke-opacity meter, exhaust ducting, and silencer were mounted on a portable cart used for all performance evaluations with both engines.

2.1.17 High-Speed Data Acquisition System

An AVL12QP505clk water-cooled, heat-shielded, piezoelectric pressure transducer was installed in one cylinder of each engine to measure cylinder-pressure histories. Cylinder number 2-Left of the DDC 6V-53N was utilized for the cylinder-pressure traces. The center cylinder of the three-cylinder head on the DDC 6V-53N was the most convenient to instrument since there is not an oil gallery cast through the cylinder head in that area. The cylinder-pressure transducer adapter sleeve only had to pass through and seal the coolant passage in the head. The number one cylinder on the Cummins NH-220G was instrumented for cylinder pressure, at a location specified by the Cummins technical center. The adapter sleeve in the Cummins engine only passed through and sealed a coolant passage.

The cylinder-pressure transducer was connected to a high-speed data acquisition system through a Kistler 504E charge amplifier. The data-acquisition system is triggered by an engine-driven clock pulse to obtain pressure data every 0.5-crank angle degree. The engine-driven clock, or encoder, was phased to the Top Dead Center (TDC) of the cylinder, which was instrumented for cylinder pressure. The encoder contained a channel with a single marker pulse aligned with TDC, which gates the 0.5-crank degree clock pulses to trigger the Analog-to-Digital (A/D) converter. One hundred engine cycles were acquired for each test point and then ensemble averaged to obtain a representative pressure history. The specifications for the high-speed data acquisition system are as shown in Table 16.

TABLE 16. High-Speed Data Acquisition System Specifications
Engine Load – Absorption dynamometer with load readout
Fuel Flow – Appropriately calibrated mass flow device (scale or electronic)
Temperatures – Calibrated thermocouples. Type K for exhaust temperature, Type J for all other temperatures
Pressures – Calibrated gauges or electronic transducers
Exhaust Opacity – Wager Model P-6 smoke opacity meter
Cylinder Pressure Measurement – AVL Model 12QP505clk – water-cooled and heat-shielded piezoelectric Kistler Model 504E – dual-mode charge amplifier
Shaft Encoder – Datametrics Model LSM-720-55E-1C – rotary switch
Minicomputer – Hewlett-Packard Model 2113E – E-series processor Hewlett-Packard Model 12786B – 256-kbyte memory module Hewlett-Packard Model 7906MR – 19.6-Mbyte disc drive Hewlett-Packard Model 2649C – graphics terminal Hewlett-Packard Model 2631G – graphics printer/plotter Hewlett-Packard Model 935875 – high-speed software Hewlett-Packard Model 93587T – modified disc driver Hewlett-Packard Model 93596L – Preston I/F kit
Analog-to-Digital (A/D) Converter – -4 channels Model GMD-1 – amplifier – multiplexer -4 channels Model GMM – multiplexer -1each Model GMC-RFL – logic control system -5 each Model GMSH-100 – sample and hold -1 each Model GMAD2-123B – A/D converter -1 each interface to HP 93596L I/O buffer (includes GMDSRC clock) -1 each Model GM-3 – card module w/power supply

2.1.18 Instrumentation

The engines were instrumented for the aforementioned variables specified in the high-speed diesel engine test plan. The measured variables were connected to panel gauges and readouts at the operator's control console and to electronic transducers. The transducers were connected to a low-speed data-acquisition system, which was polled for ten random readings for every variable at each point in the test matrix. A computer record that included the average and standard deviations of the ten readings for each variable measured was used to determine if the engine was performing properly. Table 17 and Table 18 are lists of the instrumentation utilized for the DDC 6V-53N and Cummins NH-220G performance evaluations.

TABLE 17. DDC 6V-53N Instrumentation

Variable	Computer and Operator Log	Calibration Range
Speed	Digalog Dynamometer Controller Model 1022 w/MC Option* 60-Tooth Gear with Magnetic Pickup	600-3000RPM
Load	Digalog Dynamometer Controller Model 1022 w/MC Option* BLH Load Cell U3G1-C	0-350 lb-ft
Fuel Flow	Flo-tron LMF Meter Model 10E*	0-107 lb/hr
Exhaust Opacity	Wager Model P-6 Smoke Opacity Meter*	0-100%
Water in/out Oil Sump-Fuel Inlet Air Temperatures	Honeywell Chart Recorder Electronik 15 Type J Thermocouples*	32°F and 212°F
Exhaust Temperatures	Omega Microprocessor Controlled Temperature Indicator Model 660 Type K Thermocouples*	32°F and 212°F
Wet/Dry Bulb	General Eastern Aspirator Model 702P*	32°F and 86°F
Fuel Pump Transfer	Crosby Gage (Range 0-100 psi Resolution 1 lb. Psi) Sensotec Electronic Transducer A5 Series (Range 0-100 psi)*	0-70 psig
Oil Gallery	Marsh (Mastergauge) Gage (Range 0-160 psi Resolution 1 lb. psi) Sensotec Electronic Transducer A5 Series (Range 0-75 psi)*	0-70 psig
Air After Blower	Crosby Gage (Range 0-30 psi Resolution ¼ lb psi) Sensotec Electronic Transducer A5 Series (Range 0-25 psi)*	0-20 psig
Intake Vac.	Dwyer Gage (Range 0-15 in. H_20 Resolution 0.5 in H_2O) Sensotec Electronic Transducer A5 Series (range 0-15 psi)*	0-10 in H_2O
Exhaust Comm.	Dwyer Gage (Range 0-80 in. H_2O Resolution 2 in H_2O) Sensotec Electronic Transducer A5 Series (Range 0-15 psi)*	0-40 in H_2O
Blowby	Dwyer Gage (Range -5 -+ 5 in. H_2O Resolution 0.2 in H_2O) Sensotec Electronic Transducer A5 Series (Range 0-1 psi)*	0-5 in H_2O
Barometer	Sensotec Electronic Transducer A5 Series (Range 16-32 in Hga)*	29.08 in Hg
Cylinder Pressure	Cylinder Pressure Transudcer AVL12QP300CVK Kistler Dual Model Amplifier Model 5004 Preston GM Series A/D Converter Datametrics (Trump-Ross) LSM-720-5SE-1C Optical Shaft Encoder	400-2400 psig
*Low Speed Data Acquisition system	Hewlett-Packard 3497 Data Acquisition System	

34

TABLE 18. Cummins NH-220G Instrumentation

Variable	Computer and Operator Log	Calibration Range
Speed	Digalog Dynamometer Controller Model 1022A-Standard* 60-Tooth Gear with Magnetic Pickup	600-3000RPM
Load	Digalog Dynamometer Controller Model 1022A-Standard* Lebow Load Cell 3132	0-400 lb-ft
Fuel Flow	Flo-tron LMF Meter Model 10E*	0-121 lb/hr
Exhaust Opacity	Wager Model P-6 Smoke Opacity Meter*	0-100%
Water in/out Oil Sump-Fuel Inlet Air Temperatures	Leeds and Northrup Speedomax W Recorder (Range 0-600°F Resolution 5°F) Type J Thermocouples*	32°F and 212°F
Exhaust Temperatures	Omega Microprocessor Controlled Temperature Indicator Model 660 Type K Thermocouples*	32°F and 212°F
Wet/Dry Bulb	General Eastern Aspirator Model 702P*	32°F and 86°F
Fuel Pump	Duragauge Gage (Range 0-300 psi Resolution 5 lb. psi) Sensotec Electronic Transducer A5 Series (Range 0-200 psi)*	0-70 psig
Oil Gallery	Crosby Gage (Range 0-100 psi Resolution 1 lb. psi) Sensotec Electronic Transducer A5 Series (Range 0-100 psi)*	0-70 psig
Intake Vac.	Dwyer Gage (Range 0-15 in H_20 Resolution 1-2 in H_2O) Sensotec Electronic Transducer A5 Series (Range 16-32 in Hga)*	0-15 in H_2O
Exhaust Comm.	Dwyer Gage (Range 0-80 in. H_2O Resolution 2 in H_2O) Sensotec Electronic Transducer A5 Series (Range 0-25 psi)*	0-60 in H_2O
Blowby	Dwyer Gage (Range 0-5 in H_2O Resolution 0.1 in H_2O) Sensotec Electronic Transducer A5 Series (Range 0-1 psi)*	0-5 in H_2O
Barometer	Sensotec Electronic Transducer A5 Series (Range 16-32 in Hga)*	29.08 in Hg
Cylinder Pressure	Cylinder Pressure Transudcer AVL12QP300CVK Kistler Dual Model Amplifier Model 5004 Preston GM Series A/D Converter Datametrics (Trump-Ross) LSM-720-5SE-1C Optical Shaft Encoder	400-2400 psig
*Low Speed Data Acquisition system	Hewlett-Packard 3497 Data Acquisition System	

2.1.19 Instrumentation Calibration

All instrumentation (analog gauges and electronic transducers) were calibrated immediately prior to every test fuel evaluation. All calibrations were performed with NBS traceable standards. The fuel mass flow meter was calibrated utilizing a beam balance scale, precision masses, and a calibrated stopwatch. The engine speed sensor was calibrated utilizing a precision frequency generator. Each thermocouple was verified utilizing boiling water and water/ice-mixture references. The pressure gauges were calibrated utilizing a calibrated precision absolute pressure gauge. The cylinder pressure transducer sensitivities were checked against their respective factory calibrations utilizing a dead weight tester and following a procedure outlined by Lancaster et al. (14). For the transducers connected to the low-speed data acquisition system, a record of calibration curves was maintained to establish the level of transducer drift over time.

2.2 Performance Data

Engine performance data and combustion analysis data, along with known fuel properties, will be correlated with any engine performance degradations observed. It is expected that, using the methods of multiple regression analysis, for example, empirical equations capable of predicting engine performance from a knowledge of basic fuel properties may be possible.

2.2.1 Power

Internal combustion engines convert potential energy stored as liquid fuel into kinetic energy to perform work. The rate of work performed by an engine-fuel conversion is power. The engine-observed brake horsepower is proportional to the torque measured at the dynamometer and the engine speed in revolutions/minute (RPM) at which the torque was measured. The corrected brake horsepower is the observed power corrected to standard atmospheric conditions. The fuel property impact on engine power is critical in determining which fuel specification variations will not impact the Navy surface fleet mission. Engine power is expected to be impacted by those properties that may effect the fuel injection system metering and spray processes.

2.2.2 Speed

Typically, engines produce power and torque across a speed range, and the flatter the torque curve for that speed range, the more flexible the engine. Speed impacts engine performance as time available for the chemical and physical processes of fuel metering, fuel injection, fuel/air mixing, and physical and chemical ignition delays to occur. Engine events are timed to occur as a function of crankshaft angle; therefore, for a given Crank angle duration, the physical time is shorter at higher engine speeds.

2.2.3 Brake Specific Fuel Consumption

The Brake Specific Fuel Consumption (BSFC), with units of pounds/(brake horsepower-hour), is a universal measure of engine ability to convert fuel into mechanical work. All engines that have the same BSFC, regardless of displacement, convert fuel energy to work at the same efficiency. Thus all engines can be compared and contrasted by their BSFC. Likewise a specific engine can be used to determine the effect of differing fuels on its BSFC.

2.2.4 Smoke Opacity

Smoke is produced when an appreciable fraction of the injected fuel fails to find the necessary oxygen for complete combustion. The unburned or partially burned fuel is expelled from the cylinder as visible smoke. Excessive smoke level is objectionable because of the potential detection of the infrared as well as the visible signature by an enemy, the public nuisance created by its appearance, and because engines operated for extended periods with smoky exhaust accelerate deposit accumulation and must be overhauled more frequently.

Smoke measurements are included in the performance evaluations to provide information on combustion and full-load performance. In addition, measurement of smoke level during full-rack power checks while operating on base fuel provides additional corroboration of the condition of the engine and fuel-injection system. The use of smoke level as a measure of engine condition does not replace the power measurements but complements them.

2.2.5 Cylinder Pressure Histories

The primary application of the cylinder pressure data was to establish the effects of fuel variables on maximum cylinder pressure and maximum rate of cylinder pressure rise, since both have been cited by various engine designers and manufacturers as being of substantial importance with respect to engine life. These data, along with the instantaneous cylinder volume and the derivative of instantaneous cylinder volume calculated from kinematic analysis, were also used to calculate heat release rate, cumulative heat release, relative (to base fuel) ignition delay time, combustion and thermal efficiencies.

2.2.6 Heat Release Rate

Computation of the heat release rate is based on application of the First Law of Thermodynamics to the contents of the combustion chamber. The form of the equation used is as follows:

$$\frac{\partial Q}{\partial \theta} = A \bullet \left| \frac{k}{k-1} P \bullet \frac{\partial V}{\partial \theta} + \frac{1}{k-1} V \bullet \frac{\partial P}{\partial \theta} \right|$$

where: Q = heat release, Joules

θ = crank angle, degrees

A = heat equivalent of mechanical work

k = ratio of specific heat at constant pressure to specific heat at constant volume

V = instantaneous volume of the working fluid, m^3

P = instantaneous pressure of the working fluid, Pa

Refinement and application of the heat-release rate-calculation technique to operating internal combustion engines were accomplished by Austen and Lyn (15) and later by Karim and Kahn (16,17). An analysis of errors associated with the techniques was also performed by Karim and Kahn (18). Fisher and Macey (19) and Lancaster, et al. (14), developed and refined a digital data-acquisition system for collection of cylinder-pressure data. The system was subsequently used in the development of a software package for calculation of a variety of parameters from the cylinder-pressure data, including the heat release rates (20,21).

2.2.7 Cumulative Heat Release

The cumulative heat release is the integral of the heat release rate during the closed portion of the engine cycle, i.e. when the intake valves/ports and exhaust valves are closed during the compression and combustion. The cumulative heat release is the energy of the fuel utilized to perform work on the piston and, in this program, was not adjusted for losses due to heat transferred from the piston by conduction, convection, or radiation. The cumulative heat release is also used to calculate apparent combustion efficiency.

2.2.8 Relative Ignition Delay Time

The relative ignition delay time will be referenced to the time determined for the base fuel for fuel-to-fuel comparisons. Base fuel ignition delay time will be established on the basis of the start of combustion, as determined from the heat release diagram and the engine manufacturers specification for the static start of injection (injection timing).

2.2.9 Apparent Combustion Efficiency

The apparent combustion efficiency will be calculated by dividing the cumulative heat release per cycle by the heat equivalent of the fuel injected per cycle. The true combustion efficiency depends on heat transfer and complex chemical equilibrium models that are rather unwieldy and would have been difficult to provide and integrate into all participant data systems.

2.2.10 Brake Thermal Efficiency

The observed brake thermal efficiency will be calculated by dividing the heat equivalent of the corrected brake horsepower by the product of the fuel flow rate and the net heat of combustion of the fuel. Net heat of combustion data of all test fuels was supplied by NIPER, the central fuel characterization laboratory.

2.3 Performance Data Analysis

The data acquired at each test condition are categorized as test point, performance, combustion and calculated variables. The test point variables are variables that describe the test condition and define the proper operation of the engine with respect to the test matrix. The performance variables are monitored to ascertain their

response to the test-point variable changes and as engine diagnostic tools. Combustion variables were measured so that the heat release and combustion analysis could be performed. The calculated variables are important in describing the performance of the engine and are calculated from combinations of other variables.

For the DDC 6V-53N, test-point variables included speed and load to fix a point in the test matrix, water-outlet temperature, fuel temperature, inlet air temperature, and exhaust back pressure to determine consistent engine operation. Fuel flow, exhaust opacity, water-inlet temperature, oil-sump temperature, airbox temperature, all exhaust temperatures, fuel transfer pressure, oil-gallery pressure and blowby pressure are all performance variables that are expected to change with test-point changes. The combustion variables include cylinder-pressure histories, and then the air-after-blower pressure, intake vacuum, and barometric pressure were used to calculate the reference pressure at bottom dead center of the intake stroke. The calculated variables will be used to describe the engine operation on a test fuel and include brake horsepower, brake specific fuel consumption (BSFC), thermal efficiency, apparent combustion efficiency, rate of pressure rise, heat release rate, cumulative heat release, and ignition delay.

For the Cummins NH-220G, the test-point variables are identical to the DDC 6V-53N variables because they define the matrix and ensure proper engine operation. The performance variables include fuel flow, exhaust opacity, water-inlet temperature, oil-sump temperature, all exhaust temperatures, fuel-pump pressure, oil-gallery pressure, and blowby pressure. The combustion variables include cylinder-pressure histories. The intake vacuum and barometric pressure were used to calculate the reference pressure at bottom dead center of the intake stroke. The calculated variables are identical as calculated for the DDC 6V-53N, so the sensitivity of each engine to the test fuel properties can be investigated.

All data except the pressure histories and the calculated variables are shown on the operator log sheets for the respective engines. For each combination of engine, fuel, and test point, there is an entry on the operator log. For each test point, there is a computer record that includes ten random readings along with the average and standard deviation of the ten readings for each of the variables measured. The cylinder pressure histories exist as a raw data file for each test condition, containing 100 consecutive engine cycles, and as an averaged data file from which the heat release calculations were made. All calculated variables were entered on the data summary sheets for each engine and fuel combination. The operator logs and data summary sheets for both the DDC 6V-53N and the Cummins NH-220G are in Appendix B.

An objective of the data analysis portion of the HSDE performance evaluation was to develop a representative model of engine performance parameters versus fuel properties for each engine. These models were developed by statistically analyzing the collected engine and fuel data. The sensitivity of the developed models was to be determined by incorporating the results of the uncertainty analysis of the test measurements. A goal was established to determine if a generalized model could be assembled to represent all engine/fuel combinations.

For the HSDE performance evaluations, the statistical and uncertainty analyses were accomplished by DTRC using the following independent and dependent variables of interest:

Independent Variables (Fuel Properties)
- Viscosity @ 40°C and 100°C
- Hydrogen Content
- Specific Gravity
- Distillation
- Net Heat of Combustion
- Surface Tension
- Aniline Point
- Cetane Number

Dependent Variables (Engine Performance)
- Smoke
- Power/Torque
- Brake Specific Fuel Consumption
- Maximum Cylinder Pressure
- Maximum Rate of Cylinder Pressure Rise
- Combustion Efficiency
- Maximum Heat Release Rate
- Ignition Delay
- Brake Thermal Efficiency

The statistical analyses performed by DTRC utilized the test participants to critique the strategy, review analysis results, and impart the knowledge of the effects of fuel properties on high-speed diesel engine performance in the development and interpretation of the representative models.

2.3.1 Overview of HSDE Performance Evaluation Data Analysis

The initial step in the analysis of the HSDE performance data was the development of data entry and retrieval procedures. The next step entailed scatter plots of all the data to identify any outlier data points. Concurrent to the development of the scatter plots was the calculation of the uncertainty values associated with each data point. Following the scatter plots was the multiple-variable, step-up regression analysis that was used to

develop the correlations between fuel properties and engine-performance parameter(s). A representative model for each engine versus fuel properties was determined by utilizing results previously obtained as well as known correlations supplied by the test participants.

2.3.2 HSDE Performance Evaluation Scatter Plots/Outlier Identification

The first step in the data analysis procedure was to plot all combinations of the independent versus dependent variables. The scatter plots were expected to indicate if the test plan was properly designed, that the majority of the data points plotted were sufficiently distributed within the experiment boundaries. DTRC and the test participants identified any outliers based on the scatter plots produced, and reviewed the outlier data to determine its validity.

2.3.3 HSDE Performance Evaluation Data Uncertainty Analysis

The overall uncertainty value associated with each data point was calculated and incorporated into the data file. The uncertainty value associated with the instrumentation was determined by supplying DTRC with data regarding the accuracy and precision of the instrumentation used in the collection of HSDE data. In addition, test participants furnished DTRC with calibration procedures and frequencies used to determine the uncertainty value associated with instrumentation drift between calibrations. The total uncertainty value for each data point was calculated by summing the uncertainties due to calibration, calibration drift, instrumentation accuracy, and instrument precision.

$$U_{TOTAL} = U_{CAL} + U_{CAL\ DRIFT} + U_{ACCURACY} + U_{PRECISION}$$

The uncertainty values of the test fuel properties were based on the repeatability and reproducibility values for the test method specified in the Annual Book of ASTM Standards for Petroleum Products, Lubricants, and Fossil Fuels (22). For non-ASTM test methods (hydrogen content by PE 240), the uncertainty values were calculated from duplicate fuel analyses.

The uncertainty values reviewed by the test participants and the total uncertainty value unique for each data point were incorporated into the HSDE performance data file. The data file contained three values for each data point: 1) representing the measured value, 2) representing the measured value plus the overall uncertainty value, and 3) representing the measured value minus the overall uncertainty value.

Only the measured test data was used in the development of the correlations. The uncertainty values were used only to evaluate the sensitivity of the models developed from these correlations.

2.3.4 Statistical Analysis - Multiple-Variable Analysis

The multi-variable analysis was based on each individual engine. The regression analysis was based on engine performance (dependent variable) versus fuel property (independent variable). A step-up regression analysis was performed, and the independent variables were added to determine which variables were significant. The R-squared acceptance criteria for significance was initially set at 95 percent, and with the aid of a statistician, the calculated R-squared values were reviewed and adjusted when necessary.

The regression analysis assumed linear form. However, if the collected data show a different functional form, then the analysis was based on that functional form.

2.3.5 Fuel Property versus Engine Performance Model Development Process

All the developed correlations that met the various acceptance criteria were compared with engine/fuel performance correlations that were known by the test participants from scientific literature and experience. If the developed correlations did not agree with the known correlations, all participants evaluated the cause of the disagreement. Newly developed correlations not previously encountered were reviewed to determine their plausibility.

When all correlations were found to be satisfactory, a representative engine-performance parameter versus fuel-property model was developed for each engine. The resultant models were used to predict engine performance results of the performance test-fuel matrix fuel properties and of the worldwide fuel survey fuel properties.

2.4 Checklists

A standardized checklist was used to verify that the operational sequence for each test fuel evaluation was followed for each engine. Figure 8 is the HSDE Performance Evaluation checklist based on the operational sequence previously discussed in section 2.1.4.2.6.

Navy High-Speed Diesel Engine
Performance Evaluation Checklist

Laboratory: _____
Engine Type: _____ Engine Tester: _____
Test Fuel: _____ Date: _____

Step	Initials	Test Procedure
1.	_____	Flush fuel system with BF-2.
2.	_____	Engine warm-up.
3.	_____	Clean smokemeter lenses and adjust purge air.
4.	_____	Full rack power check with BF-2. Maintain fuel temperature at 32 ± 2°C, air temperature at 38 ± 2°C and coolant temperature at 77 ± 2°C. Set exhaust back pressure at 50 ± 2 mm of mercury under full-rack conditions at rated speed.
5.	_____	Compute corrected power levels and maximum cylinder pressures.
6.	_____	Compare to 95% confidence bands of BF-2 performance.
7.	_____	Determine action; i.e., continue if full-rack power check is within the confidence band, or have Project Engineer contact DTRC.
8.	_____	Flush fuel system with test fuel.
9.	_____	Engine warm-up.
10.	_____	Clean smokemeter lenses and adjust purge air.
11.	_____	Complete performance testing load-speed matrix. Maintain fuel temperature at 32 ± 2°C, air temperature at 38 ± 2°C and coolant temperature at 77 ± 2°C. Set exhaust back pressure at 50 ± 2 mm of mercury under full-rack conditions at rated speed.
12.	_____	Flush fuel system with BF-2.
13.	_____	Engine warm-up.
14.	_____	Clean smokemeter lenses and adjust purge air.
15.	_____	Full rack power check on BF-2. Maintain fuel temperature at 32 ± 2°C, air temperature at 38 ± 2°C and coolant temperature at 77 ± 2°C. Set exhaust back pressure at 50 ± 2 mm of mercury under full-rack conditions at rated speed.
16.	_____	Compute corrected power levels and maximum cylinder pressures.
17.	_____	Compare to 95% confidence bands of BF-2 performance.
18.	_____	Determine action; i.e., continue if full-rack power check is within the confidence band, or have Project Engineer contact DTRC.
19.	_____	Flush fuel system with test fuel.
20.	_____	Engine warm-up.
21.	_____	Clean smokemeter lenses and adjust purge air.
22.	_____	Complete performance evaluation load-speed matrix. Maintain fuel temperature at 32 ± 2°C, air temperature at 38 ± 2°C and coolant temperature at 77 ± 2°C. Set exhaust back pressure at 50 ± 2 mm of mercury under full-rack conditions at rated speed.

Figure 8. HSDE Operational Sequence Protocol Checklist

2.5 Deviations From Test Plan

The following paragraphs indicate the deviations from the high speed diesel engine test plan in both setup and operational procedures that occurred at TFLRF.

2.5.1 DDC 6V-53N Fuel Temperature

The fuel system of the DDC 6V-53N engine initially made use of only one heat exchanger. This single heat exchanger was insufficient to maintain a temperature of 32 ± 2°C as defined by the test plan. Another heat exchanger was added to the system, and the engine ran within the correct temperature range.

2.5.2 Cummins NH-220G Lubricant Pre-heater

An external heater was placed on the Cummins NH-220G lubrication system to permit reaching operating temperatures faster. This system contained an external pump that pumped the lubricant from the bottom of the oil sump through a Chromalox 240-VAC, 2000-watt heater (controlled by a Powerstat rheostat), then back into the oil sump through the crankcase inspection plate.

2.5.3 Ambient Temperature Recording

During the performance runs, the wet-and-dry temperature measurements were taken using two different measuring devices. The devices were as follows:

(a) General Eastern Model 702 Aspirator, taken by computer using the low-speed data acquisition system.

(b) Pocket Psychrometer, taken manually.

This dual measurement allowed comparisons of the temperature measurements in order to have more accurate test results.

2.5.4 Smokemeter Lens Cleaning

Smokemeter lenses were not cleaned with a lens airbrush. Instead, air was used to remove any large particles, then a glass cleaner was used to remove any other particles.

2.5.5 Test Fuel Run Order

Deviations from the fuels' run order are listed as follows:

Test Plan Order	Actual Run Order
BF02	BF02
TF26	TF26
TF10	TF10
TF02	TF09
TF07	TF01
TF08	TF02
TF09	TF08
TF34	TF07
TF01	TF34

Rerun
TF01
TF02
TF08

3.0 RESULTS

The purpose of the HSDE performance program was to determine key fuel property effects on engine power, performance, smoke opacity, heat release, and calculated variables. A graphical analysis of the power and performance data was used as a precursor to the statistical analysis to illustrate significant differences between fuels that should be investigated.

3.1 Power-making Ability

To determine the power production sensitivity of each engine to fuel property changes, each engine was operated at full rack across the test speed range of the engine. To ensure repeatability with the base fuel, a physical rack stop was attached to the engine. All the full rack operation tests were run with the rack against

this stop. Figure 9 for the DDC 6V-53N and Figure 10 for the Cummins NH-220G reveal the full rack observed brake horsepower obtained with each fuel. A cursory analysis suggested that there are fuel property effects on the power produced by each engine. It should also be noted that the two engines rank the fuels differently, which may be a function of their distinctively different fuel injection systems. The fuel metering of the DDC unit injector and the Cummins PT fuel system are affected differently by the test fuel properties. Most diesel engines meter fuel volumetrically; therefore, fuel properties that affect the injected fuel mass would also affect the full rack power production.

Figure 11 for the DDC 6V-53N and Figure 12 for the Cummins NH-220G show the fuel flow at the maximum power for each test fuel. The plot for the DDC 6V-53N, which is at 2800 RPM, reveals one slope between fuel flow and horsepower for BF02 and TF26 and another slope with the other test fuels examined. Although the plot suggests a parabolic relationship, a parabola suggests a minimum at other than zero power and fuel flow. As expected, the general results tend toward increased horsepower with increased fuel flow. The Cummins NH-220G, at first glance, reveals an almost random relationship between the fuel flow and maximum power at 2100 RPM. However, it can be construed that fuels BF02 and TF26 form a line that reflects the expected results. The remaining test fuels appear to have a relationship opposite of what would be expected. Although the remaining fuels are blends made to reflect specific fuel property variations, it should be noted fuels BF02 and TF26 are real fuels. The real fuels may reflect the fuel property variations utilized as fuel injection system design parameters.

The plots of the brake thermal efficiency and the brake horsepower are shown in Figure 13 and Figure 14. The plot for the DDC 6V-53N engine appears to reveal a parabolic relationship of thermal efficiency with horsepower for the test fuels. The DDC 6V-53N engine has the best thermal efficiency at the horsepower generated by fuel BF02. This best efficiency is not surprising considering base fuel BF02 has diesel fuel properties for which the engine was most likely optimized. Figure 14 for the Cummins NH-220G engine appears to reveal a relationship for fuels BF02 and TF26 that is different from the remainder of the test fuels. Fuels BF02 and TF26 show decreased thermal efficiency with increased horsepower, which may be due to increased premixed combustion with TF26. Increased premixed combustion has been correlated to more volatile fuels and increased thermal efficiency (23). The other test fuels indicate increased thermal efficiency with increased horsepower, which may be related to the fuel metering process.

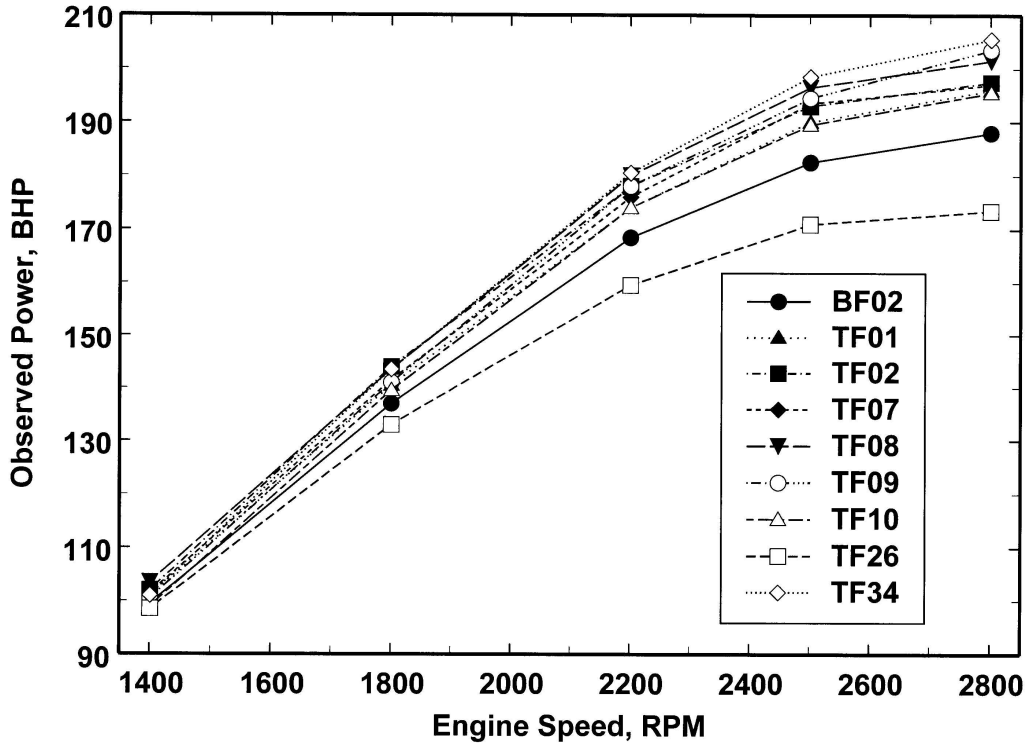

Figure 9. DDC 6V-53N Full Rack Brake Horsepower of Test Fuels

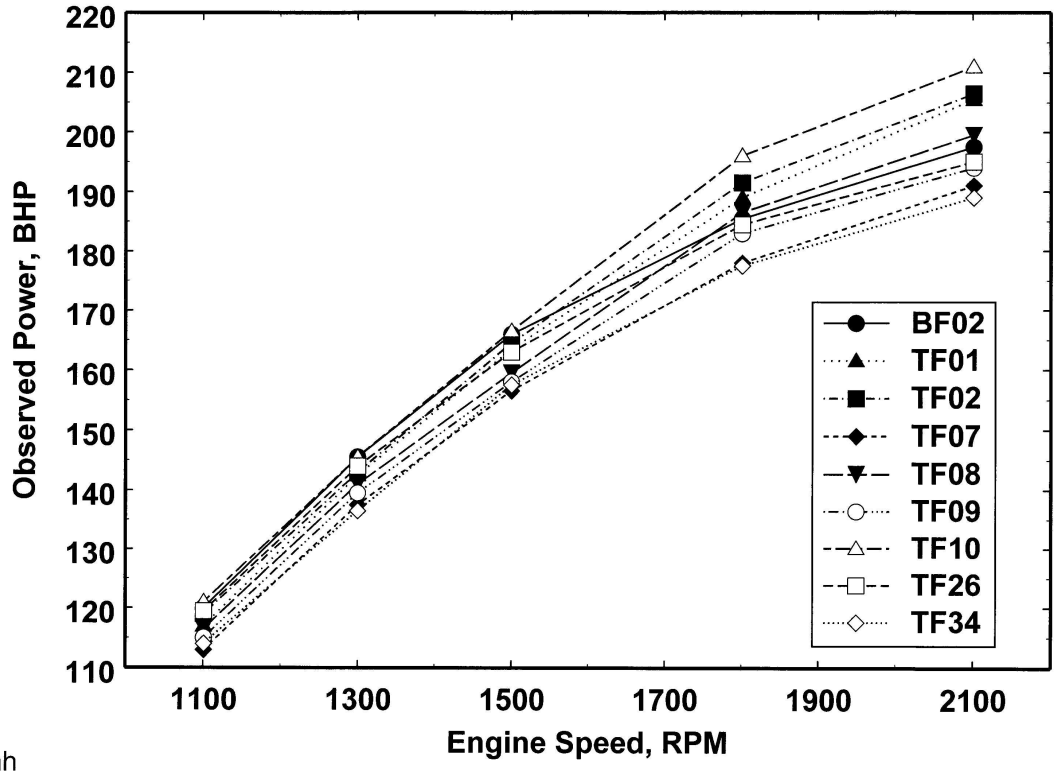

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Figure 10. Cummins NH220G Full Rack Brake Horsepower of Test Fuels

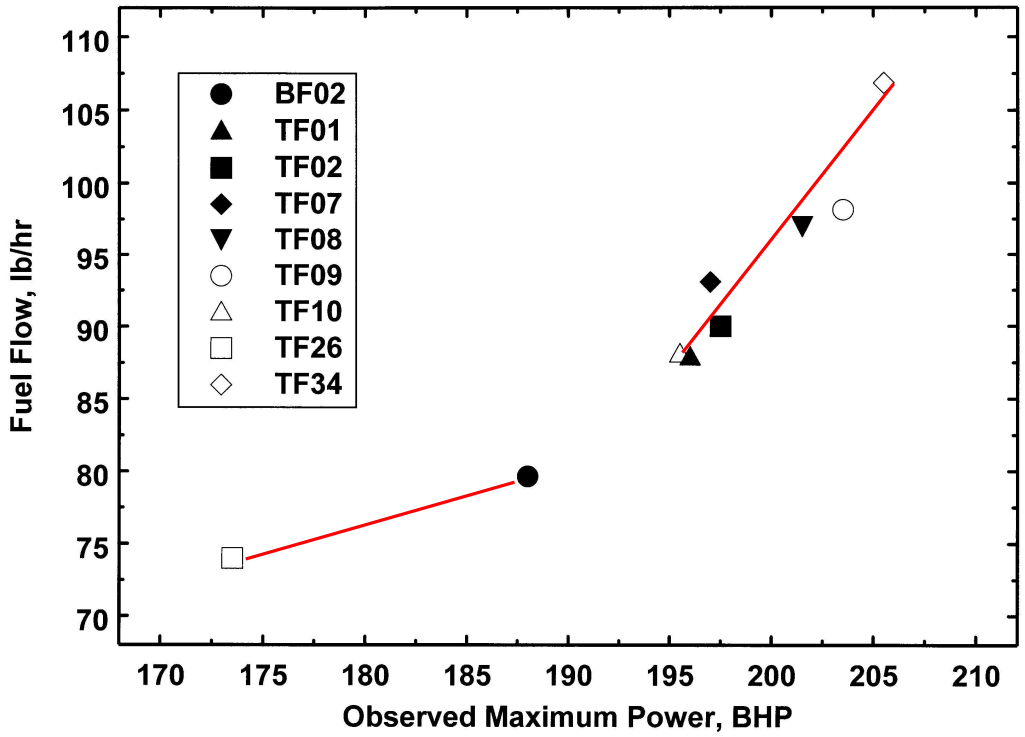

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Figure 11. DDC 6V-53N Maximum Power Fuel Flow of Test Fuels

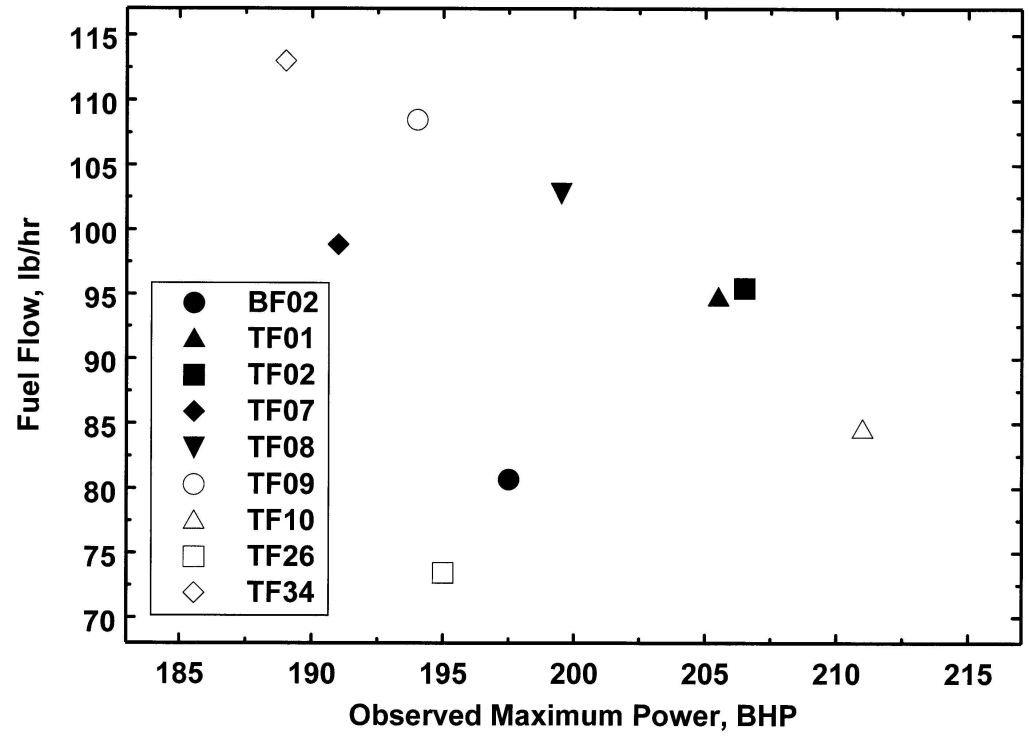

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Figure 12. Cummins NH220G Maximum Power Fuel Flow of Test Fuels

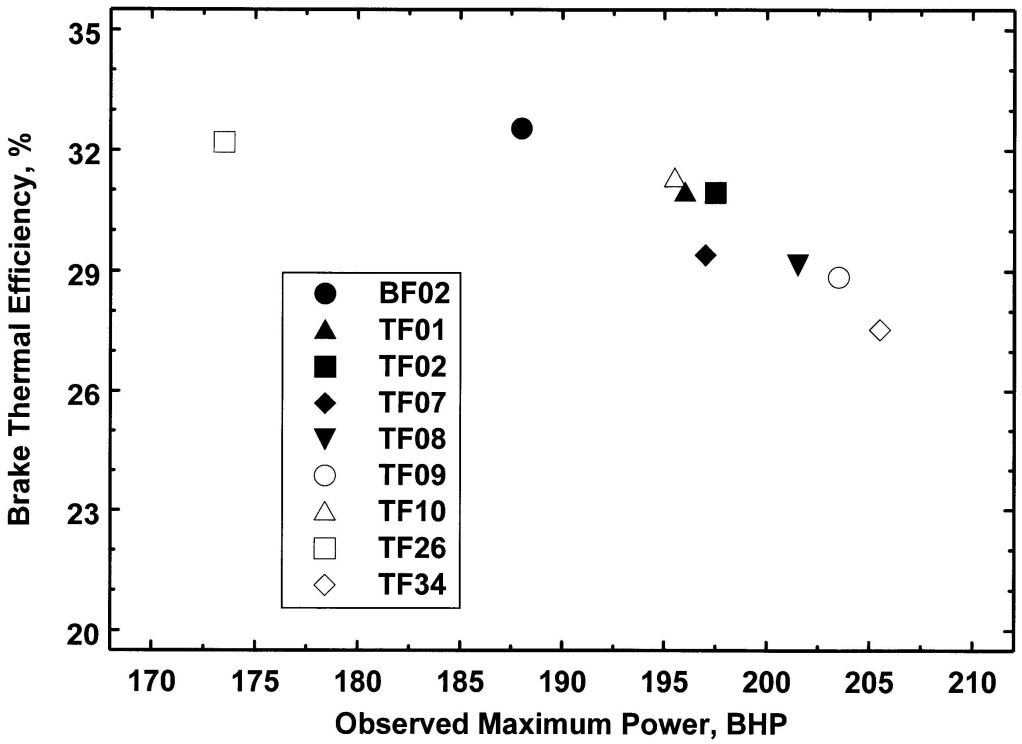

Figure 13. DDC 6V53N Maximum Power Brake Thermal Efficiency of Test Fuels

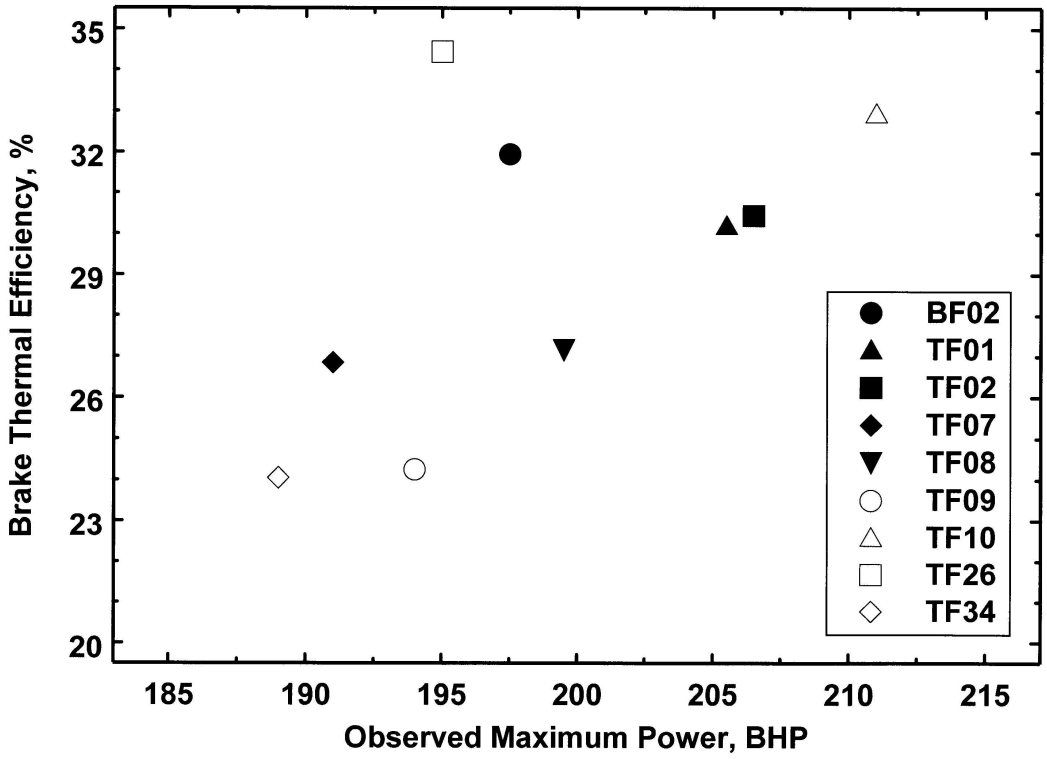

Figure 14. Cummins NH220G Maximum Power Brake Thermal Efficiency of Test Fuels

3.2 Fuel Consumption

When the graphs of the full rack fuel flow are examined for both engines (Figures 15 and 16) it is obvious that there are significant fuel flow deviations between the test fuels. It appears that both the DDC 6V-53N and the Cummins NH-220G rank the fuels in approximately the same order. This ranking is interesting because the power produced as a result of the fuel flows are not ranked in the same order for both engines. This difference in ranking indicates there is a fuel property related combustion phenomenon that determines the power production from a given fuel flow for each engine.

The observed BSFC is a comparative measure of the capability of an engine to convert fuel chemical energy into shaft work. Figures 17 and 18 are the BSFC plots at full rack for all test fuels for the DDC 6V-53N and the Cummins NH-220G. For a given test fuel, the Cummins NH-220G has a more consistent BSFC across the operational speed range. The DDC 6V-53N has a lower minimum BSFC and a lower high-speed BSFC. The differing BSFC response between engines may be attributable to the different fuel injection systems and engine operating cycles.

One of the key fuel properties evaluated in this experiment was the fuel viscosity. The viscosity was expected to have important ramifications on the power output and fuel consumption of high-speed diesel engines. In order to determine if the viscosity affects engine performance, volumetric fuel flow and viscosity (Figures 19 and 20, respectively) were plotted at the maximum power condition for each test fuel. Volumetric fuel flow was used because it takes the density variations among the test fuels into account. When the illustrations for the DDC 6V-53N and the Cummins NH-220G engines are examined, there is a definite trend of increased volumetric fuel flow with viscosity at the maximum power condition.

3.3 Smoke Opacity

A diesel engine will consume as much fuel as there is air to oxidize; however, as the equivalence ratio approaches 0.5, incomplete fuel/air mixing and subsequent incomplete combustion can lead to the formation of soot. Further increases in equivalence ratio can lead to objectionable levels of soot, at which point the fuel flow and subsequent engine power has to be limited. The plots of exhaust smoke opacity at full rack for the DDC 6V-53N and the Cummins NH-220G engines are shown in Figures 21 and 22. The plot for the DDC 6V-53N reveals the peak opacities at the lower speeds, which correlate with the lower turbulence levels for fuel/air mixing evident at lower speeds. For the Cummins NH-220G engine, the opacity values appear to be random with respect to fuels and speeds. Caution should be used when analyzing the smoke opacity data because the light blocking method of measurement has inherent inaccuracies.

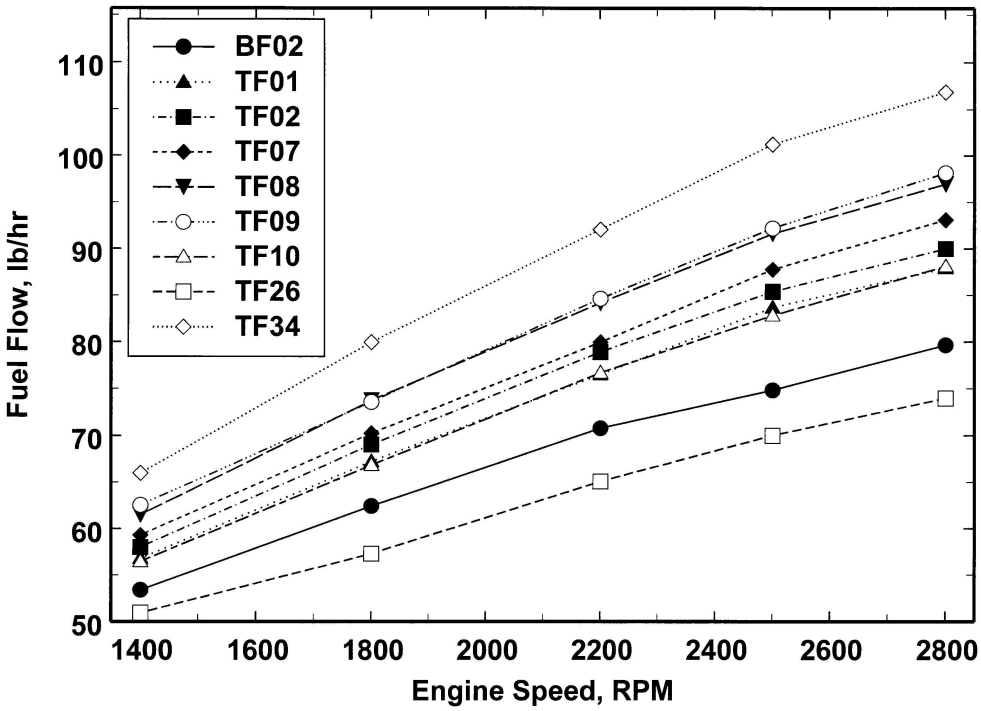

Figure 15. DDC 6V53N Full Rack Fuel flow of Test Fuels

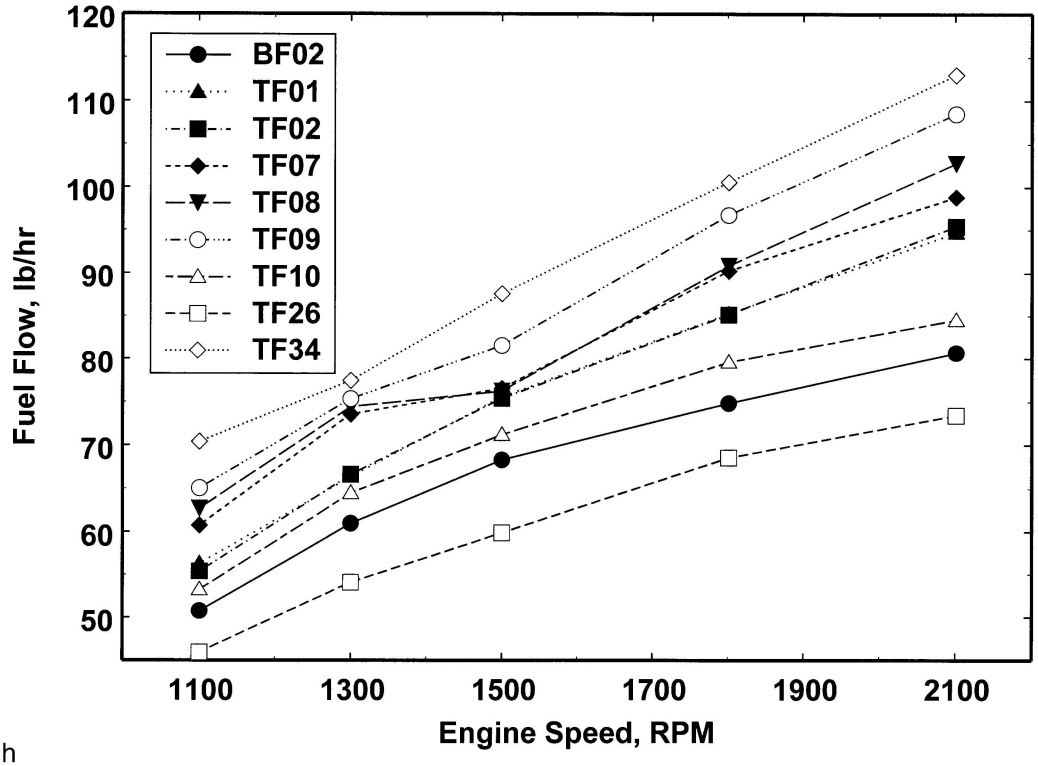

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Figure 16. Cummins NH220G Full Rack Fuel Flow of Test Fuels

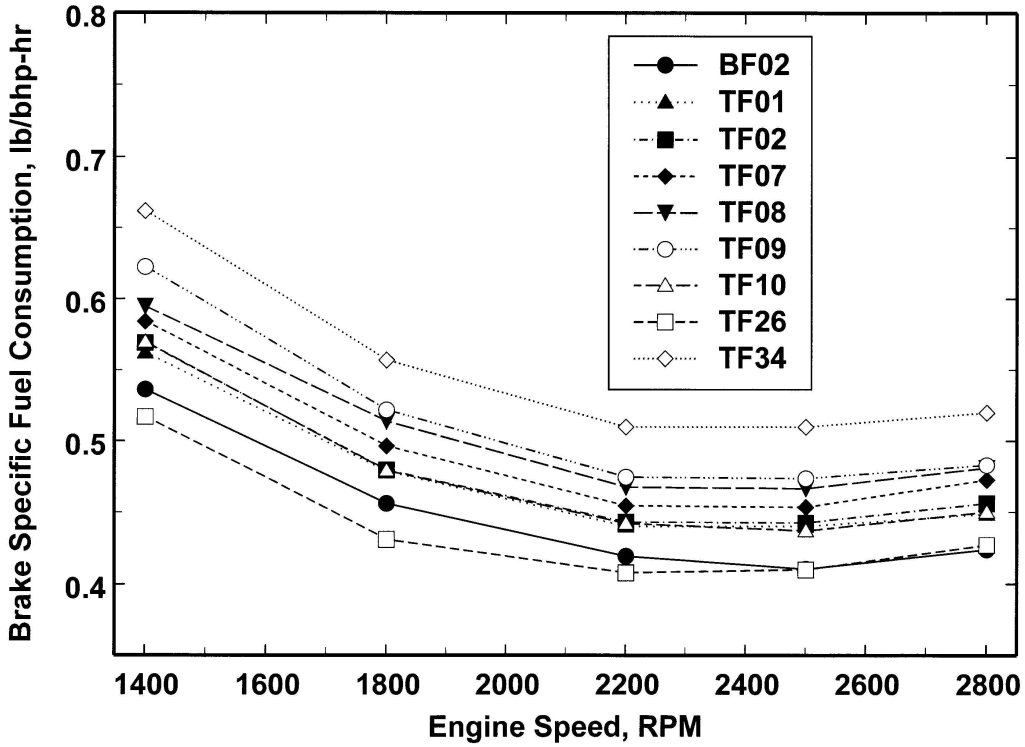

Figure 17. DDC 6V-53N Full Rack Brake Specific Fuel Consumption of Test Fuels

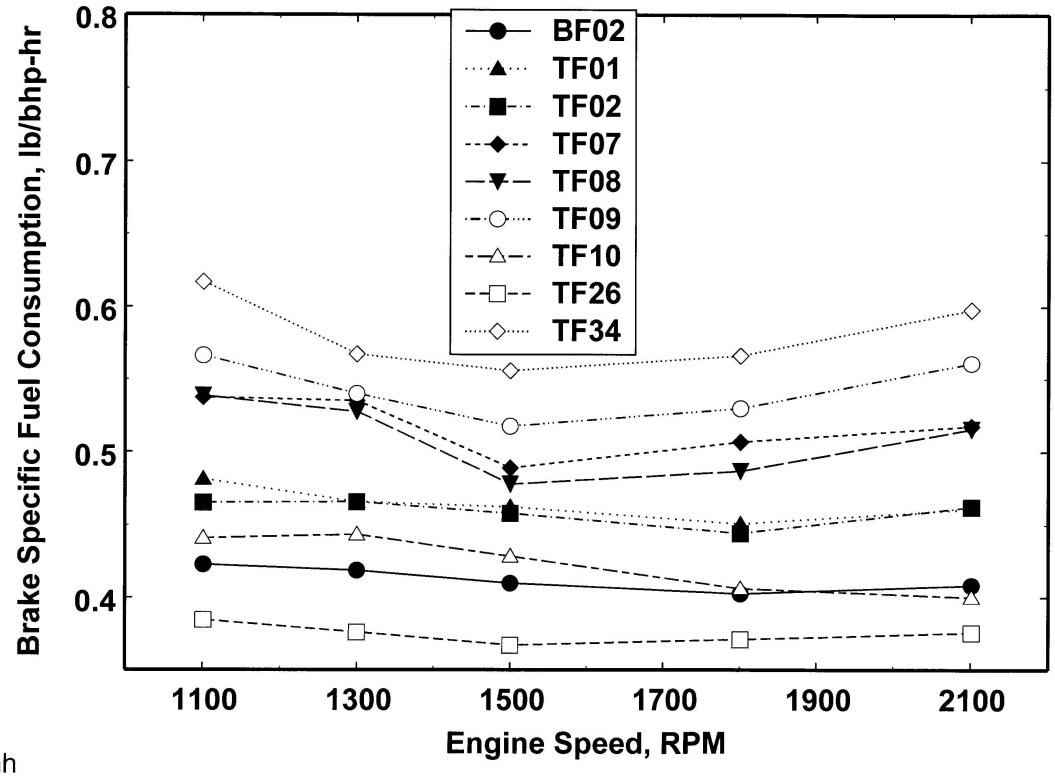

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Figure 18. Cummins NH220G full Rack Brake Specific Fuel Consumption of Test Fuels

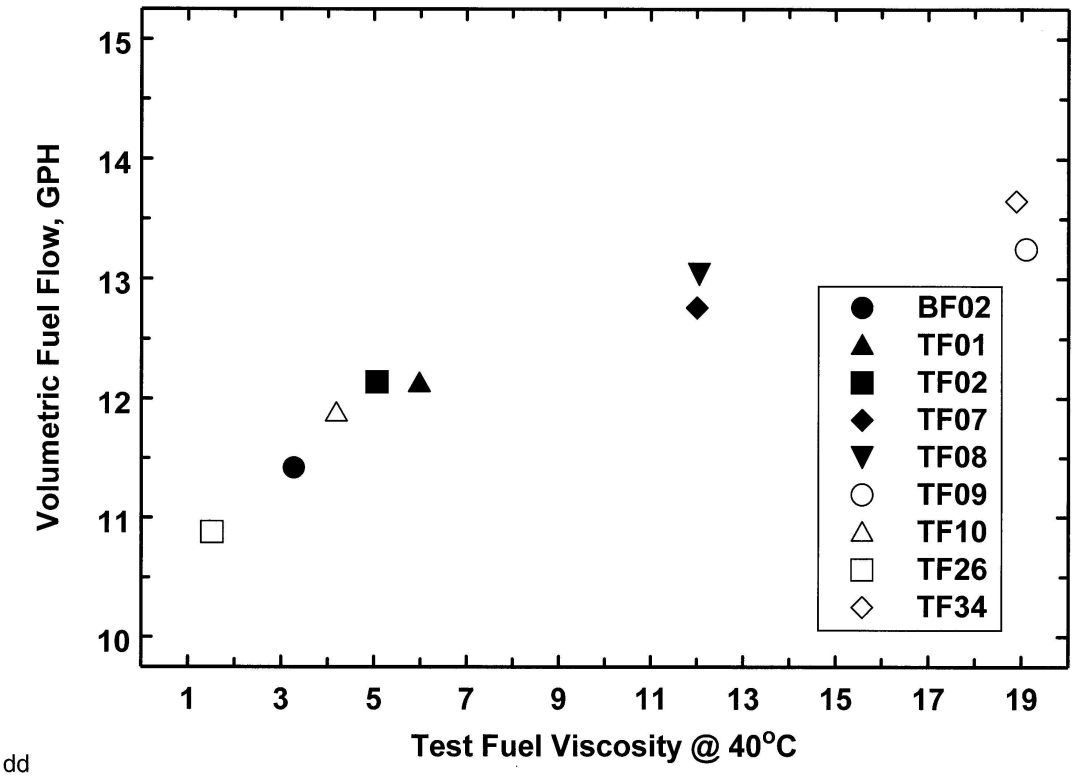

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Figure 19. DDC6V53N Maximum Power Volumetric Fuel Flow vs. Viscosity @40°C

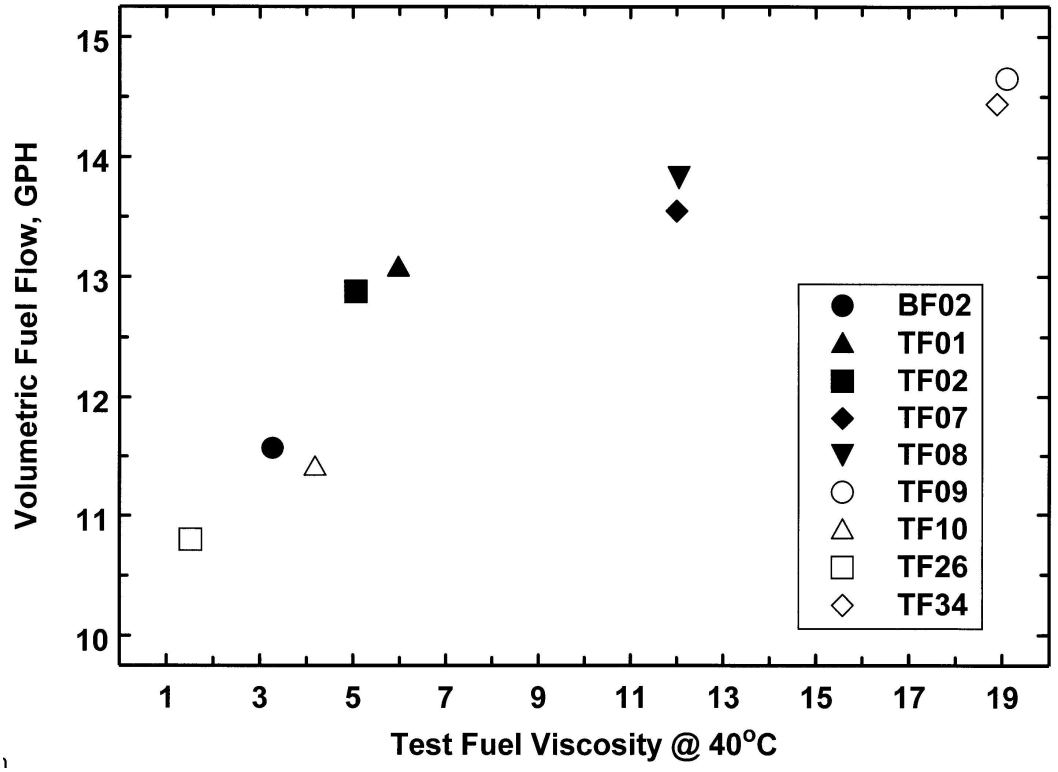

Figure 20. Cummins NH220G Maximum Power Volumetric Fuel Flow vs. Viscosity @ 40°C

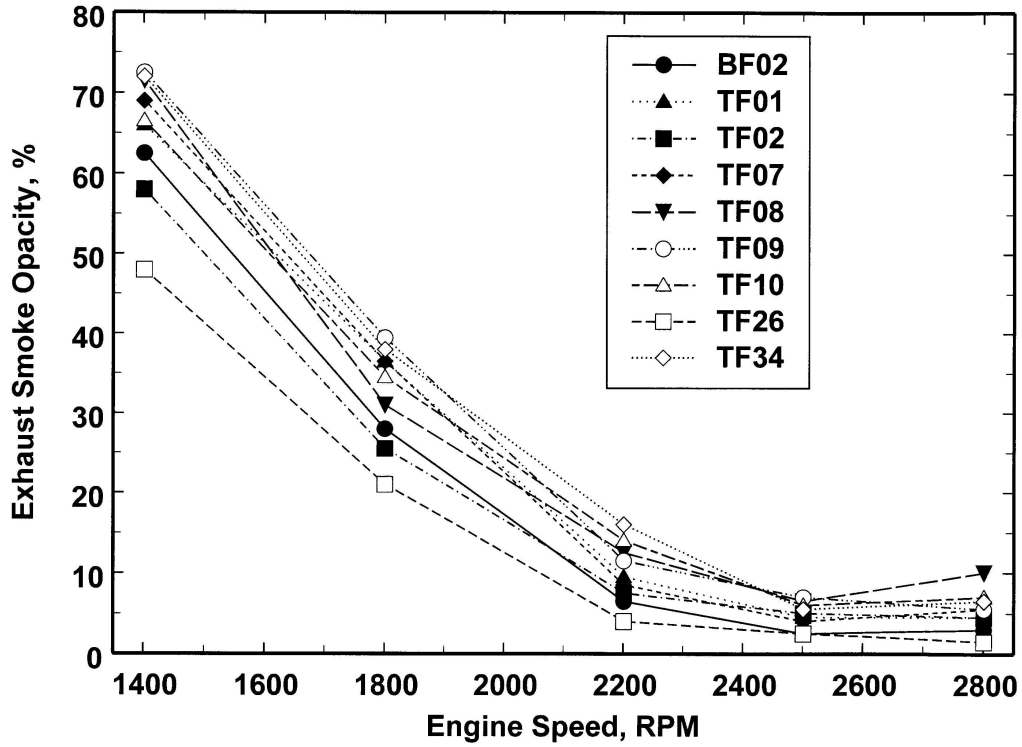

Figure 21. DDC 6V-53N Full Rack Smoke Opacity of Test Fuels

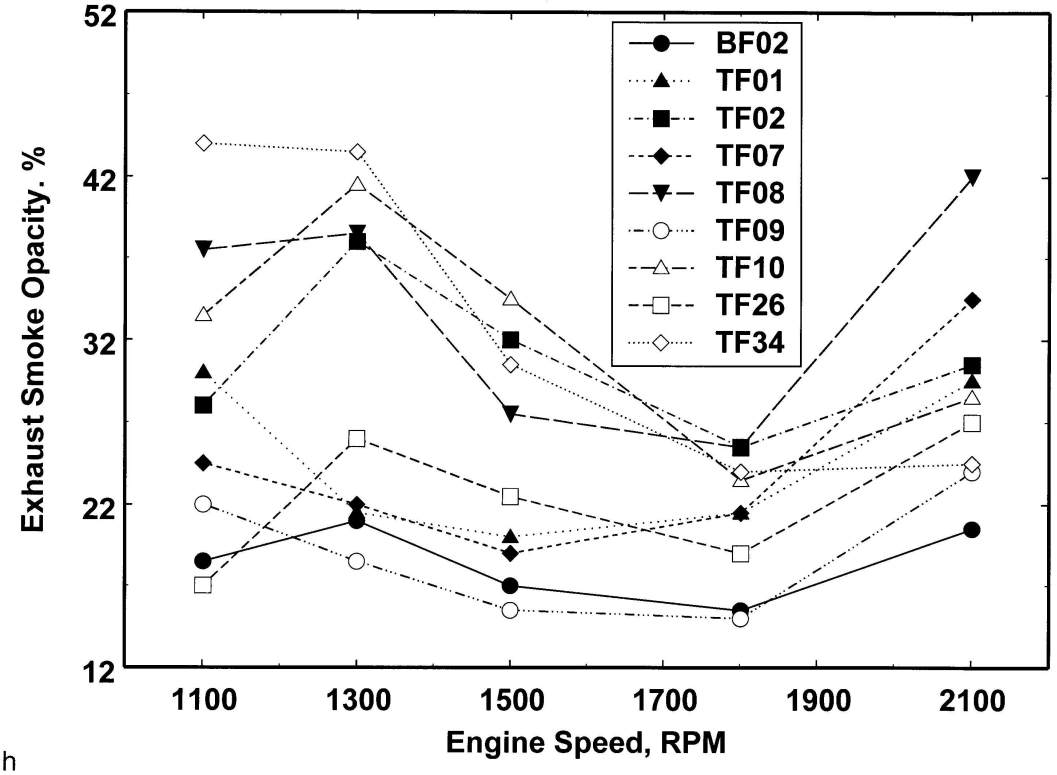

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Figure 22. Cummins NH220G Full Rack Smoke Opacity of Test Fuels

3.4 Other Performance Parameters

3.4.1 Maximum Cylinder Pressure

The peak cylinder pressure is an important variable to estimate the mechanical unit stresses in the piston, piston pin, connecting rod, and bearings. The peak cylinder pressure trends at full rack for the DDC 6V-53N and Cummins NH-220G are shown in Figures 23 and 24. Both engines show the same trend of higher peak pressures at the lower engine speeds. This result may be explained as a function of timing. At lower speeds, the piston has more loitering time around top dead center, allowing the pressures to increase. All engines are designed for a maximum cylinder pressure; therefore, understanding the effects the fuel properties can have on the cylinder pressure is imperative. Both engines reveal that there are fuel effects on cylinder pressure at full rack.

3.4.2 Maximum Rate of Pressure Rise

The peak pressure rise is a measure of knock during the autoignition of the fuel. Knock occurs when a quantity of fuel that exists in the premixed state autoignites, causing a pressure wave to reflect across the combustion chamber at the speed of sound. The pressure wave reflecting across the combustion chamber manifests itself in noise, vibration, increased convective heat transfer rates, and the scrubbing of lubricant from the cylinder walls. Figures 25 and 26 reveal the differences between fuels for the DDC 6V-53N and the Cummins NH-220G engines at full rack with respect to the peak pressure rise. Both engines show deviations in peak pressure rise that would be related to the test fuel properties. For most fuels, the greatest peak pressure rise occurs at the lower speeds where more residence time allows the premixed vapors to accumulate and conductive heat transfer from the combustion chamber to occur. The Cummins NH-220G shows that the highest peak pressure rise occurs at the engine speed for maximum torque. A key to looking at fuel effects on peak pressure rise would be to examine the fuel properties that would contribute to increased premixed vapors.

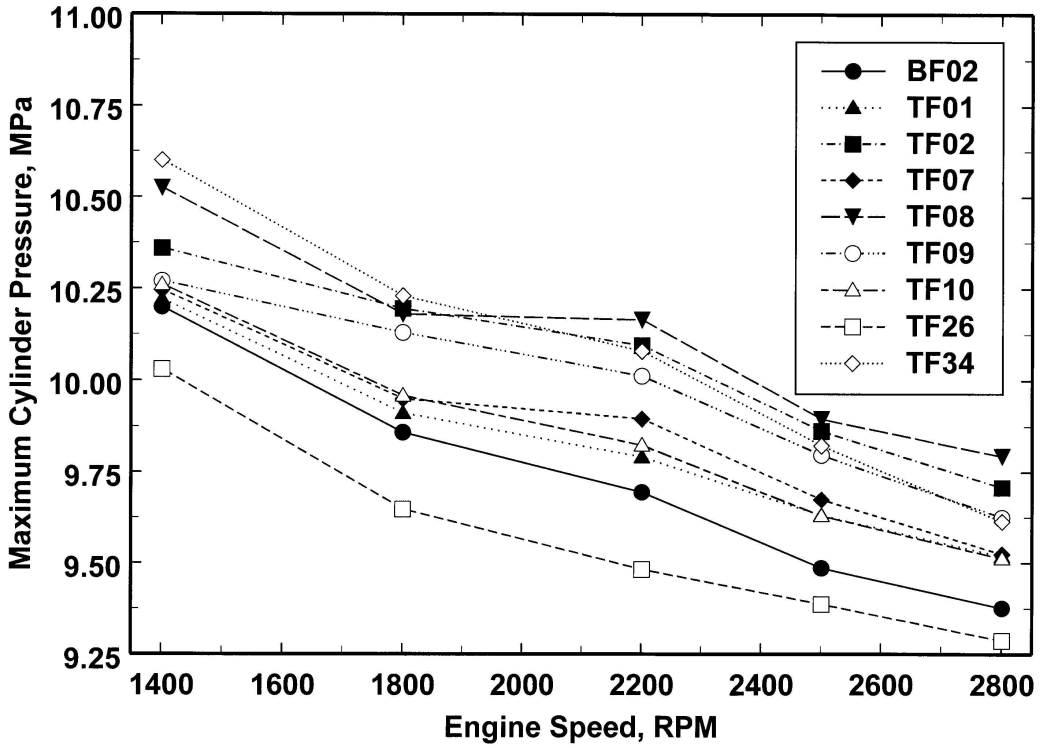

Figure 23. DDC 6V-53N Full Rack Maximum Cylinder Pressure of Test Fuels

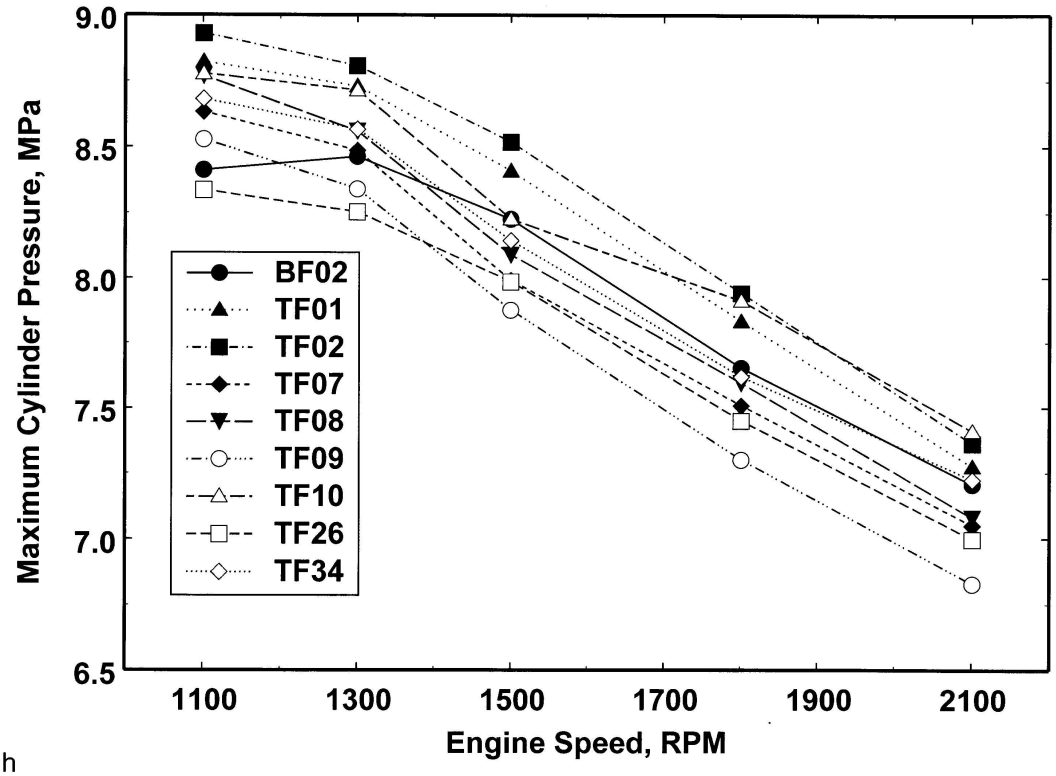

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Figure 24. Cummins NH220G Full Rack Maximum Cylinder Pressure of Test Fuels

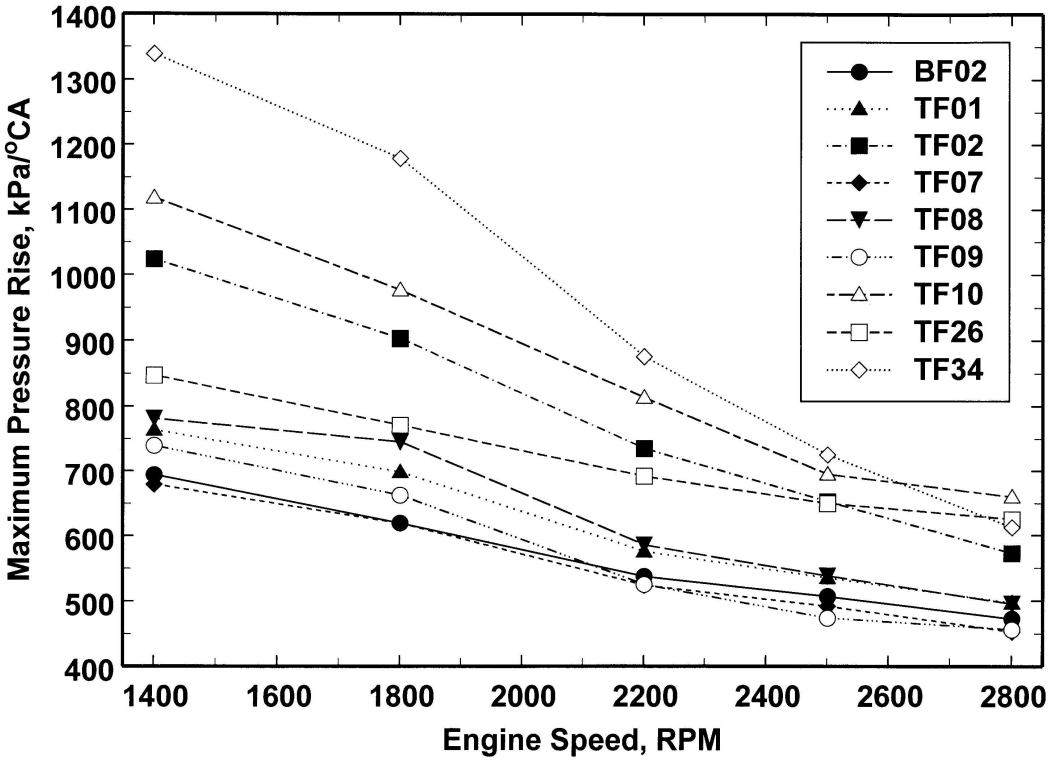

Figure 25. DDC 6V-53N Full Rack Maximum Cylinder Pressure Rise of Test Fuels

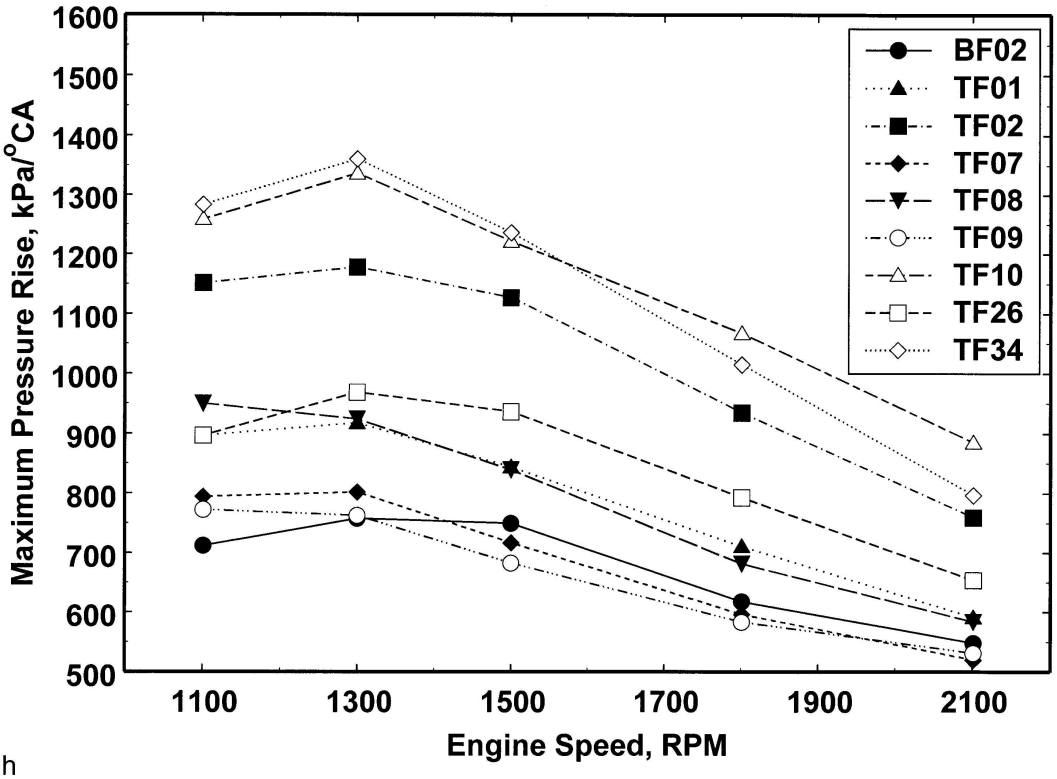

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Figure 26. Cummins NH220G Full Rack Maximum Cylinder Pressure Rise of Test Fuels

3.4.3 Heat Release Rate

At full rack operation, the maximum heat release rate closely defines the premixed mode of combustion. When the terms in the heat release equation are examined, it appears that the rate of pressure rise is the dominating term during the premixed mode. When calculating heat release rates, it should also be noted that ignition delay will have a very strong influence on the maximum heat release rate. This influence explains familiar trends seen in Figures 27 and 28 at full rack for the DDC 6V-53N and Cummins NH-220G engines. For both engines, the peak heat release rate occurs at the lower speeds, where premixed modes of combustion are more likely to occur. The primary purpose for calculating the heat release rate is its importance as the driving force for heat transfer. The maximum heat release rate correlates with the peak heat transfer rate, which is important for calculating thermal stresses in the piston and rings. The fuel properties that affect the amount of premixed vapors would be expected to impact the maximum heat release rate.

3.4.4 Ignition Delay Time

The ignition delay as measured in a diesel engine is the result of a combined process of physical and chemical delay times. The physical delay is affected by the breakup of the fuel jet into droplets during injection, the fuel and air mixing, and the time for the temperature and pressure in the cylinder to reach an autoignition state. The chemical delay is characterized by the heat transfer rates from the combustion chamber to the fuel droplets, the kinetics of combustion precursor formation, and the rate of fuel vapor diffusion across the droplet fuel/air interface. Variations in physical and chemical delay periods would be affected by fuel property variations. Figures 29 and 30 represent the ignition delays for all fuels and both engines at full rack. Both engines reveal a trend of increasing ignition delays, as measured by crank angle, with increasing engine speed. This trend indicates that an induction period exists that must be satisfied before ignition occurs, resulting in longer crank angle delays at higher speeds. It should be noted that the ignition delays acquired for the DDC 6V-53N and the Cummins NH-220G represent the onset of ignition with respect to the static injection timing, and not to the actual dynamic start of injection.

3.4.5 Cumulative Heat Release

The cumulative heat release is the cycle integral of the heat release rates and is a measure of the amount of fuel chemical energy converted to heat. The cumulative heat release as calculated does not include the heat transfer to the cylinder walls. The plots of cumulative heat release, Figure 31 for the DDC 6V-53N and Figure 32 for

the Cummins NH-220G, reveal that across the speed range of the engines at full rack, the cumulative heat release does not vary significantly. The significant difference in magnitude of the cumulative heat release between the engines is due to the two-stroke cycle of the DDC 6V-53N and the four-stroke cycle of the Cummins NH-220G. Another result is that the peak value appears at the speed for maximum torque for a given engine/fuel combination. It would be expected that the cumulative heat release will be influenced by those fuel properties that affect the energy input rate.

3.4.6 Combustion Efficiency

The apparent combustion efficiency measures how effectively an engine converts fuel chemical energy into heat. The apparent combustion efficiencies as calculated do not account for heat transfer. Figure 33 for the DDC 6V-53N and Figure 34 for the Cummins NH-220G reveal that the combustion efficiencies at full rack tend to increase with engine speed. This increase could be indicative of the higher turbulence and injection rates prevalent at the higher speeds for increased fuel/air mixing. Increased fuel/air mixing generally leads to more complete combustion. Fuel/air mixing would be dependent on fuel properties such as viscosity, density, volatility, and surface tension. Other fuel properties that would be expected to influence energy input rate and fuel/air mixing would also be expected to influence the apparent combustion efficiency.

3.4.7 Brake Thermal Efficiency

The observed thermal efficiency measures how effectively an engine converts available fuel chemical energy into measurable mechanical shaft work. In diesel engines, the larger the fraction of fuel that burns closer to top dead center, the higher the thermal efficiencies. Figures 35 and 36 are the thermal efficiency curves at full rack for all test fuels for the DDC 6V-53N and the Cummins NH-220G engines. The DDC 6V-53N has a relatively large variation in thermal efficiency across the speed range, while the Cummins NH-220G is fairly constant. Fuel properties that affect energy input rate and premixed combustion should influence brake thermal efficiencies.

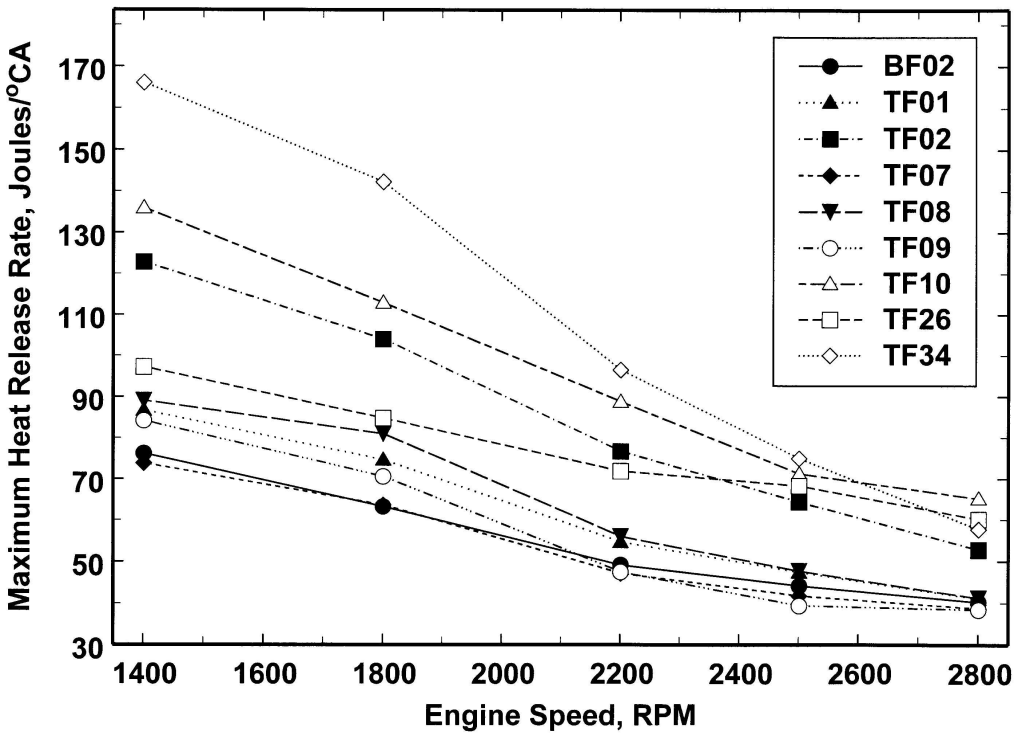

Figure 27. DDC 6V-53N Full Rack Maximum Heat Release Rate of Test Fuels

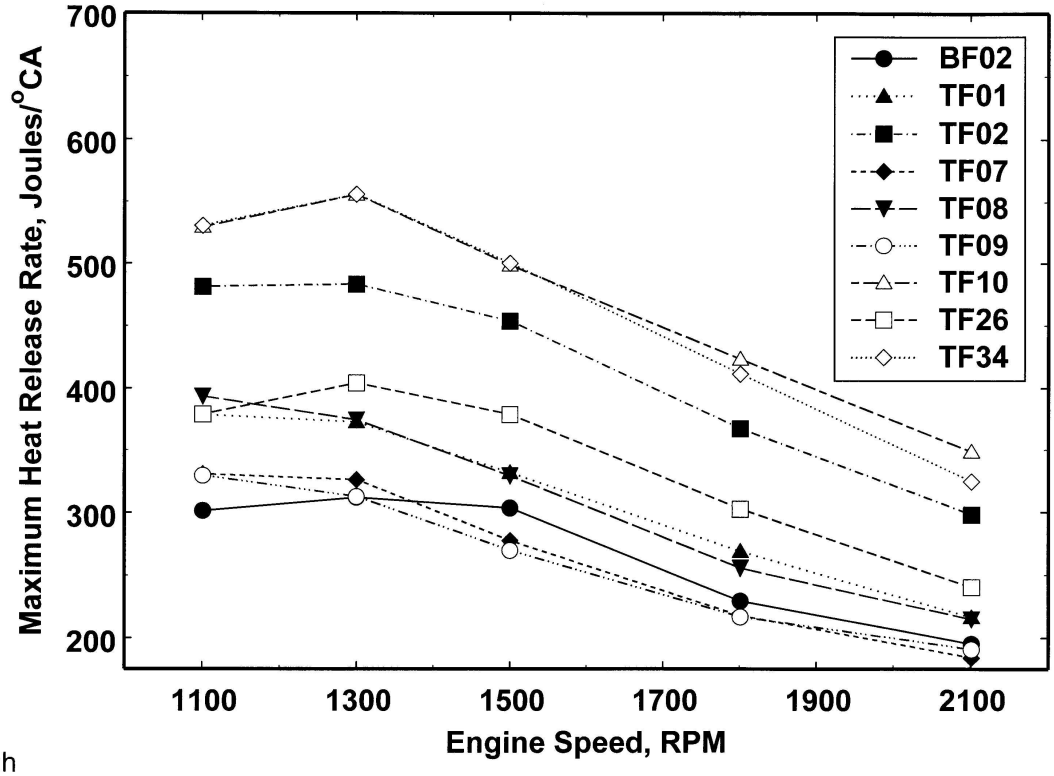

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Figure 28. Cummins NH220G Full Rack Maximum Heat Release Rate of Test Fuels

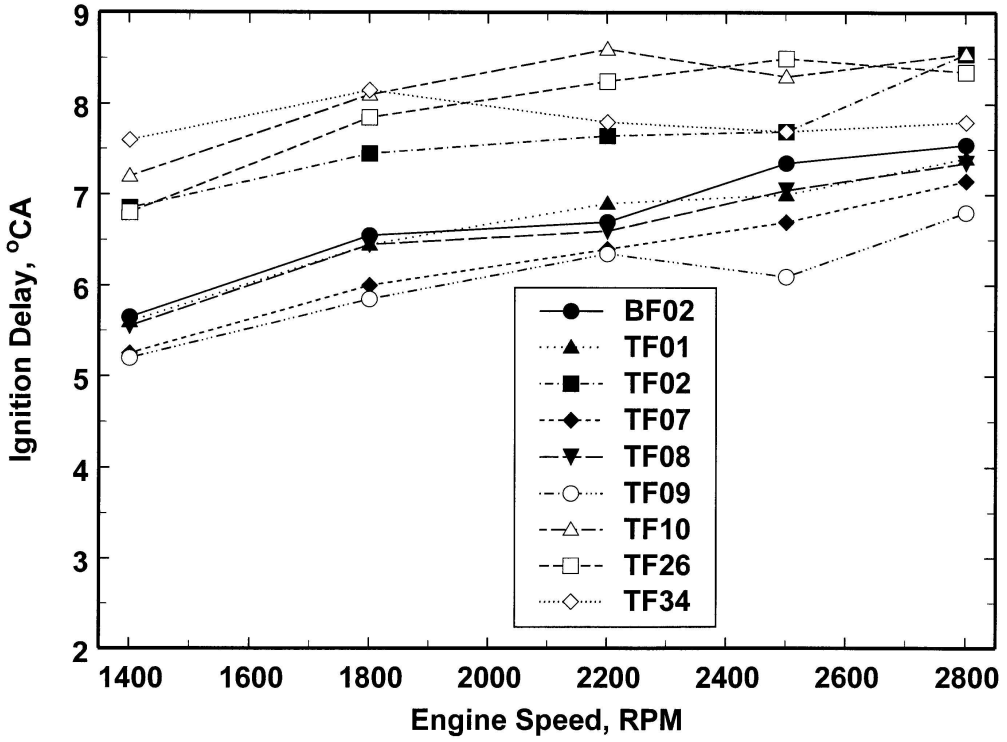

Figure 29. DDC 6V-53N Full Rack Ignition Delay of Test Fuels

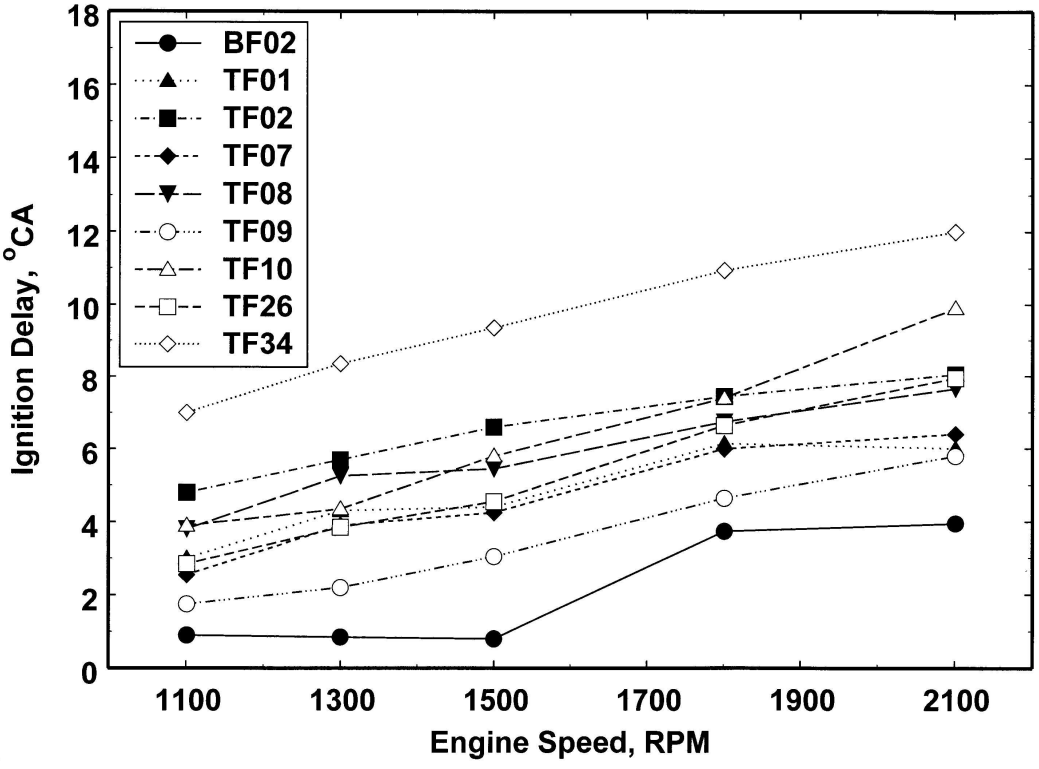

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Figure 30. Cummins NH220G Full Rack Ignition Delay of Test Fuels

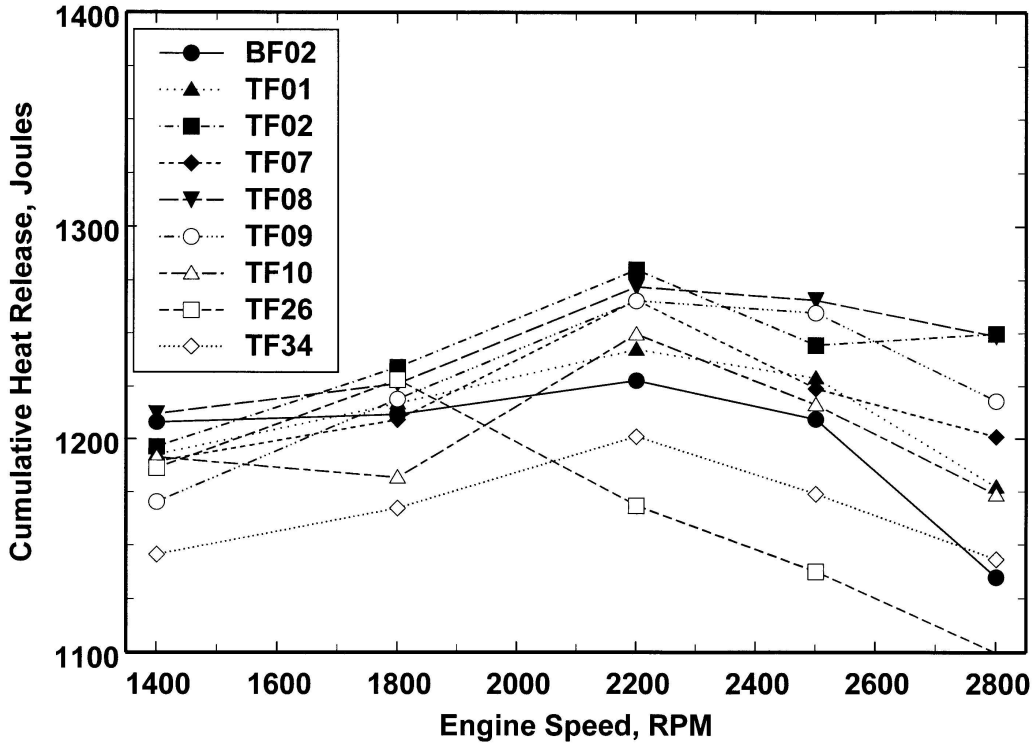

Figure 31. DDC 6V-53N Full Rack Cumulative Heat Release of Test Fuels

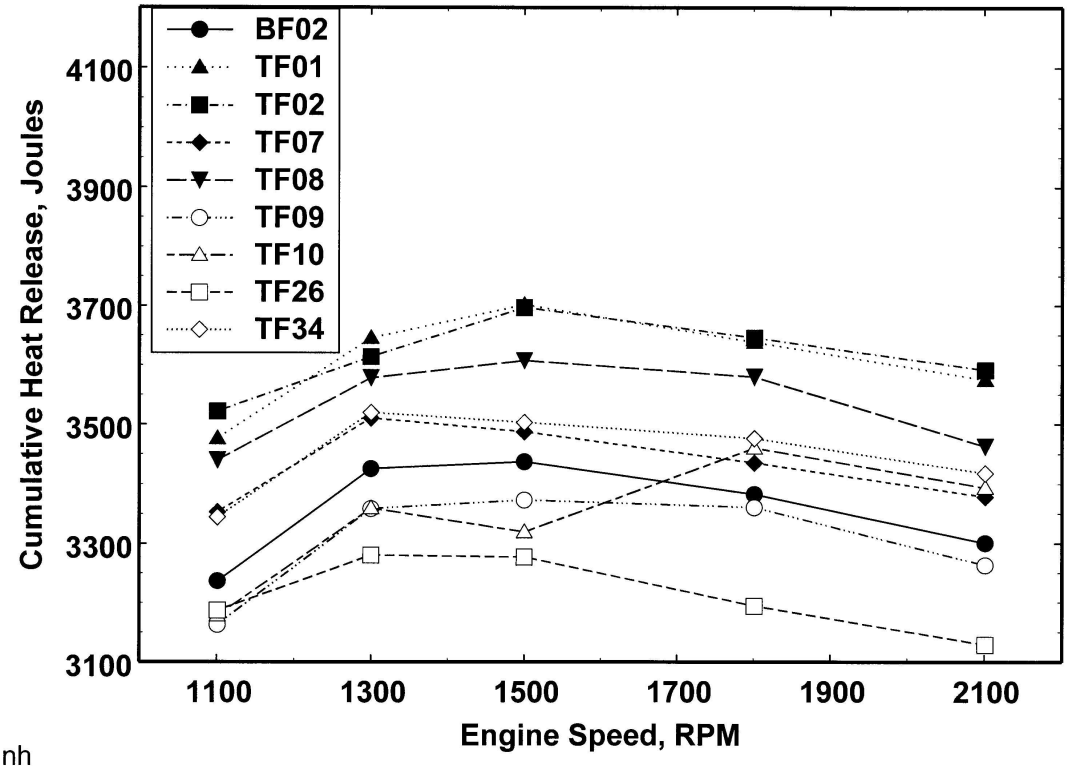

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Figure 32. Cummins NH220G Full Rack Cumulative Heat Release of Test Fuels

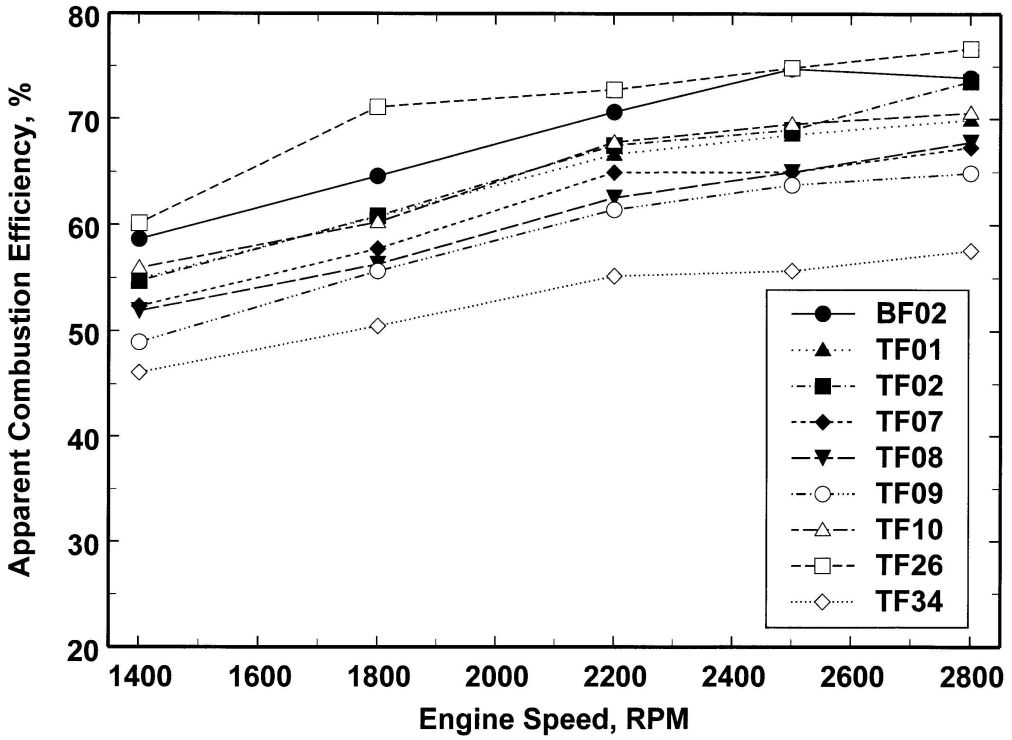

Figure 33. DDC 6V-53N Full Rack Apparent Combustion Efficiency of Test Fuels

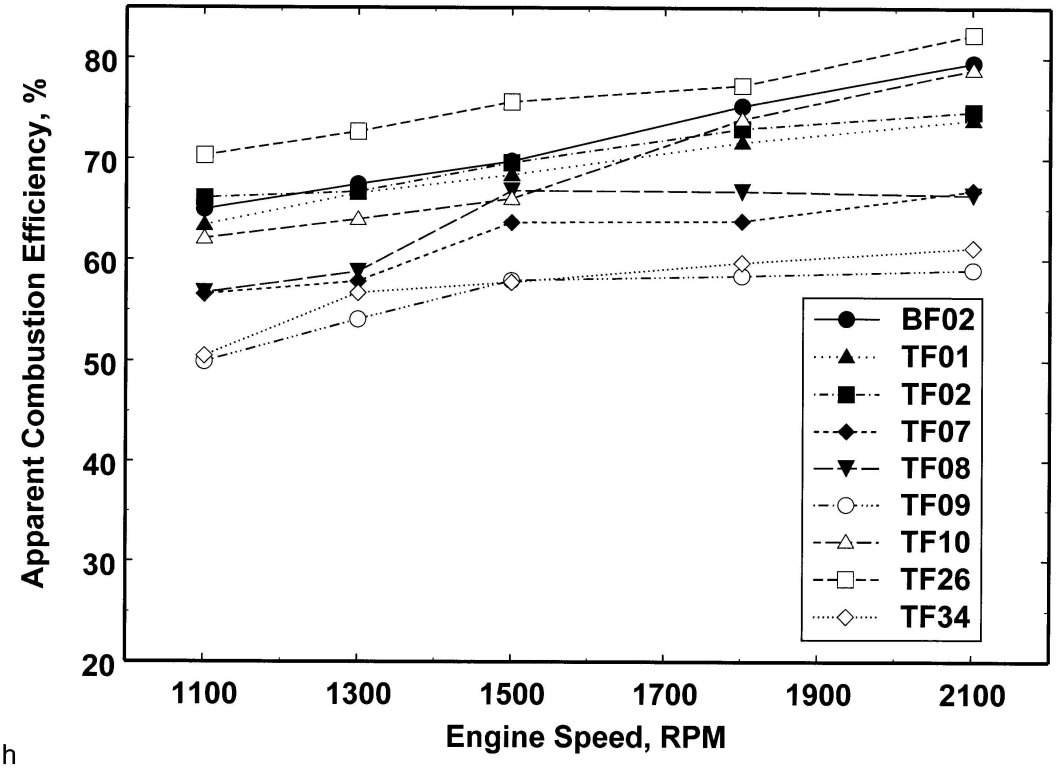

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Figure 34. Cummins NH220G Full Rack Apparent Combustion Efficiency of Test Fuels

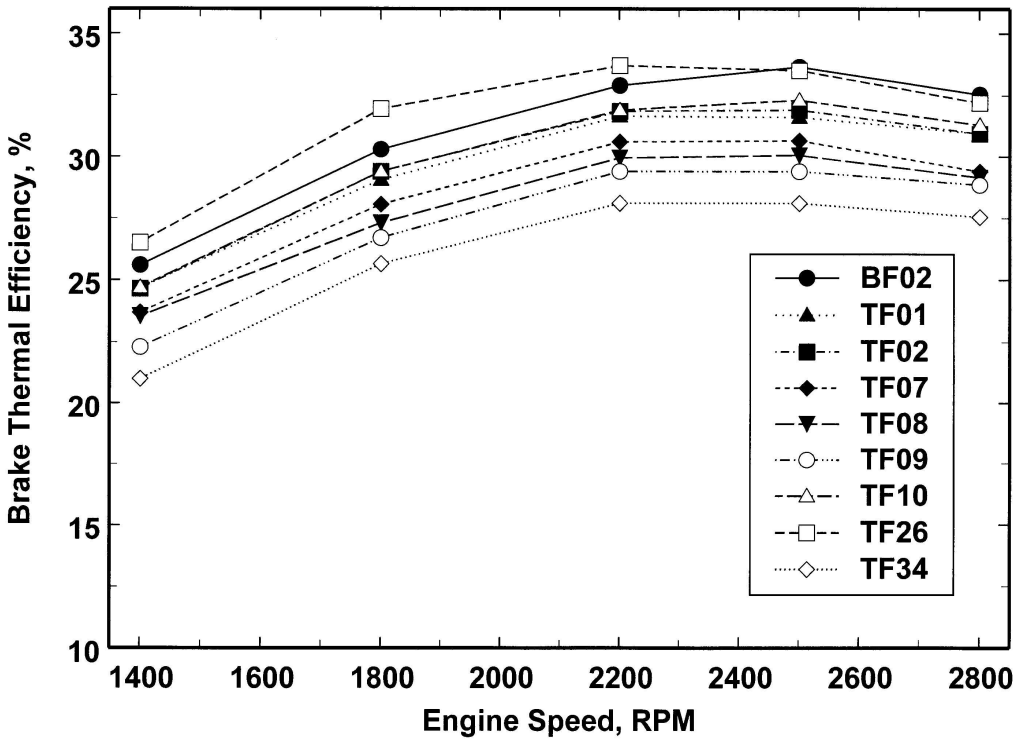
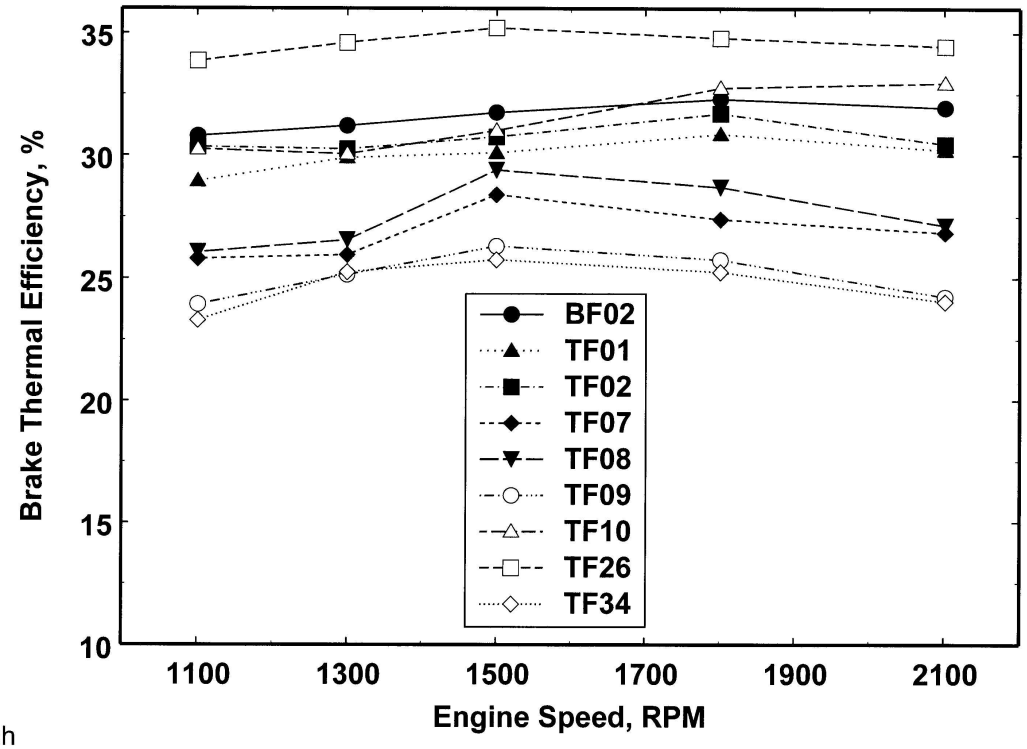


Figure 35. DDC 6V-53N Full Rack Brake Thermal Efficiency of Test Fuels



nh

Figure 36. Cummins NH220G Full Rack Brake Thermal Efficiency of Test Fuels

3.5 Performance Data Analysis Results

To evaluate how the independent and dependent variables interact, correlation matrices were generated for the fuel property variables, the engine performance variables of interest, and the engine performance versus fuel property variables.

The correlation matrix for the fuel property variables as determined by the fuel characterization protocol is included as Table 19. The values in the table represent the correlation coefficient, R. A negative R-value indicates an inverse relationship between variables. Correlating fuel properties should not be utilized together in a descriptive model because the results may be skewed by the interdependency of the independent variables. The fuel properties that have a correlation coefficient (R) greater than ±0.9 (R^2=0.8) are lightly shaded in Table 19. The correlation of the viscosity values indicate the fuels in the test matrix had similar viscosity indices (i.e. temperature sensitivity). The correlation of viscosity with 10 percent and 50 percent boiling points is reasonable because less viscous fuels also tend to be more volatile. The 50 percent and 90 percent boiling point correlation indicates the 90-percent temperatures increase as the 50-percent temperatures increase. A correlation between specific gravity and net heat of combustion should be expected, because net heat of combustion can be calculated knowing specific gravity using ASTM method D 4868. Hydrogen content has also been known to correlate with fuel heating values. The test fuel property correlation matrix is valid for the data set described by the HSDE test fuel properties and will not necessarily pertain to all fuels.

Table 19. Fuel Property Correlation Matrix

	VIS100C	H2	SPGR	D8610	D8650	D8690	NHC	ST	AP	CN
VIS40C	0.9831	-0.3971	0.7322	0.9734	0.8352	0.7387	-0.4990	0.7625	0.4003	-0.1749
VIS100C	**1.0**	-0.3769	0.7315	0.9660	0.9167	0.8209	-0.4694	0.7786	0.4765	-0.0889
H2		**1.0**	-0.8958	-0.3207	-0.4120	-0.5620	0.9813	-0.7923	0.5774	0.8052
SPGR			**1.0**	0.6719	0.7427	0.8261	-0.9356	0.8991	-0.1970	-0.6094
D8610				**1.0**	0.8414	0.7454	-0.4068	0.6996	0.4912	-0.0162
D8650					**1.0**	0.9581	-0.4700	0.7629	0.4791	0.0072
D8690						**1.0**	-0.6038	0.7658	0.2701	-0.1312
NHC							**1.0**	-0.7990	0.5214	0.8094
ST								**1.0**	-0.0400	-0.5203
AP									**1.0**	0.7759

The correlation matrix for the engine performance variables recorded using the operational sequence protocol for all fuels is included as Table 20 for the Cummins NH-220G and Table 21 for the DDC 6V-53N. The values in the table represent the correlation coefficient, R. Correlating engine performance variables are expected to result in similar descriptive fuel property effect models. The engine performance variables that have a correlation coefficient (R) greater than ±0.9 (R^2=0.8) are the lightly shaded areas in Table 20 and Table 21.

For both the Cummins NH-220G and the DDC 6V-53N, the engine speed does not show a good correlation with any other performance variable. The engine speed is a good variable to be included with the fuel properties as an independent variable to tie the fuel properties into the test point matrix. As expected, fuel flow is highly correlated with power production for both test engines, more fuel=more power. For the Cummins NH-220G the cumulative heat release (fuel energy released) also correlates with power. Load correlates well with the following: brake mean effective pressure, maximum cylinder pressure, cumulative heat release for both engines, and fuel flow for the DDC 6V-53N engine. The load-BMEP correlation is expected because BMEP is calculated from load response. The brake specific fuel consumption was expected to show a correlation with power and fuel flow, but does not; brake specific fuel consumption does correlate with the brake thermal efficiency for each engine.

The maximum cylinder pressure correlates with cumulative heat release for both engines. The maximum cylinder pressure rise correlates with the maximum cylinder pressure and maximum heat release rate for the Cummins NH-220G and maximum heat release rate for the DDC 6V-53N. Ignition delay relates to cumulative heat release for only the DDC 6V-53N. The performance variables calculated from the pressure histories generally show cross-correlation.

Neither the exhaust smoke opacity nor the apparent combustion efficiency reveal correlations with any other engine performance variable for either engine.

Table 20. Cummins NH-220G Performance Variable Correlation Matrix													
	OBHP	**LOAD**	**BMEP**	**FFIo**	**BSFC**	**MCP**	**MPR**	**ID**	**SMOKE**	**MHR**	**CHR**	**ACE**	**BTE**
RPM	0.0267	-0.4466	-0.4466	0.0132	0.1238	-0.6165	-0.5838	0.5477	-0.3988	-0.6286	-0.3604	0.3920	-0.0784
OBHP	**1.0**	0.8823	0.8823	0.9421	-0.6660	0.7566	0.6737	-0.6860	0.6992	0.6049	0.9151	-0.2047	0.6554
LOAD		**1.0**	1.0000	0.8367	-0.6530	0.9679	0.8784	-0.8734	0.8167	0.8382	0.9886	-0.3658	0.6222
BMEP			**1.0**	0.8367	-0.6530	0.9679	0.8784	-0.8734	0.8167	0.8382	0.9886	-0.3658	0.6222
FFIo				**1.0**	-0.4883	0.7343	0.6573	-0.6264	0.7373	0.5984	0.8924	-0.3745	0.4238
BSFC					**1.0**	-0.5529	-0.4744	0.5417	-0.3552	-0.4222	-0.6263	-0.1177	-0.9540
MCP						**1.0**	0.9229	-0.8852	0.8452	0.8987	0.9485	-0.4051	0.5080
MPR							**1.0**	-0.6958	0.8734	0.9914	0.8538	-0.4137	0.4528
ID								**1.0**	-0.6528	-0.6412	-0.8402	0.2804	-0.4896
SMOKE									**1.0**	0.8545	0.8327	-0.3764	0.3124
MHR										**1.0**	0.8083	-0.4340	0.4009
CHR											**1.0**	-0.3517	0.5896
ACE												**1.0**	0.2039

Table 21. DDC 6V-53N Performance Variable Correlation Matrix													
	OBHP	**LOAD**	**BMEP**	**FFIo**	**BSFC**	**MCP**	**MPR**	**ID**	**SMOKE**	**MHR**	**CHR**	**ACE**	**BTE**
RPM	0.7586	0.4145	0.4145	0.6740	-0.5954	0.2991	-0.6034	-0.1913	-0.4368	-0.6450	0.4284	0.2921	0.6189
OBHP	**1.0**	0.8967	0.8967	0.9768	-0.6128	0.8217	-0.5202	-0.7215	0.1024	-0.5915	0.8983	-0.1677	0.6053
LOAD		**1.0**	1.0000	0.9189	-0.5049	0.9736	-0.3224	-0.8801	0.4722	-0.3921	0.9876	-0.4446	0.4796
BMEP			**1.0**	0.9189	-0.5049	0.9736	-0.3224	-0.8801	0.4722	-0.3921	0.9876	-0.4446	0.4796
FFIo				**1.0**	-0.4641	0.8795	-0.4405	-0.7771	0.2479	-0.5128	0.9234	-0.3246	0.4488
BSFC					**1.0**	-0.3375	0.4553	0.2675	0.2778	0.4935	-0.4566	-0.2285	-0.9813
MCP						**1.0**	-0.2047	-0.8892	0.6281	-0.2716	0.9766	-0.5421	0.3107
MPR							**1.0**	0.4606	0.2486	0.9955	-0.3695	-0.3664	-0.4519
ID								**1.0**	-0.6085	0.5076	-0.9032	0.4493	-0.2259
SMOKE									**1.0**	0.2339	0.4954	-0.6825	-0.3157
MHR										**1.0**	-0.4361	-0.3310	-0.4892
CHR											**1.0**	-0.3830	0.4338
ACE												**1.0**	0.2865

Table 22 for the Cummins NH-220G and Table 23 for the DDC 6V-53N show the correlation matrices for the engine performance and fuel property variables. No single fuel variable correlates with an engine performance variable in either engine. The poor correlation of engine speed with any fuel variable indicates that engine speed would be a well-chosen independent variable. The poor correlations indicate the descriptive model will be linear combinations or transformations of the fuel property variables in order to predict engine performance.

3.5.1 Correlation Equations

The David Taylor Research Center performed the regression analysis of the data generated during the HSDE performance evaluation tests. The following minimum acceptance criteria were utilized during the statistical analysis:

- R-square Value: 80%
- t-ratio Value for Independent Variables Coefficients: ±2.0

The basic stepwise linear regression model included the following variables as the independent variables:

Independent Fuel Variables	
D8690	Distillation 90% Point (°C)
SPGR	Specific Gravity @ 15.6 °C
VIS40C	Viscosity @ 40°C (mm^2/s)
H2	Hydrogen Content (Wt. %)
CN	Cetane Number
"X"^2	Fuel Variables Squared
Independent Engine Variables	
RPM	Engine Speed, RPM
LOAD	Engine Load, lb-ft

The independent fuel property variables and fuel property variable transformations were chosen based on scatter plots of the performance parameters and the fuels data. The engine performance parameter models were then developed utilizing speed and load as independent variables, then adding fuel variables one at a time to improve the R-squared value of the regression equation.

Table 22. Cummins NH-220G Fuel Property vs. Performance Variable Correlation Matrix											
	VIS40C	VIS100C	H2	SPGR	D8610	D8650	D8690	NHC	ST	AP	CN
RPM	-0.0004	-0.0004	-0.0004	0.0001	-0.0008	-0.0004	-0.0004	-0.0004	0.0001	-0.0008	-0.0009
OBHP	-0.0314	-0.0314	0.0031	-0.0161	-0.0285	-0.0259	-0.0177	0.0080	-0.0208	-0.0231	0.0003
LOAD	-0.0321	-0.0322	0.0046	-0.0177	-0.0290	-0.0272	-0.0194	0.0095	-0.0222	-0.0223	0.0016
BMEP	-0.0321	-0.0322	0.0046	-0.0177	-0.0290	-0.0272	-0.0194	0.0095	-0.0222	-0.0223	0.0016
FFlo	0.2375	0.2404	-0.1446	0.2191	0.2287	0.2292	0.2214	-0.1668	0.2096	0.0681	-0.0695
BSFC	0.3116	0.3099	-0.1922	0.2818	0.2950	0.2827	0.2642	-0.2207	0.2799	0.0815	-0.1096
MCP	-0.0473	-0.0452	-0.0154	-0.0071	-0.0448	-0.0285	-0.0137	-0.0079	-0.0193	-0.0429	-0.0110
MPR	-0.0383	-0.0657	-0.2618	0.1521	-0.0715	-0.0795	-0.0176	-0.2435	0.1199	-0.3155	-0.3032
ID	0.1261	0.1054	-0.3906	0.3286	0.0591	0.0941	0.1467	-0.3947	0.2875	-0.2878	-0.4076
SMOKE	0.0219	0.0291	-0.2507	0.1888	-0.0187	0.0648	0.1010	-0.2334	0.1847	-0.1847	-0.2253
MHR	-0.0229	-0.0556	-0.3317	0.2074	-0.0638	-0.0720	0.0027	-0.3129	0.1628	-0.3749	-0.3721
CHR	0.0026	0.0077	-0.0277	0.0293	-0.0009	0.0244	0.0336	-0.0295	0.0111	-0.0112	-0.0144
ACE	-0.5804	-0.5985	0.3856	-0.5465	-0.5800	-0.5857	-0.5730	0.4062	-0.6010	-0.1683	0.1637
BTE	-0.4418	-0.4482	0.2046	-0.3551	-0.4351	-0.4169	-0.3823	0.2434	-0.3671	-0.1892	0.0663

Table 23. DDC 6V-53N Fuel Property vs. Performance Variable Correlation Matrix											
	VIS40C	VIS100C	H2	SPGR	D8610	D8650	D8690	NHC	ST	AP	CN
RPM	-0.0001	0.0000	0.0003	-0.0002	0.0003	0.0003	0.0003	0.0004	-0.0002	0.0008	0.0014
OBHP	0.0349	0.0382	-0.0311	0.0424	0.0335	0.0442	0.0472	-0.0338	0.0370	0.0065	-0.0127
LOAD	0.0387	0.0425	-0.0343	0.0471	0.0366	0.0493	0.0527	-0.0376	0.0409	0.0071	-0.0148
BMEP	0.0387	0.0425	-0.0343	0.0471	0.0366	0.0493	0.0527	-0.0376	0.0409	0.0071	-0.0148
FFlo	0.1485	0.1493	-0.1166	0.1552	0.1383	0.1431	0.1431	-0.1297	0.1451	0.0169	-0.0710
BSFC	0.2970	0.2882	-0.2346	0.3028	0.2783	0.2566	0.2490	-0.2618	0.2798	0.0200	-0.1484
MCP	0.0549	0.0548	-0.0853	0.0897	0.0427	0.0568	0.0661	-0.0917	0.0718	-0.0365	-0.0660
MPR	0.0708	-0.0022	-0.6096	0.4279	-0.0153	-0.0743	0.0365	-0.6008	0.3352	-0.6273	-0.6958
ID	-0.0980	-0.1386	-0.2167	0.0808	-0.1359	-0.1767	-0.1222	-0.1980	0.0525	-0.3504	-0.3084
SMOKE	0.0411	0.0429	-0.0516	0.0555	0.0436	0.0469	0.0526	-0.0476	0.0588	-0.0050	-0.0249
MHR	0.0597	-0.0106	-0.5689	0.3944	-0.0210	-0.0815	0.0227	-0.5598	0.3093	-0.5951	-0.6555
CHR	-0.0135	-0.0050	0.0274	-0.0181	-0.0088	0.0108	0.0110	0.0268	-0.0227	0.0272	0.0426
ACE	-0.5678	-0.5484	0.4704	-0.5909	-0.5092	-0.4820	-0.4805	0.5193	-0.5690	0.0034	0.3757
BTE	-0.3230	-0.3161	0.2147	-0.3012	-0.3016	-0.2802	-0.2641	0.2467	-0.2861	-0.0580	0.1347

Table 24 summarizes engine performance parameter correlations with fuel variables determined by the DTRC multi-variate analysis with respect to the regression acceptance criteria. The regression equations for the Cummins NH-220G and DDC 6V-53N, along with R-squared and t-ratio values, are shown in Appendix C for the DTRC analysis. The analysis results indicate that RPM and LOAD independent variables account for a significant portion of the performance variation seen by those engine performance and combustion parameters with unacceptable correlations.

Table 24. Acceptability Test of DTRC Performance Variable vs. Fuel Property Analysis

Parameter	Cummins NH-220G	DDC 6V-53N
Observed Brake Horsepower	unacceptable	unacceptable
Brake Specific Fuel Consumption	unacceptable	unacceptable
Brake Thermal Efficiency	unacceptable	unacceptable
Combustion Efficiency	satisfactory	unacceptable
Cumulative Heat Release	unacceptable	unacceptable
Maximum Heat Release Rate	satisfactory	satisfactory
Maximum Cylinder Pressure	satisfactory	satisfactory
Maximum Cylinder Pressure Rise	satisfactory	satisfactory
Ignition Delay	satisfactory	satisfactory
Smoke Opacity	unacceptable	unacceptable

A supplemental analysis performed a data transformation on the engine performance independent variable LOAD. The torque at each engine speed (for each fuel) was divided by the maximum torque for that engine speed and fuel then converted to a percentage value. This new variable was called the load set point (LSP) and replaced the independent performance variable LOAD in a stepwise linear regression. The performance data utilized for the regression analysis was the average of the duplicate runs for each engine and fuel combination. An analysis was performed on the following performance variables: observed brake horsepower (OBHP), torque (LOAD), fuel flow (FFlo), and brake specific fuel consumption (BSFC). These dependent variables were chosen to explore the test fuel property effects on engine power making ability and fuel consumption. The analysis was performed utilizing the minimum acceptance criteria discussed previously. The regression analysis was performed without a constant term (forcing the regression equation through zero) and with a constant term. In all cases analyzed, the best fit model was realized without the constant term in the regression.

The regression analysis results are summarized in Table 25 for the Cummins NH-220G. The dependent variable OBHP has a direct correlation with engine speed and load set point as expected, and an inverse relationship with kinematic viscosity at 40°C and the net heat of combustion on a mass basis.

Table 25. Cummins NH-220G Engine Regression Analysis Results				
Engine Performance Variable	Significant Independent Variables	Independent Variable Coefficients	Independent Variable t-ratio	R-squared
OBHP, bhp	RPM LSP VIS40C NHC	0.082332 1.794662 -0.507123 -3.348254	39.6899 101.8407 -5.6957 -33.9496	0.9986
LOAD, lb-ft	RPM RPM^2 LSP VIS40C NHC D8690	0.343986 -0.000128 5.436692 -1.854024 -5.067702 0.06942	9.3773 -11.1449 169.2738 -8.2549 -7.2972 2.6810	0.9996
FFlo, lb/hr	RPM LSP VIS40C NHC D8690	0.03438 0.771738 0.561092 -1.853463 0.049159	19.0066 50.2425 4.8169 -14.6863 3.7011	0.9952
BSFC, lb/bhp-hr	LSP LSP□ VIS40C SPGR H2	0.023573 -0.380641 0.00547 1.644611 0.034233	21.3997 -25.0362 5.5188 18.9572 6.5918	0.9936

Fuel Metering: The inverse correlation with viscosity suggests the fuel metering in the Cummins PT (pressure-time) fuel injection system is affected by increased fuel viscosity. Callahan and Bowden (24) show fuel metering in a Cummins PT fuel injector to decrease with increasing fuel viscosity. Less fuel metered means less power. The inverse mass-based heat of combustion correlation with power would reflect TF26 (JP-5) having a higher mass heating value than BF02 (DFM), but a lower volumetric heating value due to lower fuel density. Volumetric heating value differences between fuels have traditionally been used to estimate power deviations between fuels because fuel injection systems meter fuel by volume.

Load: The dependent variable torque (LOAD) is highly engine-speed and load-set-point dependent in the Cummins NH-220G engine (Table 25). A component effect analysis suggested the engine speed squared transformation would benefit the model. The engine torque was also significantly influenced by fuel viscosity, net heat of combustion, and 90-percent boiling point temperature. The kinematic viscosity and mass heating value show a similar inverse correlation with torque as the observed power (not surprising since power is calculated from torque). Increased 90-percent boiling point temperatures are indicative of heavier, denser, and less volatile fuels. Denser fuels typically have higher volumetric heating values to directly correlate with torque output.

The dependent variable torque is load set point dependent for the DDC 6V-53N engine (Table 26). The engine torque is also significantly influenced by both fuel viscosities and aniline point. The kinematic viscosity at 40°C shows an inverse correlation with torque. Ref. 24 indicates a parabolic response of metered fuel with DDC unit injectors with respect to viscosity at 40°C, with the maxima occurring at approximately 3 cSt. Higher 40°C viscosities result in reduced injector fill, which could result in a lower torque response. As seen in Table 10, both fuel viscosities are highly correlated; therefore, one would expect a similar impact on torque output is expected. However, the torque response increases directionally with the viscosity at 100°C. The viscosity at 100°C is probably more representative of the fuel viscosity at the operating engine fuel metering temperature. Ref. 24 also indicates DDC unit injector output is reduced by increased leakage at low fuel viscosities. The higher torque response with higher fuel viscosity at 100°C may reflect lower fuel leakage in the injector barrel and plunger. The aniline point is a measure of fuel hydrocarbon structure, more specifically, the amount of aromatic hydrocarbons in a fuel mixture. Thus fuels with higher aniline points have more aromatic hydrocarbon content, which adversely impacts the engine torque produced in the DDC 6V-53N.

Table 26. DDC 6V-53N Regression Analysis Results

Engine Performance Variable	Significant Independent Variables	Independent Variable Coefficients	Independent Variable t-ratio	R-squared
OBHP, bhp	RPM LSP NHC D8650	0.061351 1.334593 -2.881794 0.049689	28.7086 43.6000 -18.7679 3.0552	0.9962
LOAD, lb-ft	LSP VIS40C VIS100C AP	3.885555 -3.704625 32.956236 -0.470762	82.8625 -2.6879 3.5211 -3.6041	0.9975
FFlo, lb/hr	RPM LSP LSP□ VIS100C SPGR H2	0.022132 1.709918 -16.225637 2.904837 38.610372 -1.583769	24.3769 13.8144 -8.5762 6.5370 5.0975 -4.1837	0.9966
BSFC, lb/bhp-hr	RPM LSP LSP□ SPGR H2 D8690	-0.000059 0.015706 -0.252687 1.474507 0.026717 -0.000176	-7.9603 15.5203 -16.3371 18.2486 8.2946 -2.1416	0.9968

Fuel Flow: The dependent variable fuel flow (FFlo) is engine speed and load set point dependent. The fuel flow was also significantly influenced by fuel viscosity, net heat of combustion, and 90-percent boiling point temperature. The kinematic viscosity and 90-percent boiling point temperature show a direct correlation with fuel flow. Increased 90-percent boiling point temperatures are indicative of heavier, denser, and less volatile fuels. Ref. 24 also indicates the Cummins PT (pressure-time) fuel system is highly fuel rail pressure dependent. Kinematic viscosity may affect fuel rail pressure, subsequently affecting the fuel flow. Examining fuel rail pressure data for fuels BF02 (3.271 cSt) and TF26 (1.52 cSt) reveals lower fuel rail pressure for the lower viscosity fuel in the Cummins NH-220G. The response of decreasing fuel flow with increasing mass heating value is indicative of the density variations that correspond to the mass-based heating value.

BFSC: The dependent variable brake specific fuel consumption (BSFC) shows a dependency on load set point and its square root in the Cummins NH-220G engine (Table 25). The kinematic viscosity, specific gravity, and hydrogen content show a direct correlation with BSFC. BSFC is kinematic-viscosity dependent due to the effect viscosity has on the fuel rail pressure of the Cummins PT fuel system. The BSFC also increases with higher specific gravity (more dense) fuels. Generally, hydrogen content of a fuel increases with the mass heating value and decreases with fuel specific gravity. As mentioned earlier, the mass heating value had inverse impacts on fuel flow and observed power, the variables used to calculate BSFC. Therefore, an inverse correlation between BSFC and hydrogen content was expected. The HSDE test procedure was performed so that the partial load data points were operated at the same observed power levels regardless of test fuel. Fuels with higher hydrogen contents, and subsequently lower volumetric heating values, result in higher fuel consumption to generate the same level of power at part loads, increasing BSFC.

The dependent variable brake specific fuel consumption (BSFC) shows a dependency on engine speed, load set point, and the square root of load set point in the DDC 6V-53N engine (Table 26). The specific gravity and hydrogen content show a direct correlation with BSFC. The BSFC increases with higher specific gravity (more dense) fuels. Again the HSDE test procedure was performed so that the partial load data points were operated at the same observed power levels regardless of test fuel. Fuels with higher hydrogen contents, and subsequently lower volumetric heating values, result in higher fuel consumption to generate the same level of power at part loads, increasing BSFC in the DDC 6V-53N. The inverse relationship between 90-percent boiling point temperature and BSFC may reflect that higher boiling-temperature fuels tend to have higher viscosities, which may result in less fuel fill volume of the DDC 6V-53N injectors.

OBHP: The regression analysis results for the DDC 6V-53N are summarized in Table 26. The dependent variable OBHP has a direct correlation with engine speed, load set point, and 50-percent boiling point temperature, and an inverse relationship with the net heat of combustion on a mass basis. The inverse mass-based heat of combustion correlation with power would reflect TF26 (JP-5) having a higher mass heating value than BF02 (DFM), but a lower volumetric heating value due to lower fuel density. Increased 50-percent boiling point temperatures generally indicate heavier, denser, and less volatile fuels. Denser fuels typically have higher volumetric heating values.

The variable fuel flow is engine-speed, load-set-point, and the square root of load set point dependent. The fuel flow was also significantly influenced by fuel kinematic viscosity at 100°C, specific gravity, and hydrogen content. The kinematic viscosity and specific gravity show a direct correlation with fuel flow. Denser more viscous fuels result in higher fuel flows with the DDC 6V-53N. Higher hydrogen content trends toward less dense fuels (the inverse relationship with fuel flow).

3.6 Test Fuel Analysis

Four types of analytical protocols were defined for test fuel samples to be used in the HSDE program.

3.6.1 Production Protocol

The Production Protocol was utilized to verify that target values for test fuel properties were achieved during test fuel production. The Production Protocol was performed on 20-liter pilot blends to determine if the target fuel property tolerances were achieved. The Production Protocol was performed by NIPER, the fuel blending laboratory. When the pilot blend target fuel properties were satisfactory, the test fuel Characterization Protocol was performed. Based on the Characterization Protocol results of the pilot blends, the production quantity was scaled up for supplying test fuels to all participants.

3.6.2 Characterization Protocol

The fuel Characterization Protocol was performed by NIPER on all test fuels for all participating laboratories. The Characterization Protocol was performed on all initial pilot blends, on each production run of test fuels, and on each survey fuel as dictated by the FQP and the Project Officer. The analysis included all MIL-F-

16884H specified analyses, VV-F-800C (25) specified analyses not included in MIL-F-16884H, and analyses detailed in the Key Properties and Contamination/Degradation Protocols. The Characterization Protocol was performed within 21 days of receipt of a test fuel at the designated characterization laboratory. The fuel property results from the Characterization Protocol were utilized for the multi-variate data analysis. The fuel properties chosen for the regression analysis are shown in Table 27. The complete Characterization Protocol results for the HSDE test fuels are included in Appendix D.

3.6.3 Key Property Protocol

The Key Property Protocol was performed within seven days of receipt of each batch of test fuel at the test participant site. The protocol was then performed quarterly for all test fuels in storage, and within 30 days prior to the test fuel utilization. Test fuels were not utilized until the results of the Key Properties Protocol was reviewed and approved by the Project Officer. The Key Property Protocol performed at TFLRF is shown in Table 28, with the results reported to the Project Officer on the form given as Table 29.

3.6.4 Contamination/Degradation Protocol

The purpose of this Contamination/Degradation Protocol was to check for contamination and/or degradation of the test fuels during the test period. Each test participant was responsible for performing the Contamination/Degradation Protocol at their site. This protocol was to be performed within seven days of receipt of each batch of test fuel, and a monthly analysis of each batch of test fuel was required thereafter. No test fuel that exceeded the contamination/degradation tolerances was to be used unless approved by the Project Officer.

Other details of the Contamination/Degradation Protocol are provided in a document provided by the DTRC entitled "Test Fuel Analysis Elements" and in the form given as Table 30. To conserve on analytical costs, this protocol was discontinued for fuels as engine performance testing on the fuel was completed. In conjunction with the Contamination/Degradation Protocol, a fuel inventory form (FQP Test Fuel Inventory Form) was submitted to the Project Officer detailing the remaining volume of each test fuel, its container, and storage conditions. A copy of this form is given as Table 31.

Table 27. Test Fuel Properties Determined by Characterization Protocol											
Test Fuel	VIS40C	VIS100C	H2	SPGR	D8610	D8650	D8690	NHC	ST	AP	CN
BF02	3.271	1.305	13.56	0.8376	249.5	282.0	314.5	43.018	26.3	75.6	57.2
TF01	5.975	1.826	13.02	0.8699	248.0	327.5	382.5	42.572	27.5	72.4	46.8
TF02	5.061	1.626	12.35	0.8900	228.0	309.0	369.5	41.960	28.1	53.6	41.4
TF07	12.000	2.910	13.09	0.8760	287.5	372.0	396.0	42.602	30.3	84.6	50.2
TF08	12.050	2.842	12.53	0.8925	284.0	367.0	396.0	42.230	30.2	75.4	47.2
TF09	19.100	3.665	13.15	0.8893	348.0	374.0	407.5	42.508	29.5	84.3	49.8
TF10	4.182	1.457	11.90	0.8901	235.0	297.0	359.5	41.968	30.2	49.6	38.7
TF26	1.520	0.752	13.77	0.8168	199.5	214.5	234.0	43.078	26.0	62.6	44.1
TF34	18.890	3.420	11.40	0.9397	332.0	358.5	401.0	41.310	32.0	58.9	33.8

Table 28. Key Fuel Properties Protocol[1]				
Property		**Units**		**Test Method[2]**
Carbon		wt %		PE 240
Hydrogen		wt %		PE 240
Sulfur		wt %		ASTM D 4294
Neat Heat of Combustion		MJ/Kg		ASTM D 2382
Viscosity @ 40°C		Mm^2/s		ASTM D 445
Specific Gravity @ 15.6°C		-		ASTM D 4052
Distillation (all points)		°C		ASTM D 86
1 Performed upon receipt of test fuels and quarterly thereafter; also must be performed within 30 days prior to testing 2 Only the specified test methods are acceptable				

Table 29. Key Fuel Properties Inspection Form

HSDE PERFORMANCE KEY PROPERTY PROTOCOL

All test methods with a D___ designation are ASTM test methods.
Contact DTNSRDC with questions

Date Initiated: _____
Date Completed: _____

FUEL IDENTIFICATION

Fuel Property	Units	Test Method	Value	Initials
DISTILLATION				
Initial Boiling Point	°C	D 86/1160	_____	_____
5% point	°C	D 86/1160	_____	_____
10% point	°C	D 86/1160	_____	_____
20% point	°C	D 86/1160	_____	_____
30% point	°C	D 86/1160	_____	_____
40% point	°C	D 86/1160	_____	_____
50% point	°C	D 86/1160	_____	_____
60% point	°C	D 86/1160	_____	_____
70% point	°C	D 86/1160	_____	_____
80% point	°C	D 86/1160	_____	_____
90% point	°C	D 86/1160	_____	_____
95% point	°C	D 86/1160	_____	_____
End point	°C	D 86/1160	_____	_____
Residue	vol %	D 86/1160	_____	_____
Loss	vol%	D 86/1160	_____	_____
Initial Boiling Point	°C	D 2887	XXXXXXX	XXXXXXX
5% point	°C	D 2887	XXXXXXX	XXXXXXX
10% point	°C	D 2887	XXXXXXX	XXXXXXX
20% point	°C	D 2887	XXXXXXX	XXXXXXX
30% point	°C	D 2887	XXXXXXX	XXXXXXX
40% point	°C	D 2887	XXXXXXX	XXXXXXX
50% point	°C	D 2887	XXXXXXX	XXXXXXX
60% point	°C	D 2887	XXXXXXX	XXXXXXX
70% point	°C	D 2887	XXXXXXX	XXXXXXX
80% point	°C	D 2887	XXXXXXX	XXXXXXX
90% point	°C	D 2887	XXXXXXX	XXXXXXX
95% point	°C	D 2887	XXXXXXX	XXXXXXX
End point	°C	D 2887	XXXXXXX	XXXXXXX
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	_____	_____
Specific Gravity @ 15.6°C		D 4052	XXXXXXX	XXXXXXX
API Gravity (D 1298)	°API	calculate	XXXXXXX	XXXXXXX
API Gravity (D 4052)	°API	calculate	XXXXXXX	XXXXXXX
Viscosity @ 40°C	mm^2/s	D 445	XXXXXXX	XXXXXXX
Viscosity @ 100°C	mm^2/s	D 445	XXXXXXX	XXXXXXX
Flash Point	°C	D 93	XXXXXXX	XXXXXXX
Cloud Point	°C	D 2500	XXXXXXX	XXXXXXX
Pour Point	°C	D 97	XXXXXXX	XXXXXXX
Demulsification @ 25°C	minutes	D 1401	XXXXXXX	XXXXXXX
Color		D 1500	XXXXXXX	XXXXXXX
Appearance		D 4176	XXXXXXX	XXXXXXX
Surface Tension	dynes/cm	D 1331	XXXXXXX	XXXXXXX
Water and Sediment	vol%	D 2709	XXXXXXX	XXXXXXX
Particulates	mg/l	D 2276	XXXXXXX	XXXXXXX
Asphaltenes	wt%	D 2007 (f)	XXXXXXX	XXXXXXX

Fuel Property	Units	Test method	Value	Initials
CHEMICAL				
Sulfur	wt%	D 4294	_____	_____
Acid Number	mgKOH/g	D 974	XXXXXX	XXXXXX
Acid Number	mgKOH/G	D 664	XXXXXX	XXXXXX
Corrosion @ 100°C		D 130	XXXXXX	XXXXXX
Carbon Residue on 10% bottoms	wt%	D 524	XXXXXX	XXXXXX
Corrosion @ 100°C		D 430	XXXXXX	XXXXXX
Accelerated Stability	mg/100ml	D 2274	XXXXXX	XXXXXX
Accelerated Stability	P/F & No.	Dupont F-21	XXXXXX	XXXXXX
F-21 Color After		D 1500	XXXXXX	XXXXXX
Breakpoint Temperature	°C	D 3241	XXXXXX	XXXXXX
FSII		(c)	XXXXXX	XXXXXX
Neutrality	Acid/Neutral	(d)	XXXXXX	XXXXXX
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	_____	_____
Hydrogen Content	wt%	PE 240	_____	_____
Carbon Content	wt%	PE 240	_____	_____
H/C; C/H Ration		calculate	_____	_____
Cetane Number		D 613	XXXXXX	XXXXXX
Cetane Index (Using D 1298 value)		D 976	XXXXXX	XXXXXX
Cetane Index (Using D 4052 value)		D 976	XXXXXX	XXXXXX
Diesel Index (Using D 1298 value)		calculate	XXXXXX	XXXXXX
Diesel Index (Using D 4052 value)		calculate	XXXXXX	XXXXXX
Aniline Point	°C	D 611	XXXXXX	XXXXXX
Aromatics	wt%	HPLC	XXXXXX	XXXXXX
Olefins	vol%	D 1319	XXXXXX	XXXXXX
Saturates	wt%	HPLC	XXXXXX	XXXXXX
Combustion Additives	Y/N	(e)	XXXXXX	XXXXXX
Ash	wt%	D 482	XXXXXX	XXXXXX
TRACE METALS				
Aluminum	ppm wt	D 3685 (g)	XXXXXX	XXXXXX
Calcium	ppm wt	D 3685 (g)	XXXXXX	XXXXXX
Copper	ppm wt	D 3685 (g)	XXXXXX	XXXXXX
Iron	ppm wt	D 3685 (g)	XXXXXX	XXXXXX
Lead	ppm wt	D 3685 (g)	XXXXXX	XXXXXX
Nickel	ppm wt	D 3685 (g)	XXXXXX	XXXXXX
Silicon	ppm wt	D 3685 (g)	XXXXXX	XXXXXX
Potassium	ppm wt	D 3685 (g)	XXXXXX	XXXXXX
Sodium	ppm wt	D 3685 (g)	XXXXXX	XXXXXX
Vanadium	ppm wt	D 3685 (g)	XXXXXX	XXXXXX

(a) D 86 may not be appropriate for some high viscosity fuels. If this is the case, perform D 1160. INDICATE METHOD PERFORMED
(b) On selected fuels only; as instructed by DTNSRDC.
(c) Fed. Std. 791, methods 5327, 5330, 5340; commercial survey fuels
(d) Fed. Std. 791, method 5101.
(e) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(f) To be performed on commercial survey fuels only.
(g) Modified ASTM method.

Table 30. Contamination/Degradation Protocol Form

A. ORGANIZATION: B. _____	CONTAMINATION/DEGRADATION PROTOCOL	b. Date Initiated: _____ Date Completed: _____

C. This form is to be completed on a monthly basis. Identify test fuels by the Navy-assigned test fuel code, eg. TF09S10J86. Internal laboratory codes may also be included but should be in parentheses. Consult the test fuel protocols document or contact DTNSRDC for further information.

FUEL I.D.		Specific Gravity ASTMD 4052	Viscosity @ 40°C ASTM D 445 (mm^2/s)	Color ASTM D 1500	Appearance ASTM D 4176	Accelerated Stability (a) DuPont F-21 (P/F,#,color)	Particulates (b) ASTM D 2276 (mg/l)	Accelerated Stability (c) ASTM D 2274 (mg/100 ml)	Water & Sediment (c) ASTM D 2709 (vol%)
1._____	Values:								
	Analysis By:								
	Original Value:								
2._____	Values:								
	Analysis By:								
	Original Value:								
3._____	Values:								
	Analysis By:								
	Original Value:								
4._____	Values:								
	Analysis By:								
	Original Value:								
5._____	Values:								
	Analysis By:								
	Original Value:								
6._____	Values:								
	Analysis By:								
	Original Value:								
7._____	Values:								
	Analysis By:								
	Original Value:								

(a) Report Pass or Fail, blotter #, and color after running the test; for example, P / 2 / 3 .

(b) Filter only one liter of fuel.

(c) Conditional tests only. Refer to the protocols document or contact DTNSRDC for details

Table 31. High-Speed Diesel Engine Fuel Inventory Form

FQP TEST FUEL INVENTORY FORM

A. ORGANIZATION:

BFLRF

B. Equipment/Fuel Tolerance Program participants will complete this form on a monthly basis. Also, complete upon receipt of any test fuel and as instructed.
Upon completion, mail to: DTNSRDC, Code 2759, Annapolis, MD 21402-5067

C. INSTRUCTIONS: List all Navy test fuels and/or components that are presently under your organization's cognizance. Include all information necessary to complete the table below. Use the COMMENTS section at the bottom of the page for any additional comments. Table entry examples are included in block D. If you have any questions, contact DTNSRDC immediately. PRINT CLEARLY OR TYPE:

D. FUEL/COMPONENT (eg. TF0JS15J86, dibutyl disulfide, Telura 619) Use Navy designated test fuel ID or common component name only. (Individual laboratory codes may also be included but in parentheses)
VOLUME/WEIGHT (eg. 5.5 gal) Use gallons or liters for liquids, pounds or kilograms for solid components. ALWAYS SPECIFY UNITS.
CONTAINER (eg. 55 gal drum, epoxy) Specify container in which fuel or component is stored at your site. Specify the container size.
STORAGE CONDITIONS (eg. indoors @ ambient) Specify indoors or outdoors, and any special storage conditions such as nitrogen blanketing. SPECIFY TEMPERATURE Specify temperature range if outside (i.e. night and day)

	FUEL/COMPONENT	VOLUME/WEIGHT	CONTAINER	STORAGE CONDITIONS
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				

COMMENTS

DTNSRDC USE ONLY	PREPARED BY:	DATE:

3.6.4.1 Storage

The Contamination/Degradation Protocol was conducted on test fuels from October 1987 to April 1988. The storage temperature range for this period was from -4° to 35°C. The average monthly range was from -1° to 29°C. The test fuels were stored in 55-gallon drums (DOT 17E) under covered storage. One side of the storage area was open to northern exposure.

3.6.4.2 Sampling

Samples from drum storage were obtained using the guidelines for drum and barrel sampling in ASTM Method D 4057, "Manual Sampling of Petroleum and Petroleum Products." Tygon tubing was used to siphon the sample, and an all-levels sample was obtained by raising the tubing as the sample was drawn into a one-gallon metal fuel container.

3.6.4.3 Analytical Procedures Used at TFLRF

The following test procedures were followed by TFLRF:

Test	Procedure
Specific Gravity	ASTM Method D 1298
Viscosity at 40°C	ASTM Method D 445
Color	ASTM Method D 1500
Appearance	ASTM Method D 4176
Accelerated Stability	duPont F-21
Particulates	ASTM Method D 2276
Accelerated Stability	ASTM Method D 2274
Water and Sediment	ASTM Method D 2709

The only deviation from the tests called for in the Contamination/Degradation Protocol was the method used for measuring specific gravity. ASTM Method D 1298 was substituted for ASTM Method 4052 with approval of the Project Officer.

3.6.4.4 Results

Analytical results for the individual test fuel analyses are given in Appendix D. The tolerance limits are the maximum acceptable change for repeat property measurements. The tolerances for each of the protocol procedures are presented in Table 32. There were only a few instances (minor in magnitude) in which the

protocol tolerance limits were exceeded. These deviations are noted in the tabular results. Test fuel TF10 exceeded the particulate change limit of 1.0 mg/L going from 0.2 to 3.2 mg/L. Test fuel TF03 exceeded the color change limit of 1 code rating in the last analysis of this fuel, changing from 0.5 to 2.5 color code units. Test fuel TF01 exceeded both the color and particulate limits in the final three tests on this fuel. The color changed from 0.2 to 2.4 while the particulate level went from 0.2 mg/L to 2.4 mg/L. These changes are minimal, and, though indicating some degradation in stability, the impact on engine performance for these test fuels is considered negligible.

Table 32. Contamination/Degradation Protocol and Tolerances [a]

Fuel Property	Units	Tolerances	ASTM Test Method	MIL-F-16884H Test	Contamination/ Degradation Protocol
PHYSICAL					
Specific Gravity at 15.6°C		±0.005	D 1298	X	X
Viscosity at 40°C	Mm^2/sec	±0.5	D 445	X	X
Color		∈ 1	D 1500	X	X
Appearance		--	D 4176	X	X
Water and Sediment	Vol%	∈ 0.01	D 2709	--	X[b]
Particulate	Mg/L	∈ 1	D 2276[c]	X	X
CHEMICAL					
Accelerated Stability	Mg/100 mL [e]	∈ 0.5	D 2274 [f]	X	X[d]
Accelerated Stability		∈ 2		--	X

(a) To be run on only one container of each batch of test fuel at each test participant's site.
(b) To be run if appearance and/or color indicates possible contamination.
(c) Modified; to be run with 1 liter of fuel.
(d) To be run quarterly or if DuPont F-21 indicates possible degradation.
(e) Pass/fail, blotter number, and color after test.
(f) Test Method DuPont F-21.

3.7 Lube Oil Analysis

The specification and inspection properties for the Motrex 651, MIL-L-9000G lubricant utilized for all performance evaluations is shown in Table 33. The kinematic viscosity at 100°C of 12.42 centistokes is at the upper end of the range of viscosities for SAE 30-grade lubricants, almost meeting the viscosity requirements for SAE 40-grade (>12.5 cSt). The moderately high viscosity index indicates this is a good single grade lubricant, with minimal multi-viscosity characteristics. The sulfated ash content indicates a high ash (>1%) lubricant, which is not generally recommended for two-stroke engine service. The majority of the sulfated ash comes from the 0.52 weight-percent calcium, which is also reflected in the high Total Base Number (TBN)

of 14.85. The TBN of the lubricant is plausibly high to counteract the effect of the maximum 1 weight-percent sulfur allowable in the MIL-F-16884H fuel specification. This lubricant has a low amount of zinc (0.04 weight-percent), which is usually contributed by the anti-wear additive.

On two occasions during testing, the crankcase lubricant was sampled for evaluation to help diagnose operational problems that occurred during data acquisition with the Cummins NH-220G and DDC 6V-53N. To investigate erroneous data the crankcase lubricant of the Cummins NH-220G was evaluated for fuel and water dilution. The fuel dilution was <1.0 volume-percent by gas chromatography. The water dilution was 0.014 volume-percent by Karl Fisher. Both values indicated there was no engine integrity problem. A sample from the DDC 6V-53N was evaluated for fuel dilution plus iron and copper wear metals. The fuel dilution by GC showed 1.1 volume-percent. Fuel dilution in the two-stroke engines can generally be tolerated by the engine up to 4 volume-percent. The iron wear metals by XRF showed 41 ppm and the copper <10 ppm, both well within expected limits for wear.

Table 33. Specification and Inspection Properties for MIL-L-9000G Lubricant

	MIL-L-9000G		BFLRF	
Lubricant Property	ASTM Test Method	Specification Requirement	ASTM Test Method	Analysis Result
Gravity, °API	D 287	report	----	NA[1]
Sulfur, wt%	D 129	report	XRF[2]	.56
Kinematic Viscosity				
at 100°C, cSt	D 445	11.9 - 14.5	D 445	12.42
at 40°C, cSt	D 445	NR[3]	D 445	115.08
Viscosity Index	----	report	D 2270	98
Flash Point, °C, min.	D 92	199	D 92	233
Pour Point, °C, max.	D 97	-12	D 97	-21
TAN, mg/gKOH	----	NR	D 664	1.38
TBN, mg/gKOH	----	NR	D 664	14.65
Sulfated Ash, wt%	D 874	report	D 874	1.8
Contamination, mg/gal	----	10	----	NA
Zinc, wt%	D 811	report	XRF	0.04
Phosphorus, wt%	D 1091	report	XRF	0.038
Barium, wt%	D 811	report	XRF	0.01
Magnesium, wt%	D 811	report	AA[4]	0.005
Nitrogen, wt%	(Kjeldahl method)		report CLM[5]	0.075
Calcium, wt%	D 811	report	XRF	0.52
Chlorine, wt%	D 808	report	----	NA

[1]NA - Not Analyzed
[2]XRF - X-Ray Fluorescence
[3]NR - No Requirement
[4]AA - Atomic Absorption
[5]CLM - Chemiluminescence Method

4.0 PROBLEMS

4.1 Overview

During the course of testing, several problems occurred resulting in testing delays and, in some extreme cases, the elimination of data sets and re-acquisition of the test data. None of the problems that occurred were fuel related. They were primarily related to the high-speed data acquisition system.

4.2 Low Pressure Transducer Signal

Certain events indicated problems with the data system and the pressure transducers on the Cummins NH-220G engine. The sequence of events of these problems went as follows:

1. On August 10, 1987, after running the first half of test No. 3 (TF10), a voltage spike occurred that affected the high-speed data acquisition system. The test had to be halted to locate the problem. After troubleshooting the system, it was found that the differential line receiver board in the analog-to-digital (A/D) converter had two bad integrated circuit (IC) chips. The IC chips were replaced, and a systems check was performed. The check indicated that the trigger box had also been affected and had to be repaired. To eliminate the possibility that other equipment might have been affected by the voltage spike, a different encoder, charge amp, and oscilloscope were installed. After the equipment was operative, the engine was operated. The resulting data indicated that the transducer signal was low. The transducer was taken out, calibrated statically on a dead weight tester, and found to be bad.
2. Another transducer was calibrated statically on the dead weight tester, and found to be reading correctly. The transducer was then installed in the engine, and data were taken with it. The results of the data taken showed the transducer output signal to be low also.
3. The dynamometer and the fuel flow device were calibrated, and both were found to be within specification. The calibration on the Model 702P aspirator was also checked and found to have deviated slightly from the previous calibration. Adjustments were made.
4. Another transducer was calibrated statically and shown to be reading correctly. It was installed into the Cummins NH-220G engine, and the output signal was checked. Again the signal was low. Two new transducers were calibrated, and the output signals of both

appeared to be correct. All the transducers were calibrated with their individual specific lead, eliminating any problems that might have occurred with a bad lead.

5. Transducer S/N 1895 was installed into the Cummins NH-220G engine, and data were taken. Again the pressures were low, but not as low as readings from previous transducers.
6. Cylinder head No. 1 was removed, and the head gasket was checked for compression leaks. Also checked were the injection timing and the cam lobes for lift and wear. All items were within specification, so the cylinder head was reinstalled using a new head gasket. The engine was then operated to see if any changes had occurred in the signal output. Results were the same as previous runs.
7. Cylinder head Nos. 1 and 2 were pulled and exchanged. The engine was operated for comparison of pressures between cylinder Nos. 1 and 3; there was no difference.
8. Cylinder head Nos. 1 and 2 were returned to their original places, and a sight glass was added on the coolant line to check for air in the coolant system. The engine was started and operated to temperature, with no evidence of air in the coolant.
9. Transducer S/N 1895 was removed and replaced with transducer S/N 1894. Test data were taken. The results were correct and consistent with transducer readings from data previously recorded. All data from test No. 3 (TF10) prior to August 10, 1987 was set aside, and the test was restarted.

4.3 Erroneous Analog-to-Digital Voltage Conversion

Several events occurred that helped determine that the data for test fuels HD-1, HD-4, and HD-7 were in error. These events, which caused testing delays, occurred in the following order:

1. Upon initiation of testing with test fuel HD-1, it was noted that the A/D converter was not clocking. All input signals were verified to determine if the problem was external. Previous errors of this sort had allowed the problem to be traced to a line driver receiver IC chip. Upon replacing the chip, however, the clocking error persisted. It was noted that when the A/D was clocked manually, it returned a constant voltage of +6 VDC.
2. Conversations with Preston Scientific indicated that the power supply may be faulty. The A/D was shipped to the supplier for repair. Preston verified that the power supply was inoperative on the +32 VDC side, and several associated resistors and capacitors were damaged. The A/D was repaired and returned to TFLRF.

3. The system was brought on-line, and testing was initiated and completed with test fuels HD-1, HD-4, and HD-7. The low-speed data were accurate for all test fuels and conditions, and the initial inspection of the high-speed data appeared to be accurate. However, when the heat release rates were calculated and examined and the full-rack power checks compared to earlier runs, excessive noise appeared to be present.
4. Initially, the noise appeared to be present only on the data for fuel HD-7. However, examination of the test data for HD-1 and HD-4 fuels indicated noise was also evident. To ensure that this apparent noise was not in all the tests, data from HD-10 were examined. The noise did not appear on any other test fuel run prior to HD-1. One possibility was that the noise was induced by ground loops, AC interference, faulty transducer, or shaft encoder increment dropout.
5. Inspections did not reveal any evident ground loops, and all sources of AC interference were moved. The shielding of all data lines were checked for continuity with the data system. The pressure transducer was removed, and all connections were inspected. A recalibration of the transducer revealed no loss of sensitivity. A spare shaft encoder was installed on the engine, and the results were the same. It was determined that if a shaft encoder dropout had occurred, the noise would be more random. The noise that was evident appeared at the same crank angles for each separate trace; i.e., it was cyclic in nature.
6. It was decided to acquire data with a Nicolet digital storage oscilloscope due to the higher resolution obtainable. The floppy disk from the oscilloscope was read into a personal computer for a Fast Fourier Transform (FFT) analysis to determine the frequency spectrum of the noise. Interestingly, the FFT analysis revealed no sign of frequency response outside of the basic combustion frequency. This narrow response indicated that the noise was induced by the data system.
7. To verify this supposition, the DDC 6V-53N engine was coupled to the data system. An examination of pressure traces acquired from the DDC 6V-53N engine showed the noise. Once again the noise appeared cyclic, occurring at the same crank angle intervals in each trace taken. Further inspection of the data revealed that the noise occurred at approximately the same voltage value. A look at the Cummins data revealed the noise also occurred at a given voltage value. Although the voltage values at which the noise occurred were different for the two engines, it was believed that there was a digital bit-weighting error in the Preston A/D converter.
8. Preston Scientific confirmed that a digital bit-weighting error was possible and indicated how the bit-weight cards could be inspected. Upon examining the location of the bit weight cards

and comparing the cards to the blueprints, it was revealed that the cards were installed in reverse order. The cards were then inspected and installed in their correct order according to the blueprint. The data system was then used to acquire data from the DDC 6V-53N engine. The data were inspected for noise and proved to be compatible with previous "clean" data.

9. It was felt that since the order of the bit-weight cards for the "dirty" data and the proper order of the bit-weight cards were known, a correction factor could possibly be calculated to salvage the data. However, Preston scientific engineers revealed that the data errors would be totally random with no feasible way of obtaining corrected data. The supplier's engineers indicated that even though the noise was apparent only at a given voltage, the other conversions were not error free. Instead, at that given voltage, the erroneous bit-weight was the most significant bit.
10. With this information, it was decided to scrap the test data for HD-1, HD-4, and HD-7 fuels. It was determined that sufficient test fuel remained to rerun the three fuels. However, the reruns would be initiated after the completion of testing with HD-6 and HD-21 fuels.

4.4 Instrumentation Failure

Testing with fuel HD-21, with the Cummins NH-220G, revealed instrumentation difficulties that resulted in aborting the second test run. Both failures could be attributed to vibration. The instrumentation failures were as follows:

1. An erratic smokemeter reading was diagnosed as a loose capacitor in the receiving unit. The receiving unit was repaired at TFLRF and the testing continued.

2. The high-speed data acquisition system would not trigger due to an absent TDC marker pulse from the engine crankshaft mounted shaft encoder. The missing TDC marker pulse was traced to a broken wire due to inadequate strain relief at the encoder connector. The wire and connector were repaired and testing continued.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

5.1 Pre-test

5.1.1 Test Plan

The High-Speed Diesel Engine Performance Test Plan was developed to define a procedure to determine fuel property relationships to performance with representative high-speed diesel engines. The key fuel properties were examined for their effects on power level, fuel consumption, and combustion variables. The test plan was written such that the three performing organizations, NAVSSES, NIPER, and TFLRF, could follow the same test protocols. The test plan was developed with input from the three performing organizations, and the Project Officer at DTRC.

5.1.2 Training

All staff involved in the HSDE evaluations were provided a copy of the HSDE test plan, test protocols, checklists, and all relevant engine and instrumentation manuals. Engine operators and chemlab technicians were trained to follow all protocols, procedures, and checklists.

5.1.3 Coordination Efforts

All engine and fuel test procedures were discussed by the participating laboratories and the Project Officer during the development of the HSDE test plan. All procedures and protocols in the HSDE test plan were established by consensus agreement between all participants.

5.1.4 Engine Rebuilders

Only original-equipment Detroit Diesel parts were used in the DDC 6V-53N engine build, along with all procedures and practices specified in the Detroit Diesel 53 Series technical and service manuals. Original equipment Cummins parts were also used for the Cummins NH-220G engine build, along with all procedures and practices as specified in the Cummins NH Series technical and service manual. All rebuilds and maintenance of the DDC 6V-53N and Cummins NH-220G engines operated at TFLRF were performed by the TFLRF technical staff.

5.1.5 Navy Qualified Parts

To ensure that the proper engine configuration was utilized for the performance evaluations, the engine component part numbers from the Navy APL for the DDC 6V-53N model 5062-7000 and the Cummins model NH-220G engines were obtained. Only the parts numbers specified on the APL were utilized for the engine build-up prior to the performance evaluations.

Due to the product age of the Cummins NH-220G, several of the Navy APL part numbers were obsolete. The replacement part numbers were obtained and are shown in Appendix A, all other parts matched the APL numbers.

5.2 Test Operation

Before the initiation of a base fuel or test fuel run, a calibration of all instrumentation was performed using NBS traceable standards. If any instrumentation failed the calibration check, it was recalibrated if feasible; if not, it was replaced.

5.2.1 Engine Operation Data

To ensure valid data, several guidelines and procedures were followed atTFLRF. The principal guideline was one of redundancy. All engine variables were recorded or examined by both analog and digital methods. All variables, except cylinder pressure, were recorded in the analog form by the engine operator completing the log sheets with data from the panel gauges and meters. The cylinder pressure transducer signal was constantly monitored on an oscilloscope. The digital measurements were taken from electronic transducers by a data acquisition and measurement system. The results from each data acquisition method were cross-referenced to ensure that the instrumentation remained in calibration. Additionally, the standard deviations from the digital measurements were used to spot invalid data and to determine stable engine operation. Every variable was examined carefully before the engine was operated at the next test condition.

One procedure involved checking peak pressure and observed horsepower of the base fuel during full rack operation. The test plan states that the peak pressure and horsepower on the base fuel must fall within ±2 standard deviations of the previous base fuel runs in order to be valid. The running standard deviations were used by the operator to determine if the engine was adhering to the established baseline.

5.2.2 Checklists

All engine tests with all fuels utilized the checklist shown previously as **Figure 8**. The completed checklist was forwarded to all test participants to indicate that each test followed the same procedure.

5.2.3 Fuel Monitoring

All test fuels were analyzed as directed by the Project Officer and specified by the test plan, using the key property and contamination/degradation protocols discussed previously.

5.2.4 Coordination Efforts

All engine and fuel data generated were shared by the participating laboratories and with the Project Officer. All data was reviewed by all participants before decisions that impacted testing were made. Weekly teleconferences and quarterly review meetings were held to discuss data, problems, test procedures, and test progress.

5.2.5 Photographs

The engine installations were documented with photographs. The installation photographs for the DDC 6V-53N engine and the Cummins NH-220G engine are included in Appendix E.

5.3 Post-test

5.3.1 Data Review

Following the completion of testing of each engine and fuel combination, the data was forwarded to all test participants. All checklists, log sheets, data files, and performance graphs were reviewed by each participant. Preliminary results of the data correlation analysis was forwarded to each participant for comment and review. Any knowledge of fuel and engine interactions were utilized to verify the validity of the data correlation analysis.

5.3.2 Coordination Efforts

All decisions on the final data sets (representing the test participants' agreement) and analyses were developed from discussions during review meetings and teleconferences.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

A review of both engines' performance data displays several performance variables that have similar response to the test fuels and engine speeds. Power correlated well with fuel flow and cumulative heat release. The peak pressure rise and maximum heat release rate are similar because the heat release model is dominated by the pressure rise term at the location of maximum heat release. Engine torque produced was a good indicator of maximum cylinder pressure. Cumulative heat release correlated well with observed power, torque, maximum cylinder pressure, and to a lesser extent, ignition delay. The peak pressure rise and brake thermal efficiency did not correlate as expected. Increased peak pressure rise has been thought to approach constant volume combustion in a diesel engine with a concurrent increase in thermal efficiency.
The performance variables for the complete test matrix did not reveal correlations with any singular fuel property variable. Cetane number, often shown to be a good predictor of ignition delay, and to a lesser extent peak pressure rise, did not correlate for either engine.

The graphical analysis of the performance variables at full rack conditions for both the DDC 6V-53N and the Cummins NH-220G engine indicate significant fuel-to-fuel effects. A plot of the fuel viscosity versus the volumetric fuel flow at full rack indicates that viscosity effects can be seen from fuel to fuel. The performance plots and the viscosity versus volumetric fuel flow results suggest that a data analysis should reveal fuel property correlations with performance variables at full rack. The correlation analysis was performed on the complete data set, which included full rack and partial loads at the test speeds for each engine and fuel combination.

The multi-variate analysis of fuel properties with engine performance variables revealed acceptable fuel property correlations with engine combustion variables. The power and fuel consumption correlations were dominated by the test point variables speed and load included as independent variables, and were not predictable by fuel properties.

A transformation of the independent variable load into a load-set-point value (expressed as percent load) was used for an additional multivariate analysis. The power and fuel consumption of the Cummins NH-220G engine was influenced by speed, load set point, kinematic viscosity at 40°C, net heat of combustion, specific gravity , and hydrogen content. The power and fuel consumption of the Detroit Diesel Corporation 6V-53N was influenced by speed, load set point, kinematic viscosity at 40°C and 100°C, net heat of combustion, specific gravity , hydrogen content, aniline point, and 50 percent and 90 percent boiling points.

6.2 Recommendations

The range of fuel properties and the range of engine speed and load combinations are sufficiently broad that performance and fuel property correlations should be revealed. The use of the complete data set for the multi-variate analysis may mask correlations that would be more evident at full rack or at part load. Analysis of the engine and fuel operating data, for example the BSFC at partial load points versus the BSFC at full rack suggests this is the case. The following recommendations may allow a better understanding of the engine performance and fuel property relationships:

Cummins NH-220G

- X Evaluate performance and fuel property correlations at full rack conditions only.
- X Evaluate performance and fuel property correlations at alternator load conditions only.
- X Evaluate performance and fuel property correlations at the partial alternator loads separately, not including the full rack load at the alternator engine speed.

Detroit Diesel Corporation 6V-53N

- X Evaluate performance and fuel property correlations at full rack conditions only.
- X Evaluate performance and fuel property correlations at alternator load conditions only.
- X Evaluate performance and fuel property correlations at propeller load conditions only
- X Evaluate performance and fuel property correlations at the partial alternator/propeller loads separately, not including the full rack load at the alternator/propeller engine speed.

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APPENDIX A
Test Engine Configurations

Fuel Injector Calibrations and Documentation--DDC Injectors

Fuel injector operation greatly affects the performance of diesel engines. Since the performance effects of varying fuel properties will be examined in this high-speed diesel test program, the effect of fuel injectors on these variables must be minimized. Therefore, the fuel injector checkout, calibration, and documentation procedures included herein have been defined and will be employed in this program. All injectors used in the performance evaluations must have met the manufacturer's specifications for the various injector tests as set forth in the following paragraphs before they are to be used. In addition, complete data on injector part numbers and test results are to be recorded as a part of the program data. Only original equipment manufacturer (OEM) parts are to be used in rebuilding injectors. No other parts are permissible.

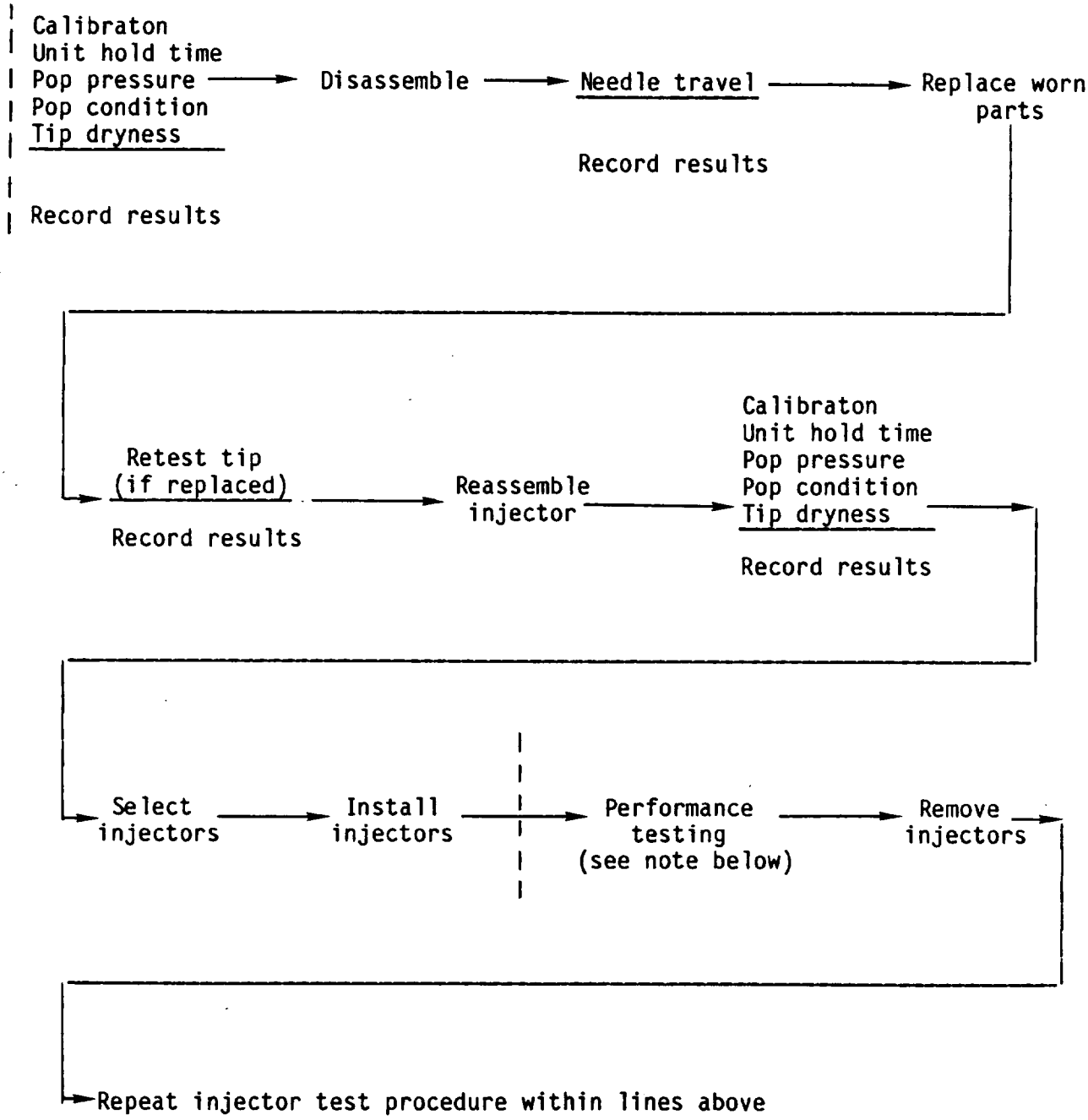
DDC Injector Specification Conformance Protocol

Prior to any engine testing, DDC injectors must be tested to assure that they meet the foregoing specifications. The pretest checkout protocol shown in Figure A will be employed. The specific tests to be performed are flow calibration, unit hold time, pop pressure, pop condition, tip dryness, needle travel, airflow, and plunger and barrel stroke. Airflow and plunger and barrel stroke tests have been included only as a means for the matching of injector components during the rebuilding process. There are no specifications relating to these two tests. The results of these several test procedures, when compared to specifications, will determine whether an injector is suitable for use in the high-speed diesel engine performance evaluations conducted in DDC engines.

The injector checkout flow chart in Figure A, which will be employed with the DDC 4-71N injectors at NAVSSES and the DDC 6V-53N injectors at BFLRF, is based on the use of the exact apparatus and procedures included in the technical and service manuals cited in paragraph 6.4.4.2 of the FQP HSDE Test Plan, the only exception being with regard to the apparatus and procedures used for the measurement of needle travel at BFLRF and NAVSSES. The details of these exceptions are described in the FQP HSDE Test Plan. The alternate apparatuses/procedures used at these laboratories are expected to yield the same results as those in the DDC manuals.

It is expected that over the duration of performance evaluation it should not be necessary to recheck or rebuild injectors. However, if the power output during full-rack power checks is observed to vary significantly from test to test while operating on base fuel, the injectors should be rechecked. If, during such recheck, any injector fails to meet the specifications set forth herein, that injector should be rebuilt or another injector selected which does meet specifications. If an injector is rebuilt, it must be completely retested as per the flow chart of Figure A, as appropriate for the type of injector and laboratory involved.

Performance Testing Flowchart



[a]If required

Note: Under normal circumstances the injectors will not need to be checked during performance testing, however, if a change in base fuel engine performance is noted, the injectors may need to be checked.

BELVOIR FUELS AND LUBRICANTS RESEARCH FACILITY (SwRI)
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BFLRF

File: 02-8341-883
18 August 1986

Commander
David Taylor Naval Ship Research
and Development Center
Attn: Code 2705, Mr. Robert M. Giannini
Annapolis, Maryland 21402

Subject: **DD N50 Injector Inspection Procedure**

Dear Sir:

A pretest checkout procedure for six Detroit Diesel N50 unit injectors to be installed in a Detroit Diesel 6V-53N was performed. The procedure as defined by ACUREX was performed in-house with the recommended apparatus, with the exception of two instances. These instances include an out-of-house flow calibration and a different apparatus for measuring needle travel.

Initial flow calibrations were performed at BFLRF with a Kent Moore J 7041 comparator. The results indicated flow in the range of 79-80 ml/1000 strokes for all six injectors. The Detroit Diesel service manual dictates that N50 injectors should have flows in the range of 50-55 ml/1000 strokes with a Kent Moore J 22410 calibrator. Table 1 lists the differences between the J 7041 comparator and the J 22410 calibrator. The six N50 injectors were sent to a Stewart and Stevenson injector rebuild facility in San Juan, Texas for flow calibration with a J 22410 calibrator. The calibrated injectors all revealed flows in the range of 52-54 ml/1000 strokes.

Table 1. J 7041 Comparator and J 22410 Calibrator Differences

Variable	J 7041	J 22410
Speed, RPM	1760	2000
Speed Control	none	flywheel
Stroke	eccentric, non-engine geometry	eccentric, engine geometry
Plunger Velocity	non-engine related	same as engine
Calibration Fluid Temperature	not controlled	constant

The Detroit Diesel service manual suggest a J 9462-02 tool for measuring needle valve lift. The J 9462-02 tool has a plunger assembly with a hollow plunger mounted to a dial indicator. The plunger assembly is placed on a flat surface, and the indicator dial is zeroed. The plunger assembly is then held tightly against the spray tip and needle valve assembly with the quill of the needle valve inside the hollow plunger. The needle value lift is then read from the indicator, the lift should be .008 inches to .018 inches. At BFLRF, a Millers Falls depth micrometer fitted with a hollow spindle was used to measure the needle valve lift. The depth micrometer was placed on a flat surface, and a reading was taken. The depth micrometer was then held tightly against the spray tip and needle valve assembly with the quill of the needle valve inside the hollow spindle. The depth micrometer was adjusted and a second reading taken; the difference between the two readings equals the needle valve lift. The needle valve lift for the six N50 injectors ranged from .008 inches to .010 inches.

All other inspections were performed using the Detroit Diesel service manual procedures and equipment. If there are any other questions concerning this matter, please contact Doug Yost (512)522-3126.

Very truly yours,

S.J. Lestz
Director

Douglas M. Yost
Research Engineer

SJL/DMY/sjd (DMY.L)

cf: U.S. Army Belvoir Research, Development and Engineering Center, Attn: STRBE-VF, Mr. M.E. LePera
Belvoir Fuels and Lubricants Research Facility (SwRI), Attn: E.C. Owens, B.R. Wright

ATTACHMENT 7
FUEL INJECTOR TEST RESULTS

Injector Type _____ Injector Serial No. _____ Engine Type 6V53

Engine Tester _____ Injector Tester _____ Engine Serial No. _____
(NIPER, SwRI, NAVSSES)

RESULTS

Test	Units	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date
Injector Valve Opening and Spray Pattern		GOOD WEAK ATOMIZED	6/23/86												
Pressure Reference No.		142		144											
Spray Pattern[a]		G		G											
Unit Hold Time															
Pressure Drop Time	sec	31.6		~~25.5~~ 27.5											
Spray Tip															
Pressure	psig	3125													
Tip Dryness[b]		D		D											
Needle Travel															
Needle Valve Lift	in.	.0092													
Calibration	ml / 1000 strokes	78 80 80													
Airflow															
P&B Stroke	in.														

[a]G - good; NG - no good
[b]D - dry; W - wet; Y - dripping

ATTACHMENT 7
FUEL INJECTOR TEST RESULTS

Injector Type _____ Injector Serial No. _____ Engine Type 6053

Engine Tester _____ Injector Tester _____ Engine Serial No. _____
(NIPER, SwRI, NAVSSES)

RESULTS

Test	Units	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date
Injector Valve Opening and Spray Pattern		WELL ATOMIZED	6/23/86												
Pressure Reference No.		138		144											
Spray Pattern[a]		5		5											
Unit Hold Time															
Pressure Drop Time	sec	31.7		36.0											
Spray Tip															
Pressure	psig	2925													
Tip Dryness[b]		D		D											
Needle Travel															
Needle Valve Lift	in.	.0090													
Calibration	ml / 1000 strokes	79 79 25													
Airflow															
P&B Stroke	in.														

[a] G - good; NG - no good
[b] D - dry; W - wet; Y - dripping

ATTACHMENT 7
FUEL INJECTOR TEST RESULTS

Injector Type _____ Injector Serial No. _____ Engine Type _____

Engine Tester _____ Injector Tester _____ Engine Serial No. _____
(NIPER, SwRI, NAVSSES)

RESULTS

Test	Units	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date
Injector Valve Opening and Spray Pattern		WELL ATOMIZED	6/23/86												
Pressure Reference No.		138		141											
Spray Pattern[a]															
Unit Hold Time															
Pressure Drop Time	sec	44.0		33.8											
Spray Tip															
Pressure	psig	2900													
Tip Dryness[b]		D		D											
Needle Travel															
Needle Valve Lift	in.	.060													
Calibration	ml / 1000 strokes	80 80 80													
Airflow															
P&B Stroke	in.														

[a]G - good; NG - no good
[b]D - dry; W - wet; Y - dripping

PAGE 4 OF 6

R-1

DATA MISSING

ATTACHMENT 7
FUEL INJECTOR TEST RESULTS

Injector Type _____ Injector Serial No. _____ Engine Type 6V53

Engine Tester _____ Injector Tester _____ Engine Serial No. _____
(NIPER, SwRI, NAVSSES)

RESULTS

Test	Units	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date
Injector Valve Opening and Spray Pattern		WEAL ADM1260													
Pressure Reference No.		140													
Spray Pattern[a]		5													
Unit Hold Time															
Pressure Drop Time	sec	29.4													
Spray Tip															
Pressure	psig	3000													
Tip Dryness[b]		D													
Needle Travel															
Needle Valve Lift	in.	.0102													
Calibration	ml / 1000 strokes	29.5 29.5 29.5													
Airflow															
P&B Stroke	in.														

[a] G - good; NG - no good

ATTACHMENT 7
FUEL INJECTOR TEST RESULTS

Injector Type _____ Injector Serial No. _____ Engine Type 6V53

Engine Tester _____ Injector Tester _____ Engine Serial No. _____
(NIPER, SwRI, NAVSSES)

RESULTS

Test	Units	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date	Results	Date
Injector Valve Opening and Spray Pattern		WEAK ATOM/250													
Pressure Reference No.		140		140											
Spray Pattern[a]		G		G											
Unit Hold Time															
Pressure Drop Time	sec	~~140~~ 34.3		28.6											
Spray Tip															
Pressure	psig	3075													
Tip Dryness[b]															
Needle Travel															
Needle Valve Lift	in.	.0082													
Calibration	ml / 1000 strokes	80.5 80.5 80.5													
Airflow															
P&B Stroke	in.														

[a] G - good; NG - no good
[b] D - dry; W - Wet; Y - dripping

DDA N–50 INJECTOR CALIBRATION
KENT–MOORE J 22410 CALIBRATOR

INJECTOR R1, ml/1000 strokes	52
INJECTOR R2, ml/1000 strokes	54
INJECTOR R3, ml/1000 strokes	54
INJECTOR L1, ml/1000 strokes	54
INJECTOR L2, ml/1000 strokes	54
INJECTOR L3, ml/1000 strokes	54

NAVY Rebuild Parts Cross-Reference List

Engine Manufacturer Cummins

Engine Model No. NHC-220-G

Description	NAVY APL No.	Manf. No.	Replacement No.	Engine Build No.
Rod Bearing (12)	42679-1	42679-1	203670	
Main Bearing Set (1)	BM-28978	BM-28978	3801260	
Head Gasket Set (1)	BM-50745	BM-50745	3802077	
Pan Gasket Set (1)	BM-62431	3011463	3801466	
Cylinder Liner (6)	132830	132830	(Cylinder Kit)	
Cylinder O-Ring (18)	67891	67891	AR-7383 (6)	
Piston Assembly (6)	BM-55100	BM-55100		
Injector (6)	BM-68974	BM-68974	BM-68974	

Cummi . Southern Plains, Inc.
600 N. Watson Road
P.O. Box 1327
Arlington, Texas
76010-1327

BRANCH FILE COPY

SERVICE ORDER

DATE 5-7-86 #3 004305

Charge To Cust #368373
CUST Southwest Research Inst. 78284
ADD 6220 Culebra San Antonio Tex.
LOC 42

Engine Model AHC-220	CPL 28	Engin S/N			
Fuel Pump No. C512822		Fuel Pump Code 0679-D			
Turbo Model		Turbo S/N			
Air Compressor S/N		Date In Service			
Equipment Make		Equipment Model			
Unit No. / Vessel Name		Hours / Miles			
Customer Phone Contact		Person Authorizing Service			

COS 13533A
W/C
II
TRSF
OTHER

☐ Cash ☐ Check ☐ Charge ☐ Internal ☐ Warranty ☐ Other

Meals
Lodging
Labor Hours ST OT
Driving Time ST OT
Miles Driven
Credit Approval

SRO SRO SRO SRO SRO SRO

Customer P.O.	Crankshaft S/N	Crankshaft Heat Code	Cust. Registry No.	PARTS DISPOSITION
				☐ Customer Pick Up ☐ Warranty ☐ Scrap

Complaint Calibrate to code 0679-D

Cause

Correction

Summary of Work Performed
Recalibrated ✓

Work Needed But Not Performed Notice coil was missing from fuel pump when I signed Shipping Ticket # 48495

DATE JOB COMPLETED	Estimate Requested ☐ Yes ☐ No	Technician's Signature

THE LIMITED WARRANTIES AND OTHER TERMS AND CONDITIONS AS STATED ON THE REVERSE SIDE OF THIS DOCUMENT APPLY. LABOR WARRANTY IS LIMITED TO REPERFORMING THE REPAIR OR CAUSING THE REPAIR TO BE MADE AND IN NO EVENT SHALL COMPANY BE RESPONSIBLE OR LIABLE FOR CONSEQUENTIAL DAMAGES. LABOR WARRANTY: 6 MONTHS / 50,000 MILES / 1,800 HOURS APPLY TO THIS SERVICE ORDER.

I hereby authorize the above repair work to be done along with the necessary material, and hereby grant you and/or your employees permission to operate the car or truck or other equipment herein described on streets, highways or elsewhere for the purpose of testing and/or inspection. An express mechanic's lien and/or possessory lien is hereby acknowledged on said car or truck or other equipment, to secure the amount of repairs thereto.

Customer's Signature X _____

FORM NO. CSP 43 (4-86)

Not Responsible for Loss or Damage to Vehicle or Personal Articles Left In Vehicles, in Case of Fire, Theft or Any Other Cause Beyond our Control.

CUMMINS
Sales & Service, Inc.
BOX 1005 • ARLINGTON, TEXAS 76010

FUEL SYSTEM DATA

DATE 5-7-86 BRANCH NO

CHARGED TO

CUST. Southwest Research Inst

ADD. San Antonio, TX

LOC. Skyline

SERVICE ORDER NO. 004305-

MAKE & ENGINE MODEL NHC-220

ENGINE SERIAL NO.

FUEL PUMP NO. C517822

UNIT NO. AND/OR VESSEL NAME

WARRANTY STATUS YES ☐ NO ☐

TYPE PUMP PT-G

FUEL PUMP CODE IN	CPL NO. IN	SEAL NO. IN & CONDITION	☐ SEALED ☐ BROKEN
679-D	28		
FUEL PUMP CODE OUT	**CPL NO. OUT**	**SEAL NO. OUT**	
679-D	28	27047	

REMARKS: Made Before & recalibrated.

FUEL PUMP READINGS	BEFORE	AFTER
1 Auto. Gov. Cutoff	2150	2143
2 VS. Gov. Cutoff		—
3 Throttle Leakage		
4 Throttle Travel		
5 Idle Speed PSI @ RPM	45 @500	38@525
6 Idle Speed CC @ RPM		
7 Calibration PSI @ RPM	142 @2100	145@2100
8 Calibration Flow	425	425
9 Check Point (1) PSI RPM	121 @1500	118@1500
10 Check Point Flow	350	350
11 Check Point (2) PSI @ RPM	93 @1000	73@1000
12 Check Point Flow	225	225
13 AFC In./Hg. PSI	—	—
14 AFC or Aneroid RPM	—	—
15 AFC PSI Flow	—	—
16 AFC No Air PSI Flow	—	—
17 WT Assist Settings	—	.940
18 Unrestricted PSI	203	180
19 Idle Plunger Size	30	37

INJECTOR READING		BEFORE TS	BEFORE FLOW	AFTER TS	AFTER FLOW
INJECTOR PART NO.	1				
	2				
	3				
INJECTOR FLOW CODE	4				
	5				
	6				
INJECTOR TOP STOP SETTING	7				
	8				
	9				
FOR ARLINGTON OFFICE ONLY	10				
	11				
	12				
	13				
	14				
	15				
	16				

REMARKS:

Technician 7211

APPENDIX B
Data Summary Sheets

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 1
Engine: Cummins NH-220G
Fuel ID: BF02V13L86
Date: 05/27/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2099	199	79.3	0.398	7.182
1800	188	74.3	0.395	7.654
1500	167	66.8	0.399	8.191
1299	146	59.4	0.407	8.433
1100	120	50.6	0.421	8.381

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2100	199	80.5	0.405	7.227	566.9	3.6	20	203.1	3303.75	79.8	32.1
1801	188	75.2	0.399	7.682	636.3	3.3	17	237.6	3433.92	76.1	32.4
1500	166	68.3	0.410	8.171	771.1	0.6	18	312.7	3423.15	69.6	31.5
1300	146	60.6	0.415	8.409	741.8	0.9	25	303.8	3453.25	68.5	31.3
1100	120	50.7	0.423	8.408	718.1	1.1	23	302.8	3248.38	65.2	30.7
Alternator Load Simulation:											
1801	188	75.2	0.399	7.682	636.3	3.3	17	237.6	3433.92	76.1	32.4
1799	133	49.8	0.374	6.448	480.3	7.3	2	170.5	2453.34	82.0	34.7
1800	97	37.4	0.386	5.755	384.9	9.0	0	133.9	1907.27	84.9	33.8
1798	48	22.3	0.465	5.030	223.8	10.6	1	71.2	1183.69	88.3	28.2
1799	14	13.8	0.986	4.608	136.7	12.0	0	46.8	631.18	76.1	13.8

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 1
Engine: Cummins NH-220G
Fuel ID: BF02V13L86
Date: 05/29/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2102	197	82.8	0.419	7.198
1801	186	74.9	0.403	7.666
1500	166	68.9	0.414	8.237
1300	145	60.6	0.417	8.439
1101	118	49.8	0.422	8.360

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2101	196	80.9	0.412	7.187	529.3	4.3	21	187.5	3298.21	79.3	31.8
1797	183	74.5	0.407	7.628	599.8	4.2	14	221.9	3331.17	74.4	32.2
1498	166	68.3	0.410	8.282	728.2	1.0	16	294.3	3450.68	70.0	32.0
1299	145	61.4	0.423	8.519	773.2	0.8	17	320.4	3397.48	66.5	31.1
1102	120	50.8	0.423	8.417	706.2	0.7	14	299.9	3225.90	64.8	30.9
Alternator Load Simulation:											
1797	183	74.5	0.407	7.628	599.8	4.2	14	221.9	3331.17	74.4	32.2
1801	132	49.7	0.377	6.492	471.4	7.2	2	165.1	2423.80	81.3	35.0
1803	98	38.1	0.389	5.828	366.8	8.6	1	124.2	1916.79	83.9	33.7
1801	47	21.7	0.461	4.978	217.2	10.1	1	62.1	1088.28	83.6	28.5
1802	15	13.7	0.913	4.597	140.5	11.6	1	43.8	615.82	75.0	14.8

NAVY HIGH-SPEED DESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 2
Engine: Cummins NH-220G
Fuel ID: TF26P22Y87
Date: 07/14/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2102	199	81.5	0.410	7.097
1800	186	74.2	0.399	7.553
1501	167	6S.5	0.409	8.205
1301	146	62.1	0.425	8.486
1102	120	50.1	0.418	8.424

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2102	195	73.7	0.377	7.063	675.0	7.8	34	249.6	3180.34	83.4	34.2
1802	186	69.5	0.373	7.505	818.2	6.6	23	314.5	3231.41	77.1	34.5
1502	163	59.5	0.365	8.109	982.1	4.3	25	399.8	3315.02	77.1	35.4
1300	144	55.1	0.383	8.384	1006.0	3.7	27	421.2	3338.45	72.6	34.0
1100	120	46.6	0.388	8.489	934.0	2.8	17	396.6	3274.46	71.2	33.4
Alternator Load Simulation:											
1802	186	69.5	0.373	7.505	818.2	6.6	23	314.5	3231.41	77.1	34.5
1801	132	45.4	0.344	6.437	589.7	9.5	8	219.4	2514.13	91.9	38.0
1801	98	36.9	0.377	5.768	468.7	10.7	6	174.2	1919.06	86.3	34.5
1802	49	22.2	0.453	5.026	247.7	12.5	3	88.8	1211.06	90.6	28.6
1801	15	13.8	0.920	4.647	134.4	13.9	2	48.2	723.88	87.0	14.9

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 2
Engine: Cumrnins NH-220G
Fuel ID: TF26P22Y87
Date: 07/15/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2103	200	81.5	0.407	7.010
1803	187	73.3	0.391	7.494
1502	167	68.3	0.409	8.154
1299	146	60.6	0.415	8.413
1100	120	49.5	0.412	8.351

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2102	195	73.2	0.374	6.932	632.3	8.1	20	231.6	3077.46	81.4	34.7
1802	183	67.6	0.369	7.397	766.9	6.7	15	291.2	3157.23	77.5	35.1
1499	163	60.3	0.369	7.861	890.1	4.8	20	357.7	3240.28	74.2	35.0
1302	144	53.1	0.369	8.123	930.9	4.0	25	387.1	3222.90	72.8	35.2
1102	119	45.3	0.381	8.184	858.6	2.9	17	361.2	3100.11	69.5	34.3
Alternator Load Simulation:											
1802	183	67.6	0.369	7.397	766.9	6.7	15	291.2	3157.23	77.5	35.1
1802	133	46.4	0.349	6.310	548.5	9.5	6	201.5	2441.65	87.4	37.2
1803	98	35.9	0.365	5.635	427.3	10.8	4	156.6	1902.40	88.0	35.4
1802	47	21.3	0.453	5.002	249.4	12.5	1	87.2	1259.41	98.2	29.1
1803	13	13.0	1.000	4.562	127.4	14.0	1	50.8	708.65	90.5	12.9

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 3
Engine: Cummins NH-220G
Fuel ID: TF10NI8Y87
Date: 10/23/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2100	198	82.3	0.416	7.060
1800	187	75.9	0.406	7.556
1499	166	67.2	0.406	8.196
1299	146	61.6	0.422	8.578
1099	119	54.0	0.454	8.607

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2099	209	81.1	0.388	7.321	853.9	10.0	24	335.6	3376.57	80.8	33.7
1800	195	80.0	0.410	7.852	1036.0	7.5	23	409.6	3446.10	73.1	32.5
1501	167	70.6	0.423	8.298	1213.0	5.9	30	496.3	3435.53	68.7	31.4
1299	145	64.6	0.446	8.622	1324.0	4.4	39	552.2	3353.48	63.7	30.0
1100	121	54.2	0.449	8.672	1277.0	3.7	34	540.1	3120.59	59.9	29.8
Alternator Load Simulation:											
1800	195	80.0	0.410	7.852	1036.0	7.5	23	409.6	3446.10	73.1	32.5
1803	133	54.9	0.413	6.376	636.6	12.5	51	256.2	2428.74	81.9	35.2
1800	97	40.0	0.413	5.703	451.0	14.5	3	191.2	1885.93	80.1	32.5
1801	48	24.6	0.513	4.931	270.2	16.7	2	136.4	1230.10	87.7	27.2
1801	16	15.6	0.975	4.308	153.3	18.4	1	102.9	757.78	81.7	13.2

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 3
Engine: Cumrnins NH-220G
Fuel ID: TF10N18Y87
Date: 10/26/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2100	204	82.9	0.407	7.064
1800	192	75.7	0.395	7.645
1501	167	68.2	0.408	8.336
1301	148	62.1	0.419	8.740
1101	120	50.6	0.422	8.747

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2102	213	88.0	0.412	7.499	915.8	9.8	33	361.6	3410.66	77.0	32.2
1804	197	79.2	0.403	7.971	1098.0	7.3	24	437.3	3473.75	74.8	33.0
1502	166	71.8	0.434	8.155	1229.0	5.7	39	500.7	3202.99	63.4	30.6
1300	146	64.4	0.441	8.807	1348.0	4.3	44	559.7	3364.91	64.3	30.1
1099	121	52.3	0.433	8.883	1240.0	4.1	33	518.9	3236.02	64.3	30.7
ator Load Simulation:											
1804	197	79.2	0.403	7.971	1098.0	7.3	24	437.3	3473.75	74.8	33.0
1801	133	48.2	0.363	6.340	627.1	13.0	2	255.1	2376.25	84.0	36.6
1801	99	41.3	0.417	5.752	477.2	14.6	1	202.3	1896.80	78.3	31.9
1801	48	24.0	0.500	4.927	262.6	16.8	I	133.0	1220.59	86.7	26.7
1800	16	16.6	1.038	4.347	148.2	18.2	1	100.9	768.67	81.3	13.3

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 4
Engine: Cummins NH-220G
Fuel ID: TF09N14S87
Date: 12/02/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2100	204	86.7	0.426	7.122
1802	190	79.3	0.417	7.629
1502	165	70.9	0.429	8.290
1300	145	63.4	0.438	8.612
1100	118	52.0	0.440	8.539

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2103	187	109.0	0.584	6.751	520.5	6.0	29	l87.7	3238.50	58.3	23.8
1801	176	97.9	0.556	7.224	577.2	4.4	17	215.3	3341.64	57.4	25.1
1499	154	82.1	0.534	7.772	676.0	3.2	16	26S.2	3335.56	56.9	26.1
1299	136	74.9	0.550	8.217	738.2	2.3	20	304.8	3321.77	53.8	25.3
1100	112	65.1	0.581	8.451	771.2	1.7	24	329.1	3155.00	49.8	23.9
Alternator Load Simulation:											
1801	176	97.9	0.556	7.224	577.2	4.4	17	215.3	3341.64	57.4	25.1
1800	133	63.3	0.475	6.027	409.2	8.6	4	142.2	2458.17	65.3	28.1
1801	99	49.8	0.504	5.402	302.9	10.2	2	101.1	1928.34	65.1	26.4
1799	49	30.8	0.629	4.755	189.7	12.1	0	69.7	1252.77	68.3	21.3
1798	17	l8.3	1.076	4.397	146.0	13.6	0	54.5	754.21	69.2	12.5

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 4
Engine: Cummins NH-220G
Fuel ID: TF09N14S87
Date: 12/10/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2103	204	85.8	0.421	7.168
1800	192	78.6	0.410	7.653
1500	167	70.7	0.423	8.357
1299	147	62.6	0.427	8.642
1101	120	52.1	0.434	8.521

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2100	201	108.0	0.538	6.905	541.6	5.6	19	193.9	3288.64	59.7	24.7
1800	190	95.6	0.504	7.379	589.2	4.9	13	218.9	3379.47	59.4	26.4
1500	162	81.0	0.501	7.980	689.2	2.9	15	271.5	3410.30	59.0	26.5
1300	143	75.8	0.530	8.463	786.8	2.1	17	320.4	3394.98	54.4	25.0
1101	118	65.0	0.552	8.607	772.8	1.8	20	330.1	3171.35	50.1	24.0
Alternator Load Simulation:											
1800	190	95.6	0.504	7.379	589.2	4.9	13	218.9	3379.47	59.4	26.4
1801	133	60.7	0.456	6.059	407.0	8.8	3	140.8	2361.33	65.4	29.2
1801	98	47.4	0.483	5.449	292.2	10.1	1	95.8	I869.17	66.3	27.5
1800	49	28.1	0.573	4.759	192.2	12.6	0	69.3	1150.09	68.8	23.2
1800	18	18.8	1.044	4.446	153.3	14.1	0	61.8	734.03	65.6	12.9

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 5
Engine: Cummins NH-220G
Fuel ID: TF01N01S87
Date: 04/13/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2100	200	86.6	0.433	7.224
1802	188	79.1	0.421	7.821
1501	165	70.4	0.427	8.561
1299	144	63.7	0.442	8.882
1101	116	52.4	0.452	8.857

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Therm al Efficiency, %
Full Rack Operation:											
2101	204	94.1	0.461	7.304	594.6	5.3	25	216.9	3549.70	73.9	30.2
1802	187	84.7	0.453	7.888	720.9	6.2	19	272.9	3642.40	72.2	30.7
1499	161	75.3	0.468	8.435	856.9	4.2	20	338.1	3725.53	69.1	29.7
1300	140	65.9	0.471	8.735	920.0	4.2	20	373.0	3645.35	67.0	29.6
1103	115	56.1	0.488	8.839	902.8	3.1	35	381.4	3473.89	63.7	28.6
Alternator Load Simulation:											
1802	187	84.7	0.453	7.888	720.9	6.2	19	272.9	3642.40	72.2	30.7
1801	127	54.2	0.427	6.173	424.0	9.9	5	153.4	2487.89	77.1	32.6
1800	91	41.2	0.453	5.596	328.7	11.5	4	123.1	1955.85	79.7	30.6
1799	45	27.6	0.613	4.824	190.7	14.2	6	79.2	1188.91	72.2	22.7
1799	16	17.7	1.106	4.413	141.0	15.5	1	62.9	747.50	70.8	12.5

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 5
Engine: Cummins NH-220G
Fuel ID: TF01N01S87
Date: 04/14/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2100	199	86.5	0.435	7.223
1801	186	79.7	0.428	7.817
1500	163	71.1	0.436	8.484
1299	141	63.5	0.450	8.867
1099	115	51.9	0.451	8.830

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2101	207	95.4	0.461	7.244	587.3	6.7	34	216.0	3598.82	73.9	30.2
1802	191	85.8	0.449	7.777	701.1	6.1	24	265.2	3633.55	71.1	31.0
1500	166	75.8	0.457	8.383	830.2	4.6	20	325.2	3677.87	67.8	30.5
1301	145	66.8	0.461	8.724	914.4	4.4	23	372.2	3645.08	66.2	30.2
1101	119	56.5	0.475	8.807	890.1	2.9	25	375.6	3478.59	63.2	29.3
Alternator Load Simulation:											
1802	191	85.8	0.449	7.777	701.1	6.1	24	265.2	3633.55	71.1	31.0
1801	127	52.5	0.413	6.016	399.5	10.5	8	145.6	2379.04	76.1	33.5
1801	93	38.9	0.418	5.424	293.1	12.5	7	111.3	1816.67	78.4	33.2
1800	45	22.6	0.502	4.661	164.9	15.0	4	75.9	1040.79	77.3	27.6
1800	17	14.8	0.871	4.336	133.4	15.7	2	62.4	629.08	71.3	15.9

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 6
Engine: Cummins NH-220G
Fuel ID: TF02N21L87
Date: 04/15/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2100	201	87.0	0.433	7.218
1801	188	78.7	0.419	7.835
1500	165	70.6	0.428	8.499
1299	144	63.2	0.439	8.856
1099	117	52.0	0.444	8.803

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2100	207	96.6	0.467	7.365	759.4	8.7	31	298.2	3586.88	73.7	30.2
1804	192	85.1	0.443	7.954	939.4	7.6	26	368.6	3664.97	73.5	31.8
1502	165	74.8	0.453	8.527	1147.0	6.6	35	463.8	3691.45	70.1	31.1
1301	144	66.8	0.464	8.817	1178.0	5.7	41	479.2	3627.13	66.8	30.3
1101	120	55.6	0.463	8.933	1158.0	4.7	30	484.9	3533.76	66.2	30.6
Alternator Load Simulation:											
1804	192	85.1	0.443	7.954	939.4	7.6	26	368.6	3664.97	73.5	31.8
1803	127	52.2	0.411	6.160	470.5	12.9	7	192.2	2433.99	79.5	34.3
1802	94	38.6	0.411	5.623	349.3	14.6	6	155.5	1878.18	82.9	34.3
1802	46	24.2	0.526	4.676	189.4	17.1	4	109.5	1105.55	77.9	27.0
1803	16	15.1	0.944	4.121	105.1	17.1	1	71.9	676.23	76.4	15.1

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 6
Engine: Cummins NH-220G
Fuel ID: TF02N21L87
Date: 04/18/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2100	197	86.3	0.438	7.246
1799	185	79.6	0.430	7.797
1501	163	70.5	0.433	8.489
1301	142	64.3	0.453	8.862
1101	116	52.1	0.449	8.834

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Obser ved BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2100	206	94.3	0.458	7.362	759.8	7.4	30	298.1	3595.08	75.7	30.7
1802	191	85.2	0.446	7.929	929.9	7.3	25	366.3	3626.89	72.5	31.6
1501	164	76	0.463	8.509	1107.0	6.6	29	443.8	3702.81	69.2	30.4
1300	142	66.4	0.468	8.797	1178.0	5.7	35	487.6	3600.23	66.7	30.2
1099	118	55.2	0.468	8.926	1145.0	4.9	26	477.8	3509.28	66.1	30.1
Alternator Load Simulation:											
1802	191	85.2	0.446	7.929	929.9	7.3	25	366.3	3626.89	72.5	31.6
1802	126	52.1	0.413	6.153	489.7	12.7	7	200.3	2434.16	79.6	34.0
1801	94	41.6	0.443	5.596	343.3	14.6	7	153.0	1879.51	77.0	31.7
1801	45	24.4	0.542	4.727	202.0	17.0	3	114.3	1129.70	78.9	25.8
1800	16	15.1	0.944	4.130	105.2	17.5	0	74.8	672.70	75.8	15.4

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 7
Engine: Cummins NH-220G
Fuel ID: TF08N19U87
Date: 04/20/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2098	196	87.2	0.445	7.238
1800	184	80.1	0.435	7.744
1502	164	71.6	0.437	8.518
1300	144	63.9	0.444	8.861
1100	117	52.8	0.451	8.807

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2102	199	102.3	0.514	7.078	58l.8	8.0	39	214.3	3458.45	66.6	27.2
1800	186	94.1	0.506	7.599	665.3	7.0	23	248.0	3582.58	64.4	27.6
1500	159	79.5	0.500	8.058	845.5	5.3	27	330.3	3592.61	63.7	28.0
1300	140	74.5	0.532	8.527	917.5	5.4	41	368.1	3566.51	58.5	26.4
1101	117	63.5	0.543	8.768	948	3.8	41	392.9	3440.10	56.0	25.8
Alternator Load Simulation:											
l800	l86	94.1	0.506	7.599	665.3	7.0	23	248.0	3582.58	64.4	27.6
l803	127	60.1	0.473	6.006	405.7	11.1	10	150.4	2496.88	70.4	29.7
l802	94	44.6	0.474	5.474	308.4	13.2	7	122.3	1907.99	72.4	29.4
l802	46	26.7	0.580	4.729	l84.5	15.6	5	92.4	1144.79	72.6	24.2
l801	15	16.6	1.107	4.380	161.2	16.4	4	81.4	707.81	72.2	12.7

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 7
Engine: Cummins NH-220G
Fuel ID: TF08N19U87
Date: 04/20/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2102	200	87.1	0.436	7.200
1800	185	78.6	0.425	7.750
1499	163	70.6	0.433	8.496
1302	145	64.0	0.44l	8.859
1100	118	51.6	0.437	8.807

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2101	200	103.3	0.517	7.081	585.6	7.3	45	215.4	3466.77	66.3	27.1
1804	187	87.6	0.468	7.593	697.6	6.5	28	263.6	3576.02	69.2	29.8
1501	160	73.0	0.456	8.118	831.5	5.6	28	327.9	3621.49	70.0	30.8
1303	142	74.3	0.523	8.592	930.2	5.1	36	380.5	3588.87	59.1	26.7
1100	116	61.9	0.534	8.769	951.0	3.8	34	393.8	3438.56	57.4	26.3
Alternator Load Simulation:											
1804	187	87.6	0.468	7.593	697.6	6.5	28	263.6	3576.02	69.2	29.8
1802	126	57.4	0.456	6.011	419.4	11.1	11	156.2	2455.58	72.4	30.9
1804	94	45.1	0.480	5.474	325.9	13.3	9	131.3	1919.90	72.2	29.3
1803	47	26.8	0.570	4.745	197.5	15.9	7	97.8	1152.12	72.8	24.6
1802	15	16.7	1.113	4.736	156.4	17.0	5	79.3	726.14	73.6	12.4

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 8
Engine: Cummins NH-220G
Fuel ID: TF07N11U87
Date: 04/05/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2100	191	85.8	0.449	7.099
1798	178	78.6	0.442	7.631
1501	157	70.6	0.450	8.364
1299	137	62.5	0.456	8.719
1102	112	51.3	0.458	8.652

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2101	190	98.8	0.520	7.039	536.5	6.5	35	191.1	3367.12	66.7	26.8
1803	177	89.7	0.507	7.492	617.3	6.0	25	229.0	3433.92	64.3	27.4
1500	155	74.4	0.480	7.993	748.4	3.9	21	291.2	3481.41	65.4	28.9
1300	136	71.5	0.526	8.420	803.2	4.0	25	328.8	3493.97	59.2	26.4
1100	112	61.2	0.546	8.582	806.7	2.6	28	339.2	3322.56	55.6	25.4
Alternator Load Simulation:											
1803	177	89.7	0.507	7.492	617.3	6.0	25	229.0	3433.92	64.3	27.4
1802	126	59.3	0.471	6.073	395.4	9.5	6	137.8	2430.22	68.8	29.6
1802	93	44.7	0.481	5.412	293.8	11.4	5	99.8	1831.56	68.8	29.0
1802	46	26.9	0.585	4.698	200.0	14.1	3	74.8	1070.75	66.8	23.8
1803	15	15.3	1.020	4.299	162.4	15.7	2	69.3	511.29	56.1	13.9

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 8
Engine: Cummins NH-220G
Fuel ID: TF07N11U87
Date: 04/06/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2100	193	86.0	0.446	7.150
1801	178	77.9	0.430	7.662
1502	158	70.0	0.443	8.396
1301	139	62.5	0.450	8.717
1101	114	50.4	0.442	8.709

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2102	192	98.9	0.515	7.060	503.6	6.3	34	177.0	3390.23	67.1	26.9
1798	179	90.8	0.507	7.527	575.0	6.0	I8	207.1	3435.8	63.4	27.4
1501	158	78 .7	0.498	7.988	685.9	4.6	17	264.1	3492.25	62.0	27.9
1301	139	75.6	0.544	8.551	800.0	3.8	19	323.3	3525.94	56.5	25.5
1100	114	60.3	0.529	8.685	78I.2	2.5	21	322.2	3382.96	57.5	26.2
Alternator Load Simulation:											
1798	179	90.8	0.507	7.527	575.0	6	I8	207.1	3435.80	63.4	27.4
1800	127	58.9	0.464	6.153	366.9	8.8	5	121.8	2414.10	68.7	30.0
1800	92	45.1	0.490	5.490	305.9	10.6	5	101.8	1816.77	67.5	28.3
1800	46	26.5	0.576	4.763	207.7	13.9	3	75.7	1049.71	66.4	24.0
1801	16	17.9	1.119	4.386	158.6	15.4	2	65.2	553.43	51.9	12.2

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 9
Engine: Cummins NH-220G
Fuel ID: TF34N28J88
Date: 04/07/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2101	201	85.2	0.424	7.255
1800	185	78.3	0.423	7.826
149S	156	68.7	0.440	8.415
1300	140	62.7	0.448	8.851
1100	114	50.9	0.446	8.809

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2101	190	113.0	0.595	7.342	825.1	11.0	26	330.6	3430.55	61.3	24.1
1804	177	99.2	0.560	7.705	1039.0	10.5	22	418.1	3447.72	60.2	25.5
1501	156	83.4	0.535	8.177	1268.0	9.2	28	513.6	3446.76	59.6	26.7
1300	136	77.7	0.571	8.593	1387.0	8.2	40	568.2	3440.90	55.3	25.1
1102	113	64.4	0.570	8.669	1297.0	7.1	39	535.7	3293.99	54.1	25.2
Alternator Load Simulation:											
1804	177	99.2	0.560	7.705	1039.0	10.5	22	418.1	3447.72	60.2	25.5
1802	126	67.3	0.534	6.416	605.5	14.8	5	265.0	2407.51	61.9	26.8
1802	93	48.5	0.522	5.756	469.2	17.2	5	233.9	1854.03	66.0	27.3
1803	46	28.6	0.622	4.555	206.7	19.1	3	138.4	1133.16	68.6	23.1
1800	15	19.8	1.320	3.800	104.0	19.5	2	77.7	662.29	57.8	10.6

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 9
Engine: Cummins NH-220G
Fuel ID: TF34N28J88
Date: 04/11/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2099	192	89.0	0.464	7.297
1800	179	78.7	0.440	7.826
1500	161	70.6	0.439	8.491
1299	142	63.9	0.450	8.929
1100	116	52.5	0.453	8.785

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2101	188	113.0	0.601	7.108	768.4	13.0	23	318.7	3404.73	61.1	24.0
1800	178	102.0	0.573	7.535	990.7	11.4	26	404.7	3504.18	59.2	25.0
1501	159	91.8	0.577	8.112	1204.0	9.5	33	486.8	3558.58	55.9	24.8
1298	137	77.2	0.564	8.539	1333.0	8.5	47	544.0	3597.46	58.1	25.4
1102	115	76.5	0.665	8.696	1270.0	6.9	50	525.6	3394.87	47.0	21.5
Alternator Load Simulation:											
1800	178	102.0	0.573	7.535	990.7	11.4	26	404.7	3504.18	59.2	25.0
1799	127	65.2	0.513	6.457	589.2	14.9	7	265.3	2510.46	66.5	27.9
1801	95	50.0	0.526	5.657	415.8	17.0	5	222.5	1900.29	65.8	27.3
1799	45	30.5	0.678	4.424	179.6	18.6	2	133.0	1158.03	65.6	21.2
1800	15	21.8	1.453	3.807	108.4	18.1	1	76.6	708.25	56.2	10.0

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 1
Engine: Detroit Diesel 6V-53N
Fuel ID: BF02V13L86
Date: 06/09/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2799	186	78.4	0.422	9.266
2501	181	76.0	0.419	9.431
2197	167	68.4	0.409	9.624
1802	138	62.9	0.455	9.862
1398	100	54.6	0.547	10.180

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2800	189	78.8	0.418	9.338	469.3	7.6	2	40.1	1141.17	75.1	33.0
2500	183	76.4	0.418	9.485	510.0	7.5	2	44.8	1232.16	74.6	33.0
2203	169	71.1	0.420	9.689	527.3	6.7	7	47.6	1238.72	71.0	32.8
1799	137	62.6	0.456	9.848	617.6	6.5	29	63.4	1208.89	64.3	30.3
1399	100	52.7	0.527	10.170	709.6	5.7	62	77.7	1215.92	59.8	26.1
Alternator Load Simulation:											
1799	137	62.6	0.456	9.848	617.6	6.5	29	63.4	1208.89	64.3	30.3
1800	94	36.7	0.389	8.166	599.0	9.2	3	61.8	813.52	73.8	35.4
1798	50	23.5	0.470	7.171	688.1	11.0	3	77.3	688.17	79.3	29.5
1793	20	15.5	0.775	6.652	624.9	11.6	0	70.2	422.16	90.4	18.2
Propeller Load Simulation:											
2800	189	78.8	0.418	9.338	469.3	7.6	2	40.1	1141.17	75.1	33.0
2599	136	54.7	0.403	8.473	537.5	9.5	0	52.0	922.59	78.0	34.2
2198	95	39.4	0.415	7.899	599.3	10.1	0	62.4	725.70	74.9	33.3
1798	50	23.5	0.470	7.171	688.1	11.0	3	77.3	559.93	79.3	29.5
1400	26	15.4	0.593	6.792	727.9	10.6	0	83.3	427.46	71.9	23.2

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 1
Engine: Detroit Diesel 6V-53N
Fuel ID: BF02V13L86
Date: 06/10/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2800	186	78.7	0.423	9.327
2505	182	77.4	0.425	9.484
2201	168	71.2	0.424	9.695
1815	138	61.5	0.446	9.866
1399	99	52.9	0.534	10.180

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2801	187	80.5	0.430	9.415	475.8	7.5	4	40.4	1128.38	72.7	32.1
2500	182	73.3	0.403	9.489	504.4	7.2	3	43.5	1186.67	74.9	34.3
2201	168	70.5	0.419	9.701	547.7	6.7	6	50.8	1216.84	70.3	33.0
1800	137	62.3	0.456	9.869	621.7	6.6	27	63.0	1214.46	64.9	30.3
1400	99	54.1	0.546	10.230	678.7	5.6	63	74.6	1200.29	57.5	25.1
Alternator Load Simulation:											
1800	137	62.3	0.456	9.869	621.7	6.6	27	63.0	1214.46	64.9	30.3
1800	93	37.2	0.400	8.152	618.1	9.3	5	64.9	764.19	68.4	34.7
1800	50	22.9	0.458	7.172	671.6	11.1	4	75.0	577.35	84.0	30.2
1800	21	14.9	0.710	6.678	633.0	11.7	2	71.3	422.77	93.9	19.3
Propeller Load Simulation:											
2801	187	80.5	0.430	9.415	475.8	7.5	4	40.4	1128.38	72.7	32.1
2497	137	54.3	0.397	8.526	539.4	9.3	3	51.5	893.97	76.1	34.7
2196	94	38.7	0.412	7.895	611.2	10.2	1	64.1	710.16	74.6	33.4
1800	50	22.9	0.458	7.172	671.6	11.1	2	75.0	577.35	84.0	30.2
1400	26	14.6	0.561	6.803	745.7	10.7	5	85.1	415.13	73.7	24.7

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 2
Engine: Detroit Diesel 6V-53N
Fuel ID: TF26P22Y87
Date: 06/30/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2799	187	79.8	0.426	9.360
2500	182	75.5	0.416	9.414
2200	168	69.6	0.415	9.543
1800	136	61.4	0.452	9.792
1401	99	53.9	0.544	10.120

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2800	173	73.8	0.427	9.304	632.4	8.5	2	61.1	1099.65	76.9	32.2
2500	171	70.3	0.412	9.391	677.6	8.6	4	69.3	1148.70	75.3	33.3
2199	159	65.1	0.409	9.466	689.4	8.3	5	71.6	1169.89	72.8	33.6
1800	133	57.3	0.431	9.645	771.4	7.9	26	85.0	1243.52	72.0	31.9
1401	99	50.1	0.506	10.090	851.6	6.7	54	97.4	1192.17	61.4	27.0
Alternator Load Simulation:											
1800	133	57.3	0.431	9.645	771.4	7.9	26	85.0	1243.52	72.0	31.9
1800	93	37.3	0.401	8.274	753.6	10.4	2	84.1	866.79	77.1	34.4
1800	51	24.0	0.471	7.390	792.6	12.2	2	93.2	516.33	71.4	29.4
1800	27	17.3	0.641	6.949	738.9	13.0	2	87.7	358.48	68.8	21.5
Propeller Load Simulation:											
2800	173	73.8	0.427	9.304	632.4	8.5	2	61.1	1099.65	76.9	32.2
2500	136	56.0	0.411	8.575	649.2	10.4	2	68.0	895.89	73.7	33.4
2200	94	39.6	0.422	8.085	775.6	11.6	2	88.6	731.29	74.9	32.6
1800	51	24.0	0.471	7.390	792.6	12.2	2	93.2	516.33	71.4	29.4
1400	26	14.7	0.565	6.993	902.4	11.8	2	107.8	395.66	69.4	24.5

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 2
Engine: Detroit Diesel 6V-53N
Fuel ID: TF26P22Y87
Date: 07/02/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2799	186	78.7	0.423	9.408
2500	181	77.0	0.426	9.499
2198	167	69.4	0.415	9.671
1805	137	61.8	0.451	9.818
1398	99	52.4	0.530	10.090

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2800	174	74.2	0.427	9.271	617.5	8.2	1	59.2	1099.73	76.5	32.2
2498	171	69.7	0.408	9.383	622.2	8.4	1	67.4	1126.25	74.4	33.7
2199	160	65.1	0.407	9.499	695.1	8.2	3	72.2	1167.01	72.7	33.8
1800	133	57.3	0.431	9.650	770.2	7.8	16	84.5	1212.73	70.2	32.0
1401	98	51.8	0.528	9.970	842.9	6.9	42	97.0	1180.51	58.9	26.0
Alternator Load Simulation:											
1800	133	57.3	0.431	9.650	770.2	7.8	16	84.5	1212.73	70.2	32.0
1800	93	37.0	0.398	8.258	772.2	10.2	6	86.7	783.92	70.3	34.6
1800	51	24.0	0.471	7.361	805.1	12.2	4	94.9	518.83	71.7	29.2
1799	29	17.3	0.597	6.934	749.5	13.0	5	89.2	407.77	78.2	23.2
Propeller Load Simulation:											
2800	174	74.2	0.427	9.271	617.5	8.2	1	59.2	1099.73	76.5	32.2
2498	136	56.0	0.411	8.587	665.6	10.3	1	69.9	880.04	72.4	33.4
2197	93	39.6	0.426	8.012	780.3	11.5	4	89.3	717.88	73.4	32.3
1800	51	24.0	0.471	7.361	805.1	12.2	4	94.9	518.83	71.7	29.2
1401	26	14.4	0.555	6.949	900.0	11.9	6	107.7	387.61	69.5	24.7

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 3
Engine: Detroit Diesel 6V-53N
Fuel ID: TF10N18Y87
Date: 08/17/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2799	185	78.1	0.423	9.311
2499	181	75.3	0.417	9.474
2201	168	69.9	0.416	9.689
1800	138	61.4	0.446	9.833
1401	100	53.6	0.536	10.160

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2801	195	87.9	0.450	9.576	662.4	8.5	6	65.2	1177.09	70.9	31.3
2502	189	82.8	0.437	9.715	702.2	8.3	3	72.6	1213.71	69.4	32.3
2201	174	76.7	0.442	9.940	821.9	8.6	12	89.8	1251.78	67.9	31.9
1802	140	66.8	0.477	10.040	979.8	8.1	32	113.1	1189.41	60.7	29.5
1402	98	56.0	0.570	10.320	1137.0	7.2	68	138.7	1196.09	56.6	24.7
Alternator Load Simulation:											
1802	140	66.8	0.477	10.040	979.8	8.1	32	113.1	1189.41	60.7	29.5
1801	94	39.8	0.424	8.364	937.2	11.1	7	109.7	759.07	65.0	33.3
1802	51	24.2	0.475	7.565	978.8	12.9	11	119.4	513.52	72.3	29.5
1801	30	18.1	0.603	7.157	880.7	13.4	4	107.7	391.59	73.7	23.1
Propeller Load Simulation:											
2801	195	87.9	0.450	9.576	662.4	8.5	6	65.2	1177.09	70.9	31.3
2501	137	57.5	0.421	8.681	790.3	11.0	2	87.8	873.09	71.8	33.5
2201	94	40.5	0.430	8.181	955.8	12.6	0	115.3	694.94	71.4	32.8
1802	51	24.2	0.475	7.565	978.8	12.9	11	119.4	513.52	72.3	29.5
1402	26	15.4	0.592	7.238	1063.0	12.4	4	130.1	387.73	66.8	23.5

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA
Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 3
Engine: Detroit Diesel 6V-53N
Fuel ID: TF10N18Y87
Date: 08/18/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2797	185	80.3	0.434	9.216
2500	180	75.6	0.420	9.344
2201	167	68.6	0.410	9.550
1799	137	62.1	0.453	9.703
1401	100	52.4	0.524	10.060

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2800	196	88.3	0.450	9.449	657.3	8.6	8	65.1	1169.80	70.2	31.3
2500	190	82.8	0.437	9.546	687.9	8.3	9	69.9	1218.66	69.6	32.3
2200	174	76.7	0.442	9.708	805.3	8.6	16	87.9	1247.48	67.7	31.9
1800	139	66.9	0.481	9.877	972.6	8.1	37	112.6	1173.96	59.8	29.3
1402	100	56.9	0.569	10.200	1099.0	7.2	65	133.1	1186.58	55.3	24.7
Alternator Load Simulation:											
1800	139	66.9	0.481	9.877	972.6	8.1	37	112.6	1173.96	59.8	29.3
1800	95	38.7	0.408	8.180	938.9	11.1	1	110.4	768.87	67.7	34.6
1801	51	24.7	0.484	7.404	958.3	12.9	0	117.0	513.40	70.8	29.3
1801	30	18.5	0.617	6.966	857.2	13.5	4	105.3	353.91	65.2	22.1
Propeller Load Simulation:											
2800	196	88.3	0.450	9.449	657.3	8.6	8	65.1	1169.80	70.2	31.3
2499	138	58.5	0.424	8.519	760.3	10.8	1	83.9	888.64	71.8	33.2
2200	94	41.1	0.437	7.979	973.7	12.6	0	118.2	694.52	70.5	32.3
1801	51	24.7	0.484	7.404	958.3	12.9	0	117.0	513.40	70.8	29.3
1402	26	15.1	0.581	7.014	990.5	12.5	8	121.1	388.00	68.6	24.7

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 4
Engine: Detroit Diesel 6V-53N
Fuel ID: TF09N14S87
Date: 11/04/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2802	187	79.3	0.425	9.359
2501	182	75.2	0.412	9.451
2201	169	69.7	0.413	9.692
1800	139	61.3	0.442	9.779
1401	101	52.4	0.518	10.080

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2800	204	98.4	0.483	9.607	452.3	6.7	5	37.8	1226.82	65.2	28.9
2503	195	92.7	0.475	9.771	470.3	6.0	7	38.9	1264.91	63.8	29.3
2202	178	84.6	0.475	9.995	525.9	6.4	11	47.8	1265.69	61.5	29.4
1800	141	73.5	0.521	10.120	662.9	5.8	37	70.6	1216.44	55.6	26.7
1401	100	63.0	0.630	10.470	733.0	5.1	70	83.4	1204.98	50.0	22.1
Alternator Load Simulation:											
1800	141	73.5	0.521	10.120	662.9	5.8	37	70.6	1216.44	55.6	26.7
1800	95	41.5	0.437	8.249	641.7	8.9	0	67.9	770.76	62.4	31.9
1800	51	25.9	0.508	7.237	713.3	10.6	0	80.0	506.75	65.8	27.3
1800	34	19.8	0.582	6.957	708.6	11.0	0	80.0	427.52	72.6	24.0
Propeller Load Simulation:											
2800	204	98.4	0.483	9.607	452.3	6.7	5	37.8	1226.82	65.2	28.9
2501	137	62.1	0.454	8.556	529.4	8.8	0	48.9	898.92	67.6	30.7
2202	95	44.1	0.465	7.961	609.9	10.0	0	63.7	708.71	66.1	29.9
1800	51	25.9	0.508	7.237	713.3	10.6	0	80.0	506.75	65.8	27.3
1402	27	16.5	0.611	6.887	772.3	10.2	0	89.0	412.91	65.5	22.6

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 4
Engine: Detroit Diesel 6V-53N
Fuel ID: TF09N14S87
Date: 11/05/87
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2800	187	80.0	0.428	9.387
2501	182	74.9	0.412	9.497
2200	168	69.5	0.413	9.706
1801	138	61.3	0.444	9.830
1401	101	52.3	0.517	10.180

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2802	203	97.9	0.483	9.643	459.9	6.9	6	39.1	1209.06	64.6	28.8
2499	194	91.7	0.472	9.825	478.1	6.2	7	39.8	1254.61	63.8	29.5
2200	178	84.6	0.474	10.030	524.1	6.3	12	47.2	1265.20	61.4	29.4
1800	141	73.7	0.523	10.140	662.3	5.9	42	70.5	1221.46	55.7	26.7
1402	101	62.1	0.615	10.070	745.7	5.3	75	84.9	1135.55	47.9	22.5
Alternator Load Simulation:											
1800	141	73.7	0.523	10.140	662.3	5.9	42	70.5	1221.46	55.7	26.7
1800	96	42.0	0.439	8.329	639.0	8.8	0	67.1	775.02	62.0	31.7
1800	51	26.6	0.522	7.306	716.5	10.5	0	80.3	522.24	66.0	26.9
1800	35	21.5	0.614	7.012	713.8	11.0	0	80.4	432.79	67.7	22.5
Propeller Load Simulation:											
2802	203	97.9	0.483	9.643	459.9	6.9	6	39.1	1209.06	64.6	28.8
2499	138	63.3	0.459	8.626	537.0	8.6	0	49.9	900.85	66.4	30.4
2200	96	44.9	0.468	8.040	612.4	9.9	0	63.9	724.40	66.3	29.9
1800	51	26.6	0.522	7.306	716.5	10.5	0	80.3	522.24	66.0	26.9
1402	26	16.3	0.627	6.964	776.8	10.2	0	88.4	422.84	67.9	22.5

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 5
Engine: Detroit Diesel 6V-53N
Fuel ID: TF01N01S87
Date: 01/14/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2803	186	80.6	0.433	9.421
2502	181	75.0	0.414	9.532
2200	167	69.8	0.418	9.647
1801	140	61.4	0.439	9.779
1404	102	52.5	0.515	10.110

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2800	195	87.8	0.450	9.605	495.4	7.2	3	40.4	1154.76	68.7	30.9
2499	190	84.0	0.442	9.699	545.9	6.9	4	48.4	1220.05	67.7	31.5
2200	174	76.5	0.440	9.856	569.3	6.9	11	53.6	1230.60	66.0	31.7
1801	141	67.1	0.476	9.945	674.3	6.2	40	70.9	1212.95	60.7	29.1
1403	101	57.5	0.569	10.320	752.1	5.4	72	85.1	1189.96	54.1	24.4
Alternator Load Simulation:											
1801	141	67.1	0.476	9.945	674.3	6.2	40	70.9	1212.95	60.7	29.1
1803	97	41.0	0.423	8.310	657.7	8.9	1	69.9	802.41	65.8	32.9
1802	53	26.3	0.496	7.349	768.9	10.9	I	87.6	538.44	68.8	28.2
1802	32	19.8	0.619	6.960	744.1	11.5	I	85.2	423.64	71.9	22.8
Propeller Load Simulation:											
2800	195	87.8	0.450	9.605	495.4	7.2	3	40.4	1154.76	68.7	30.9
2501	143	62.3	0.436	8.746	575.7	8.7	0	55.1	931.50	69.7	32.0
2201	97	43.2	0.445	8.077	675.1	10.2	0	72.7	719.39	68.3	31.2
1802	53	26.3	0.496	7.349	768.9	10.9	1	87.6	538.44	68.8	28.2
1403	27	16.2	0.600	6.941	837.1	10.5	0	97.4	413.73	66.8	23.4

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 5
Engine: Detroit Diesel 6V-53N
Fuel ID: TF01N01S87
Date: 01/18/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2803	188	79.9	0.425	9.390
2501	181	75.2	0.415	9.439
2201	168	69.6	0.414	9.642
1802	138	61.4	0.445	9.638
1404	100	52.6	0.526	9.987

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2800	197	88.0	0.447	9.431	498.7	7.6	6	41.7	1199.48	71.1	31.0
2501	190	83.3	0.438	9.564	525.1	7.1	5	46.4	1237.58	69.3	31.7
2201	174	76.5	0.440	9.728	582.9	6.9	8	55.9	1254.18	67.3	31.6
1800	140	67.4	0.481	9.877	722.7	6.7	33	78.3	1220.73	60.8	29.0
1401	101	56.1	0.555	10.120	775.2	5.8	60	88.3	1195.33	55.7	25.0
Alternator Load Simulation:											
1800	140	67.4	0.481	9.877	722.7	6.7	33	78.3	1220.73	60.8	29.0
1800	94	38.9	0.414	8.140	676.7	9.4	0	73.3	786.58	67.9	33.6
1799	51	25.0	0.490	7.233	772.9	11.3	0	89.0	527.52	70.8	28.5
1801	31	18.9	0.610	6.876	744.9	11.9	1	86.3	410.63	72.9	22.5
Propeller Load Simulation:											
2800	197	88.0	0.447	9.431	498.7	7.6	6	41.7	1199.48	71.1	31.0
2501	136	58.8	0.432	8.478	566.5	9.3	0	55.3	906.44	71.9	32.2
2202	94	41.6	0.443	7.954	693.6	10.6	0	76.0	718.16	70.9	31.4
1799	51	25.0	0.490	7.233	772.9	11.3	0	89.0	527.52	70.8	28.5
1402	27	15.6	0.578	6.844	841.6	10.8	0	98.6	414.37	69.4	23.7

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 6
Engine: Detroit Diesel 6V-53N
Fuel ID: TF02N21L87
Date: 01/22/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2801	190	81.2	0.427	9.545
2501	185	77.2	0.417	9.679
2199	171	71.3	0.417	9.817
1802	142	63.1	0.444	9.961
1400	103	53.3	0.517	10.180

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2799	198	90.4	0.457	9.696	589.7	8.7	6	55.5	1253.60	73.4	30.9
2501	193	85.6	0.444	9.815	657.0	7.7	5	64.5	1239.41	68.5	31.8
2200	179	79.7	0.445	10.110	737.9	7.6	9	77.1	1287.48	67.2	31.7
1801	144	68.7	0.477	10.180	907.9	7.5	23	104.9	1230.99	61.0	29.6
1402	100	57.7	0.577	10.250	1055.0	7.0	57	128.5	1181.07	54.3	24.3
Alternator Load Simulation:											
1801	144	68.7	0.477	10.180	907.9	7.5	23	104.9	1230.99	61.0	29.6
1801	95	40.1	0.422	8.337	853.3	10.3	5	97.9	790.22	67.1	33.3
1801	51	25.8	0.506	7.532	932.9	12.2	2	111.9	514.47	67.9	27.9
1801	31	19.6	0.632	7.130	889.0	12.8	4	107.5	410.70	71.4	22.2
Propeller Load Simulation:											
2799	198	90.4	0.457	9.696	589.7	8.7	6	55.5	1253.60	73.4	30.9
2501	138	60.6	0.439	8.766	726.9	10.2	2	78.0	906.85	70.8	32.1
2201	94	42.4	0.451	8.199	882.8	11.7	2	103.2	735.51	72.2	31.3
1801	51	25.8	0.506	7.532	932.9	12.2	2	111.9	514.47	67.9	27.9
1401	26	16.0	0.615	7.167	1005.0	11.8	6	121.6	399.72	66.2	23.0

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 6
Engine: Detroit Diesel 6V-53N
Fuel ID: TF02N21L87
Date: 01/25/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2801	188	80.6	0.429	9.609
2503	183	76.4	0.417	9.686
2199	170	70.5	0.415	9.858
1803	140	62.4	0.446	9.924
1401	103	53.0	0.515	10.310

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2801	197	89.6	0.455	9.720	554.9	8.4	3	50.1	1246.14	73.7	31.0
2500	193	85.1	0.441	9.911	648.8	7.7	5	64.3	1249.54	69.4	32.0
2201	177	78.1	0.441	10.080	732.6	7.7	6	76.4	1272.37	67.8	32.0
1800	144	69.4	0.482	10.210	898.4	7.4	28	103.0	1237.00	60.7	29.2
1401	104	58.3	0.561	10.470	992.0	6.7	59	117.1	1211.70	55.1	25.0
Alternator Load Simulation:											
1800	144	69.4	0.482	10.210	898.4	7.4	28	103.0	1237	60.7	29.2
1800	95	40.6	0.427	8.436	863.0	10.4	1	99.0	800.04	67.1	33.1
1800	51	26.0	0.510	7.560	961.9	12.2	1	115.7	519.7	68.1	27.8
1799	31	19.6	0.632	7.180	888.9	12.7	1	107.3	416.18	72.3	22.1
Propeller Load Simulation:											
2801	197	89.6	0.455	9.720	554.9	8.4	3	50.1	1246.14	73.7	31.0
2500	137	60.0	0.438	8.753	720.7	10.1	0	77.0	898.80	70.8	32.1
2199	95	42.4	0.446	8.242	899.8	11.6	1	105.2	736.64	72.3	31.5
1800	51	26.0	0.510	7.560	961.9	12.2	1	115.7	519.70	68.1	27.8
1402	26	16.1	0.619	7.194	1003.0	11.7	0	121.0	407.82	67.2	22.6

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 7
Engine: Detroit Diesel 6V-53N
Fuel ID: TF08N19U87
Date: 01/27/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2801	189	80.8	0.428	9.627
2500	184	76.2	0.414	9.703
2203	170	70.7	0.416	9.880
1800	141	62.4	0.443	9.993
1401	104	53.2	0.512	10.210

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2801	200	97.0	0.485	9.769	485.2	7.1	12	39.5	1203.01	65.3	28.9
2502	197	92.1	0.468	9.893	532.6	7.0	7	46.9	1268.46	64.8	29.9
2201	180	84.8	0.471	10.150	582.9	6.6	16	55.7	1275.33	62.2	29.7
1802	143	74.5	0.521	10.100	756.5	6.6	34	82.2	1216.78	55.3	27.0
1400	103	62.1	0.603	10.570	767.9	5.5	73	87.3	1214.70	51.5	23.3
Alternator Load Simulation:											
1802	143	74.5	0.521	10.100	756.5	6.6	34	82.2	1216.78	55.3	27.0
1802	95	42.2	0.444	8.435	700.5	9.2	2	75.4	803.24	64.5	31.7
1802	51	27.0	0.529	7.470	768.4	11.0	0	87.6	527.53	66.2	26.5
1802	31	20.7	0.668	7.085	769.1	11.5	0	88.7	428.10	70.0	21.2
Propeller Load Simulation:											
2801	200	97.0	0.485	9.769	485.2	7.1	12	39.5	1203.01	65.3	28.9
2500	138	64.1	0.464	8.771	590.1	9.4	1	57.9	899.21	65.9	30.2
2202	95	44.9	0.473	8.177	694.0	10.4	1	75.1	719.09	66.3	29.6
1802	51	27.0	0.529	7.470	768.4	11.0	0	87.6	527.53	66.2	26.5
1401	26	16.6	0.638	7.042	853.8	10.7	1	99.4	410.69	65.1	21.8

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 7
Engine: Detroit Diesel 6V-53N
Fuel ID: TF08N19U87
Date: 1/28/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2801	190	80.7	0.425	9.563
2501	185	75.7	0.409	9.717
2204	170	70.2	0.413	9.825
1802	141	66.1	0.469	9.976
1402	104	52.5	0.505	10.300

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2801	203	96.9	0.477	9.819	505.7	7.6	8	43.0	1294.28	70.3	29.4
2502	196	91.1	0.465	9.899	543.9	7.1	6	48.5	1262.84	65.2	30.2
2202	180	83.5	0.464	10.180	589.2	6.6	9	56.4	1268.42	62.9	30.2
1800	144	73.0	0.507	10.260	733.7	6.3	28	79.7	1235.59	57.3	27.6
1402	104	60.9	0.586	10.480	794.5	5.6	70	90.8	1209.33	52.3	23.8
Alternator Load Simulation:											
1800	144	73.0	0.507	10.260	733.7	6.3	28	79.7	1235.59	57.3	27.6
1800	95	41.3	0.435	8.398	716.7	9.4	0	78.0	791.61	64.8	32.1
1800	51	26.0	0.510	7.428	820.1	11.1	0	94.8	518.40	67.4	27.3
1800	30	19.8	0.660	7.096	804.4	11.6	0	93.9	418.12	71.4	21.4
Propeller Load Simulation:											
2801	203	96.9	0.477	9.819	505.7	7.6	8	43.0	1294.28	70.3	29.4
2502	139	62.6	0.450	8.745	610.6	9.5	0	61.0	892.42	67.0	31.1
2201	94	43.7	0.465	8.129	718.6	10.4	0	78.5	708.17	67.0	30.1
1800	51	26.0	0.510	7.428	820.1	11.1	0	94.8	518.40	67.4	27.3
1402	26	16.0	0.615	7.081	898.7	10.8	0	105.9	416.26	68.5	22.8

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 8
Engine: Detroit Diesel 6V-53N
Fuel ID: TF07N11U87
Date: 02/01/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2800	188	80.0	0.426	9.312
2503	182	74.5	0.409	9.448
2201	169	68.1	0.403	9.619
1800	139	61.3	0.441	9.713
1400	101	52.1	0.516	10.070

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2801	195	91.7	0.470	9.471	471.0	7.6	6	39.8	1218.13	69.3	29.5
2502	193	86.4	0.448	9.604	499.0	6.8	4	43.0	1215.45	65.6	31.0
2201	175	79.2	0.453	9.826	530.5	6.7	9	48.8	1290.50	66.8	30.8
1803	141	69.6	0.494	9.900	622.3	6.1	37	63.9	1198.61	57.8	28.2
1400	101	58.6	0.580	10.170	692.1	5.3	70	75.9	1172.88	52.2	23.9
Alternator Load Simulation:											
1803	141	69.6	0.494	9.900	622.3	6.1	37	63.9	1198.61	57.8	28.2
1803	95	38.8	0.408	8.150	614.3	8.9	0	64.1	769.50	66.6	33.9
1803	51	25.4	0.498	7.171	694.4	10.6	0	77.4	515.29	68.1	28.0
1803	28	18.5	0.661	6.777	686.8	11.3	0	77.8	396.44	72.0	20.9
Propeller Load Simulation:											
2801	195	91.7	0.470	9.471	471.0	7.6	6	39.8	1218.13	69.3	29.5
2503	136	59.7	0.439	8.504	549.0	9.1	0	52.1	871.89	68.1	31.6
2199	94	42.5	0.452	7.872	629.8	9.9	0	66.3	700.20	67.5	30.9
1803	51	25.4	0.498	7.171	694.4	10.6	0	77.4	515.29	68.1	28.0
1400	26	11.2	0.431	6.799	783.4	10.5	0	90.6	408.74	95.2	32.3

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA
Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 8
Engine: Detroit Diesel 6V-53N
Fuel ID: TF07N11U87
Date: 02/02/88
Operator(s): Phillips
FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2802	187	79.3	0.424	9.401
2505	183	75.3	0.411	9.547
2201	169	69.8	0.413	9.712
1801	140	61.7	0.441	9.765
1402	102	53.1	0.521	10.160

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2800	199	94.5	0.475	9.578	434.7	6.7	5	37.7	1183.80	65.3	29.3
2500	194	89.1	0.459	9.747	485.3	6.6	4	40.5	1232.26	64.4	30.3
2203	177	80.7	0.456	9.966	517.5	6.1	8	45.6	1240.79	63.1	30.4
1801	142	70.9	0.499	9.999	616.4	5.9	36	63.3	1219.64	57.7	27.9
1402	102	60.0	0.588	10.320	666.6	5.2	68	71.6	1205.97	52.5	23.5
Alternator Load Simulation:											
1801	142	70.9	0.499	9.999	616.4	5.9	36	63.3	1219.64	57.7	27.9
1802	95	42.0	0.442	8.243	606.8	8.8	0	62.5	786.99	62.9	31.5
1801	50	26.1	0.522	7.174	657.5	10.6	0	72.3	517.70	66.6	26.7
1801	30	19.9	0.663	6.827	652.8	11.1	0	72.5	412.40	69.5	21.1
Propeller Load Simulation:											
2800	199	94.5	0.475	9.578	434.7	6.7	5	37.7	1183.80	65.3	29.3
2500	136	61.9	0.455	8.554	506.1	8.8	0	45.8	875.56	65.9	30.5
2202	94	44.4	0.472	7.984	603.6	9.8	0	62.3	707.10	65.3	29.5
1801	50	26.1	0.522	7.174	657.5	10.6	0	72.3	517.70	66.6	26.7
1403	97	16.5	0.611	6.838	756.9	10.3	0	86.2	411.78	65.2	22.4

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 9
Engine: Detroit Diesel 6V-53N
Fuel ID: TF34N28J88
Date: 03/30/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2801	187	79.2	0.424	9.286
2500	183	75.0	0.410	9.390
2201	170	69.4	0.408	9.586
1801	140	62.0	0.443	9.738
1401	102	52.4	0.514	10.060

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2803	206	107.3	0.521	9.662	606.5	7.6	4	56.6	1152.87	57.9	27.5
2501	199	101.2	0.509	9.857	724.0	7.6	2	74.3	1175.99	55.8	28.2
2201	181	92.5	0.511	10.130	838.3	7.6	16	91.0	1198.98	54.8	28.0
1801	144	79.8	0.554	10.300	1169.0	8.1	36	140.2	1170.01	50.7	25.8
1403	102	67.1	0.658	10.700	1330.0	7.5	69	165.1	1152.49	46.3	21.7
Alternator Load Simulation:											
1801	144	79.8	0.554	10.300	1169.0	8.1	36	140.2	1170.01	50.7	25.8
1801	94	43.7	0.465	8.403	1137.0	11.2	0	137.4	724.99	57.4	31.0
1801	51	28.1	0.551	7.662	1101.0	13.0	1	136.3	477.93	58.9	25.8
1800	29	20.6	0.710	7.138	996.4	13.7	1	124.3	374.70	62.9	20.2
Propeller Load Simulation:											
2803	206	107.3	0.521	9.662	606.5	7.6	4	56.6	1152.87	57.9	27.5
2500	137	65.6	0.479	8.626	802.1	10.9	0	89.5	799.68	58.6	29.9
2201	93	45.5	0.489	8.155	1074.0	12.5	0	130.8	657.87	61.1	29.3
1801	51	28.1	0.551	7.662	1101.0	13.0	1	136.3	477.93	58.9	25.8
1402	26	17.6	0.677	7.321	1173.0	12.6	0	145.3	383.67	58.7	21.5

NAVY HIGH-SPEED DIESEL ENGINE PERFORMANCE TEST DATA

Laboratory: Belvoir Fuels and Lubricants Research Facility (SwRI)
Test No.: 9
Engine: Detroit Diesel 6V-53N
Fuel ID: TF34N28J88
Date: 03/31/88
Operator(s): Phillips

FULL RACK POWER CHECK: (BF02 Base Fuel)

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa
2801	188	79.0	0.420	9.270
2500	182	73.8	0.405	9.355
2202	169	68.6	0.406	9.539
1803	139	61.1	0.440	9.628
1402	101	51.8	0.513	10.030

PERFORMANCE TEST:

Speed, RPM	Observed BHP	Fuel Flow, lb/hr	Observed BSFC, lb/bhp-hr	Max. Cylinder Pressure, MPa	Max. Rate Pressure Rise, kPA/°CA	Ignition Delay, °CA	Smoke Opacity, %	Max Heat Release Rate, Joules/°CA	Cumulative Heat Release, Joules	Apparent Combustion Efficiency, %	Observed Brake Thermal Efficiency, %
Full Rack Operation:											
2801	205	106.4	0.519	9.566	618.2	8.0	9	58.8	1133.46	57.3	27.6
2500	198	101.2	0.511	9.790	727.1	7.8	9	75.7	1171.80	55.6	28.0
2201	180	91.6	0.509	10.030	913.7	8.0	16	102.1	1203.35	55.6	28.2
1802	143	80.1	0.560	10.160	1188.0	8.2	40	144.2	1164.52	50.3	25.5
1402	100	66.7	0.667	10.580	1349.0	7.8	76	168.7	1138.92	46.0	21.5
Alternator Load Simulation:											
1802	143	80.1	0.560	10.160	1188	8.2	40	144.2	1164.52	50.3	25.5
1801	94	43.7	0.465	8.364	1137	11.4	0	138.2	722.31	57.2	20.7
1802	51	27.8	0.545	7.620	1157	13.2	0	144.2	482.02	60.0	26.5
1802	29	20.4	0.703	7.148	1018	13.9	0	127.4	369.48	62.7	20.7
Propeller Load Simulation:											
2801	205	106.4	0.519	9.566	618.2	8.0	9	58.8	1133.46	57.3	27.6
2500	135	65.9	0.488	8.572	820.6	11.4	1	93.2	799.99	58.3	29.4
2202	94	45.9	0.488	8.148	1099.0	12.6	0	134.5	648.76	59.8	29.3
1802	51	27.8	0.545	7.620	1157.0	13.2	0	144.2	482.02	60.0	26.5
1401	26	17.1	0.658	7.214	1182.0	13.0	1	147.5	378.24	59.5	21.7

APPENDIX C
DTRC Regression Analysis

DDC 6V-53N Engine Performance Evaluation Regression Analysis Equations And Results

(1) Depend. Var.	(2) Independent Variable Combination	(3) R ** 2	(4) S.O.S	(5) Sigma	(6) t-ratio values	(7) Equation Coefficient Values
	(8)					
OBHP	---	---	---	---	---	---
BSFC	---	---	---	---	---	---
BTE	---	---	---	---	---	---
CE	---	---	---	---	---	---
CHR	---	---	---	---	---	---
MHR	Speed,Load,D8690,Grav	87.9	0.016631	0.009283	-19.9,-21.02,-5.72,-21.25,26.65	-0.497-.000035-.000035-.000469+.939
	Speed,Load,D8690,Hydro	88.6	0.015685	0.009015	35.06,-21.66,-5.86,-14.46,-27.65	0.609-.000035-.000034-.000213-.0293
	Speed,Load,Grav,Hydro	82.5	0.024106	0.1118	13.61,-17.4,-4.91,-8.29,-15.86	1.05-.000035-.000036-.45-.039
	Speed,Load,Visc40,Hydro	79.3	0.028449	0.01214	26.51,-15.95,-4.67,-5.36,-18.21	0.464-.000035-.000037-.00804-.0235
	Speed,Load,D8690,Grav,Visc40	90.4	0.013202	0.008292	-23.14,23.52,-6.41,-19.77,30.52,-7.06	-0.572-.000035-.000035-.000417+1.01-.00104
	Speed,Load,D8690,Grav,Hydro	90	0.013748	0.008462	1.09,-2306,-6.26,-12.03,5.2,-6.35	0.107-.000035-.000035-.000342+.441-.0167
	Speed,Load,D8690,Grav,Cetane	90.6	0.012995	0.008227	0.28,-23.71,-6.47,-3.97,3.81,-7.33	0.0203-.000035-.000035-.000177+.335-.00207
	Speed,Load,D8690,Visc40,Hydro	89.3	0.01467	0.008741	36.06,-22.33,-6.05,-13.43,3.64,-28.62	0.623-.000035-.000034-.000261+.000535-.0295
	Speed,Load,D8690,Hydro,Cetane	90.8	0.012722	0.00814	14.01,-23.97,-6.53,-4.34,-4.35,-6.69	0.431-.000035-.000035-.000095-0.012-.00191
	Speed,Load,Grav,Visc40,Hydro	84.5	0.021282	0.01053	10.74,-18.5,-5.12,-8.04,5.05,-13.02	1.83-.000035-.000035-1.07+.00171-.0584
	Speed,Load,Grav,Hydro,Cetane	90.2	0.013521	0.008392	6.68,-23.23,-6.4,-2.52,-2.77,-12.26	0.492-.000035-.000035-.123-.00858-.0026
	Speed,Load,D8690,Grav,Visc40,Cetane	91.1	0.012179	0.007985	-2.14,-24.43,-6.67,-5.2,5.31,-3.58,-4.01	-0.203-.000035-.000035-.000246+.588-.000626-.00136
	Speed,Load,D8690,Grav,Hydro,Cetane	91	0.012365	0.008046	2.27,-24.25,-6.61,-4.23,2.35,-3.12,-4.62	0.218-.000035-.000035-.000184+.22-.00927-.00152
	Speed,Load,D8690,Grav,Grav*2	89.6	0.014243	0.008613	-6.54,-22.64,-6.19,-17.79,6.4,-5.67	-3.71-.000035-.000035-.000635+8.21-4.03
	Speed,Load,D8690,Hydro,Hydro*2	89.1	0.01503	0.008848	5.32,-22.07,-5.95,-8.8,-3.6,2.89	1.33-.000035-.000034-.000174-.148+.00479
	Speed,Load,D8690,Hydro,D8690*2	89.6	0.014361	0.008649	22.82,-22.57,-6.13,-5.52,-29.13,4.12	0.722-.000035-.000035-.000882-.03+.000001
	Speed,Loads,D8690,Cetane,D8690*2	90.4	0.013213	0.008296	9.46,-23.52,-6.41,3.24,-30.64,-3.33	0.225-.000035-.000035+.000488-.00311-.000001
	Speed,Load,Grav,Visc40,Visc40*2	84.8	0.020984	0.01045	-15.43,-18.61,-5.21,21.52-15.9,13.22	-0.433-.000035-.000036+.742-.0104+.000365
	Speed,Load,Grav,Visc40,Grav*2	86.9	0.018003	0.009683	14.28,-20.13,-5.53,-14.58,-14.5,15.34	5.03-.000035-.000035-11.7-.00235+7.08
	Speed,load,Grav,Hydro,Hydro*2	87.3	0.017507	0.009549	13.14,-20.44,-5.55,-6.27,-9.63,8.51	2.72-.000035-.000035-.309-.33+.0118

	Speed, Load, Grav, Hydro, Grav*2	88.2	0.016197	0.009185	12.65,-21.24,-5.78,-10.24,-15.97,9.68	4.23-.000035-.000035-7.99-.0335+4.37
	Speed, Load, Visc40, Hydro, Hydro*2	87.3	0.017444	0.009532	13.23,-20.47,-5.57,-6.33,-11.71,11.01	2.73-.000035-.000035-.000746-.385+.0144
	Speed, Load, Visc40, Hydro, Visc40*2	88	0.016549	0.009284	36.54,-20.98,-5.79,-12.99,-25.28,11.75	0.507-.000035-.000035-.00684-.0252+.000278
	Speed, Load, Visc40, Cetane, Cetane*2	90.7	0.012787	0.008161	12.85,-23.92,-6.49,-2.55,-6.22,4.26	0.442-.000035-.000035-.000257-.00974+.000076
	Speed, Load, Hydro, Cetane, Hydro*2	90.4	0.013276	0.008315	4.45,-23.44,-6.47,-3.21,-10.63,3.17	1.07-.000035-.000035-.123-.00243+.00468
	Speed, load, D8690, Grav, Visc40, D8690*2	90.6	0.012895	0.008217	-13.5,-23.74,-6.49,-3.91,30.58,-6.03,2.13	-0.511-.000035-.000035-.000912+1.03-.00144+.000001
	Speed, Load, D8690, Grav, Cetane, Grav*2	90.9	0.012575	0.008114	-2.48,-24.04,-6.57,-4.47,2.75,-5.03,-2.53	-1.67-.000035-.000035-.000319+4.03-.00164-1.98
	Speed, Load, D8690, Grav, Cetane, D8690*2	91.3	0.012005	0.007928	-1.28,-24.61,-6.7,2.58,4.38,-7.3,-3.97	-0.099-.000035-.000035+.000377+.374-.00199-.000001
	Speed, Load, D8690, Visc40, Hydro, Visc40*2	89.8	0.014009	0.008564	30.4,-22.8,-6.17,-5.89,-2.39,-26.55,3.0	0.594-.000035-.000034-.000185-.00221-.0284+.000109
	Speed, Load, D8690, Visc40, Cetane, D8690*2	91.1	0.012205	0.007994	3.99,-24.41,-6.63,5.2,3.97,-31.61,-5.26	0.131-.000035-.000035+.00114+.000865-.00309-.000002
	Speed, Load, D8690, Hydro, Cetane, Cetane*2	91	0.012383	0.008052	12.89,-24.24,-6.58,-3.59,-3.11,-3.37,2.29	0.481-.000035-.000035-.000081-.00927-.00579+.000041
	Speed, Load, Grav, Visc40, Hydro, Visc40*2	88.3	0.016044	0.009165	5.19,-21.28,-5.82,-2.45,-5.57,-7.67,7.9	0.958-.000035-.000035-.36-.00503-.0366+.000234
	Speed, Load, Grav, Visc40, Cetane, Visc40*2	90.5	0.013016	0.008255	1.91,-23.61,-6.49,3.45,-3.84,-10.81,3.6	0.106-.000035-.000035+.198-.00322-.00237+.000115
	Speed, Load, Grav, Visc40, Cetane, Grav*2	90.5	0.013007	0.008252	4.15,-23.63,-6.47,-3.58,-3.6,-8.56,3.62	1.94-.000035-.000035-4.05-.000813-.00219+2.43
	Speed, Load, Grav, Hydro, Cetane, Cetane*2	90.8	0.01266	0.008141	7.77,-23.97,-6.52,-2.9,-2.51,-5.2,3.6	0.618-.000035-.000035-.138-.00756-.00831+.000006
	Speed, Load, Grav, Hydro, Cetane.Hydro*2	90.7	0.012804	0.008187	5.12,-23.83,-6.46,-2.65,-3.49,-8.38,3.27	1.27-.000035-.000035-.126-.132-.00212+.00476
	Speed, Load, Grav, Hydro, Cetane, Grav*2	90.7	0.012818	0.008192	4.3,-23.81,-6.5,-3.36,-4.0,-7.1,3.24	1.91-.000035-.000035-3.24-.0135-.00199+1.76
	Speed, Load, Visc40, Hydro, Cetane, Hydro*2	90.7	0.012731	0.008164	5.19,-23.9,-6.51,-2.86,-3.96,-8.41,3.88	1.28-.000035-.000035-.000322-.155-.00211+.00585
	Speed, Load, Visc40, Hydro, Cetane, Visc40*2	90.8	0.01263	0.008132	18.74,-23.98,-6.57,-4.33,-4.26,-7.7,4.09	0.381-.000035-.000035-.00296-.00945-.00201+.00012
	Speed, Load, D8690, Cetane, D8690*2, Cetane*2	90.9	0.012545	0.008105	7.81,-24.08,-6.53,2.52,-5.27,-2.66,3.19	0.344-.000035-.000035+.00038-.00785-.000001
	Speed, Load, Grav, Visc40, Grav*2, Visc40*2	88.6	0.015642	0.00905	7.11,-21.55,-5.89,-7.37,-8.36,8.08,5.37	3.28-.000035-.000035-7.78-.00632+4.84+.000178
	Speed, Load, Visc40, Hydro, Visc40*2, Hydro*2	88.7	0.015556	0.009025	5.13,-21.62,-5.88,-5.69,-4.0,4.81,3.49	1.58-.000035-.000035-.00463-.199+.000178+.00691
	Speed, Load, D8690, Grav, Visc40, D8690*2, Visc40*2	91.1	0.012287	0.008042	-10.74,-24.25,-6.63,-4.79,28.65,-4.35,3.3,3.07	-0.45-.000035-.000035-.00116+.995-.00462+.000001+.000118
	Speed, Load, D8690, Grav, Cetane, Grav*2, Cetane*2	91.2	0.012096	0.007979	-3.06,-24.46,-6.65,-3.54,3.55,-3.37,-3.44,2.74	-2.07-.000035-.000035-.000259+5.44-.00847-2.87+.000071
	Speed, Load, D8690, Visc40, Hydro, D8690*2, Visc40*2	90.6	0.012931	0.00825	17.88,-23.65,-6.43,-4.69,-4.32,-27.76,3.98,4.54	0.74-.000035-.000035-.00117-.00471-.0286+.000002+.000176
	Speed, Load, Grav, Visc40, Hydro, Grav*2, Visc40*2	89.6	0.014283	0.00867	6.59,-22.51,-6.11,-5.12,-4.96,-4.25,4.84,4.86	2.96-.000035-.000035-5.74-.0043-.0228+3.29+.000157
	Speed, load, Grav, Visc40, Cetane, Grav*2, Visc40*2	90.9	0.012492	0.008108	3.02,-24.05,-6.57,-2.65,-3.68,-6.92,2.83,2.8	1.48-.000035-.000035-3.09-.00304-.00189+1.93+.000091
MCP	Speed, Load, D8690, Grav	96.2	231030	34.6	6.14,-8.16,65.87,-2.75,3.98	571.0-.0506+1.49-.227+522.0
	Speed, Load, D8690, Grav, Hydro, Hydro*2	96.3	222467	34.13	-2.28,-8.26,66.74,-3.23,2.84,2.68,-2.7	-4270.0-.0505+1.49-.701+1427.0+654.0-25.3
	Speed, Load, D8690, Grav, Cetane, Cetane*2	96.3	222756	34.15	-1.43,-8.25,66.7,-2.85,3.04,2.66,-2.66	-865.0-.0505+1.49-.731+1617.0+27.0-.272
	Speed, Load, D8690, Visc40, Hydro, Hydro*2	96.3	225453	34.36	-1.61,-8.21,66.31,-2.81,2.33,2.32,-2.38	-2466.0-.0505+1.49-.469+2.15+592.0-24.5
	Speed, Load, D8690, Visc40, Cetane, D8690*2, Visc40*2, Cetane*2	96.3	223911	34.42	-1.28,-8.19,66.19,2.69,2.65,2.59,-2.71,-2.18,-2.7	-884.0-.0505+1.49+6.68+17.7+42.1-.0116-.421-.504
CPR	Speed, Load, D8690, Grav	86.7	18614	9.821	-19.61,-19.5,-3.3,-21.26,26.91	-518.0-.0343-.0212-.497+1003.0
	Speed, Load, D8690, Hydro	87.6	17400	9.495	,36.28,-20.18,-3.39,-14.39,-28.07	663.0-.0343-.021-.223-31.4
	Speed, Load, Grav, Hydro	81	26674	11.76	13.87,-16.22,-2.92,-8.25,-16.03	1126.0-.0342-.0224-471.0-41.5
	Speed, Load, D8690, Grav, Visc40	89.6	14558	8.708	-23.11,-21.98,-3.74,-19.86,31.09,-7.31	-600.0-.0343-.0212-.44+1084.0-1.13

Speed, Load, D8690, Grav, Hydro	89.1	15247	8.911	1.31, -21.49, -3.63, -12.0, 5.21, -6.51	135.0-.0343-.0211-.359+465.0-18.0
Speed, Load, D8690, Grav, Cetane	89.8	14385	8.656	0.51, -22.11, -3.77, -3.87, 3.8, -7.51	39.8-.0343-.0213-.181+352.0-2.23
Speed, Load, D8690, Visc40, Hydro	88.4	16313	9.218	37.22, -20.78, -3.49, -13.32, 3.58, -29.01	678.0-.0343-.021-.273+.554-31.5
Speed, Load, D8690, Hydro, Cetane	90	14024	8.546	14.67, -22.4, -3.81, -4.24, -4.44, -6.8	474.0-.0343-.0212-.0978-12.9-2.04
Speed, Load, Grav, Visc40, Hydro	83.1	23697	11.11	10.71, -17.21, -3.0, -7.89, 4.91, -12.97	1923.0-.0343-.0218-1109.0+1.75-61.4
Speed, Load, Grav, Hydro, Cetane	89.4	14866	8.799	6.94, -21.74, -3.76, -2.46, -2.88, -12.35	536.0-.0343-.0216-126.0-9.34-2.75
Speed, Load, D8690, Grav, Visc40, Cetane	90.5	13394	8.374	-2.07, -22.86, -3.9, -5.19, 5.42, -3.76, -4.07	-206.0-.0343-.0213-.257+631.0-.69-1.45
Speed, Load, D8690, Grav, Hydro, Cetane	90.3	13644	8.452	2.51, -22.65, -3.85, -4.14, 2.31, -3.22, -4.74	254.0-.0343-.0212-.189+227.0-10.3-1.63
Speed, Load, D8690, Grav, Grav*2	88.7	15877	9.093	-6.61, -21.05, -3.59, -17.89, 6.49, -5.75	-3960.0-.0343-.0213-.675+8789.0-4312.0
Speed, Load, D8690, Hydro, Hydro*2	88.1	16723	9.333	5.29, -20.54, -3.43, -8.8, -3.51, 2.79	1398.0-.0343-.0209-.183-152.0+4.87
Speed, Load, D8690, Hydro, D8690*2	88.7	15888	9.097	23.58, -21.05, -3.56, -5.58, -29.61, 4.27	784.0-.0343-.0211-.938-32.1+.0011
Speed, Load, D8690, Cetane, D8690*2	89.6	14591	8.718	10.13, -21.96, -3.73, 3.33, -31.17, -3.39	253.0-.0343-.0212+.526-3.32-.00083
Speed, Load, Grav, Visc40, Visc40*2	83.3	23470	11.06	-15.25, -17.26, -3.07, 21.86, -15.83, 13.1	-464.0-.0342-.0221+796.0-10.9+.383
Speed, Load, Grav, Visc40, Visc40*2	85.9	19779	10.15	14.33, -18.84, -3.25, -14.69, -14.8, 15.48	5323.0-.0343-.0215-12407.0-2.51+7483.0
Speed, Load, Grav, Hydro, Hydro*2	86.1	19523	10.08	13.1, -18.99, -3.22, -6.23, -9.51, 8.39	2862.0-.0343-.0212-324.0-345.0+12.3
Speed, Load, Grav, Hydro, Grav*2	87.2	17922	9.661	12.71, -19.82, -3.36, -10.24, -16.17, 9.68	4472.0-.0343-.0212-8409.0-35.7+4597.0
Speed, Load, Visc40, Hydro, Hydro*2	86.2	19421	10.063	13.2, -19.04, -3.23, -6.33, -11.59, 10.87	2876.0-.0343-.0212-.786-402.0+15.0
Speed, Load, Visc40, Hydro, Visc40*2	86.8	18495	9.815	37.95, -19.48, -3.38, -12.81, -25.65, 11.56	556.0-.0343-.0216-7.13-27.0+.29
Speed, Load, Visc40, Cetane, Cetane*2	89.9	14194	8.598	13.25, -22.29, -3.74, -2.33, -6.13, 4.14	480.0-.0343-.021-.248-10.1-.0779
Speed, Load, Hydro, Cetane, Hydro*2	89.6	14641	8.732	4.4, -21.9, -3.8, -3.07, -10.76, 3.02	1107.0-.0343-.0216-123.0-2.59+4.68
Speed, Load, D8690, Grav, Visc40, D8690*2	89.9	14153	8.608	-13.35, -22.23, -3.8, -4.13, 31.26, -6.36, 2.34	-529.0-.0343-.0213-1.01+1101.0-1.59+.000932
Speed, Load, D8690, Grav, Cetane, Grav*2	90.1	13916	8.536	-2.47, -22.42, -3.83, -4.42, 2.76, -5.19, -2.54	-1742.0-.0343-.0213-331+4257.0-1.78-2090.0
Speed, Load, D8690, Grav, Cetane, D8690*2	90.6	13256	8.331	-1.08, -22.98, -3.9, 2.67, 4.39, -7.49, -4.03	-87.6-.0343-.0212+.41+394.0-2.15-.000949
Speed, Load, D8690, Visc40, Hydro, Visc40*2	88.9	15639	9.049	31.43, -21.17, -3.56, -5.91, -2.27, -26.91, 2.87	648.0-.0343-.021-.197-2.22-30.4+.11
Speed, Load, D8690, Visc40, Cetane, D8690*2	90.3	13554	8.424	4.56, -22.73, -3.84, 5.15, 3.82, -32.07, -5.18	158.0-.0343-.0211+1.19+.878-3.13-.00198
Speed, Load, D8690, Hydro, Cetane, Cetane*2	90.2	13696	8.468	13.32, -22.62, -3.82, -3.52, -3.25, -3.24, 2.14	523.0-.0343-.0211-.0838-10.2-5.85+.0406
Speed, Load, Grav, Visc40, Hydro, Visc40*2	87.2	17974	9.701	5.2, -19.73, -3.37, -2.35, -5.54, -7.64, 7.8	1015.0-.0343-.0213-366.0-5.29-38.6+.244
Speed, Load, Grav, Visc40, Cetane, Visc40	89.8	14385	8.678	2.11, -22.04, -3.8, 3.58, -3.72, -10.98, 3.45	124.0-.0343-.0215+215.0-3.29-2.53+.115
Speed, Load, Grav, Visc40, Cetane, Grav*2	89.8	14259	8.64	4.24, -22.15, -3.79, -3.64, -3.8, -8.6, 3.7	2080.0-.0343-.0214-4316.0-.898-2.31+2596.0
Speed, Load, Grav, Hydro, Cetane, Cetane*2	90	14006	8.563	7.91, -22.36, -3.8, -2.81, -2.62, -5.03, 3.42	662.0-.0343-.0212-141.1-8.32-8.45+.0635
Speed, Load, Grav, Hydro, Cetane, Hydro*2	89.9	14149	8.607	5.03, -22.24, -3.78, -2.58, -3.34, -8.52, 3.11	1312.0-.0343-.0212-129.0-133.0-2.27+4.76
Speed, Load, Grav, Hydro, Cetane, Grav*2	89.9	14110	8.595	4.31, -22.27, -3.79, -3.32, -4.07, -7.18, 3.2	2004.0-.0343-.0213-3364.0-14.5-2.11+1829.0
Speed, Load, Visc40, Hydro, Cetane, Hydro*2	90	14056	8.578	5.12, -22.32, -3.79, -2.82, -3.81, -8.54, 3.72	1329.0-.0343-.0212-.334-157.0-2.25+5.89
Speed, Load, Visc40, Hydro, Cetane, Visc40*2	90	13977	8.554	19.71, -22.37, -3.84, -4.12, -4.34, -7.86, 3.87	422.0-.0343-.0214-2.96-10.1-2.16+.119
Speed, Load, D8690, Cetane, D8690*2, Cetane*2	90.1	13906	8.533	8.06, -22.45, -3.79, 2.63, -5.18, -2.74, 3.07	374.0-.0343-.0211+.417-8.12-.000671+.055
Speed, Load, Grav, Visc40, Grav*2, Visc40*2	87.8	17311	9.52	7.28, -20.1, -3.44, -7.52, -8.27, 8.24, 5.22	3540.0-.0343-.0213-8350.0-6.58+5197.0+.182
Speed, Load, Visc40, Hydro, Visc40*2, Hydro*2	87.6	17399	9.544	5.17, -20.26, -3.4, -5.58, -3.98, 4.71, 3.47	1687.0-.0343-.0212-4.8-209.0+0.184+7.26
Speed, Load, D8690, Grav, Visc40, D8690*2, Visc40*2	90.4	13516	8.343	-10.63, -22.69, -3.88, -4.98, 29.29, -4.35, 3.45, 2.99	-467.0-.0343-.0214-1.26+1067.0-4.85+.0015+.12

	Speed, Load, D8690, Grav, Cetane, Grav*2, Cetane*2	90.4	13443	8.411	-3.0, -22.76, -3.86, -3.52, 3.51, -3.24, -3.38, 2.59	-2142.0-.0343-.0212-.272+5654.0-8.57-2980.0+.0707
	Speed, Load, D8690, Visc40, Hydro, D8690*2, Visc40*2	89.8	14352	8.691	18.54, -22.03, -3.74, -4.85, -4.31, -28.23, 4.13, 4.49	809.0-.0343-.0212-1.27-4.95-30.7+.00185+.183
	Speed, Load, Grav, Visc40, Hydro, Grav*2, Visc40*2	88.7	15867	9.138	6.77, -20.96, -3.54, -5.29, -4.91, -4.16, 5.02, 4.71	3207.0-.0343-.0211-6245.0-4.49-23.5+3600.0+.16
	Speed, Load, Grav, Visc40, Cetane, Grav*2, Visc40*2	90.2	13760	8.51	3.16, -22.49, -3.84, -2.76, -3.57, -7.0, 2.94, 2.63	1624.0-.0343-.0213-3369.0-3.09-2.01+2104.0+.0892
IGD	Speed, Load, D8690, Grav	92.1	78.51	0.6378	-8.06, 9.41, -43.18, -15.32, 16.15	-13.8, .00108-.018-.0233+39.1
	Speed, Load, D8690, Hydro	93.5	64.01	0.5759	30.04, 10.42, -47.82, -13.96, -19.07	33.3+.00108-.018-.0131-1.29
	Speed, Load, D8690, Cetane	93.3	66.72	0.588	39.86, 10.22, -46.86, -5.36, -18.47	19.6+.00108-.018-.00427-.132
	Speed, Load, Grav, Visc40	87.5	124.23	0.8023	-4.01, 7.59, -34.6, 9.81, -8.79	-8.61+.00109-.0181+24.8-.117
	Speed, Load, Grav, Hydro	91.8	81.68	0.6505	15.21, 9.27, -42.46, -10.54, -14.77	68.3+.00108-.018-33.3-2.11
	Speed, Load, Grav, Cetane	93.1	67.97	0.5935	15.49, 10.13, -46.46, -4.96, -17.35	26.0+.00108-.018-7.89-.155
	Speed, Load, Visc40, Hydro	90	98.89	0.7159	24.55, 8.49, -38.76, -7.62, -13.05	25.3+.00109-.0181-.0673-.991
	Speed, Load, Visc40, Cetane	93.4	65.67	0.5833	47.57, 10.33, -47.34, -5.68, 18.82	18.5+.00108-.018-.0379-.134
	Speed, Load, Hydro, Cetane	92.5	74.18	0.6199	16.57, 9.76, -44.63, 2.53, -11.91	15.7+.00108-.018+.267-.156
	Speed, Load, D8690, Grav, Visc40	93.6	63.64	0.5757	-10.95, 10.43, -47.85, -13.52, 19.1, -6.7	-18.8+.00108-.018-.0198+44.0-.0684
	Speed, Load, D8690, Hydro, Cetane	93.8	61.42	0.5656	13012, 10.61, -48.7, 6.31, -4.07, -2.84	28.1+.00108-.018-.00965-.781-.0564
	Speed, Load, Grav, Visc40, Hydro	92.3	76.53	0.6313	9.94, 9.53, -43.68, -7.49, 3.59, -10.94	101.0+.00108-.018-59.8+.0729-2.94
	Speed, Load, Grav, Hydro, Cetane	93.7	62.88	0.5723	8.91, 10.5, -48.17, -5.87, -3.94, -7.58	44.8+.00108-.018-19.5-.832-.11
	Speed, Load, D8690, Grav, Visc40, Cetane	93.8	61.47	0.5673	-0.27, 10.59, -48.57, -3.54, 3.1, 3.97, -2.6	-1.79+.00108-.018-.0119+24.4-.0494-.0625
	Speed, Load, D8690, Grav, Grav*2	93.3	66.2	0.5872	-6.33, 10.23, -46.93, -14.44, 6.42, -5.98	-245.0+.00108-.018-.0352+561.0-289.0
	Speed, Load, D8690, Grav, D8690*2	92.8	71.81	0.6116	-8.97, 9.81, -45.02, 2.09, 17.26, -4.23	-22.0+.00108-.0108+.0231+40.4-.000073
	Speed, Load, D8690, Visc40, Visc40*2	83.5	163.38	0.9225	14.12, 6.49, -29.8, 2.98, -4.98, 4.98	10.9+.00107-.0179+.00869-.468+.0183
	Speed, Load, D8690, Cetane, D8690*2	93.8	61.53	0.5661	8.22, 10.6, -48.66, 3.6, -19.49, -4.03	13.3+.00108-.018+.037-.135-.000064
	Speed, Load, Grav, Visc40, Visc40*2	91.7	82.3	0.6547	-7.02, 9.22, -42.18, 14.38, -12.4, 9.89	-12.6+.00108-.018+31.0-.507+.0171
	Speed, Load, Grav, Visc40, Grav*2	92.2	77.53	0.6355	10.35, 9.47, -43.4, -10.28, -12.25, 10.75	239.0+.00108-.018-543.0-.13+325.0
	Speed, Load, Grav, Hydro, Hydro*2	92.8	71.1	0.6085	10.25, 9.86, -45.26, -8.8, -6.3, 5.35	135.0+.00108-.018-27.7-13.8+.472
	Speed, Load, Grav, Hydro, Grav*2	93	69.25	0.6006	8.89, 9.99, -45.86, -6.51, -13.82, 5.87	194.0+.00108-.018-332.0-1.9+173.0
	Speed, Load, Grav, Cetane, Cetane*2	93.3	66.4	0.5881	9.51, 10.21, -46.84, -5.44, -3.5, 2.13	32.3+.00108-.018-9.13-.396+.0027
	Speed, Load, Visc40, Hydro, Hydro*2	92.7	72.53	0.6146	10.24, 9.77, -44.83, -8.5, -8.82, 8.35	136.0+.00108-.018-.0645-18.7+.703
	Speed, Load, Visc40, Hydro, Visc40*2	92.9	70.68	0.6068	30.24, 9.92, -45.48, -10.5, -16.5, 8.75	27.4+.00108-.018-.361-1.07+.0136
	Speed, Load, Visc40, Cetane, Cetane*2	93.6	63.33	0.5743	10.27, 10.47, -48.04, -6.35, -3.87, 2.66	24.8+.00108-.018-.045-.427+.00334
	Speed, Load, Visc40, Cetane, Visc40*2	93.5	64.28	0.5786	47.98, 10.38, -47.64, -3.15, -17.85, 2.03	18.5+.00108-.018-.103-.13+.00307
	Speed, Load, D8690, Grav, Cetane, Grav*2	93.7	62.54	0.5722	-3.14, 10.5, -48.16, -4.04, 3.54, -3.34, -3.5	-149.0+.00108-.018-.0203+365.0-.0769-193.0
	Speed, Load, Grav, Visc40, Hydro, Visc40*2	93.2	67.21	0.5932	5.43, 10.12, -46.44, -3.14, -3.62, -6.55, 5.15	64.8+.00108-.018-29.8-.211-2.02+.00986
	Speed, Load, Visc40, Hydro, Cetane, Hydro*2	93.7	62.74	0.5731	4.05, 10.48, -48.08, -5.71, -2.98, -5.46, 2.98	70.2+.00108-.018-.0452-8.21-.0963+.315
	Speed, Load, Visc40, Hydro, Cetane, Visc40*2	93.7	62.56	0.5723	15.16, 10.51, -48.19, -3.84, -2.29, -4.98, 3.07	21.7+.00108-.018-.185-.358-.0916+.00632
	Speed, Load, Grav, Visc40, Grav*2, Visc40*2	92.8	71.76	0.613	4.88, 9.81, -44.97, -4.86, -6.38, 5.3, 3.92	153.0+.00108-.018-347.0-.327+215.0+.00882
	Speed, Load, Grav, Cetane, Grav*2, Cetane*2	93.6	63.46	0.5764	-2.0, 10.42, -47.79, 2.87, -4.6, -2.98, 3.65	-67.1+.00108-.018+243.0-.765-147.0+.00654

	Speed, Load, Visc40, Hydro, Visc40*2, Hydro*2	93.1	68.2	0.5975	3.98,10.05,-46.11,-4.65,-2.97,3.48,2.64	81.3+.00108-.018-.251-9.75+.00851+.346
	Speed, Load, D8690, Grav, Cetane, Grav*2, Cetane*2	93.9	60.32	0.5634	-3.69,10.65,-48.88,-3.14,4.27,-3.06,-4.3,2.64	-176.0+.00108-.018-.0163+461.0-.542-254.0+.00484
	Speed, Load, D8690, Visc40, Hydro, D8690*2, Visc40*2	93.8	61.03	0.5668	13.52,10.59,-48.6,-3.06,-2.85,-17.8,2.48,2.67	38.5+.00108-.018-.0522-.214-1.26+.000072+.00712
	Speed, Load, Grav, Visc40, Hydro, Grav*2, Visc40*2	93.4	65.31	0.5863	4.3,10.24,-46.97,-2.73,-3.19,-4.33,2.35,3.36	131.0+.00108-.018-207.0-.187-1.57+108.0+.00732
SMK	---	---	---	---	---	---

(1) : Dependent Variable (Engine Performance)

Abbreviations	
OBHP	: Observed Brake Horsepower (BHP)
BSFC	: Brake Specific Fuel Consumption (lb-Hp/Hr)
BTE	: Brake Thermal Efficiency (%)
CE	: Combustion Efficiency (%)
CHR	: Maximum Cumulative Heat Release (BTU)
MHR	: Maximum Heat Release Rate (BTU/Deg)
MCP	: Maximum Cylinder Pressure (Psia)
CPR	: Maximum Rate Of Cylinder Pressure Rise (Psia/Deg)
IGD	: Ignition Delay (Deg)
SMK	: Smoke/Opacity (%)

(2) : Independent Variable (Fuel Property)

Abbreviations	
D8690	: Distillation 90% Point (^{o}C)
Grav	: Specific Gravity @ 15.6^{o}C
Visc40	: Viscosity @ 40^{o}C (mm^2/s)
Hydro	: Hydrogen Content (Wt. %)
Cetane	: Cetane Number
*2	: Independent Variable Squared

(3) : R-square value

(4) : The regression error sum of the squares; used in the partial f-test.

(5) : Sigma is the standard error for the Y-value. Plus or minus twice the sigma value is the error band for the regression equation.

(6) : The t-ratio is used to determine the significance of the coefficients. The first value represents the t-ratio value for the equation's constant. The remaining value of t-ratio represents the t-ratio value of the independent variables, as listed in the independent variable combination column.

Example : IGD is the performance parameter

Independent Variable Combination	t-ratio
Speed,Load,Grav,Visc40,Hydro,Grav*2,Visc40*2	4.3,10.24,-46.97,-2.73,-3.19,-4.33,2.35,3.36

The independent variable and it's corresponding t-ratio value

Constant	:	4.3
Speed	:	10.24
Load	:	-46.97
Grav	:	-2.73
Visc40	:	-3.19
Hydro	:	-4.33
Grav*2	:	2.35
Visc40*2	:	3.36

(7) : The independent variable and the corresponding equation coefficients follow the same protocol as the t-ratio values.

Example : IGD is the performance parameter

IGD = 131.0 + 0.00108 Speed - 0.018 Load - 207.0 Grav - 0.187 Visc40 - 1.57 Hydro + 108.0 Grav*2 + 0.00732 Visc40*2

Independent Variable Combination	Equation Coefficient Values
Speed,Load,Grav,Visc40,Hydro,Grav*2,Visc40*2	31.0+.00108-.018-207.0-.187-1.57+108.0+.00732

(8) : --- represents no equation/independent variable combination met the criteria

Cummins NH220G Engine Performance Evaluation Analysis Equations And Results

(1) Depend. Variable	(2) Independent Variable Combination	(3) R ** 2	(4) S.O.S	(5) Sigma	(6) t-ratio Values	(7) Equation Coefficient Values
	(8)					
OBHP	---	---	---	---	---	---
BSFC	---	---	---	---	---	---
BTE	---	---	---	---	---	---
CE	Speed,Load,D8690,Visc40	80.7	2950	4.335	19.56,9.39,-5.97,-4.38,-10.53	77.2+.0123-.0123-.042-.848
	Speed,Load,Grav,Visc40,Hydro	80	3053.4	4.424	4.31,9.19,-5.86,-3.57,-3.66,-3.3	341.0+.0123-.0123-221.0-.576-6.87
	Speed,Load,Grav,Visc40,Cetane	80.6	2966.3	4.361	6.99,9.31,-5.98,-3.97,-8.35,-3.97	156.0+.0123-.0123-89.7-.805-.349
	Speed,Load,Visc40,Hydro,Cetane	80.2	3016.3	4.397	4.18+9.22,-5.97,-15.49,3.59,-3.85	38.7+.0122-.0124-1.0+3.45-.426
	Speed,Load,Grav,Visc40,Grav*2	80	3055.4	4.426	3.74,9.18,-5.89,-3.33,-12.84,3.28	666.0+.0123-.0123-1358.0-1.05+764.0
	Speed,Load,Visc40,Hydro,Hydro*2	79.5	3121.4	4.473	3.56,9.08,-5.83,-17.77,-2.99,3.01	382.0+.0123-.0124-1.09-50.9+2.04
	Speed,Load,D8690,Grav,Hydro,Hydro*2	80	3044.9	4.432	-1.27,9.18,-5.82,-2.85,-3.58,3.28,-3.68	-343.0+.0123-.0122-.0888-258.0+115.0-4.95
	Speed,Load,D8690,Visc40,Hydro,Hydro*2	81.4	2834.5	4.276	-1.65,9.49,-6.09,-3.96,-5.03,2.06,-2.08	-349.0+.0123-.0123-.0909-.638+72.3-2.94
	Speed,Load,Grav,Hydro,Cetane,Hydro*2	79.6	3106.5	4.477	0.88,9.09,-5.76,-14.65,2.64,-2.21,-3.2	131.0+.0123-.0122-421.0+60.2-.339-2.82
	Speed,Load,D8690,Hydro,D8690*2,Hydro*2	81	2902.8	4.328	-6.78,9.4,-5.98,2.63,6.76,-4.59,-6.77	-967.0+.0123-.0123+.264+165.0-.00068-6.64
	Speed,Load,D8690,Cetane,D8690*2,Cetane*2	82.1	2732.2	4.198	-6.87,9.67,-6.21,8.66,7.46,-9.97,-7.56	-174+.0123-.0124+.749+6.37-.00133-.0738
	Speed,Load,Visc40,Cetane,Visc40*2,Cetane*2	81.5	2816.5	4.263	1.16,9.51,-6.14,-8.84,2.18,4.92,-2.21	24.1+.0123-.0124-2.42+2.08+.0636-.0239
	Speed,Load,D8690,Visc40,Hydro,Visc40*2,Hydro*2	82	2743.4	4.221	-2.25,9.62,-6.17,-2.94,-3.45,2.62,2.26,-2.63	-490.0+.0123-.0123-.0712-1.74+94.2+.0462-3.8
	Speed,Load,D8690,Hydro,Cetane,D8690*2,Hydro*2	81.6	2808.3	4.27	-7.13,9.51,-6.1,3.48,6.8,-2.28,-4.92,-6.55	-1013.0+.0123-.0123+.51+163.0-.54-.001-6.39
CHR	---	---	---	---	---	---
MHR	Speed,Load,D8690,Grav	91.3	0.24882	0.03981	-12.51,-12.03,26.39,-13.04,15.53	-1.5-.000145+.000498-.00137+2.59
	Speed,Load,D8690,Hydro	93.5	0.18453	0.03427	22.01,-14.01,30.49,-11.37,-19.5	1.65-.000145+.000495-.000702-.0869
	Speed,Load,Grav,Visc40	87.7	0.35217	0.04736	-8.86,-10.27,21.8,11.13,-8.6	-1.25-.000147+.000489+1.84-.00748
	Speed,Load,Grav,Hydro	92.3	0.21973	0.03741	12.55,-12.93,27.79,-9.12,-14.6	3.59-.000146+.000492-1.83-.133
	Speed,Load,Visc40,Hydro	90.8	0.26313	0.04094	17.92,-11.86,25.3,-6.6,-14.8	1.23-.000147+.000491-.00369-.071
	Speed,Load,Visc40,Cetane	93.1	0.19778	0.03549	22.26,-13.59,29.38,-3.3,-18.53	0.7-.000146+.000494-.00148-.00889
	Speed,Load,D8690,Grav,Visc40	93.3	0.19138	0.03503	-15.78,-13.77,29.75,-11.45,18.91,-6.84	-1.84-.000146+.000494-.00113+2.93-.0047

	Speed, Load, D8690, Hydro, Cetane	93.7	0.17927	0.0339	9.75,-14.21,30.81,-5.26,-4.87,-2.1	1.39-.000145+.000495-.000532-.0619-.00276
	Speed, Load, Grav, Visc40, Hydro	92.8	0.20609	0.03635	8.43,-13.25,28.71,-6.57,3.21,-10.52	5.47-.000145+.000495-3.34+.00415-.18
	Speed, Load, Grav, Hydro, Cetane	93.7	0.18002	0.03397	7.25,-14.21,30.67,-5.18,-4.89,-5.87	2.39-.000146+.000494-1.13-.0677-.00557
	Speed, Load, Visc40, Hydro, Cetane	93.4	0.1888	0.03479	12.03,-13.9,29.89,-4.29,2.72,-7.84	0.881-.000146+.000493-.00219-.0207-.00687
	Speed, Load, D8690, Grav, Visc40, Cetane	93.5	0.18463	0.03451	-1.74,-13.98,30.18,-2.84,3.25,-4.22,-2.38	-0.79-.000146+.000494-.000641+1.72-.000353-.00385
	Speed, Load, D8690, Grav, Grav*2	93.1	0.19688	0.03553	-6.99,-13.56,29.39,-13.64,6.86,-6.41	-18.1-.000145+.000495-.00222+40.1-20.8
	Speed, Load, D8690, Grav, D8690*2	92.4	0.2172	0.0371	-12.33,-12.87,28.07,2.89,17.05,-4.77	-2.12-.000145+.000496+.00216+2.69-.000006
	Speed, Load, D8690, Visc40, Visc40*2	81	0.54242	0.05897	2.13,-8.13,17.75,3.99,-5.03,5.02	0.131-.000145+.000496+.000821-.0334+.0013
	Speed, Load, D8690, Cetane, D8690*2	93.7	0.18114	0.03408	2.17,-14.16,30.57,4.51,-19.48,-4.67	0.237-.000146+.000494+.00308-.00897-.000005
	Speed, Load, Grav, Visc40, Visc40*2	91.9	0.23028	0.03842	-12.69,-12.58,27.06,15.78,-11.58,9.09	-1.5-.000146+.000493+2.21-.0307+.00102
	Speed, Load, Grav, Visc40, Grav*2	91.8	0.23483	0.0388	8.0,-14.45,26.81,-8.31,-11.43,8.83	12.5-.000146+.000493-29.6-.00819+18
	Speed, Load, Grav, Hydro, Hydro*2	93.1	0.1961	0.03545	8.34,-13.57,29.46,-7.59,-5.27,4.34	7.08-.000145+.000495-1.54-.743+.0247
	Speed, Load, Grav, Hydro, Grav*2	93.1	0.19655	0.0355	6.72,-13.57,29.41,-4.83,-13.66,4.29	9.61-.000145+.000495-16.1-.122+8.27
	Speed, Load, Visc40, Hydro, Hydro*2	92.9	0.20171	0.03596	8.3,-13.39,29.02,-7.19,-7.41,6.89	7.15-.000145+.000495-.00353-1.02+.0375
	Speed, Load, Visc40, Hydro, Visc40*2	93.4	0.18971	0.03487	22.29,-13.83,29.88,-9.27,-18.32,7.77	1.34-.000146+.000494-.0203-.0757+.000764
	Speed, Load, Visc40, Cetane, Cetane*2	93.4	0.18848	0.03476	7.03,-13.85,30.05,-4.17,-3.97,2.77	1.14-.000145+.000495-.00198-.0293+.000233
	Speed, Load, D8690, Grav, Cetane, Grav*2	93.5	0.18607	0.03465	-3.89,-13.92,30.1,-3.95,4.1,-3.0,-4.06	-12.3-.000146+.000494-.00133+28.3-.00462-15.0
	Speed, Load.D8690, Visc40, Hydro, Visc40*2	93.8	0.17819	0.03391	17.77,-14.2,30.79,-3.17,-2.31,-17.8,2.3	1.55-.000145+.000495-.000436-.00935-.0833+.000365
	Speed, Load, Grav, Visc40, Hydro, Visc40*2	93.7	0.18125	0.0342	4.45,-14.07,30.53,-2.69,-3.24,-6.48,4.61	3.38-.000145+.000495-1.63-.0121-.128+.000563
	Speed, Load, Grav, Visc40, Cetane, Visc40*2	93.5	0.18662	0.0347	0.29,-13.92,30.0,3.01,-3.12,-6.02,2.51	-0.075-.000146+.000493+.801-.0122-.000613+.000371
	Speed, Load, Visc40, Hydro, Cetane, Cetane*2	93.6	0.18246	0.03431	7.45,-14.06,30.36,-4.79,-2.26,-3.21,2.32	1.22-.000146+.000494-.00249-.0173-.0244+.000196
	Speed, Load, Visc40, Hydro, Cetane, Hydro*2	93.7	0.18115	0.03419	3.32,-14.11,30.48,-4.89,-2.67,-4.19,2.56	3.8-.000146+.000494-.00255-.485-.00488+.0178
	Speed, Load, Visc40, Hydro, Cetane, Visc40*2	93.8	0.17647	0.03374	11.47,-14.3,30.88,-3.95,-4.3,-3.41,3.29	1.09-.000146+.000494-.0124-.0438-.00409
	Speed, Load, Grav, Visc40, Grav*2, Visc40*2	92.6	0.21096	0.03689	3.04,-13.08,28.22,-3.3,-6.51,3.77,4.19	6.34-.000146+.000493-15.7-.0222+10.2+.000627
	Speed, Load, Grav, Cetane, Grav*2, Cetane*2	93.7	0.18013	0.03409	-3.8,-14.13,30.61,4.35,-5.51,-4.4,4.61	-8.36-.000145+.000494+24.1-.06-14.2+.000539
	Speed, Load, D8690, Grav, Cetane, Grav*2, Cetane*2	94	0.17115	0.03334	-4.74,-14.45,31.31,-2.84,5.24,-4.03,-5.31,3.66	-14.8-.000145+.000495-.000964+37.0-.0468-20.5+.000
MCP	Speed, load, D8690, Hydro	98.2	149583	30.87	15.6,-18.72,71.58,-3.55,-2.17	1052.0-.175+1.05-.198-8.7
	Speed, Load, Grav, Hydro	98.2	142868	30.17	8.26,-19.18,73.2,-4.54,-4.16	1905.0-.175+1.05-735.0-30.5
	Speed, Load, Grav, Cetane	98.1	152490	31.17	11.82,-18.55,70.89,-2.91,-2.52	1165.0-.175+1.05-269.0-1.31
	Speed, Load, Visc40, Hydro	98.2	143179	30.2	19.32,-19.18,73.05,-4.5,-1.98	977.0-.175+1.04-1.85-7.01
	Speed, Load, D8690, Hydro, Cetane	98.2	144335	30.42	10.25,-19.0,72.64,-4.08,-3.0,-2.38	1313.0-.175+1.05-.37-34.2+2.81
	Speed, Load, Grav, Cetane, Cetane*2	98.2	148398	30.84	7.7,-18.71,71.66,-3.48,-2.27,2.07	1521.0-.174+1.05-339.0-14.9+.153
	Speed, Load, Visc40, Cetane, Cetane*2	98.3	137711	29.71	9.32,-19.46,74.33,-5.02,-2.89,2.79	1294.0-.175+1.05-2.03-18.2+.201
	Speed, Load, Grav, Cetane, Grav*2, Cetane*2	98.3	137812	29.82	-2.64,-19.38,74.06,3.38,-4.14,-3.45,3.97	-5074.0-.175+1.05+16384.0-39.3-9728.0+.407
CPR	Speed, Load, D8690, Grav	90.3	39181	15.8	-9.66,-8.56,27.65,-10.57,11.95	-459.0-.0408+.207-.439+792.0

	Speed, Load, D8690, Hydro	91.9	32485	14.38	16.07, -9.46, 30.24, -9.2, -14.3	505.0-.0411+.206-.238-26.8
	Speed, Load, D8690, Cetane	91.3	34857	14.9	14.06, -9.13, 29.2, -2.46, -13.41	218.0-.0411+.206-.0547-2.69
	Speed, Load, Grav, Visc40	87.4	50574	17.95	-6.99, -7.67, 24.02, 8.66, -7.15	-375.0-.0416+.204+542.0-2.36
	Speed, Load, Grav, Hydro	91	36104	15.16	10.17, -9.02, 28.59, -7.77, -11.6	1179.0-.0413+.205-633.0-42.8
	Speed, Load, Grav, Cetane	91.3	35032	14.94	6.37, -9.11, 29.11, -2.28, -11.98	301.0-.0411+.206-101.0-2.99
	Speed, Load, Visc40, Hydro	89.7	41476	16.25	13.34, -8.45, 26.58, -5.67, -11.22	363.0-.0415+.205-1.26-21.4
	Speed, Load, Visc40, Cetane	91.6	33936	14.7	15.86, -9.29, 29.52, -3.23, -13.74	206.0-.0412+.206-.6-2.73
	Speed, Load, D8690, Grav, Visc40	91.6	33674	14.69	-11.55, -9.28, 29.55, -8.85, 13.79, -5.05	-564.0-.0412+.206-.366+897.0-1.46
	Speed, Load, Grav, Visc40, Hydro	91.5	34245	14.82	7.09, -9.18, 29.34, -5.74, 2.91, -8.62	1875.0-.0411+.206-1189.0+1.53-60.2
	Speed, Load, Grav, Hydro, Cetane	92	32095	14.34	5.76, -9.52, 30.26, -4.45, -3.78, -4.41	799.0-.0412+.206-410.0-22.1-1.77
	Speed, Load, D8690, Grav, Grav*2	91.6	33818	14.72	-5.4, -9.24, 29.53, -10.58, 5.3, -4.97	-5788.0-.0411+.206-.714+12845.0-6676.0
	Speed, Load, D8690, Grav, D8690*2	91	36106	15.21	-9.31, -8.91, 28.65, 2.17, 12.78, -3.64	-653.0-.041+.206+.659+823.0-.00173
	Speed, Load, D8690, Visc40, Visc40*2	83.5	66373	20.63	1.75, -6.57, 21.12, 3.23, -4.44, 4.42	37.7-.0409+.206+.232-10.3+.402
	Speed, Load, D8690, Cetane, D8690*2	91.9	32371	14.41	1.47, -9.47, 30.14, 3.26, -14.15, -3.46	67.7-.0412+.206+.943-2.75-.00155
	Speed, Load, Grav, Visc40, Visc40*2	90.6	37787	15.56	-9.49, -8.78, 27.84, 11.68, -9.2, 7.27	-453.0-.0413+.205+662.0-9.88+.33
	Speed, Load, Grav, Visc40, Grav*2	90.4	38492	15.71	6.38, -8.69, 27.6, -6.62, -8.91, 7.0	4029.0-.0412+.205-9562.0-2.59+5787.0
	Speed, Load, Grav, hydro, Hydro*2	91.7	33479	14.65	6.68, -9.28, 29.69, -6.39, -4.22, 3.5	2342.0-.0411+.206-534.0-246.0+8.23
	Speed, Load, Grav, Hydro, Grav*2	91.6	33706	14.7	5.26, -9.26, 29.57, -3.78, -10.62, 3.33	3115.0-.0411+.206-5226.0-39.4+2660.0
	Speed, Load, Visc40, Hydro, Hydro*2	91.4	34440	14.86	6.65, -9.16, 29.25, -5.94, -6.02, 5.65	2366.0-.0411+.206-1.21-341.0+12.7
	Speed, Load, Visc40, Hydro, Visc40*2	91.7	33331	14.62	15.89, -9.33, 29.7, -7.4, -13.24, 6.17	401.0-.0412+.206-6.78-22.9+.255
	Speed, Load, Visc40, Cetane, Cetane*2	91.8	32943	14.53	5.17, -9.37, 29.91, -3.85, -3.05, 2.17	351.0-.0411+.206-.763-9.41+.0762
	Speed, Load, D8690, Grav, Cetane, Grav*2	91.8	32751	14.54	-2.99, -9.38, 19.88, -3.07, 3.15, -2.25, -3.14	-3980.0-.0412+.206-.434+9153.0-1.45-4865.0
	Speed, Load, Grav, Visc40, Hydro, Visc40*2	92.1	31919	14.35	3.87, -9.47, 30.31, -2.62, -2.2, -5.34, 3.36	1235.0-.0411+.206-665.0-3.43-44.1+.172
	Speed, Load, Visc40, Hydro, Cetane, Hydro*2	91.9	32421	14.46	2.72, -9.42, 30.02, -4.07, -2.27, -3.11, 2.21	1317.0-.0412+.206-.899-175.0-1.53+6.53
	Speed, Load, Visc40, Hydro, Cetane, Visc40*2	92	31988	14.37	7.93, -9.49, 30.21, -3.2, 2.95, -2.55, 2.66	320.0-.0412+.206-5.27-12.8-1.3+.152
	Speed, Load, Grav, Visc40, Grav*2, Visc40*2	91.1	35887	15.22	2.33, -8.96, 28.51, -2.53, -5.13, 2.86, 3.35	2004.0-.0412+.206-4953.0-7.2+3191.0+.207
	Speed, Load, Grav, Cetane, Grav*2, Cetane*2	92	31971	14.36	-2.97, -9.48, 30.26, 3.4, -4.36, -3.45, 3.67	-2743.0-.0411+.206+7937.0-20.0-4691.0+.181
	Speed, Load, D8690, Grav, Cetane, Grav*2, Cetane*2	92.3	31040	14.2	-3.62, -9.59, 30.62, -2.15, 4.02, -3.18, -4.09, 2.91	-4821.0-.0411+.206-.31+12089.0-15.7-6738.0+.149
IGD	Speed, Load, D8690, Grav	93.6	246.33	1.253	-15.84, 8.84, -34.39, -10.38, 18.08	-59.7+.00335-.0204-.0342+95.0
	Speed, Load, D8690, Hydro	94.4	214.41	1.169	20.85, 9.39, -37.04, -4.15, -19.97	53.2+.00332-.0205-.00874-3.04
	Speed, Load, D8690, Cetane	96	155.9	0.9965	21.13, 11.02, -43.44, 7.96, -24.64	22.0+.00332-.0205+.0119-.33
	Speed, Load, Grav, Visc40	92.7	282.93	1.342	-14.02, 8.1, -32.43, 16.97, -8.57	-56.3+.00328-.0206+79.4-.211
	Speed, Load, Grav, Hydro	94	229.49	1.209	7.29, 9.06, -35.85, -2.4, -11.27	67.4+.00331-.0205-15.6-3.31
	Speed, Load, Grav, Cetane	95.8	163.25	1.02	1.22, 10.79, -42.4, 7.3, -15.57	3.93+.00332-.0205+22.0-.265
	Speed, Load, Visc40, Hydro	94	231.38	1.214	23.33, 9.01, -35.74, -2.11, -19.67	47.4+.0033-.0205-.0349-2.8
	Speed, Load, Visc40, Cetane	94.8	200.19	1.129	25.73, 9.79, -38.17, 3.81, -21.72	25.7+.00334-.0204+.0554-.332
	Speed, Load, Hydro, Cetane	95.7	165.45	1.027	20.88, 10.7, -42.14, -7.11, -8.29	37.8+.00332-.0205-1.37-.199

Speed, Load, D8690, Grav, Visc40	95	191.69	1.108	-19.04, 9.89, -39.06, -8.62, 21.48, -6.67	-70.2+.00331-.0205-.0269+105.0-.145
Speed, Load, D8690, Grav, Hydro	94.6	206.81	1.151	1.25, 9.56, -37.53, -4.14, 2.39, -5.46	18.5+.00332-.0205-.0177+30.5-2.16
Speed, Load, D8690, Visc40, Cetane	96.1	150.73	0.983	19.61, 11.13, -44.09, 7.15, -2.31, -25.09	21.2+.0033-.0205+.0156-.0424-.333
Speed, Load, Grav, Visc40, Cetane	96	153.17	0.9909	-1.75, 11.06, -43.70, 6.92, -3.2, -11.5	-8.88+.00331-.0205+35.6-.0703-.229
Speed, Load, Grav, Visc40, Hydro, Cetane	96.1	149.26	0.9813	-2.36, 11.14, -44.17, 4.04, -3.49, 2.2, -9.12	52.6+.0033-.0205+67.7-.134+1.42-.275
Speed, Load, D8690, Grav, Grav*2	94.3	218.34	1.183	-5.15, 9.3, -36.5, -9.96, 4.95, -4.46	-444.0+.00333-.0205-.054+964.0-481.0
Speed, Load, D8690, Hydro, D8690*2	95.5	174.02	1.056	17.47, 10.44, -40.87, -6.4, -22.76, 6.02	75.0+.00333-.0205-.138-3.17+.000199
Speed, Load, Grav, Visc40, Visc40*2	93.1	267.31	1.309	-14.69, 8.33, -33.19, 17.52, -5.25, 3.02	-59.0+.00329-.0206+83.6-.474+.0115
Speed, Load, Grav, Visc40, Grav*2	94.8	202.41	1.139	6.63, 9.62, -38.03, -7.11, -10.93, 7.88	303.0+.00331-.0205-745.0-.23+472.0
Speed, Load, Grav, Hydro, Grav*2	94.5	212.82	1.168	4.86, 9.42, -37.0, -3.63, -10.29, 3.49	229.0+.00332-.0205-399.0-3.04+222.0
Speed, Load, Grav, Cetane, Cetane*2	96.2	144.73	0.9632	-3.25, 11.36, -45.0, 8.8, 3.16, -4.47	-20.0+.00331-.0205+26.7+.647-.0103
Speed, Load, Grav, Cetane, Grav*2	95.9	157.1	1.004	-2.39, 10.93, -43.14, 2.67, -14.1, -2.47	-116.0+.00331-.0205+304.0-.296-163.0
Speed, Load, Visc40, Cetane, Visc40*2	97.1	113.08	0.8514	33.67, 12.83, -50.95, 1.76, -30.64, -10.96	25.4+.0033-.0206+.626-.364-.0269
Speed, Load, Hydro, Cetane, Cetane*2	96.2	147.24	0.9715	5.13, 11.24, -44.65, -8.57, 3.42, -4.39	21.3+.0033-.0206-1.67+.72-.0102
Speed, Load, Hydro, Cetane, Hydro*2	96.2	148.11	0.9744	-3.05, 11.2, -44.52, 3.99, -9.45, -4.27	-94.7+.0033-.0206+19.8-.28-.818
Speed, Load, D8690, Grav, Visc40, Visc40*2	95.9	157.86	1.009	-21.66, 10.85, -42.91, -10.37, 24.05, 4.47, -5.76	74.4+.00331-.0205-.0478+116.0+.536-.0276
Speed, Load, D8690, Grav, Visc40, D8690*2	97.2	109.41	0.8402	-8.13, 12.97, -51.68, -11.77, 29.96, -13.92, 10.8	-34.9+.00329-.0206-.31+114.0-.377+.000464
Speed, Load, D8690, Grav, Hydro, Hydro*2	95.3	180.68	1.08	-4.35, 10.14, -40.13, -6.35, 5.21, 4.48, -4.73	-285.0+.00331-.0205-.0482+91.4+38.2-1.55
Speed, Load, D8690, Grav, Hydro, D8690*2	95.7	165.88	1.035	5.9, 10.63, -41.77, -6.76, -2.76, -8.66, 6.18	139.0+.00332-.0205-.187-46.8-4.57+.000296
Speed, Load, D8690, Visc40, Hydro, Hydro*2	94.8	200.52	1.137	-2.2, 964, -38.05, -4.51, 3.01, 2.83, -3.16	-123.0+.00331-.0205-.0275+.102-26.4-1.19
Speed, Load, D8690, Visc40, Hydro, Visc40*2	95	192.37	1.114	20.81, 9.86, -38.81, -5.58, 4.21, -21.14, -4.12	59.5+.00332-.0205-.0253+.559-3.25-.0214
Speed, Load, D8690, Visc40, Hydro, D8690*2	96.6	130.43	0.9173	19.75, 11.91, -47.26, -10.26, -7.2, -26.98, 9.93	99.3+.0033-.0205-.294-.201-3.3+.000466
Speed, Load, D8690, Visc40, Cetane, D8690*2	96.4	139.97	0.9503	8.22, 11.49, -45.64, -2.9, -4.19, -25.84, 3.45	35.7+.0033-.0206-.0836-.12-.332+.000164
Speed, Load, D8690, Hydro, Cetane, Cetane*2	96.3	142.73	0.9596	3.08, 11.38, -45.2, 2.21, -2.31, 2.3, -3.67	'15.2+.0033-.0206+.00659-.909+.522-.00874
Speed, Load, Grav, Visc40, Cetane, Cetane*2	96.4	138.72	0.946	-4.11, 11.53, -45.87, 7.5, -2.59, 2.87, -4.02	-27.6+.0033-.0206+36.9-.0551+.581-.00921
Speed, Load, Grav, Hydro, Cetane, Hydro*2	96.3	143.33	0.9616	-3.64, 11.36, -45.1, 2.27, 4.24, -9.55, -4.37	-117.0+.0033-.0206+14+20.8-.314-.827
Speed, Load, D8690, Grav, D8690*2, Grav*2	94.5	210.88	1.166	-5.72, 9.44, -37.02, -4.12, 5.52, 2.36, -5.1	-552+.00333-.0205-.124+1232.0+.0001-631.0
Speed, Load, D8690, Visc40, D8690*2, Visc40*2	81.7	706.39	2.135	3.32, 5.16, -20.24, -2.63, -3.07, 2.98, 2.84	34.8+.0033-.0205-.185-.93+.000362+.0303
Speed, Load, D8690, Hydro, D8690*2, Hydro*2	96	154.24	0.9976	-2.14, 10.99, -43.39, -8.08, 3.89, 7.64, -4.46	-70.3+.00331-.0205-.187+21.9+.000261-1.01
SMK ---	---	---	---	---	---

(1): Independent Variable (Engine Performance)

Abbreviations	
OBHP	: Observed Brake Horsepower (BHP)
BSFC	: Brake Specific Fuel Consumption (lb-Hp/Hr)
BTE	: Brake Thermal Efficiency (%)
CE	: Combustion Efficiency (%)
CHR	: Maximum Cumulative Heat Release (BTU)
MHR	: Maximum Heat Release Rate (BTU/Deg)
MCP	: Maximum Cylinder Pressure (Psia)
CPR	: Maximum Rate Of Cylinder Pressure Rise (Psia/Deg)
IGD	: Ignition Delay (Deg)
SMK	: Smoke/Opacity (%)

(2) : Independent Variable (Fuel Property)

Abbreviations	
D8690	: Distillation 90% Point (^{o}C)
Grav	: Specific Gravity @ 15.6^{o}C
Visc40	: Viscosity @ 40^{o}C (mm^2/s)
Hydro	: Hydrogen Content (Wt. %)
Cetane	: Cetane Number
*2	: Independent Variable Squared

(3) : R-square value

(4) : The regression error sum of the squares; used in the partial f-test.

(5) : Sigma is the standard error for the Y-value. Plus or minus twice the sigma value is the error band for the regression equation.

(6) : The t-ratio is used to determine the significance of the coefficients. The first value represents the t-ratio value for the equation's constant. The remaining value of t-ratio represents the t-ratio value of the independent variables, as listed in the independent variable combination column.

Example : IGD is the performance parameter

Independent Variable Combination	t-ratio
Speed,Load,D8690,Hydro,D8690*2,Hydro*2	-2.14,10.99,-43.39,-8.08,3.89,7.64,-4.46

The independent variable and it's corresponding t-ratio value

Constant	:	-2.14
Speed	:	10.99
Load	:	-43.39
D8690	:	-8.08
Hydro	:	3.89
D8690*2	:	7.64
Hydro*2	:	-4.46

(7) : The independent variable and the corresponding equation coefficients follow the same protocol as the t-ratio values.

Example : IGD is the performance parameter

IGD = -70.3 + 0.00331 Speed - 0.0205 Load - 0.187 D8690 + 21.9 Hydro + 0.000261 D8690*2 - 1.01 Hydro*2

Independent Variable Combination	Equation Coefficient Values
Speed,Load,D8690,Hydro,D8690*2,Hydro*2	-70.3+.00331-.0205-.187+21.9+.000261-1.01

(8) : --- represents no equation/independent variable combination met the criteria

APPENDIX D
Fuel Analysis

APPENDIX D1
CHARACTERIZATION PROTOCOL

test methods with a D ___ designation are ASTM test methods.
tact DTNSRDC with questions.

87NAVY009T

Date Initiated: 2-5-87
Date Completed: 7-31-87

FUEL IDENTIFICATIO

BF02V31J87 (BF02)

Rec'd 13 Aug 87

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
STILLATION (a)				
itial Boiling Point	°C	D 86/1160	212.5	SHG
% point	°C	D 86/1160	238.5	
% point	°C	D 86/1160	249.5	
% point	°C	D 86/1160	259.0	
% point	°C	D 86/1160	267.5	
% point	°C	D 86/1160	275.0	
% point	°C	D 86/1160	282.0	
% point	°C	D 86/1160	288.5	
% point	°C	D 86/1160	296.0	
% point	°C	D 86/1160	304.0	
% point	°C	D 86/1160	314.5	
% point	°C	D 86/1160	322.5	
d point	°C	D 86/1160	332.0	
esidue	vol%	D 86/1160	1.0	
ss	vol%	D 86/1160	1.0	
itial Boiling Point	°C	D 2887	132.0	JT
% point	°C	D 2887	201.5	
% point	°C	D 2887	224.5	
% point	°C	D 2887	249.0	
% point	°C	D 2887	263.5	
% point	°C	D 2887	275.5	
% point	°C	D 2887	287.5	
% point	°C	D 2887	300.5	
% point	°C	D 2887	310.5	
% point	°C	D 2887	322.5	
% point	°C	D 2887	339.0	
% point	°C	D 2887	349.5	
d point	°C	D 2887	370.0	
YSICAL				
ecific Gravity @ 15.6°C		D 1298	0.8376	SHG
ecific Gravity @ 15.6°C		D 4052	0.8376	SHG
I Gravity (D 1298)	°API	calculate	37.4	SHG
I Gravity (D 4052)	°API	calculate	37.4	SHG
scosity @ 40°C	mm²/s	D 445	3.271	LAC
scosity @ 100°C	mm²/s	D 445	1.305	LAC
ash Point	°C	D 93	84.5	SHG
oud Point	°C	D 2500	-6	SHG
ur Point	°C	D 97	-9	SHG
ulsification @ 25°C	minutes	D 1401	1	LAC
lor		D 1500	L1.0	LAC
pearance Particulates		D 4176	Fail	LAC
face Tension	dynes/cm	D 1331	26.3	JD
ter and Sediment	vol%	D 2709	<0.005	LAC
rticulates (ml, 3875)	mg/l	D 2276	1.15	LC
sphaltenes	wt%	D 2007(f)	----	

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITI
CHEMICAL				
Sulfur	wt%	D 4294	0.11	BD
Acid Number	mgKOH/g	D 974	0.01	JG
Acid Number	mgKOH/g	D 664	0.01	JG
Corrosion @ 100°C		D 130	1a	LC
Carbon Residue on 10% bottoms	wt%	D 524	0.10	JG
Accelerated Stability	mg/100ml	D 2274	0.17	EZ
Accelerated Stability	P/F & No.	DuPont F-21	P2	KW
F-21 Color After		D 1500	L1.0	KW
Breakpoint Temperature	°C	D 3241 (b)	----	
FSII		(c)	----	
Neutrality	Acid/Neutral	(d)	Neutral	LA
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	43.018	NS
Hydrogen Content	wt%	PE 240	13.56	JY
Carbon Content	wt%	PE 240	86.47	JY
H/C; C/H Ratio		calculate	0.16-6.38	JY
Cetane Number		D 613	57.2	PP
Cetane Index (Using D 1298 value)		D 976	54.2	SH
Cetane Index (Using D 4052 value)		D 976	54.2	&
Diesel Index (Using D 1298 value)		calculate	62.9	JY
Diesel Index (Using D 4052 value)		calculate	62.9	
Aniline Point	°C	D 611	75.6	LAC
Aromatics	wt%	HPLC	---	
Olefins	vol%	D 1319	---	
Saturates	wt%	HPLC	---	
Combustion Additives	Y/N	(e)	----	
Ash	wt%	D 482	<0.0001	KWB
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	<0.03	JG/
Calcium	ppm wt	D 3605 (g)	0.05	JG
Copper	ppm wt	D 3605 (g)	0.26	ML
Iron	ppm wt	D 3605 (g)	0.48	JG/
Lead	ppm wt	D 3605 (g)	0.11	ML
Nickel	ppm wt	D 3605 (g)	0.03	ML
Silicon	ppm wt	D 3605 (g)	<0.04	JG/
Potassium	ppm wt	D 3605 (g)	<0.01	ML
Sodium	ppm wt	D 3605 (g)	0.31	ML
Vanadium	ppm wt	D 3605 (g)	<0.04	ML

Saturates ---, Polars ---, Aromatics ---

D 86 may not be appropriate for some high viscosity fuels. If this is the case, perform D 1160. INDICATE METHOD PERFORMED
On selected fuels only; as instructed by DTNSRDC.
Fed. Std. 791 methods 5327, 5328, 5348; commercial survey fuels.

(d) Fed. Std. 791, method 5101.
(e) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(f) To be performed on commercial survey fuels only.
(g) Modified ASTM method.

DTNSRDC2485

CHARACTERIZATION PROTOCOL ✓

All test methods with a D ____ designation are ASTM test methods.
Contact DTNSRDC with questions. 87NAVY113T

Date Initiated: 6-26-87
Date Completed: 8-19-87 ✓

TEST FUEL SAMPLE ID
TF26P22Y87 (JP5)

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
DISTILLATION (a)				
Initial Boiling Point	°C	D 86/1160	171.5	PDW
5% point	°C	D 86/1160	195.0	
10% point	°C	D 86/1160	199.5	
20% point	°C	D 86/1160	204.5	
30% point	°C	D 86/1160	207.5	
40% point	°C	D 86/1160	211.0	
50% point	°C	D 86/1160	214.5	
60% point	°C	D 86/1160	218.0	
70% point	°C	D 86/1160	222.5	
80% point	°C	D 86/1160	227.0	
90% point	°C	D 86/1160	234.0	
95% point	°C	D 86/1160	239.5	
End point	°C	D 86/1160	250.5	
Residue	vol%	D 86/1160	1.0	
Loss	vol%	D 86/1160	0.0	
Initial Boiling Point	°C	D 2887	122.0	JT
5% point	°C	D 2887	167.0	
10% point	°C	D 2887	181.5	
20% point	°C	D 2887	195.5	
30% point	°C	D 2887	202.0	
40% point	°C	D 2887	208.5	
50% point	°C	D 2887	214.5	
60% point	°C	D 2887	221.5	
70% point	°C	D 2887	229.0	
80% point	°C	D 2887	236.5	
90% point	°C	D 2887	248.0	
95% point	°C	D 2887	254.5	
End point	°C	D 2887	275.5	
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	0.8168	PDW
Specific Gravity @ 15.6°C		D 4052	0.8170	PDW
API Gravity (D 1298)	°API	calculate	41.7	PDW
API Gravity (D 4052)	°API	calculate	41.7	PDW
Viscosity @ 40°C	mm^2/s	D 445	1.520	RLT
Viscosity @ 100°C	mm^2/s	D 445	0.7515	RLT
Flash Point	°C	D 93	62.5	RLT
Cloud Point	°C	D 2500	-56	PDW
Pour Point	°C	D 97	-54	PDW
Demulsification @ 25°C	minutes	D 1401	1	LAC
Color		D 1500	L0.5	RLT
Appearance particulates		D 4176	fail	RLT
Surface Tension	mN/m	D 1331	26.0	JD
Water and Sediment	vol%	D 2709	<0.005	LAC
Particulates (3740 ml)	mg/l	D 2276	0.32	LC

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
CHEMICAL				
Sulfur	wt%	D 4294	0.05	BD
Acid Number	mgKOH/g	D 974	<0.01	JG
Acid Number	mgKOH/g	D 664	<0.01	JG
Corrosion @ 100°C		D 130	1a	LC
Carbon Residue on 10% bottoms	wt%	D 524	0.07	JG
Accelerated Stability	mg/100ml	D 2274	0.20	EZ
Accelerated Stability	P/F & No.	DuPont F-21	P1	LAC
F-21 Color After		D 1500	L0.5	LAC
Breakpoint Temperature	°C	D 3241 (b)	------	
FSII		(c)	------	
Neutrality	Acid/Neutral	(d)	neutral	LAC
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	43.078	NS
Hydrogen Content	wt%	PE 240	13.77	SHG
Carbon Content	wt%	PE 240	85.80	SHG
H/C; C/H Ratio		calculate	0.16/6.23	SHG
Cetane Number		D 613	44.1	PP
Cetane Index (Using D 1298 value)		D 976	43.5	SHG
Cetane Index (Using D 4052 value)		D 976	43.5	SHG
Diesel Index (Using D 1298 value)		calculate	60.3	SHG
Diesel Index (Using D 4052 value)		calculate	60.3	SHG
Aniline Point	°C	D 611	62.60	LAC
Aromatics	vol%-wt%	D 1319-HPLC	------	
Olefins	vol%-wt%	D 1319-HPLC	------	
Saturates	vol%-wt%	D 1319-HPLC	------	
Asphaltenes	wt%	D 2887 (e)	------	
Combustion Additives	Y/N	(f)	------	
Ash	wt%	D 482	<0.0001	RLT
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	<0.02	JG&MI
Calcium	ppm wt	D 3605 (g)	0.09	
Copper	ppm wt	D 3605 (g)	0.02	
Iron	ppm wt	D 3605 (g)	0.06	
Lead	ppm wt	D 3605 (g)	0.01	
Nickel	ppm wt	D 3605 (g)	0.01	
Silicon	ppm wt	D 3605 (g)	<0.04 ✓	
Potassium	ppm wt	D 3605 (g)	<0.01	
Sodium	ppm wt	D 3605 (g)	<0.04	
Vanadium	ppm wt	D 3605 (g)	<0.03	

(a) D 86 may not be appropriate for some high viscosity fuels. If this is the case, perform D 1160. CIRCLE METHOD PERFORMED
(b) On selected fuels only; as instructed by DTNSRDC.
(c) Fed. Std. 791, methods 5327,5330,5340; commercial survey fuels.
(d) Fed. Std. 791, method 5101.
(e) To be performed on survey fuels only.
(f) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(g) Modified ASTM method.

CHARACTERIZATION PROTOCOL

l test methods with a D ___ designation are ASTM test methods.
ontact DTNSRDC with questions. 87NAVY088T

Date Initiated: 5-20-87
Date Completed: 8-19-87

FUEL IDENTIFICATIO
TF1ØN18Y87 (HD13)

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
DISTILLATION (a)				
Initial Boiling Point	°C	D 86/1160	199.0	SHG
5% point	°C	D 86/1160	223.0	
10% point	°C	D 86/1160	235.0	
20% point	°C	D 86/1160	253.5	
30% point	°C	D 86/1160	270.5	
40% point	°C	D 86/1160	284.5	
50% point	°C	D 86/1160	297.0	
60% point	°C	D 86/1160	309.5	
70% point	°C	D 86/1160	323.5	
80% point	°C	D 86/1160	338.5	
90% point	°C	D 86/1160	359.5	
95% point	°C	D 86/1160	382.0	
End point	°C	D 86/1160	368.0	
Residue	vol%	D 86/1160	0.0	
Loss	vol%	D 86/1160	3.0	
Initial Boiling Point	°C	D 2887	140.0	JT
5% point	°C	D 2887	187.5	
10% point	°C	D 2887	207.0	
20% point	°C	D 2887	241.0	
30% point	°C	D 2887	265.0	
40% point	°C	D 2887	284.5	
50% point	°C	D 2887	303.5	
60% point	°C	D 2887	321.5	
70% point	°C	D 2887	338.5	
80% point	°C	D 2887	356.0	
90% point	°C	D 2887	380.0	
95% point	°C	D 2887	402.5	
End point	°C	D 2887	459.5	
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	0.8901	PDW
Specific Gravity @ 15.6°C		D 4052	0.8902	PDW
API Gravity (D 1298)	°API	calculate	27.5	PDW
API Gravity (D 4052)	°API	calculate	27.5	SHG
Viscosity @ 40°C	mm²/s	D 445	4.182	SB
Viscosity @ 100°C	mm²/s	D 445	1.457	SB
Flash Point	°C	D 93	61.5	RLT
Cloud Point	°C	D 2500	-14	SB
Pour Point	°C	D 97	-21	SB
Emulsification @ 25°C	minutes	D 1401	2	RLT
Color		D 1500	1.5	RLT
Appearance		D 4176	fail	RLT
Surface Tension	dynes/cm	D 1331	30.2	JD
Water and Sediment	vol%	D 2709	<0.005	LAC
Particulates (ml, 3500)	mg/l	D 2276	0.63	LC
Asphaltenes	wt%	D 2007(f)	—	

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
CHEMICAL				
Sulfur	wt%	D 4294	0.63	BD
Acid Number	mgKOH/g	D 974	0.04	JG
Acid Number	mgKOH/g	D 664	0.03	JG
Corrosion @ 100°C		D 130	1a	LC
Carbon Residue on 10% bottoms	wt%	D 524	0.17	JG
Accelerated Stability	mg/100ml	D 2274	0.06	EZ
Accelerated Stability	P/F & No.	DuPont F-21	pass/2	LAC
F-21 Color After		D 1500	L3.5	LAC
Breakpoint Temperature	°C	D 3241 (b)	-----	
FSII		(c)	-----	
Neutrality	Acid/Neutral	(d)	Neutral	LAC
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	41.968	NS
Hydrogen Content	wt%	PE 240	11.90	SHG
Carbon Content	wt%	PE 240	87.11	SHG
H/C; C/H Ratio		calculate	0.14/7.32	SHG
Cetane Number		D 613	38.7	PP
Cetane Index (Using D 1298 value)		D 976	41.0	SHG
Cetane Index (Using D 4052 value)		D 976	41.0	SHG
Diesel Index (Using D 1298 value)		calculate	33.4	SHG
Diesel Index (Using D 4052 value)		calculate	33.4	SHG
Aniline Point	°C	D 611	49.60	LAC
Aromatics	wt%	HPLC	-----	
Olefins	vol%	D 1319	-----	
Saturates	wt%	HPLC	-----	
Combustion Additives	Y/N	(e)	-----	
Ash	wt%	D 482	0.0001	RLT
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	<0.02	JG&MC
Calcium	ppm wt	D 3605 (g)	0.04	
Copper	ppm wt	D 3605 (g)	0.11	
Iron	ppm wt	D 3605 (g)	1.30	
Lead	ppm wt	D 3605 (g)	0.06	
Nickel	ppm wt	D 3605 (g)	0.01	
Silicon	ppm wt	D 3605 (g)	<0.04	
Potassium	ppm wt	D 3605 (g)	<0.01	
Sodium	ppm wt	D 3605 (g)	0.14	
Vanadium	ppm wt	D 3605 (g)	<0.03	

Saturates —, Polars —, Aromatics —

) D 86 may not be appropriate for some high viscosity fuels.
If this is the case, perform D 1160. INDICATE METHOD PERFORMED
) On selected fuels only; as instructed by DTNSRDC.

(d) Fed. Std. 791, method 5181.
(e) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(f) To be performed on commercial survey fuels only.
(g) Modified ASTM method.

DTNSRDC/SME/88/02

CHARACTERIZATION PROTOCOL

All test methods with a D ___ designation are ASTM test methods.
Contact DTNSRDC with questions. 87NAVY157T

Date Initiated: 9-10-87
Date Completed: 10-7-87

FUEL IDENTIFICATI
~~NDI0PD01087~~ (D-10

Rec'd 1 DEC 87

(TF09N1458

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
DISTILLATION (a)				
Initial Boiling Point	°C	D 86/1160	327.5	PDW
5% point	°C	D 86/1160	342.0	
10% point	°C	D 86/1160	348.0	
20% point	°C	D 86/1160	353.5	
30% point	°C	D 86/1160	360.5	
40% point	°C	D 86/1160	367.0	
50% point	°C	D 86/1160	374.0	
60% point	°C	D 86/1160	380.5	
70% point	°C	D 86/1160	387.5	
80% point	°C	D 86/1160	397.0	
90% point	°C	D 86/1160	407.5	
95% point	°C	D 86/1160	-----	
End point	°C	D 86/1160	411.5	
Residue	vol%	D 86/1160	4.5	
Loss	vol%	D 86/1160	0.5	
Initial Boiling Point	°C	D 2887	247.5	MW
5% point	°C	D 2887	303.5	
10% point	°C	D 2887	320.5	
20% point	°C	D 2887	341.5	
30% point	°C	D 2887	357.0	
40% point	°C	D 2887	370.5	
50% point	°C	D 2887	383.5	
60% point	°C	D 2887	396.0	
70% point	°C	D 2887	409.5	
80% point	°C	D 2887	423.5	
90% point	°C	D 2887	441.0	
95% point	°C	D 2887	455.5	
End point	°C	D 2887	494.0	
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	0.8893	PDW
Specific Gravity @ 15.6°C		D 4052	0.8897	PDW
API Gravity (D 1298)	°API	calculate	27.6	PDW
API Gravity (D 4052)	°API	calculate	27.5	PDW
Viscosity @ 40°C	mm²/s	D 445	19.10	RLT
Viscosity @ 100°C	mm²/s	D 445	3.665	LAC
Flash Point	°C	D 93	162.5	RLT
Cloud Point	°C	D 2500	-20	PDW
Pour Point	°C	D 97	-30	PDW
Deaulsification @ 25°C	minutes	D 1401	13	RLT
Color		D 1500	L1.5	RLT
Appearance		D 4176	pass	RLT
Surface Tension	dynes/cm	D 1331	29.5	KB
Water and Sediment	vol%	D 2709	<0.005	LAC
Particulates (ml, 1000)	mg/l	D 2276	0.40	LC
Asphaltenes	wt%	D 2007(f)	---	

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INI
CHEMICAL				
Sulfur	wt%	D 4294	0.37	EL
Acid Number	mgKOH/g	D 974	0.02	JG
Acid Number	mgKOH/g	D 664	0.02	JG
Corrosion @ 100°C		D 130	1a	LA
Carbon Residue				
on 10% bottoms	wt%	D 524	0.09	JG
Accelerated Stability	mg/100ml	D 2274	0.18	KB
Accelerated Stability	P/F & No.	DuPont F-21	P 1	LA
F-21 Color After		D 1500	L2.0	LA
Breakpoint Temperature	°C	D 3241 (b)	-----	
FSII		(c)	-----	
Neutrality	Acid/Neutral	(d)	Neutral	LA
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	42.508	MS
Hydrogen Content	wt%	PE 240	13.15	SH
Carbon Content	wt%	PE 240	86.36	SH
H/C; C/H Ratio		calculate	0.15/6.57	SH
Cetane Number		D 613	49.8	
Cetane Index (Using D 1298 value)		D 976	44.4	SH
Cetane Index (Using D 4052 value)		D 976	44.2	SH
Diesel Index (Using D 1298 value)		calculate	50.7	SH
Diesel Index (Using D 4052 value)		calculate	50.5	SH
Aniline Point	°C	D 611	84.30	LA
Aromatics	wt%	HPLC	-----	
Olefins	vol%	D 1319	-----	
Saturates	wt%	HPLC	-----	
Combustion Additives	Y/N	(e)	-----	
Ash	wt%	D 482	<0.0001	RL
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	0.02	JGS
Calcium	ppm wt	D 3605 (g)	<0.06	
Copper	ppm wt	D 3605 (g)	0.02	
Iron	ppm wt	D 3605 (g)	<0.04	
Lead	ppm wt	D 3605 (g)	0.01	
Nickel	ppm wt	D 3605 (g)	<0.01	
Silicon	ppm wt	D 3605 (g)	0.16	
Potassium	ppm wt	D 3605 (g)	<0.01	
Sodium	ppm wt	D 3605 (g)	<0.04	
Vanadium	ppm wt	D 3605 (g)	<0.03	

Saturates ---, Polars ---, Aromatics ---

(a) D 86 may not be appropriate for some high viscosity fuels. If this is the case, perform D 1160. INDICATE METHOD PERFORMED
(b) On selected fuels only; as instructed by DTNSRDC.
(d) Fed. Std. 791, method 5101.
(e) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(f) To be performed on commercial survey fuels only.

CHARACTERIZATION PROTOCOL ~~F76/P657~~

All test methods with a D ____ designation are ASTM test methods.
Contact DTNSRDC with questions. 87NAVY141T

Date Initiated: 8-27-87
Date Completed: 10-7-87

FUEL IDENTIFICATIO ~~HD1PB06207~~ TF87N015

Recd 1 DEC 87

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
DISTILLATION (a)				
Initial Boiling Point	°C	D 86/1160	217.5	PDW
5% point	°C	D 86/1160	238.0	
10% point	°C	D 86/1160	248.0	
20% point	°C	D 86/1160	274.0	
30% point	°C	D 86/1160	294.5	
40% point	°C	D 86/1160	313.5	
50% point	°C	D 86/1160	327.5	
60% point	°C	D 86/1160	339.5	
70% point	°C	D 86/1160	350.5	
80% point	°C	D 86/1160	364.0	
90% point	°C	D 86/1160	382.5	
95% point	°C	D 86/1160	400.0	
End point	°C	D 86/1160	400.5	
Residue	vol%	D 86/1160	2.5	
Loss	vol%	D 86/1160	2.0	
Initial Boiling Point	°C	D 2887	148.5	MW
5% point	°C	D 2887	198.5	
10% point	°C	D 2887	216.0	
20% point	°C	D 2887	252.0	
30% point	°C	D 2887	285.0	
40% point	°C	D 2887	310.0	
50% point	°C	D 2887	328.5	
60% point	°C	D 2887	344.5	
70% point	°C	D 2887	360.0	
80% point	°C	D 2887	377.5	
90% point	°C	D 2887	402.5	
95% point	°C	D 2887	423.5	
End point	°C	D 2887	474.5	
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	0.8699	PDW
Specific Gravity @ 15.6°C		D 4052	0.8703	PDW
API Gravity (D 1298)	°API	calculate	31.2	PDW
API Gravity (D 4052)	°API	calculate	31.1	KWH
Viscosity @ 40°C	mm²/s	D 445	5.975	LAC
Viscosity @ 100°C	mm²/s	D 445	1.826	LAC
Flash Point	°C	D 93	89.5	RLT
Cloud Point	°C	D 2500	-19	RLT
Pour Point	°C	D 97	-21	RLT
Demulsification @ 25°C	minutes	D 1401	2	LAC
Color		D 1500	L1.5	RLT
Appearance		D 4176	pass	RLT
Surface Tension	dynes/cm	D 1331	27.5	KB
Water and Sediment	vol%	D 2709	<0.005	LAC
Particulates (ml, 2660)	mg/l	D 2276	0.44	LC
Asphaltenes	wt%	D 2007(f)	----	

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INIT
CHEMICAL				
Sulfur	wt%	D 4294	0.42	BD
Acid Number	mgKOH/g	D 974	0.03	JG
Acid Number	mgKOH/g	D 664	0.03	JG
Corrosion @ 100°C		D 130	1a	LC
Carbon Residue on 10% bottoms	wt%	D 524	0.10	JG
Accelerated Stability	mg/100ml	D 2274	1.85	KS
Accelerated Stability	P/F & No.	DuPont F-21	P 4	LA
F-21 Color After		D 1500	L3.0	LA
Breakpoint Temperature	°C	D 3241 (b)	-----	
FSII		(c)	-----	
Neutrality	Acid/Neutral	(d)	Neutral	LA
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	42.572	NS
Hydrogen Content	wt%	PE 240	13.02	SH
Carbon Content	wt%	PE 240	86.47	SH
H/C; C/H Ratio		calculate	0.15/6.64	SH
Cetane Number		D 613	46.8	PP
Cetane Index (Using D 1298 value)		D 976	49.4	SH
Cetane Index (Using D 4052 value)		D 976	49.2	SH
Diesel Index (Using D 1298 value)		calculate	50.6	SH
Diesel Index (Using D 4052 value)		calculate	50.5	SH
Aniline Point	°C	D 611	72.40	LA
Aromatics	wt%	HPLC	-----	
Olefins	vol%	D 1319	-----	
Saturates	wt%	HPLC	-----	
Combustion Additives	Y/N	(e)	-----	
Ash	wt%	D 482	<0.0001	RL
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	0.02	JG&
Calcium	ppm wt	D 3605 (g)	<0.06	
Copper	ppm wt	D 3605 (g)	0.07	
Iron	ppm wt	D 3605 (g)	<0.04	
Lead	ppm wt	D 3605 (g)	0.04	
Nickel	ppm wt	D 3605 (g)	<0.01	
Silicon	ppm wt	D 3605 (g)	0.12	
Potassium	ppm wt	D 3605 (g)	<0.01	
Sodium	ppm wt	D 3605 (g)	<0.04	
Vanadium	ppm wt	D 3605 (g)	<0.03	

Saturates ---, Polars ---, Aromatics ---

) D 86 may not be appropriate for some high viscosity fuels. If this is the case, perform D 1160. INDICATE METHOD PERFORMED
) On selected fuels only; as instructed by DTNSRDC.

(d) Fed. Std. 791, method 5101.
(e) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(f) To be performed on commercial survey fuels only.

CHARACTERIZATION PROTOCOL

All test methods with a D ___ designation are ASTM test methods.
Contact DTNSRDC with questions. 87NAVY123T

Date Initiated: 7-17-87
Date Completed: 9-8-87

FUEL IDENTIFICAT
TFØ2N21L87 (HD4)

* see reverse side

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
DISTILLATION (a)				
Initial Boiling Point	°C	D 86/116B	199.0	PDW
5% point	°C	D 86/116B	217.5	
10% point	°C	D 86/116B	228.0	
20% point	°C	D 86/116B	245.5	
30% point	°C	D 86/116B	265.5	
40% point	°C	D 86/116B	288.0	
50% point	°C	D 86/116B	309.0	
60% point	°C	D 86/116B	325.0	
70% point	°C	D 86/116B	336.5	
80% point	°C	D 86/116B	351.0	
90% point	°C	D 86/116B	369.5	
95% point	°C	D 86/116B	385.5	
End point	°C	D 86/116B	388.5	
Residue	vol%	D 86/116B	2.5	
Loss	vol%	D 86/116B	1.0	
Initial Boiling Point	°C	D 2887	145.5	JT
5% point	°C	D 2887	195.0	
10% point	°C	D 2887	208.0	
20% point	°C	D 2887	233.5	
30% point	°C	D 2887	264.5	
40% point	°C	D 2887	298.0	
50% point	°C	D 2887	320.5	
60% point	°C	D 2887	337.5	
70% point	°C	D 2887	353.0	
80% point	°C	D 2887	369.5	
90% point	°C	D 2887	393.0	
95% point	°C	D 2887	414.0	
End point	°C	D 2887	468.0	
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	0.8900	PDW
Specific Gravity @ 15.6°C		D 4052	0.8904	PDW
API Gravity (D 1298)	°API	calculate	27.5	PDW
API Gravity (D 4052)	°API	calculate	27.4	PDW
Viscosity @ 40°C	mm²/s	D 445	5.061	RLT
Viscosity @ 100°C	mm²/s	D 445	1.626	LAC
Flash Point	°C	D 93	81.0	RLT
Cloud Point	°C	D 2500	-20	PDW
Pour Point	°C	D 97	-24	PDW
Emulsification @ 25°C	minutes	D 1401	2	LAC
Color		D 1500	L1.5	LAC
Appearance		D 4176	pass	LAC
Surface Tension	dynes/cm	D 1331	28.1	JD
Water and Sediment	vol%	D 2709	<0.005	LAC
Particulates (ml, 3560)	mg/l	D 2276	0.74	LC
Asphaltenes	wt%	D 2007(f)	----	

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	IN
CHEMICAL				
Sulfur	wt%	D 4294	0.76	B
Acid Number	mgKOH/g	D 974	0.04	J
Acid Number	mgKOH/g	D 664	0.04	J
Corrosion @ 100°C		D 130	1a	L
Carbon Residue on 10% bottoms	wt%	D 524	0.17	JC
Accelerated Stability	mg/100ml	D 2274	0.13	E
Accelerated Stability F-21 Color After	P/F & No.	DuPont F-21	pass/1	L
Breakpoint Temperature	°C	D 1500	L3.0	L
FSII		D 3241 (b)	-----	
Neutrality	Acid/Neutral	(c)	-----	
		(d)	neutral	L
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	41.960	NS
Hydrogen Content	wt%	PE 240	12.35	SE
Carbon Content	wt%	PE 240	87.01	SE
H/C; C/H Ratio		calculate	0.14/7.05	SE
Cetane Number		D 613	* 41.4±2	PE
Cetane Index (Using D 1298 value)		D 976	42.4	SE
Cetane Index (Using D 4052 value)		D 976	42.3	SE
Diesel Index (Using D 1298 value)		calculate	35.3	SE
Diesel Index (Using D 4052 value)		calculate	35.2	SE
Aniline Point	°C	D 611	53.60	LA
Aromatics	wt%	HPLC	-----	
Olefins	vol%	D 1319	-----	
Saturates	wt%	HPLC	-----	
Combustion Additives	Y/N	(e)	-----	
Ash	wt%	D 482	<0.0001	RL
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	<0.02	JG&
Calcium	ppm wt	D 3605 (g)	0.05	
Copper	ppm wt	D 3605 (g)	0.07	
Iron	ppm wt	D 3605 (g)	0.26	
Lead	ppm wt	D 3605 (g)	0.02	
Nickel	ppm wt	D 3605 (g)	0.01	
Silicon	ppm wt	D 3605 (g)	<0.01	
Potassium	ppm wt	D 3605 (g)	0.03	
Sodium	ppm wt	D 3605 (g)	0.12	
Vanadium	ppm wt	D 3605 (g)	0.06	

Saturates ____, Polars ____, Aromatics ____

D 86 may not be appropriate for some high viscosity fuels.
If this is the case, perform D 1160. INDICATE METHOD PERFORMED
On selected fuels only; as instructed by DTNSRDC.

(d) Fed. Std. 791, method 5181.
(e) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(f) To be performed on commercial survey fuels only.

* D613, It was difficult to obtain a stable reading for this fuel. Cetane value may be ± 2 numbers.

CHARACTERIZATION PROTOCOL

All test methods with a D ____ designation are ASTM test methods.
Contact DTNSRDC with questions. 87NAVY123T

Date Initiated: 7-17-87
Date Completed: 9-8-87

FUEL IDENTIFICA
TFØ2N21L87 (HD4)

* see reverse side

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
DISTILLATION (a)				
Initial Boiling Point	°C	D 86/116B	199.0	PDW
5% point	°C	D 86/116B	217.5	
10% point	°C	D 86/116B	228.0	
20% point	°C	D 86/116B	245.5	
30% point	°C	D 86/116B	265.5	
40% point	°C	D 86/116B	288.0	
50% point	°C	D 86/116B	309.0	
60% point	°C	D 86/116B	325.0	
70% point	°C	D 86/116B	336.5	
80% point	°C	D 86/116B	351.0	
90% point	°C	D 86/116B	369.5	
95% point	°C	D 86/116B	385.5	
End point	°C	D 86/116B	388.5	
Residue	vol%	D 86/116B	2.5	
Loss	vol%	D 86/116B	1.0	
Initial Boiling Point	°C	D 2887	145.5	JT
5% point	°C	D 2887	195.0	
10% point	°C	D 2887	208.0	
20% point	°C	D 2887	233.5	
30% point	°C	D 2887	264.5	
40% point	°C	D 2887	298.0	
50% point	°C	D 2887	320.5	
60% point	°C	D 2887	337.5	
70% point	°C	D 2887	353.0	
80% point	°C	D 2887	369.5	
90% point	°C	D 2887	393.0	
95% point	°C	D 2887	414.0	
End point	°C	D 2887	468.0	
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	0.8900	PDW
Specific Gravity @ 15.6°C		D 4052	0.8904	PDW
API Gravity (D 1298)	°API	calculate	27.5	PDW
API Gravity (D 4052)	°API	calculate	27.4	PDW
Viscosity @ 40°C	mm²/s	D 445	5.061	RLT
Viscosity @ 100°C	mm²/s	D 445	1.626	LAC
Flash Point	°C	D 93	81.0	RLT
Cloud Point	°C	D 2500	-20	PDW
Pour Point	°C	D 97	-24	PDW
Demulsification @ 25°C	minutes	D 1401	2	LAC
Color		D 1500	L1.5	LAC
Appearance		D 4176	pass	LAC
Surface Tension	dynes/cm	D 1331	28.1	JD
Water and Sediment	vol%	D 2709	<0.005	LAC
Particulates (ml, 3560)	mg/l	D 2276	0.74	LC
Asphaltenes	wt%	D 2007(f)	----	

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	I
CHEMICAL				
Sulfur	wt%	D 4294	0.76	
Acid Number	mgKOH/g	D 974	0.04	
Acid Number	mgKOH/g	D 664	0.04	
Corrosion @ 100°C		D 130	1a	
Carbon Residue on 10% bottoms	wt%	D 524	0.17	J
Accelerated Stability	mg/100ml	D 2274	0.13	E
Accelerated Stability F-21 Color After	P/F & No.	DuPont F-21 D 1500	pass/1	L
Breakpoint Temperature	°C	D 3241 (b)	L3.0	L
FSII		(c)	-----	
Neutrality	Acid/Neutral	(d)	neutral	L
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	41.960	NS
Hydrogen Content	wt%	PE 240	12.35	SE
Carbon Content	wt%	PE 240	87.01	SE
H/C; C/H Ratio		calculate	0.14/7.05	SE
Cetane Number		D 613	* 41.4±2	PE
Cetane Index (Using D 1298 value)		D 976	42.4	SE
Cetane Index (Using D 4052 value)		D 976	42.3	SE
Diesel Index (Using D 1298 value)		calculate	35.3	SE
Diesel Index (Using D 4052 value)		calculate	35.2	SE
Aniline Point	°C	D 611	53.60	LA
Aromatics	wt%	HPLC	-----	
Olefins	vol%	D 1319	-----	
Saturates	wt%	HPLC	-----	
Combustion Additives	Y/N	(e)	-----	
Ash	wt%	D 482	<0.0001	RL
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	<0.02	JG&M
Calcium	ppm wt	D 3605 (g)	0.05	
Copper	ppm wt	D 3605 (g)	0.07	
Iron	ppm wt	D 3605 (g)	0.26	
Lead	ppm wt	D 3605 (g)	0.02	
Nickel	ppm wt	D 3605 (g)	0.01	
Silicon	ppm wt	D 3605 (g)	<0.01	
Potassium	ppm wt	D 3605 (g)	0.03	
Sodium	ppm wt	D 3605 (g)	0.12	
Vanadium	ppm wt	D 3605 (g)	0.06	

Saturates ____, Polars ____, Aromatics ____

) D 86 may not be appropriate for some high viscosity fuels.
If this is the case, perform D 1160. INDICATE METHOD PERFORMED
On selected fuels only; as instructed by DTNSRDC.

(d) Fed. Std. 791, method 5101.
(e) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(f) To be performed on commercial survey fuels only

CHARACTERIZATION PROTOCOL ✓

All test methods with a D ____ designation are ASTM test methods.
Contact DTNSRDC with questions. 87NAVY112T

Date Initiated: 6-26-87
Date Completed: 8-19-87

TEST FUEL SAMPLE ID
TFØ8N19U87 (HD7)

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
DISTILLATION (a)				
Initial Boiling Point	°C	D 86/1160	207.5	PDW
5% point	°C	D 86/1160	252.0	
10% point	°C	D 86/1160	284.5	
20% point	°C	D 86/1160	331.5	
30% point	°C	D 86/1160	350.5	
40% point	°C	D 86/1160	360.0	
50% point	°C	D 86/1160	367.0	
60% point	°C	D 86/1160	373.5	
70% point	°C	D 86/1160	379.5	
80% point	°C	D 86/1160	387.0	
90% point	°C	D 86/1160	396.0	cracking
95% point	°C	D 86/1160		
End point	°C	D 86/1160		
Residue	vol%	D 86/1160		
Loss	vol%	D 86/1160		
Initial Boiling Point	°C	D 2887	158.5	JT
5% point	°C	D 2887	201.5	
10% point	°C	D 2887	245.0	
20% point	°C	D 2887	321.0	
30% point	°C	D 2887	348.5	
40% point	°C	D 2887	366.5	
50% point	°C	D 2887	381.0	
60% point	°C	D 2887	395.0	
70% point	°C	D 2887	408.5	
80% point	°C	D 2887	422.5	
90% point	°C	D 2887	440.0	
95% point	°C	D 2887	454.0	
End point	°C	D 2887	495.5	
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	0.8925	PDW
Specific Gravity @ 15.6°C		D 4052	0.8929	LAC
API Gravity (D 1298)	°API	calculate	27.0	PDW
API Gravity (D 4052)	°API	calculate	27.0	LAC
Viscosity @ 40°C	mm²/s	D 445	12.05	RLT
Viscosity @ 100°C	mm²/s	D 445	2.842	RLT
Flash Point	°C	D 93	97.5	RLT
Cloud Point	°C	D 2500	-22	PDW
Pour Point	°C	D 97	-21	PDW
Demulsification @ 25°C	minutes	D 1401	10	RLT
Color		D 1500	1	RLT
Appearance		D 4176	pass	RLT
Surface Tension	mN/m	D 1331	30.2	JD
Water and Sediment	vol%	D 2709	<0.005	LAC
Particulates (2000 ml)	mg/l	D 2276	0.25	LC

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIAL
CHEMICAL				
Sulfur	wt%	D 4294	0.58	BD
Acid Number	mgKOH/g	D 974	0.03	JG
Acid Number	mgKOH/g	D 664	0.04	JG
Corrosion @ 100°C		D 130	1a	LC
Carbon Residue on 10% bottoms	wt%	D 524	0.10	JG
Accelerated Stability	mg/100ml	D 2274	0.14	EZ
Accelerated Stability F-21 Color After	P/F & No.	DuPont F-21 D 1500	P2 L3.5	LAC LAC
Breakpoint Temperature	°C	D 3241 (b)	------	
SII		(c)	------	
Neutrality	Acid/Neutral	(d)	neutral	LAC
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	42.230	NS
Hydrogen Content	wt%	PE 240	12.53	SHG
Carbon Content	wt%	PE 240	86.58	SHG
H/C; C/H Ratio		calculate	0.14/6.91	SHG
Cetane Number		D 613	47.2	PP
Cetane Index (Using D 1298 value)		D 976	42.0	SHG
Cetane Index (Using D 4052 value)		D 976	42.0	SHG
Diesel Index (Using D 1298 value)		calculate	45.3	SHG
Diesel Index (Using D 4052 value)		calculate	45.3	SHG
Aniline Point	°C	D 611	75.40	LAC
Aromatics	vol%	P 1319	------	
Olefins	vol%	D 1319	------	
Saturates	vol%	P 1319	------	
Asphaltenes	wt%	D 2007 (e)	------	
Combustion Additives	Y/N	(f)	------	
Ash	wt%	D 482	<0.0001	RLT
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	<0.02	JG&ML
Calcium	ppm wt	D 3605 (g)	0.10	
Copper	ppm wt	D 3605 (g)	0.02	
Iron	ppm wt	D 3605 (g)	0.08	
Lead	ppm wt	D 3605 (g)	<0.01	
Nickel	ppm wt	D 3605 (g)	<0.01	
Silicon	ppm wt	D 3605 (g)	<0.04	
Potassium	ppm wt	D 3605 (g)	<0.01	
Sodium	ppm wt	D 3605 (g)	<0.04	
Vanadium	ppm wt	D 3605 (g)	<0.03	

a) D 86 may not be appropriate for some high viscosity fuels. If this is the case, perform D 1160. CIRCLE METHOD PERFORMED
b) On selected fuels only; as instructed by DTNSRDC.
c) Fed. Std. 791, methods 5327,5330,5340; commercial survey fuels.
(d) Fed. Std. 791, method 5101.
(e) To be performed on survey fuels only.
(f) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(g) Modified ASTM method.

CHARACTERIZATION PROTOCOL

All test methods with a D ___ designation are ASTM test methods.
Contact DTNSRDC with questions. 87NAVY104T

Date Initiated: 6-10-87
Date Completed: 8-19-87

FUEL IDENTIFICATIO
TFØ7N11U87 (HD6)

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
DISTILLATION (a)				
Initial Boiling Point	°C	D 86/1160	201.5	PDW
5% point	°C	D 86/1160	249.0	
10% point	°C	D 86/1160	287.5	
20% point	°C	D 86/1160	341.0	
30% point	°C	D 86/1160	359.0	
40% point	°C	D 86/1160	367.5	
50% point	°C	D 86/1160	372.0	
60% point	°C	D 86/1160	377.0	
70% point	°C	D 86/1160	382.5	
80% point	°C	D 86/1160	389.0	
90% point	°C	D 86/1160	396.0 cracking	FSI
95% point	°C	D 86/1160		
End point	°C	D 86/1160		
Residue	vol%	D 86/1160		
Loss	vol%	D 86/1160		
Initial Boiling Point	°C	D 2887	158.5	JT
5% point	°C	D 2887	201.5	
10% point	°C	D 2887	242.0	
20% point	°C	D 2887	333.0	
30% point	°C	D 2887	362.0	
40% point	°C	D 2887	378.5	
50% point	°C	D 2887	392.0	
60% point	°C	D 2887	404.5	
70% point	°C	D 2887	416.0	
80% point	°C	D 2887	428.5	
90% point	°C	D 2887	444.5	
95% point	°C	D 2887	458.0	
End point	°C	D 2887	499.0	
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	0.8760	PDW
Specific Gravity @ 15.6°C		D 4052	0.8763	KWH
API Gravity (D 1298)	°API	calculate	30.0	PDW
API Gravity (D 4052)	°API	calculate	30.0	PDW
Viscosity @ 40°C	mm²/s	D 445	12.00	LAC
Viscosity @ 100°C	mm²/s	D 445	2.91	RLT
Flash Point	°C	D 93	97.5	RLT
Cloud Point	°C	D 2500	-21	PDW
Pour Point	°C	D 97	-24	PDW
Demulsification @ 25°C	minutes	D 1401	5	RLT
Color		D 1500	0.5	RLT
Appearance		D 4176	pass	RLT
Surface Tension	dynes/cm	D 1331	30.3	JD
Water and Sediment	vol%	D 2709	<0.005	LAC
Particulates (ml, 2000)	mg/l	D 2276	0.62	LC
Asphaltenes	wt%	D 2007(f)	—	

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITI
CHEMICAL				
Sulfur	wt%	D 4294	0.35	BD
Acid Number	mgKOH/g	D 974	<0.01	JG
Acid Number	mgKOH/g	D 664	<0.01	JG
Corrosion @ 100°C		D 130	1b	LC
Carbon Residue on 10% bottoms	wt%	D 524	0.08	JG
Accelerated Stability	mg/100ml	D 2274	0.19	EZ
Accelerated Stability	P/F & No.	DuPont F-21	P 2	LAC
F-21 Color After		D 1500	2.5	LAC
Breakpoint Temperature	°C	D 3241 (b)	-----	
FSII		(c)	-----	
Neutrality	Acid/Neutral	(d)	Neutral	LAC
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	42.602	NS
Hydrogen Content	wt%	PE 240	13.09	SHG
Carbon Content	wt%	PE 240	86.34	SHG
H/C; C/H Ratio		calculate	0.15/6.60	SHG
Cetane Number		D 613	50.2	PP
Cetane Index (Using D 1298 value)		D 976	48.0	SHG
Cetane Index (Using D 4052 value)		D 976	48.0	SHG
Diesel Index (Using D 1298 value)		calculate	55.3	SHG
Diesel Index (Using D 4052 value)		calculate	55.3	SHG
Aniline Point	°C	D 611	84.60	LAC
Aromatics	wt%	HPLC	-----	
Olefins	vol%	D 1319	-----	
Saturates	wt%	HPLC	-----	
Combustion Additives	Y/N	(e)	-----	
Ash	wt%	D 482	0.0001	RLT
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	0.02	JG&MC
Calcium	ppm wt	D 3605 (g)	0.09	
Copper	ppm wt	D 3605 (g)	0.03	
Iron	ppm wt	D 3605 (g)	<0.04	
Lead	ppm wt	D 3605 (g)	<0.01	
Nickel	ppm wt	D 3605 (g)	<0.01	
Silicon	ppm wt	D 3605 (g)	<0.04	
Potassium	ppm wt	D 3605 (g)	<0.01	
Sodium	ppm wt	D 3605 (g)	0.04	
Vanadium	ppm wt	D 3605 (g)	<0.03	

Saturates — ,Polars — ,Aromatics —

) D 86 may not be appropriate for some high viscosity fuels.
If this is the case, perform D 1160. INDICATE METHOD PERFORMED
) On selected fuels only; as instructed by DTNSRDC.

(d) Fed. Std. 791, method 5101.
(e) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(f) To be performed on commercial survey fuels only.

CHARACTERIZATION PROTOCOL

All test methods with a D ___ designation are ASTM test methods.
Contact DTNSRDC with questions. 88NAVY011T

Date Initiated: 2-2-88
Date Completed: 3-2-88

FUEL IDENTIFICATION
HD21 TF34N28J88

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
DISTILLATION (a)				
Initial Boiling Point	°C	D 86/116B	300.0	PDW
5% point	°C	D 86/116B	325.5	
10% point	°C	D 86/116B	332.0	
20% point	°C	D 86/116B	338.5	
30% point	°C	D 86/116B	346.0	
40% point	°C	D 86/116B	352.0	
50% point	°C	D 86/116B	358.5	
60% point	°C	D 86/116B	365.0	
70% point	°C	D 86/116B	373.5	
80% point	°C	D 86/116B	384.0	
90% point	°C	D 86/116B	401.0	
95% point	°C	D 86/116B	------	
End point	°C	D 86/116B	406.0	
Residue	vol%	D 86/116B	4.0	
Loss	vol%	D 86/116B	1.5	
Initial Boiling Point	°C	D 2887	219.0	MW
5% point	°C	D 2887	283.5	
10% point	°C	D 2887	303.5	
20% point	°C	D 2887	325.0	
30% point	°C	D 2887	338.5	
40% point	°C	D 2887	349.5	
50% point	°C	D 2887	360.0	
60% point	°C	D 2887	371.0	
70% point	°C	D 2887	383.0	
80% point	°C	D 2887	399.0	
90% point	°C	D 2887	423.5	
95% point	°C	D 2887	443.0	
End point	°C	D 2887	502.5	
PHYSICAL				
Specific Gravity @ 15.6°C		D 1298	0.9397	PDW
Specific Gravity @ 15.6°C		D 4052	0.9399	PDW
API Gravity (D 1298)	°API	calculate	19.1	PDW
API Gravity (D 4052)	°API	calculate	19.1	PDW
Viscosity @ 40°C	mm²/s	D 445	18.89	RLT
Viscosity @ 100°C	mm²/s	D 445	3.420	RLT
Flash Point	°C	B 93	146	RLT
Cloud Point	°C	D 2500	-26	PDW
Pour Point	°C	D 97	-27	PDW
Demulsification @ 25°C	minutes	D 1401	24	LAC
Color		D 1500	L2.0	LAC
Appearance		D 4176	pass	LAC
Surface Tension	dynes/cm	D 1331	32.0	JD
Interfacial Tension	dynes/cm	D 1331	20.0	JD
Water and Sediment	vol%	D 2709	0.005	LAC
Particulates 2000 ml	mg/l	D 2276	1.05	LC

FUEL PROPERTY	UNITS	TEST METHOD	VALUE	INITIALS
CHEMICAL				
Sulfur	wt%	D 4294	1.19	JG
Acid Number	mgKOH/g	D 974	0.05	JG
Acid Number	mgKOH/g	D 664	0.08	JG
Corrosion @ 100°C		D 130	1a	LC
Carbon Residue				
on 10% bottoms	wt%	D 524	0.17	JG
Accelerated Stability	mg/100ml	D 2274	0.27	EZ
Accelerated Stability	P/F & No.	DuPont F-21	P1	LAC
F-21 Color After		D 1500	L3.5	LAC
Breakpoint Temperature	°C	D 3241 (b)	------	
FSII		(c)	------	
Neutrality	Acid/Neutral	(d)	neutral	LAC
COMBUSTION				
Net Heat of Combustion	MJ/kg	D 2382	41.310	NS
Hydrogen Content	wt%	PE 240	11.40	SHG
Carbon Content	wt%	PE 240	86.82	SHG
H/C; C/H Ratio		calculate	0.13/7.62	SHG
Cetane Number		D 613	33.8	PP
Cetane Index (Using D 1298 value)		D 976	33.8	SHG
Cetane Index (Using D 4052 value)		D 976	33.8	SHG
Diesel Index (Using D 1298 value)		calculate	26.3	SHG
Diesel Index (Using D 4052 value)		calculate	26.3	SHG
Aniline Point	°C	D 611	58.85	LAC
H gamma	wt%	PNMR	23.95	DD
H beta/alpha	wt%	PNMR	67.26	DD
H olefin	wt%	PNMR	0.19	DD
H aromatic/total	wt%	PNMR	8.61	DD
H total	wt%	PNMR	11.24	DD
Combustion Additives	Y/N	(e)	------	
Ash	wt%	D 482	0.0013	RLT/LAC
Asphaltenes	wt%	D 2007(f)	------	
TRACE METALS				
Aluminum	ppm wt	D 3605 (g)	<0.05	ML&JG
Calcium	ppm wt	D 3605 (g)	<0.06	
Copper	ppm wt	D 3605 (g)	0.02	
Iron	ppm wt	D 3605 (g)	0.52	
Lead	ppm wt	D 3605 (g)	0.01	
Nickel	ppm wt	D 3605 (g)	<0.01	
Silicon	ppm wt	D 3605 (g)	<0.27	
Potassium	ppm wt	D 3605 (g)	0.02	
Sodium	ppm wt	D 3605 (g)	0.04	
Vanadium	ppm wt	D 3605 (g)	<0.01	

(a) D 86 may not be appropriate for some high viscosity fuels. If this is the case, perform D 1160. INDICATE METHOD PERFORMED
(b) On selected fuels only; as instructed by DTNSRDC.
(c) Fed. Std. 791, methods 5327,5330,5340; commercial survey fuels.
(d) Fed. Std. 791, method 5101.
(e) Test Method in VV-F-800C, Appendix B; for survey fuels only.
(f) To be performed on commercial survey fuels only.
(g) Modified ASTM method.

DTRC14JAN88

APPENDIX D2
CONTAMINATION/DEGRADATION PROTOCOL

BF02V13L86

	10/22/87	11/12/87	12/02/87	01/19/88	02/10/88	03/10/88	04/10/88*
Specfic Gravity ASTM D 1298	0.8373	0.8373	0.8413	0.8368	0.8373		0.8373
Viscosity @ 40 C ASTM D 445	3.33	3.29	3.64	3.33	3.29		3.33
Color ASTM D 1500	1.0	1.0	1.5	1.0	0.5		1.0
Appearance ASTM D 4176	Pass	Pass	Pass	Pass	Pass		Pass
Accelerated Stability(a) Dupont F-21	P-1-1.0	P-2-1.0	P-5-1.5	P-4-2.0	F-9-1.5		P-1-1.0
Particulates (b) ASTM D 2276	0.8	1.0	0.8	0.3	0.3		0.8
Accelerated Stability(c) ASTM D 2274	0.26	0.42			0.59		
Water & Sediment(c) ASTM D 2274	<0.005	<0.005			<0.005		

* Represents BF02V31J87

TF26P22Y87

	10/22/87	11/12/87	12/02/87	01/19/88	02/10/88	03/10/88	04/10/88*
Specfic Gravity ASTM D 1298	0.8170	0.8165					
Viscosity @ 40 C ASTM D 445	1.53	1.53					
Color ASTM D 1500	<0.5	0.5					
Appearance ASTM D 4176	Pass	Pass					
Accelerated Stability(a) Dupont F-21	P-2-0.5	P-1-<0.5					
Particulates (b) ASTM D 2276	0.7	0.6					
Accelerated Stability(c) ASTM D 2274	0.20	0.35					
Water & Sediment(c) ASTM D 2274	<0.005	<0.005					

TF10N18Y87

	10/22/87	11/12/87	12/02/87	01/19/88	02/10/88	03/10/88	04/10/88*
Specfic Gravity ASTM D 1298	0.8894	0.8899					
Viscosity @ 40 C ASTM D 445	4.27	4.24					
Color ASTM D 1500	2.0	2.0					
Appearance ASTM D 4176	Pass	Pass					
Accelerated Stability(a) Dupont F-21	P-2-3.5	P-1-4.5					
Particulates (b) ASTM D 2276	0.2	3.2 *					
Accelerated Stability(c) ASTM D 2274	0.28	0.29					
Water & Sediment(c) ASTM D 2274	<0.005	<0.005					

* Exceeded Protocol Tolerance

TF09N14S87

	10/22/87	11/12/87	12/02/87	01/19/88	02/10/88	03/10/88	04/10/88*
Specfic Gravity ASTM D 1298	0.8894	0.8899					
Viscosity @ 40 C ASTM D 445	18.78	19.01					
Color ASTM D 1500	1.0	1.0					
Appearance ASTM D 4176	Pass	Pass					
Accelerated Stability(a) Dupont F-21	P-1-1.5	P-1-2.0					
Particulates (b) ASTM D 2276	0.6	0.6					
Accelerated Stability(c) ASTM D 2274	0.26	0.30					
Water & Sediment(c) ASTM D 2274	<0.005	<0.005					

TF01N01S87

	10/22/87	11/12/87	12/02/87	01/19/88	02/10/88	03/10/88	04/10/88*
Specfic Gravity ASTM D 1298	0.8697	0.8697	0.8686	0.8660	0.8692		0.8697
Viscosity @ 40 C ASTM D 445	5.93	5.94	5.96	5.97	5.97		5.96
Color ASTM D 1500	0.2	0.6	1.2	1.3 *	1.4 *		2.4 *
Appearance ASTM D 4176	Pass	Pass	Pass	Pass	Pass		Pass
Accelerated Stability(a) Dupont F-21	F-18-3.0	F-18-3.0	F-19-3.0	F-19-4.0	F-8-2.5		P-1-4.5
Particulates (b) ASTM D 2276	0.2	0.6	1.2	1.3 *	1.4 *		2.4 *
Accelerated Stability(c) ASTM D 2274	1.85	1.90	2.20	1.80	1.62		
Water & Sediment(c) ASTM D 2274	<0.005	<0.005	<0.005	<0.005	<0.005		

* Exceeded Protocol Tolerance

TF02N21L87

	10/22/87	11/12/87	12/02/87	01/19/88	02/10/88	03/10/88	04/10/88*
Specfic Gravity ASTM D 1298	0.8894	0.8899	0.8899	0.8916	0.8899		0.8899
Viscosity @ 40 C ASTM D 445	5.08	5.03	5.02	5.05	5.05		5.03
Color ASTM D 1500	2.0	2.0	2.0	2.5	2.0		2.5
Appearance ASTM D 4176	Pass	3ass	Pass	Pass	Pass		Pass
Accelerated Stability(a) Dupont F-21	P-1-3.5	P-1-3.0	P-1-3.5	P-2-4.5	P-2-4.0		P-1-4.0
Particulates (b) ASTM D 2276	0.4	0.4	0.1	0.3	0.4		0.6
Accelerated Stability(c) ASTM D 2274	0.19	0.27					
Water & Sediment(c) ASTM D 2274	<0.005	<0.005					

TF08N19U87

	10/22/87	11/12/87	12/02/87	01/19/88	02/10/88	03/10/88	04/10/88*
Specfic Gravity ASTM D 1298	0.8927	0.8927	0.8927	0.8927	0.8922	0.8927	0.8927
Viscosity @ 40 C ASTM D 445	12.15	12.03	12.07	12.00	12.06	12.02	12.05
Color ASTM D 1500	1.0	1.5	1.0	1.0	1.5	1.0	1.0
Appearance ASTM D 4176	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Accelerated Stability(a) Dupont F-21	P-1-2.5	P-1-2.5	P-1-2.5	P-1-2.5	P-2-2.5	P-2-2.5	P-1-2.5
Particulates (b) ASTM D 2276	0.5	0.8	0.5	0.5	1.1	0.6	0.5
Accelerated Stability(c) ASTM D 2274	0.35	0.50					
Water & Sediment(c) ASTM D 2274	<0.005	<0.005					

TF07N11U87

	10/22/87	11/12/87	12/02/87	01/19/88	02/10/88	03/10/88	04/10/88*
Specfic Gravity ASTM D 1298	0.8756	0.8756	0.8751	0.8745	0.8751	0.8756	0.8751
Viscosity @ 40 C ASTM D 445	11.88	12.00	12.01	12.00	12.03	12.03	12.03
Color ASTM D 1500	1.0	1.0	1.5	1.0	1.0	0.5	1.5
Appearance ASTM D 4176	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Accelerated Stability(a) Dupont F-21	P-2-2.0	P-1-2.5	P-4-2.0	P-1-2.0	P-4-2.0	P-4-2.5	P-2-2.0
Particulates (b) ASTM D 2276	0.2	0.8	0.6	0.3	0.5	0.7	0.3
Accelerated Stability(c) ASTM D 2274	0.43	0.48					
Water & Sediment(c) ASTM D 2274	<0.005	<0.005					

TF34N28J88

	10/22/87	11/12/87	12/02/87	01/19/88	02/10/88	03/10/88	04/10/88*
Specfic Gravity ASTM D 1298						0.9390	0.9390
Viscosity @ 40 C ASTM D 445						18.70	18.73
Color ASTM D 1500						2.0	2.5
Appearance ASTM D 4176						Pass	Pass
Accelerated Stability(a) Dupont F-21						P-2-3.0	P-1-3.0
Particulates (b) ASTM D 2276						1.2	1.1
Accelerated Stability(c) ASTM D 2274							
Water & Sediment(c) ASTM D 2274							

APPENDIX E
Photographs

Figure E1. Detroit Diesel 6V-53N Engine Installed on Test Stand with 300-HP Universal Absorbing/Motoring Dynamometer.

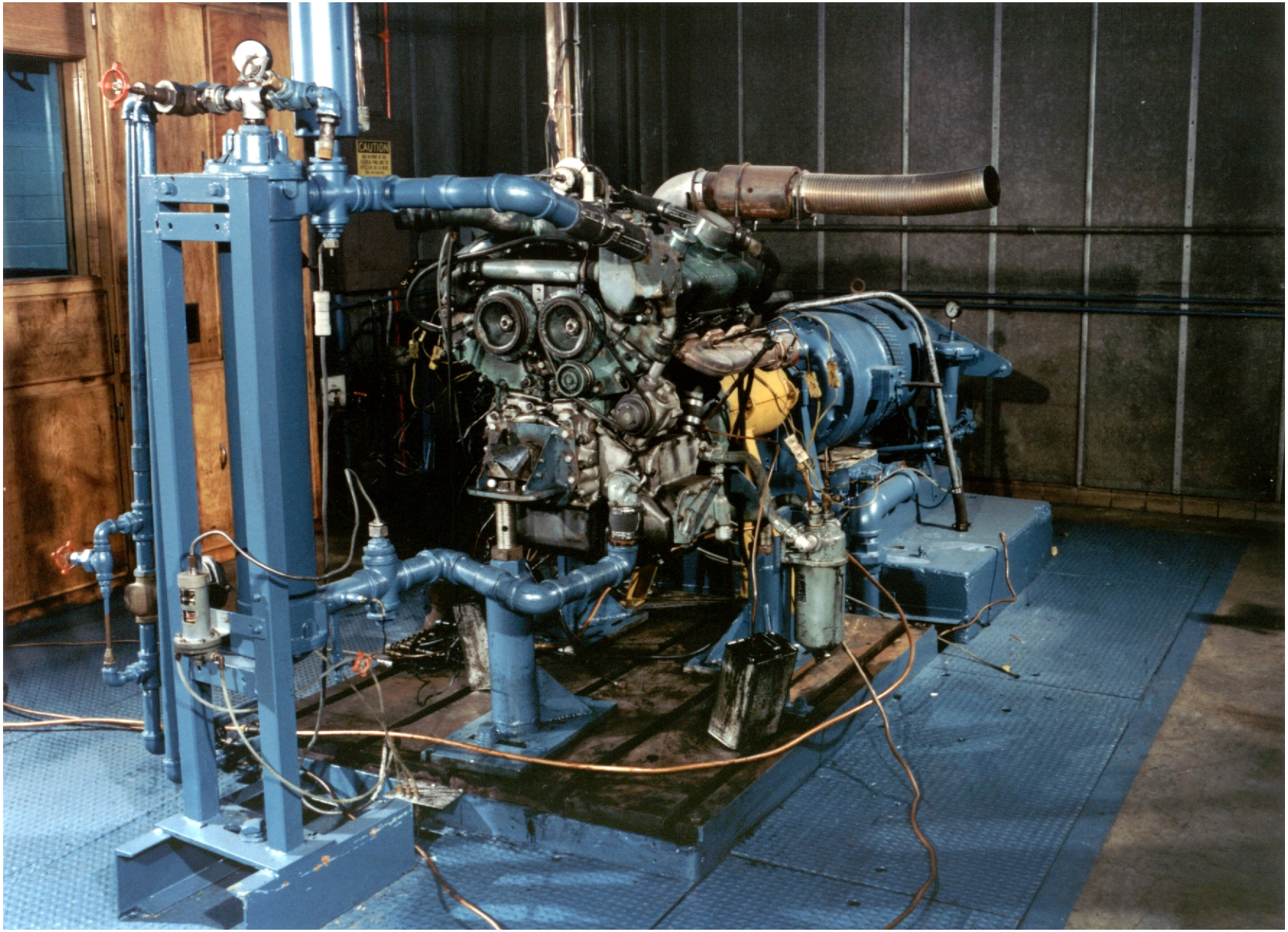


Figure E2. Starboard View of Detroit Diesel 6V-53N Engine with Intake Air and Exhaust Systems Installed.

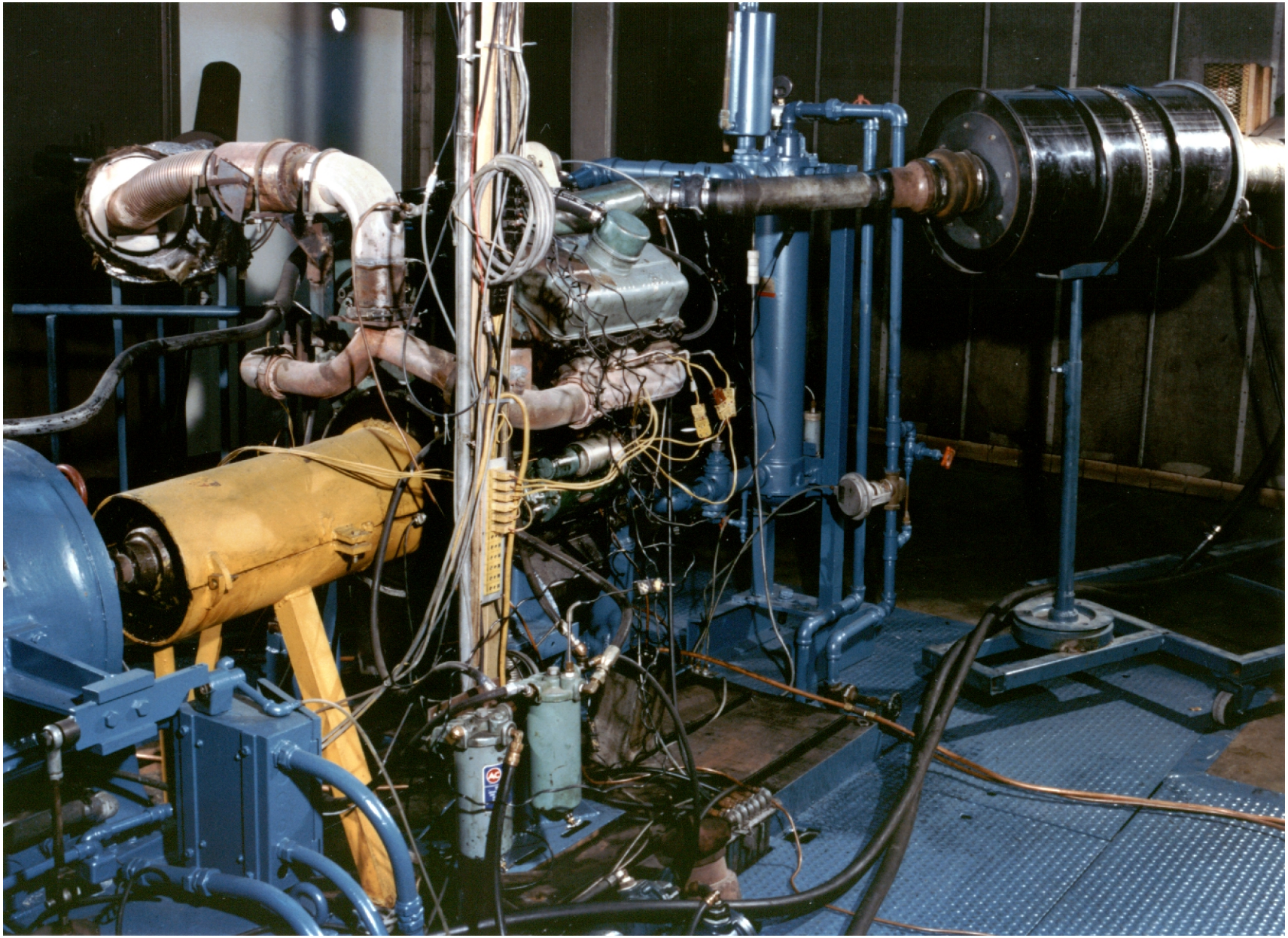


Figure E3. Detroit Diesel 6V-53N Engine Port View.

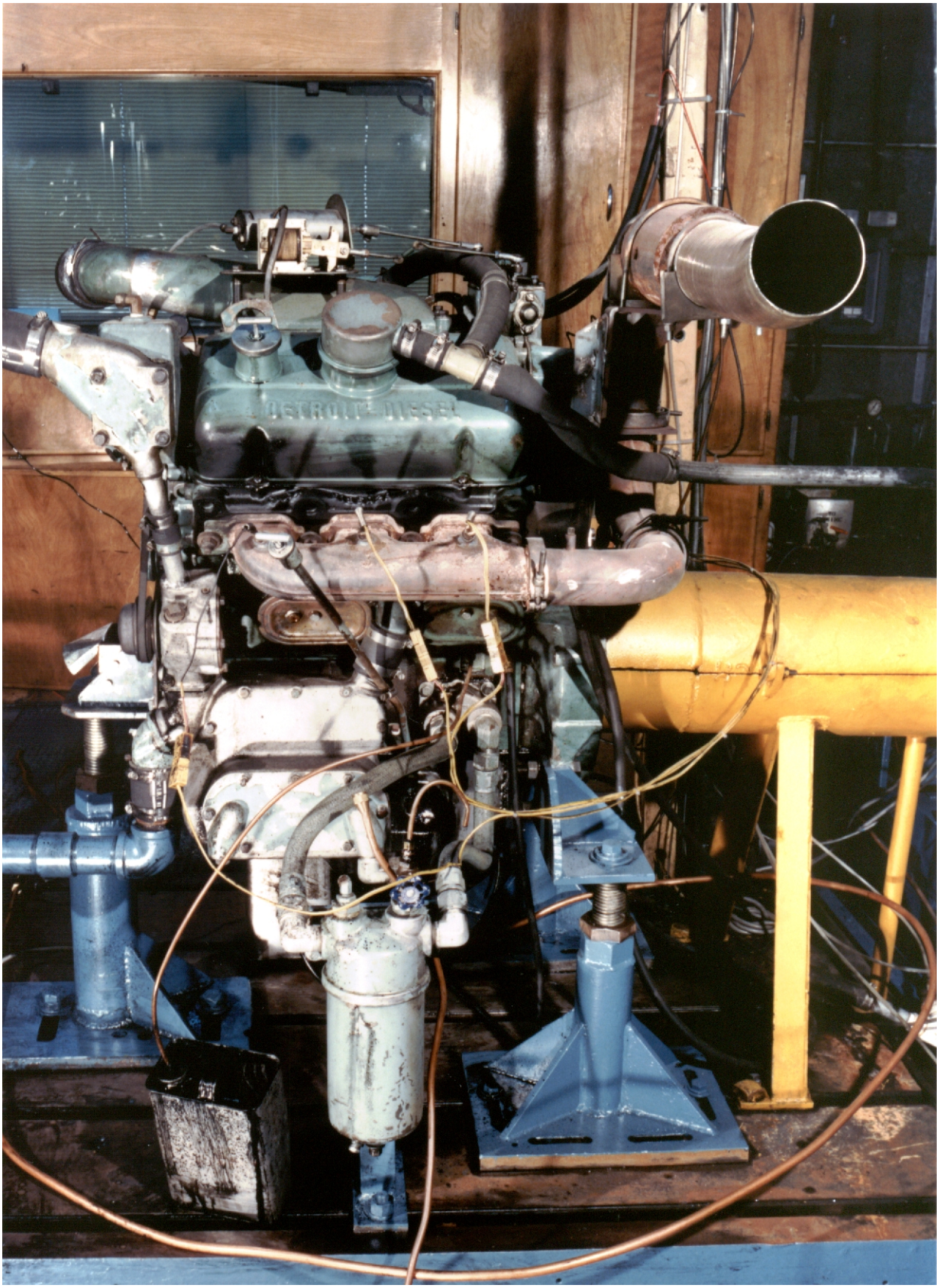


Figure E4. Cummins Engine Company NH220G Engine Installed on Test Stand with 630-HP Absorbing Dynamometer.

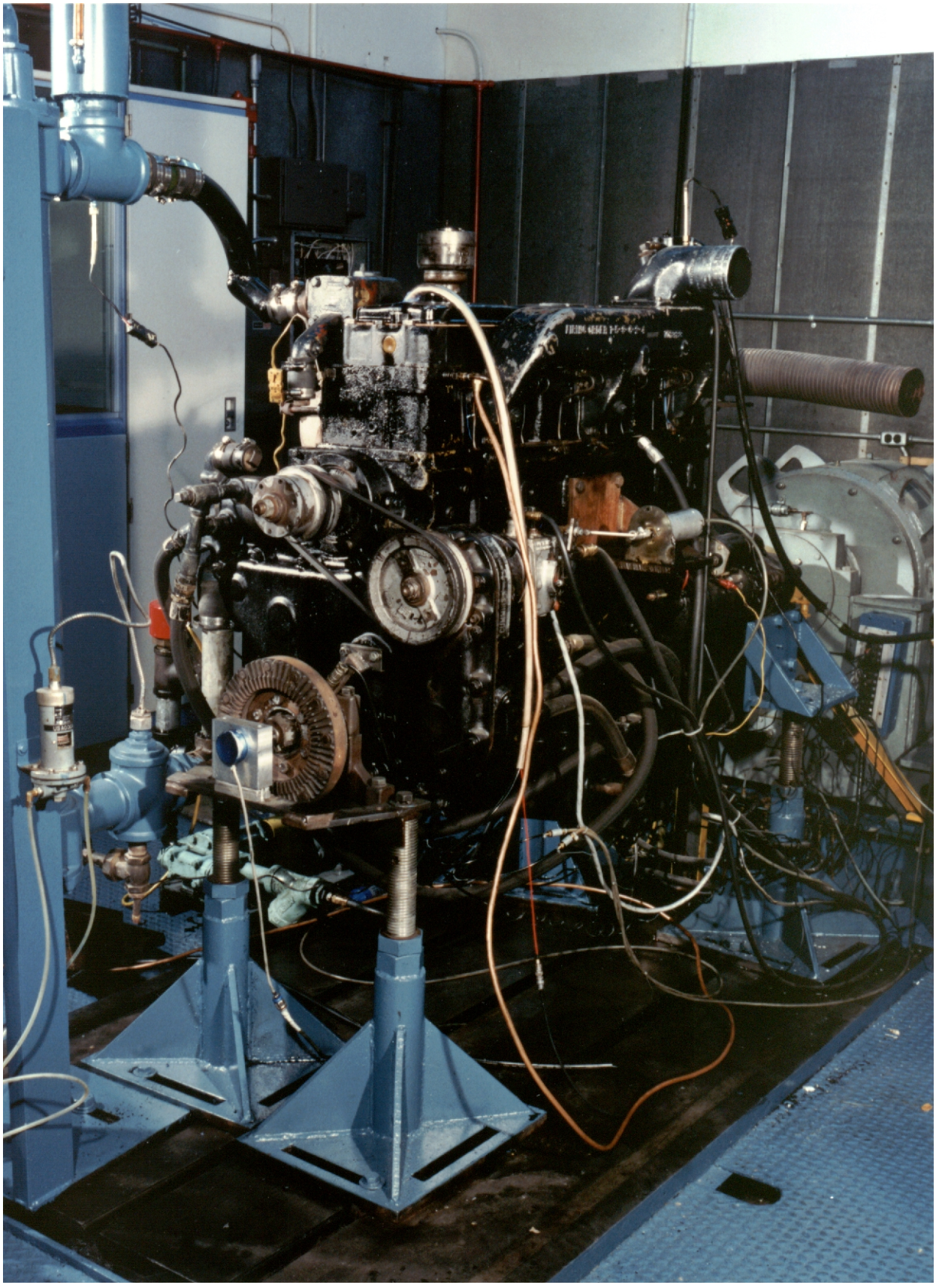


Figure E5. Starboard View of Cummins Engine Company NH220G Engine with Intake Air and Exhaust Systems Installed.

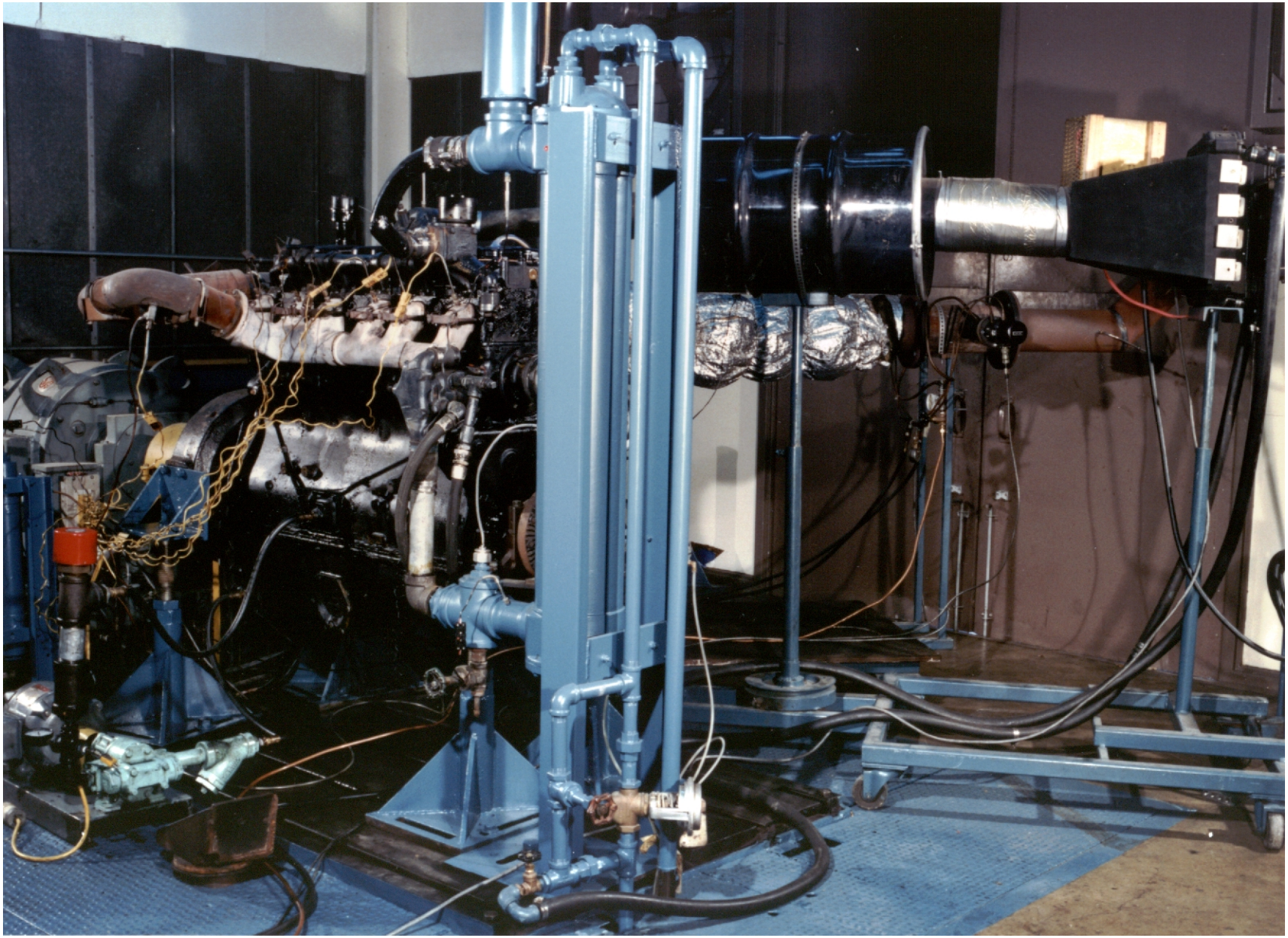


Figure E6. Cummins Engine Company NH220G Engine Port View.

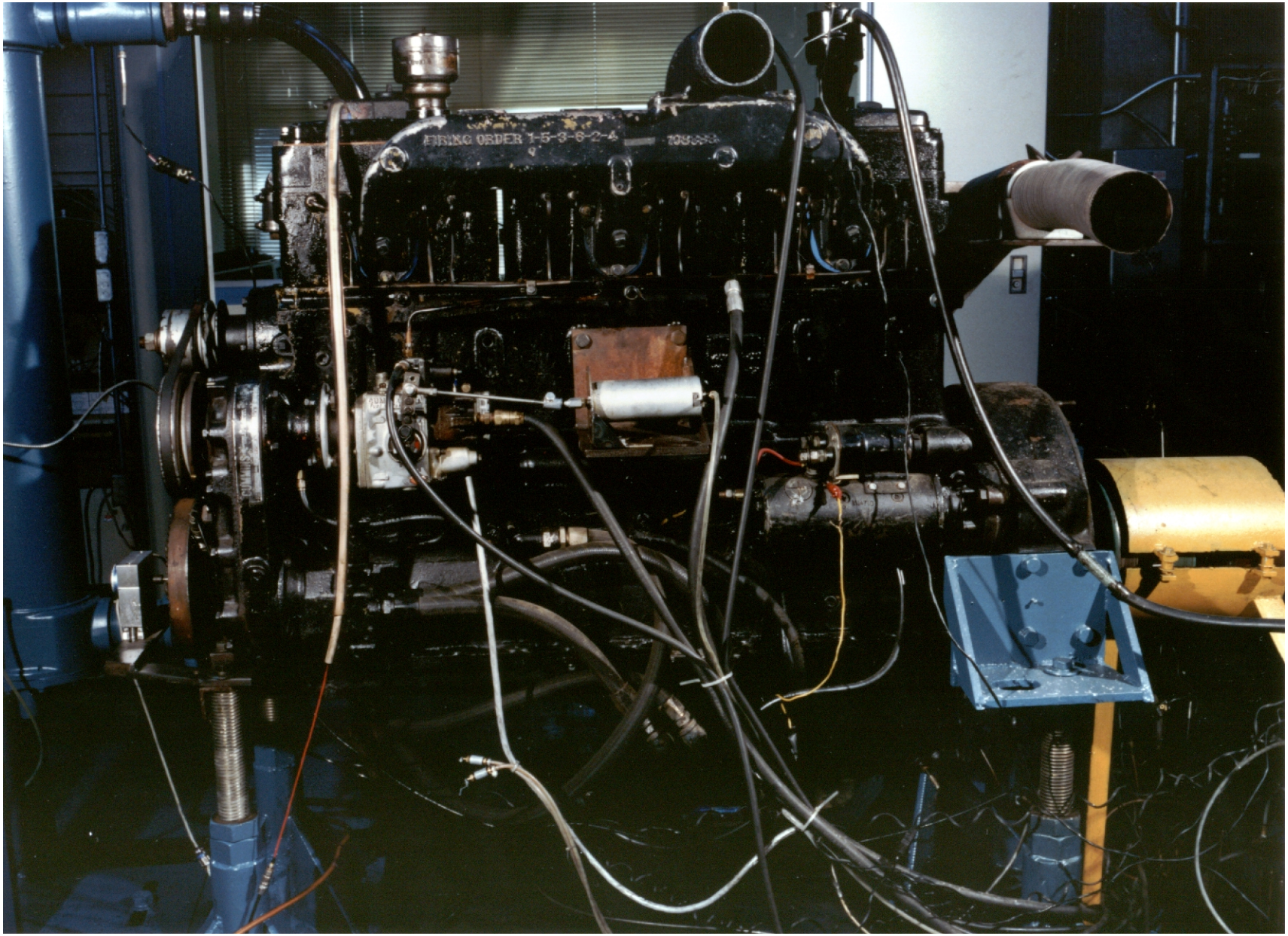


Figure E7. Auxiliary Lubricant Heating System Utilized with Cummins Engine Company NH220G Engine to Reduce Fuel Consumed During Engine Warm-up.

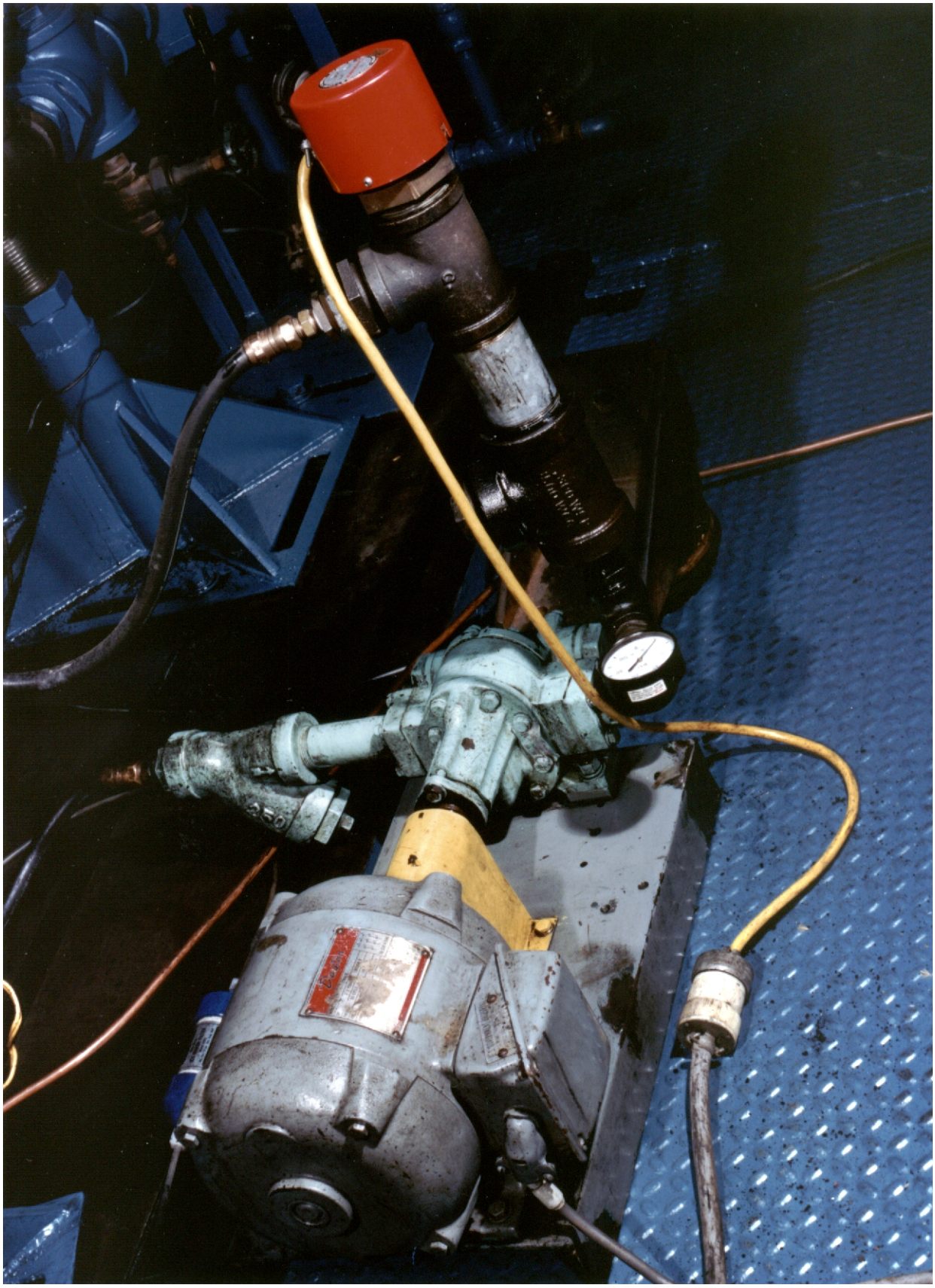


Figure E8. Flotron Measurement System and Constant Level Day Tank Utilized for Mass Fuel Flow Measurements with Both Engines.

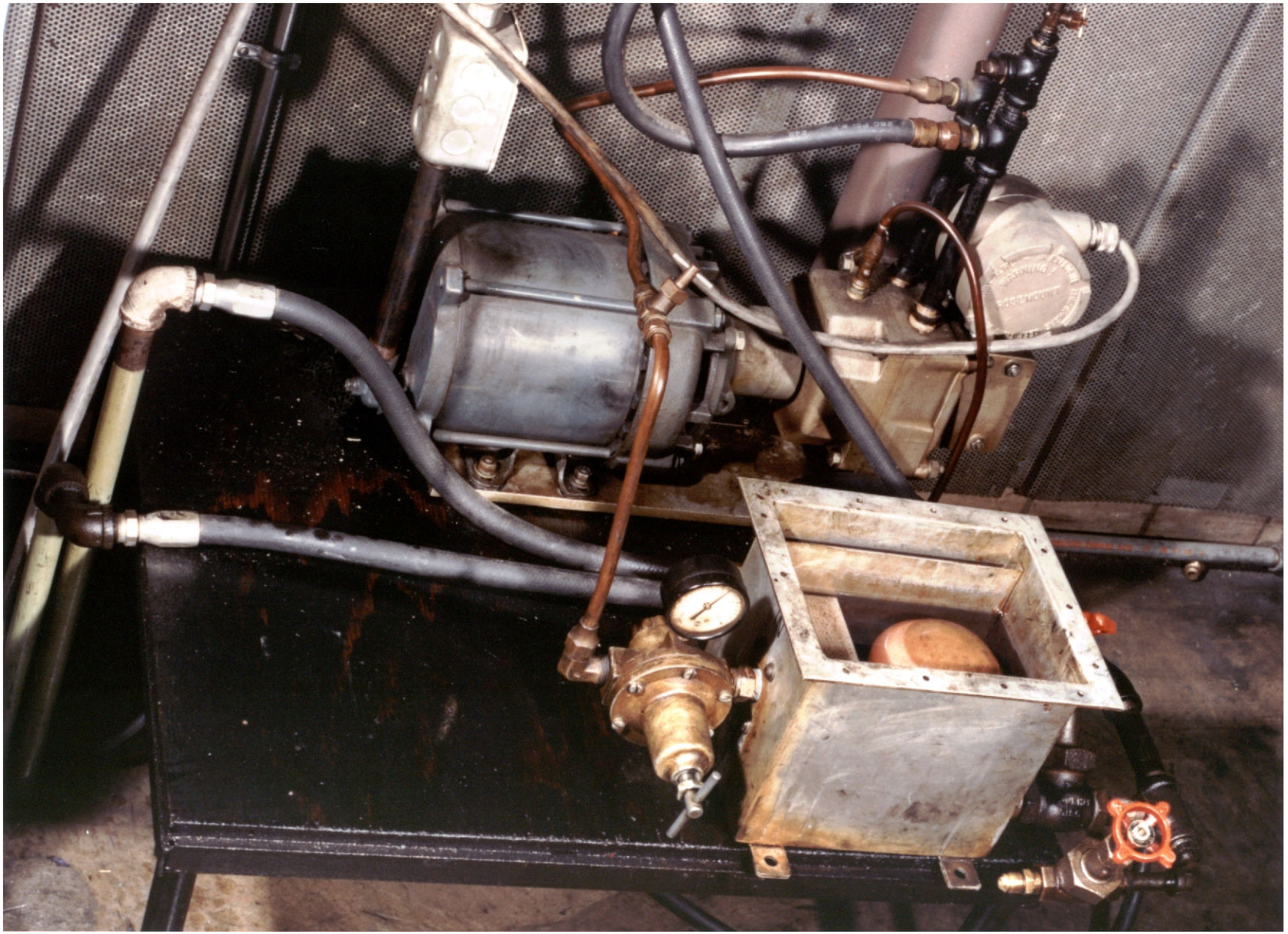
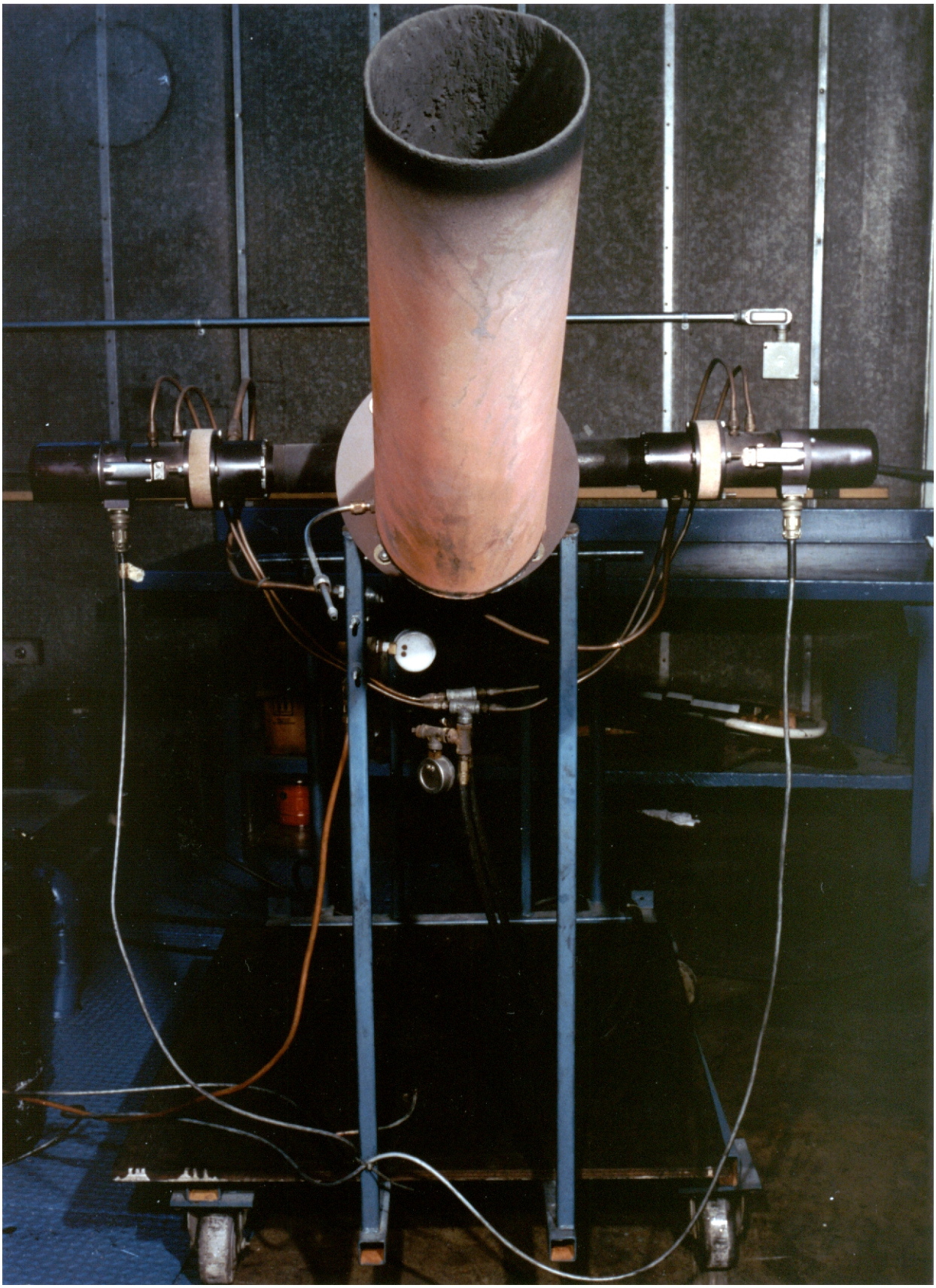


Figure E9. Wager P6 In-line Opacity Smoke Meter Mounted to Exhaust System.



APPENDIX F
DDC 6V-53N Data Sheets

APPENDIX F1
DDC 6V-53N DATA SHEETS
FUEL BLEND BF02

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Test Procedure Checklist

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 AL-15299-F Date: 6-9-87
BF02V13L86

Step	Initials	Test Procedure
1.	G.L.P.	Flush Fuel System with BF-2
2.	G.L.P.	Engine Warmup
3.	G.L.P.	Clean Smokemeter Lenses
4.	G.L.P.	Full Rack Power Check with BF-2
5.	G.L.P.	Compute Corrected Power Levels
6.	G.L.P.	Compare to 95% Confidence Bands of BF-2 Performance
7.	G.L.P.	Determine Action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush Fuel System with BF-2 Blend
9.	G.L.P.	Engine Warmup
10.	G.L.P.	Clean Smokemeter Lenses
11.	G.L.P.	Complete Performance Testing Load-Speed Matrix
12.	G.L.P.	Flush Fuel System with BF-2
13.	G.L.P	Engine Warmup
14.	G.L.P.	Clean Smokemeter Lenses
15.	G.L.P.	Full Rack Power Check on BF-2
16.	G.L.P.	Compute Corrected Power Levels
17.	G.L.P.	Compare to 95% Confidence Bands of BF-2 Performance
18.	G.L.P.	Determine Action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush Fuel System with BF-2 Blend
20.	G.L.P.	Engine Warmup
21.	G.L.P	Clean Smokemeter Lenses
22.	G.L.P.	Complete Performance Testing Load-Speed Matrix

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 AL-15299-F Date: 6-9-87
BF02V13L86

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	1	DN1111	DN1112
2500	2	DN1113	DN1114
2200	3	DN1115	DN1116
1800	4	DN1117	DN1118
1400	5	DN1119	DN1120

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: BF-2 AL-15299-F
BF02V13L86

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	6	DN1121	DN1122
2500	Full-Rack	7	DN1123	DN1124
2500	145	8	DN1125	DN1126
2200	Full-Rack	9	DN1127	DN1128
2200	100	10	DN1129	DN1130
1800	Full-Rack	11	DN1131	DN1132
1800	100	12	DN1133	DN1134
1800	54	13	DN1135	DN1136
1800	20	14	DN1137	DN1138
1400	Full-Rack	15	DN1139	DN1140
1400	28	16	DN1141	DN1142

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 AL-15299-F Date: 6-10-87
BF02V13L86

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	17	DN1143	DN1144
2500	18	DN1145	DN1146
2200	19	DN1147	DN1148
1800	20	DN1149	DN1150
1400	22	DN1151	DN1152

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: BF-2 AL-15299-F
BF02V13L86

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	23	DN1153	DN1154
2500	Full-Rack	24	DN1155	DN1156
2500	145	25	DN1157	DN1158
2200	Full-Rack	26	DN1159	DN1160
2200	100	27	DN1161	DN1162
1800	Full-Rack	28	DN1163	DN1164
1800	100	29	DN1165	DN1166
1800	54	30	DN1167	DN1168
1800	20	31	DN1169	DN1170
1400	Full-Rack	32	DN1171	DN1172
1400	28	33	DN1173	DN1174

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL ~~DF-2~~ AL-15299-F DATE ~~6-8-82~~ PAGE 1

BF02U13L86

Operator GREG							
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	401.0	378.8		
Fuel Flow, lb/hr	72.8	75.4	68.6	62.3	52.8		
Exh. Opacity, %	4.2	2.0	11.0	33.0	62.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	770	730	660	600		
Exhaust Cyl. L2	790	800	800	750	660		
Exhaust Cyl. L3	860	900	900	840	750		
Exhaust Cyl. R1	800	790	760	700	620		
Exhaust Cyl. R2	880	900	920	890	790		
Exhaust Cyl. R3	900	900	920	890	740		
Exhaust Common	450	440	400	380	345		
Water In	157	156	155	152	153		
Water Out	170	169	169	167	169		
Oil Sump	243	240	239	234	232		
Fuel	92	93	93	90	90.0		
Inlet Air	102	102	103	98	97.0		
Airbox	193	186	178	162	154		
Wet Bulb	73.5	73.2	74.0	74.0	74.0		
Dry Bulb	77.5	78.0	78.0	78.5	78.5		
PRESSURES, PSIG							
Oil Gallery	53.1	51.5	48.2	43.5	33.2		
Air After Blower	4.9	3.8	2.9	2.0	1.4		
Fuel Transfer	76.0	74.5	73.0	71.0	69.0		
LOW PRESSURES							
Intake Vac., in.water	15.6	14.4	11.7	7.8	4.6		
Exh. Comm., in.Water	26.5	21.8	17.0	12.0	8.0		
Blowby, in.water	.1	.1	.1	.1	.1		
Barometer, in.Hg	29.03	29.03	29.03	29.03	29.03		

870609.103427 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	75.632	.051	24.240	.028
Wet Bulb Temperature, F	74.617	.047	23.676	.026
P11-Baro (Vent), "Hg ABS	29.033	.000	98.316	.001
P3 C3 Fuel Pressure,psig	75.999	.420	524.00	2.898
P4 C3 Oil Pressure, psig	53.681	.019	370.12	.134
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.871	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316
K3 C3 Exhaust 3, F	899.99	.428	482.21	.238
K4 C3 Exhaust 4, F	822.05	.787	438.92	.437
K5 C3 Exhaust 5, F	912.05	.473	488.92	.263
K6 C3 Exhaust 6, F	928.85	1.418	498.25	.788
K7-C3 Exhaust Comm, F	466.21	.832	241.23	.462
J1 C3 Water In, F	156.76	.150	69.309	.083
J2 C3 Water Out, F	169.86	.161	76.589	.089
J3 C3 Oil Sump, F	243.83	.164	117.68	.091
J4 C3 Fuel In, F	92.713	.039	33.730	.022
J5 C3 Inlet Air, F	102.29	.196	39.049	.109
J6 C3 Airbox, F	193.94	.268	89.967	.149
Horsepower	185.58	.825	138.37	.615
Corrected Horsepower	197.41	.878	147.18	.655
BSFC, lb/hp-hr	.423	.009	.257	.006
Corrected BSFC	.397	.009	.242	.005
Relative Humidity	95.430	.098	95.430	.098
Reference Pressure, inHg	37.524		127.07	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1112

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.52 in-Hg
Speed :	2800 RPM
Load :	348.2 lb-ft
Fuel Flow :	78.4 lb/hr
Brake Power :	185.64 bhp
BSFC :	.422 lb/bhp-hr
Indicated Power :	27.62 kW/cyl
Peak Pressure :	9.266 MPa
Peak Rate of Pressure Rise:	459.9 kPa/deg
Peak Heat Release Rate :	40.5 Joules/deg
Cumulative Heat Release :	1152.41 Joules
Apparent Combustion Efficiency :	76.2 %
Indicated Thermal Efficiency :	39.1 %
Brake Thermal Efficiency :	32.7 %
Ignition Delay :	7.8 degrees
Centroid Phasing :	199.1 degrees
Centroid Magnitude :	11.38 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.26406

870609.105114 AL-15299-F AL-12920-L 6V-53 1

Dry Bulb Temperature, F	76.239	.118	24.577	.066
Wet Bulb Temperature, F	74.767	.066	23.759	.037
P11-Baro (Vent), "Hg ABS	29.033	.000	98.316	.002
P3 C3 Fuel Pressure,psig	74.225	.190	511.76	1.310
P4 C3 Oil Pressure, psig	52.044	.017	358.83	.117
P5 C3 Airbox Pres., psig	3.700	.024	25.513	.163
P10 C3 Exh Comm, inH2Og	23.720	.181	5.903	.045
P11 C3 Intake Vac,inH2Ov	12.146	.092	3.023	.023
P12 C3 Blowby, inH2Og	.021	.005	.005	.001
C3 Speed, RPM	2501.6	2.577	2501.6	2.577
C3 Fuel Flow, lb/hr	76.017	2.805	34.481	1.272
C3 Smoke, %	.431	.103	.431	.103
Cell 3 Load, lb-ft	380.86	1.063	516.38	1.441
K1 C3 Exhaust 1, F	791.80	.266	422.11	.148
K2 C3 Exhaust 2, F	831.63	.509	444.24	.283
K3 C3 Exhaust 3, F	929.72	1.260	498.73	.700
K4 C3 Exhaust 4, F	815.23	.751	435.13	.417
K5 C3 Exhaust 5, F	923.78	.320	495.43	.178
K6 C3 Exhaust 6, F	939.29	.394	504.05	.219
K7-C3 Exhaust Comm, F	440.12	.676	226.73	.375
J1 C3 Water In, F	154.88	.091	68.265	.051
J2 C3 Water Out, F	168.28	.083	75.713	.046
J3 C3 Oil Sump, F	240.27	.294	115.71	.163
J4 C3 Fuel In, F	92.391	.134	33.550	.074
J5 C3 Inlet Air, F	103.03	.251	39.460	.139
J6 C3 Airbox, F	184.70	.277	84.834	.154
Horsepower	181.41	.585	135.26	.436
Corrected Horsepower	193.09	.623	143.96	.464
BSFC, lb/hp-hr	.419	.015	.255	.009
Corrected BSFC	.394	.014	.239	.008
Relative Humidity	93.450	.266	93.450	.266
Reference Pressure, inHg	35.673		120.80	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1114

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.67 in-Hg
Speed :	2502 RPM
Load :	380.9 lb-ft
Fuel Flow :	76.0 lb/hr
Brake Power :	181.46 bhp
BSFC :	.419 lb/bhp-hr
Indicated Power :	25.71 kW/cyl
Peak Pressure :	9.431 MPa
Peak Rate of Pressure Rise:	498.9 kPa/deg
Peak Heat Release Rate :	43.2 Joules/deg
Cumulative Heat Release :	1232.83 Joules
Apparent Combustion Efficiency :	75.1 %
Indicated Thermal Efficiency :	37.6 %
Brake Thermal Efficiency :	33.0 %
Ignition Delay :	7.4 degrees
Centroid Phasing :	198.7 degrees
Centroid Magnitude :	11.49 J/degree
Sensitivity :	29.3 degrees
Premixed/Diffusion Ratio :	.25216

870609.110708 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	75.832	.047	24.351	.026
Wet Bulb Temperature, F	74.748	.021	23.749	.011
P11-Baro (Vent), "Hg ABS	29.032	.000	98.314	.001
P3 C3 Fuel Pressure,psig	72.698	.127	501.24	.876
P4 C3 Oil Pressure, psig	48.672	.007	335.58	.048
P5 C3 Airbox Pres., psig	2.631	.012	18.137	.083
P10 C3 Exh Comm, inH2Og	19.101	.213	4.753	.053
P11 C3 Intake Vac,inH2Ov	9.434	.114	2.348	.028
P12 C3 Blowby, inH2Og	.013	.003	.003	.001
C3 Speed, RPM	2197.8	1.245	2197.8	1.245
C3 Fuel Flow, lb/hr	68.370	2.051	31.012	.930
C3 Smoke, %	13.237	.237	13.237	.237
Cell 3 Load, lb-ft	399.91	1.193	542.20	1.618
K1 C3 Exhaust 1, F	759.05	.455	403.92	.253
K2 C3 Exhaust 2, F	819.06	.319	437.26	.177
K3 C3 Exhaust 3, F	934.94	1.943	501.63	1.079
K4 C3 Exhaust 4, F	798.25	.461	425.70	.256
K5 C3 Exhaust 5, F	953.39	6.649	511.88	3.694
K6 C3 Exhaust 6, F	957.23	7.420	514.02	4.122
K7-C3 Exhaust Comm, F	419.43	3.451	215.24	1.917
J1 C3 Water In, F	155.14	.084	68.409	.047
J2 C3 Water Out, F	169.38	.057	76.321	.032
J3 C3 Oil Sump, F	240.94	.103	116.08	.057
J4 C3 Fuel In, F	91.533	.252	33.074	.140
J5 C3 Inlet Air, F	104.23	.208	40.130	.116
J6 C3 Airbox, F	178.48	.105	81.379	.058
Horsepower	167.35	.501	124.77	.373
Corrected Horsepower	178.35	.533	132.97	.398
BSFC, lb/hp-hr	.409	.012	.249	.007
Corrected BSFC	.383	.011	.233	.007
Relative Humidity	95.135	.163	95.135	.163
Reference Pressure, inHg	33.694		114.10	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1116

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.69 in-Hg
Speed :	2198 RPM
Load :	399.9 lb-ft
Fuel Flow :	68.4 lb/hr
Brake Power :	167.36 bhp
BSFC :	.409 lb/bhp-hr
Indicated Power :	22.94 kW/cyl
Peak Pressure :	9.624 MPa
Peak Rate of Pressure Rise:	526.3 kPa/deg
Peak Heat Release Rate :	47.7 Joules/deg
Cumulative Heat Release :	1252.21 Joules
Apparent Combustion Efficiency :	74.5 %
Indicated Thermal Efficiency :	37.2 %
Brake Thermal Efficiency :	33.8 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	197.7 degrees
Centroid Magnitude :	11.71 J/degree
Sensitivity :	29.1 degrees
Premixed/Diffusion Ratio :	.22712

870609.115820 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	76.880	.062	24.934	.034
Wet Bulb Temperature, F	75.611	.032	24.228	.018
P11-Baro (Vent), "Hg ABS	29.031	.000	98.308	.001
P3 C3 Fuel Pressure,psig	70.698	.133	487.44	.918
P4 C3 Oil Pressure, psig	44.296	.026	305.41	.181
P5 C3 Airbox Pres., psig	1.801	.010	12.419	.071
P10 C3 Exh Comm, inH2Og	14.435	.130	3.592	.032
P11 C3 Intake Vac,inH2Ov	5.663	.035	1.409	.009
P12 C3 Blowby, inH2Og	.005	.002	.001	.000
C3 Speed, RPM	1802.1	1.096	1802.1	1.096
C3 Fuel Flow, lb/hr	62.906	2.719	28.533	1.233
C3 Smoke, %	31.157	.480	31.157	.480
Cell 3 Load, lb-ft	403.36	.874	546.88	1.185
K1 C3 Exhaust 1, F	683.15	4.086	361.75	2.270
K2 C3 Exhaust 2, F	784.45	4.124	418.03	2.291
K3 C3 Exhaust 3, F	867.33	.721	464.07	.401
K4 C3 Exhaust 4, F	739.09	1.081	392.83	.600
K5 C3 Exhaust 5, F	911.76	1.042	488.76	.579
K6 C3 Exhaust 6, F	913.29	.536	489.61	.298
K7-C3 Exhaust Comm, F	385.00	3.074	196.11	1.708
J1 C3 Water In, F	152.40	.206	66.887	.115
J2 C3 Water Out, F	167.16	.214	75.089	.119
J3 C3 Oil Sump, F	234.55	1.193	112.53	.663
J4 C3 Fuel In, F	90.738	.246	32.632	.137
J5 C3 Inlet Air, F	98.429	.092	36.905	.051
J6 C3 Airbox, F	161.20	.262	71.778	.145
Horsepower	138.40	.369	103.19	.275
Corrected Horsepower	146.86	.391	109.50	.292
BSFC, lb/hp-hr	.455	.019	.277	.012
Corrected BSFC	.428	.018	.261	.011
Relative Humidity	94.384	.232	94.384	.232
Reference Pressure, inHg	32.281		109.32	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1118

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.28 in-Hg
Speed :	1802 RPM
Load :	403.4 lb-ft
Fuel Flow :	62.9 lb/hr
Brake Power :	138.41 bhp
BSFC :	.454 lb/bhp-hr
Indicated Power :	18.89 kW/cyl
Peak Pressure :	9.862 MPa
Peak Rate of Pressure Rise:	608.0 kPa/deg
Peak Heat Release Rate :	61.7 Joules/deg
Cumulative Heat Release :	1276.91 Joules
Apparent Combustion Efficiency :	67.7 %
Indicated Thermal Efficiency :	33.4 %
Brake Thermal Efficiency :	30.4 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	197.1 degrees
Centroid Magnitude :	12.91 J/degree
Sensitivity :	28.6 degrees
Premixed/Diffusion Ratio :	.22966

B70609.121600 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	77.392	.151	25.218	.084
Wet Bulb Temperature, F	75.698	.100	24.277	.056
P11-Baro (Vent), "Hg ABS	29.025	.000	98.291	.001
P3 C3 Fuel Pressure,psig	68.488	.090	472.21	.621
P4 C3 Oil Pressure, psig	33.660	.014	232.08	.096
P5 C3 Airbox Pres., psig	1.210	.009	8.346	.065
P10 C3 Exh Comm, inH20g	10.304	.138	2.564	.034
P11 C3 Intake Vac,inH20v	2.649	.049	.659	.012
P12 C3 Blowby, inH20g	.005	.002	.001	.000
C3 Speed, RPM	1398.4	2.029	1398.4	2.029
C3 Fuel Flow, lb/hr	54.621	2.585	24.775	1.173
C3 Smoke, %	61.933	.768	61.933	.768
Cell 3 Load, lb-ft	375.13	1.523	508.60	2.065
K1 C3 Exhaust 1, F	613.89	4.750	323.27	2.639
K2 C3 Exhaust 2, F	693.68	.590	367.60	.328
K3 C3 Exhaust 3, F	775.08	6.232	412.82	3.462
K4 C3 Exhaust 4, F	636.02	12.621	335.57	7.012
K5 C3 Exhaust 5, F	808.98	.936	431.66	.520
K6 C3 Exhaust 6, F	756.45	.811	402.47	.450
K7-C3 Exhaust Comm, F	347.44	.224	175.24	.124
J1 C3 Water In, F	153.40	.252	67.446	.140
J2 C3 Water Out, F	169.32	.152	76.288	.084
J3 C3 Oil Sump, F	227.52	17.595	108.62	9.775
J4 **C3 Fuel In, F**	**90.155**	.082	32.309	.045
J5 **C3 Inlet Air, F**	**90.500**	.166	36.**944**	**.092**
J6 **C3 Airbox, F**	**154.48**	.169	68.**042**	**.094**
Hor**sepower**	**99.879**	.395	74.**467**	**.295**
C**orrected Horsepower**	106.**00**	.420	79.**033**	**.313**
BSFC, lb/hp-hr	.547	.025	.333	.015
Corrected BSFC	.515	.024	.313	.014
Relative Humidity	92.586	.302	92.586	.302
Reference Pressure, inHg	31.295		105.98	

DETROIT DIESEL 6V–53N LOG SHEET

TEST NO. 1 FUEL BF-2 DATE 6-9-87 PAGE 2

AL-15299-F
BF02U13L86

Operator GRG							
Time	12:45	1:00	1:15	1:30	1:45	2:00	2:15
Test Hour							
Speed, RPM	2800	2500	2500	2000	2200	1800	1800
Load, lb–ft	351.7	384.2	285.9	404.0	287.4	401.9	274.1
Fuel Flow, lb/hr	82.5	78.5	53.6	70.6	37.1	61.2	35.4
Exh. Opacity, %	3.0	3.0	.05	7.1	.06	29.0	3.0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	760	590	720	500	660	500
Exhaust Cyl. L2	790	800	610	780	500	750	510
Exhaust Cyl. L3	860	900	690	890	550	850	570
Exhaust Cyl. R1	780	780	610	750	500	700	500
Exhaust Cyl. R2	860	890	690	900	550	890	610
Exhaust Cyl. R3	890	900	700	910	550	850	600
Exhaust Common	450	430	350	400	300	370	300
Water In	155	153	160	157	159	153	158
Water Out	169	167	170	168	169	167	170
Oil Sump	242	240	232	240	223	234	222
Fuel	93	92	92	92	91	92	89
Inlet Air	98	99	98	99	98	100	99
Airbox	186	180	169	173	157	161	152
Wet Bulb	74.5	75.0	75.8	76.0	76.0	75.1	75.8
Dry Bulb	79.5	80.0	80.5	81.2	81.0	81.5	82.0
PRESSURES, PSIG							
Oil Gallery	53.0	51.2	53.0	48.0	51.5	43.5	46.0
Air After Blower	5.0	4.0	3.7	3.0	2.8	2.0	1.7
Fuel Transfer	76.0	74.0	75.0	73.0	73.5	71.0	71.2
LOW PRESSURES							
Intake Vac., in.water	16.2	14.5	14.7	12.0	12.2	7.9	8.2
Exh. Comm., in.Water	26.5	22.0	18.5	17.5	14.0	12.5	10.0
Blowby, in.water	.1	.1	.1	.1	.1	.1	.1
Barometer, in.Hg	29.03	29.02	29.02	29.01	29.00	29.00	29.0

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL BF-2 DATE 6-9-87 PAGE 3

AL-15299-F
BF02V13L86

Operator GREG							
Time	2:30	2:45	3:00	3:10			
Test Hour							
Speed, RPM	1800	1800	1400	1400			
Load, lb-ft	147.3	60.4	37.4	98.2			
Fuel Flow, lb/hr	25.3	14.8	5.48	16.0			
Exh. Opacity, %	2.0	0	6.30	.2			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	380	310	600	350			
Exhaust Cyl. L2	380	300	650	310			
Exhaust Cyl. L3	410	350	750	350			
Exhaust Cyl. R1	360	250	640	290			
Exhaust Cyl. R2	380	250	780	290			
Exhaust Cyl. R3	390	270	730	300			
Exhaust Common	240	200	390	220			
Water In	161	166	155	160			
Water Out	169	173	170	168			
Oil Sump	213	207	230	204			
Fuel	89	91	91	90			
Inlet Air	97	97	97	100			
Airbox	150	144	156	148			
Wet Bulb	75.0	74.5	76.0	75.5			
Dry Bulb	81.5	80.0	80.5	82.0			
PRESSURES, PSIG							
Oil Gallery	47.5	48.5	33.5	38.0			
Air After Blower	1.8	1.8	1.3	1.3			
Fuel Transfer	72.2	72.5	69.0	70.0			
LOW PRESSURES							
Intake Vac., in.water	8.2	8.1	4.8	4.8			
Exh. Comm., in.Water	9.0	7.5	8.0	5.0			
Blowby, in.water	.1	.1	.1	.1			
Barometer, in.Hg	28.99	28.99	28.99	28.99			

870609.124531 AL-15299-F AL-12920-L 6V-53 1

Dry Bulb Temperature, F	78.687	.146	25.937	.081
Wet Bulb Temperature, F	76.570	.101	24.761	.056
P11-Baro (Vent), "Hg ABS	29.022	.000	98.280	.002
P3 C3 Fuel Pressure,psig	75.983	.465	523.88	3.203
P4 C3 Oil Pressure, psig	53.515	.023	368.98	.156
P5 C3 Airbox Pres., psig	4.796	.014	33.064	.096
P10 C3 Exh Comm, inH2Og	28.564	.232	7.108	.058
P11 C3 Intake Vac,inH2Ov	16.266	.087	4.048	.022
P12 C3 Blowby, inH2Og	.051	.001	.013	.000
C3 Speed, RPM	2800.9	1.500	2800.9	1.500
C3 Fuel Flow, lb/hr	78.823	2.747	35.753	1.246
C3 Smoke, %	2.340	.178	2.340	.178
Cell 3 Load, lb-ft	353.45	1.055	479.21	1.430
K1 C3 Exhaust 1, F	754.57	.390	401.43	.217
K2 C3 Exhaust 2, F	807.67	.754	430.93	.419
K3 C3 Exhaust 3, F	893.78	.323	478.77	.180
K4 C3 Exhaust 4, F	806.42	2.469	430.24	1.372
K5 C3 Exhaust 5, F	900.24	.532	482.35	.296
K6 C3 Exhaust 6, F	918.79	.588	492.66	.327
K7-C3 Exhaust Comm, F	452.45	.594	233.58	.330
J1 C3 Water In, F	156.37	.154	69.096	.085
J2 C3 Water Out, F	169.29	.100	76.274	.055
J3 C3 Oil Sump, F	243.13	.313	117.30	.174
J4 C3 Fuel In, F	93.752	.032	34.306	.018
J5 C3 Inlet Air, F	98.343	.080	36.857	.044
J6 C3 Airbox, F	186.18	.207	85.654	.115
Horsepower	188.50	.621	140.54	.463
Corrected Horsepower	200.20	.659	149.27	.491
BSFC, lb/hp-hr	.418	.015	.254	.009
Corrected BSFC	.394	.014	.240	.009
Relative Humidity	90.910	.472	90.910	.472
Reference Pressure, inHg	37.590		127.29	

HAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1122

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.59 in-Hg
Speed :	2801 RPM
Load :	353.5 lb-ft
Fuel Flow :	78.8 lb/hr
Brake Power :	188.53 bhp
BSFC :	.418 lb/bhp-hr
Indicated Power :	27.36 kW/cyl
Peak Pressure :	9.338 MPa
Peak Rate of Pressure Rise:	469.3 kPa/deg
Peak Heat Release Rate :	40.1 Joules/deg
Cumulative Heat Release :	1141.17 Joules
Apparent Combustion Efficiency :	75.1 %
Indicated Thermal Efficiency :	38.6 %
Brake Thermal Efficiency :	33.0 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	11.21 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.25751

870609.130207 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	78.674	.165	25.930	.092
Wet Bulb Temperature, F	76.284	.102	24.602	.057
P11-Baro (Vent), "Hg ABS	29.018	.000	98.265	.001
P3 C3 Fuel Pressure,psig	73.886	.214	509.42	1.478
P4 C3 Oil Pressure, psig	51.833	.028	357.38	.194
P5 C3 Airbox Pres., psig	3.752	.024	25.872	.168
P10 C3 Exh Comm, inH2Og	23.976	.218	5.966	.054
P11 C3 Intake Vac,inH2Ov	12.619	.085	3.140	.021
P12 C3 Blowby, inH2Og	.030	.004	.008	.001
C3 Speed, RPM	2500.4	1.914	2500.4	1.914
C3 Fuel Flow, lb/hr	76.402	2.405	34.655	1.091
C3 Smoke, %	2.485	.074	2.485	.074
Cell 3 Load, lb-ft	383.84	1.029	520.42	1.396
K1 C3 Exhaust 1, F	787.52	.302	419.73	.168
K2 C3 Exhaust 2, F	824.44	.393	440.24	.219
K3 C3 Exhaust 3, F	923.77	1.359	495.43	.755
K4 C3 Exhaust 4, F	806.69	1.554	430.38	.863
K5 C3 Exhaust 5, F	914.44	.413	490.24	.229
K6 C3 Exhaust 6, F	929.55	.467	498.64	.259
K7-C3 Exhaust Comm, F	438.72	.774	225.96	.430
J1 C3 Water In, F	153.31	.150	67.392	.083
J2 C3 Water Out, F	166.63	.210	74.792	.117
J3 C3 Oil Sump, F	240.85	.281	116.03	.156
J4 C3 Fuel In, F	92.694	.193	33.719	.107
J5 C3 Inlet Air, F	99.592	.160	37.551	.089
J6 C3 Airbox, F	181.25	.179	82.918	.099
Horsepower	182.74	.551	136.25	.411
Corrected Horsepower	194.26	.585	144.83	.436
BSFC, lb/hp-hr	.418	.013	.254	.008
Corrected BSFC	.393	.012	.239	.007
Relative Humidity	89.771	.289	89.771	.289
Reference Pressure, inHg	35.729		120.99	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1124

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.73 in-Hg
Speed :	2500 RPM
Load :	383.8 lb-ft
Fuel Flow :	76.4 lb/hr
Brake Power :	182.69 bhp
BSFC :	.418 lb/bhp-hr
Indicated Power :	25.68 kW/cyl
Peak Pressure :	9.485 MPa
Peak Rate of Pressure Rise:	510.0 kPa/deg
Peak Heat Release Rate :	44.8 Joules/deg
Cumulative Heat Release :	1232.16 Joules
Apparent Combustion Efficiency :	74.6 %
Indicated Thermal Efficiency :	37.3 %
Brake Thermal Efficiency :	33.0 %
Ignition Delay :	7.5 degrees
Centroid Phasing :	198.5 degrees
Centroid Magnitude :	11.65 J/degree
Sensitivity :	29.1 degrees
Premixed/Diffusion Ratio :	.25784

870609.131623 AL-15299-F AL-12920-L 6V-53 1

Dry Bulb Temperature, F	78.865	.084	26.036	.047
Wet Bulb Temperature, F	76.694	.050	24.830	.028
P11-Baro (Vent), "Hg ABS	29.015	.000	98.256	.001
P3 C3 Fuel Pressure,psig	74.576	.380	514.18	2.617
P4 C3 Oil Pressure, psig	53.410	.017	368.25	.118
P5 C3 Airbox Pres., psig	3.563	.022	24.565	.154
P10 C3 Exh Comm, inH2Og	20.812	.224	5.179	.056
P11 C3 Intake Vac,inH2Ov	12.822	.054	3.191	.013
P12 C3 Blowby, inH2Og	.029	.002	.007	.001
C3 Speed, RPM	2499.5	1.771	2499.5	1.771
C3 Fuel Flow, lb/hr	54.716	1.375	24.819	.624
C3 Smoke, %	.031	.057	.031	.057
Cell 3 Load, lb-ft	284.97	2.242	386.36	3.040
K1 C3 Exhaust 1, F	590.78	.377	310.44	.209
K2 C3 Exhaust 2, F	629.31	.526	331.84	.292
K3 C3 Exhaust 3, F	707.18	1.227	375.10	.682
K4 C3 Exhaust 4, F	633.76	.399	334.31	.222
K5 C3 Exhaust 5, F	709.91	.682	376.62	.379
K6 C3 Exhaust 6, F	720.63	.475	382.57	.264
K7-C3 Exhaust Comm, F	362.00	.572	183.34	.318
J1 C3 Water In, F	159.26	.040	70.698	.022
J2 C3 Water Out, F	170.59	.036	76.997	.020
J3 C3 Oil Sump, F	232.74	.190	111.52	.106
J4 C3 Fuel In, F	93.035	.079	33.909	.044
J5 C3 Inlet Air, F	98.459	.170	36.921	.095
J6 C3 Airbox, F	169.48	.444	76.377	.247
Horsepower	135.62	1.093	101.11	.815
Corrected Horsepower	144.11	1.162	107.44	.866
BSFC, lb/hp-hr	.403	.010	.245	.006
Corrected BSFC	.380	.009	.231	.006
Relative Humidity	90.705	.306	90.705	.306
Reference Pressure, inHg	35.326		119.63	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1126

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.33 in-Hg
Speed :	2500 RPM
Load :	285.0 lb-ft
Fuel Flow :	54.7 lb/hr
Brake Power :	135.66 bhp
BSFC :	.403 lb/bhp-hr
Indicated Power :	19.59 kW/cyl
Peak Pressure :	8.473 MPa
Peak Rate of Pressure Rise:	537.5 kPa/deg
Peak Heat Release Rate :	52.0 Joules/deg
Cumulative Heat Release :	922.590 Joules
Apparent Combustion Efficiency :	78.0 %
Indicated Thermal Efficiency :	39.8 %
Brake Thermal Efficiency :	34.2 %
Ignition Delay :	9.5 degrees
Centroid Phasing :	196.9 degrees
Centroid Magnitude :	11.13 J/degree
Sensitivity :	25.4 degrees
Premixed/Diffusion Ratio :	.37566

870609.133041 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	79.320	.094	26.289	.052
Wet Bulb Temperature, F	76.719	.115	24.844	.064
P11-Baro (Vent), "Hg ABS	29.007	.000	98.229	.002
P3 C3 Fuel Pressure,psig	72.635	.294	500.80	2.026
P4 C3 Oil Pressure, psig	48.634	.013	335.32	.090
P5 C3 Airbox Pres., psig	2.686	.013	18.519	.088
P10 C3 Exh Comm, inH2Og	19.599	.226	4.877	.056
P11 C3 Intake Vac,inH2Ov	9.997	.109	2.488	.027
P12 C3 Blowby, inH2Og	.023	.002	.006	.001
C3 Speed, RPM	2203.1	1.635	2203.1	1.635
C3 Fuel Flow, lb/hr	71.061	1.627	32.232	.738
C3 Smoke, %	6.622	.155	6.622	.155
Cell 3 Load, lb-ft	403.29	1.280	546.78	1.735
K1 C3 Exhaust 1, F	741.25	.381	394.03	.212
K2 C3 Exhaust 2, F	810.72	.314	432.62	.175
K3 C3 Exhaust 3, F	926.97	2.359	497.21	1.311
K4 C3 Exhaust 4, F	788.88	.481	420.49	.267
K5 C3 Exhaust 5, F	945.48	.613	507.49	.340
K6 C3 Exhaust 6, F	949.56	.287	509.75	.159
K7-C3 Exhaust Comm, F	414.21	.879	212.34	.488
J1 C3 Water In, F	153.74	.059	67.636	.033
J2 C3 Water Out, F	167.77	.093	75.428	.052
J3 C3 Oil Sump, F	240.03	.136	115.57	.076
J4 C3 Fuel In, F	92.247	.231	33.471	.129
J5 C3 Inlet Air, F	99.700	.127	37.611	.070
J6 C3 Airbox, F	173.20	.096	78.442	.053
Horsepower	169.17	.552	126.13	.412
Corrected Horsepower	179.98	.587	134.19	.438
BSFC, lb/hp-hr	.420	.009	.256	.005
Corrected BSFC	.395	.008	.240	.005
Relative Humidity	88.973	.288	88.973	.288
Reference Pressure, inHg	33.740		114.26	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1128

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.74 in-Hg
Speed :	2203 RPM
Load :	403.3 lb-ft
Fuel Flow :	71.1 lb/hr
Brake Power :	169.17 bhp
BSFC :	.420 lb/bhp-hr
Indicated Power :	22.83 kW/cyl
Peak Pressure :	9.689 MPa
Peak Rate of Pressure Rise:	527.3 kPa/deg
Peak Heat Release Rate :	47.6 Joules/deg
Cumulative Heat Release :	1238.72 Joules
Apparent Combustion Efficiency :	71.0 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	32.8 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	197.7 degrees
Centroid Magnitude :	11.78 J/degree
Sensitivity :	29.0 degrees
Premixed/Diffusion Ratio :	.23037

870609.134822 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	79.651	.065	26.473	.036
Wet Bulb Temperature, F	76.811	.060	24.895	.033
P11-Baro (Vent), "Hg ABS	29.002	.000	98.210	.001
P3 C3 Fuel Pressure,psig	73.294	.368	505.34	2.535
P4 C3 Oil Pressure, psig	52.116	.035	359.33	.243
P5 C3 Airbox Pres., psig	2.480	.008	17.096	.056
P10 C3 Exh Comm, inH2Og	15.736	.192	3.916	.048
P11 C3 Intake Vac,inH2Ov	10.330	.044	2.571	.011
P12 C3 Blowby, inH2Og	.021	.002	.005	.001
C3 Speed, RPM	2198.0	1.681	2198.0	1.681
C3 Fuel Flow, lb/hr	39.447	2.080	17.893	.944
C3 Smoke, %	.441	.068	.441	.068
Cell 3 Load, lb-ft	227.39	1.644	308.30	2.229
K1 C3 Exhaust 1, F	508.13	4.359	264.52	2.422
K2 C3 Exhaust 2, F	517.63	.343	269.80	.191
K3 C3 Exhaust 3, F	570.92	4.510	299.40	2.505
K4 C3 Exhaust 4, F	520.38	3.933	271.32	2.185
K5 C3 Exhaust 5, F	573.59	.792	300.88	.440
K6 C3 Exhaust 6, F	573.97	.704	301.09	.391
K7-C3 Exhaust Comm, F	297.32	1.130	147.40	.628
J1 C3 Water In, F	159.80	.095	71.001	.053
J2 C3 Water Out, F	169.55	.202	76.417	.112
J3 C3 Oil Sump, F	222.74	.105	105.96	.058
J4 C3 Fuel In, F	90.560	.047	32.534	.026
J5 C3 Inlet Air, F	98.139	.115	36.744	.064
J6 C3 Airbox, F	156.64	.122	69.245	.068
Horsepower	95.166	.675	70.954	.503
Corrected Horsepower	101.13	.718	75.400	.535
BSFC, lb/hp-hr	.415	.022	.252	.013
Corrected BSFC	.390	.021	.237	.013
Relative Humidity	88.033	.123	88.033	.123
Reference Pressure, inHg	33.290		112.73	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1130

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.29 in-Hg
Speed :	2198 RPM
Load :	227.4 lb-ft
Fuel Flow :	39.4 lb/hr
Brake Power :	95.17 bhp
BSFC :	.414 lb/bhp-hr
Indicated Power :	13.98 kW/cyl
Peak Pressure :	7.899 MPa
Peak Rate of Pressure Rise:	599.3 kPa/deg
Peak Heat Release Rate :	62.4 Joules/deg
Cumulative Heat Release :	725.703 Joules
Apparent Combustion Efficiency :	74.9 %
Indicated Thermal Efficiency :	39.4 %
Brake Thermal Efficiency :	33.3 %
Ignition Delay :	10.1 degrees
Centroid Phasing :	194.8 degrees
Centroid Magnitude :	11.71 J/degree
Sensitivity :	22.7 degrees
Premixed/Diffusion Ratio :	.44725

870609.140444 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	80.010	.133	26.672	.074
Wet Bulb Temperature, F	76.988	.061	24.994	.034
P11-Baro (Vent), "Hg ABS	29.000	.000	98.204	.001
P3 C3 Fuel Pressure,psig	70.558	.075	486.48	.516
P4 C3 Oil Pressure, psig	44.235	.020	304.99	.135
P5 C3 Airbox Pres., psig	1.765	.010	12.166	.067
P10 C3 Exh Comm, inH2Og	14.416	.129	3.587	.032
P11 C3 Intake Vac,inH2Ov	6.099	.032	1.518	.008
P12 C3 Blowby, inH2Og	.021	.001	.005	.000
C3 Speed, RPM	1799.5	1.453	1799.5	1.453
C3 Fuel Flow, lb/hr	62.568	2.194	28.381	.995
C3 Smoke, %	29.339	.384	29.339	.384
Cell 3 Load, lb-ft	400.50	.934	543.00	1.266
K1 C3 Exhaust 1, F	673.92	.327	356.62	.182
K2 C3 Exhaust 2, F	778.58	.257	414.76	.143
K3 C3 Exhaust 3, F	869.62	.682	465.35	.379
K4 C3 Exhaust 4, F	732.92	.454	389.40	.252
K5 C3 Exhaust 5, F	913.84	.967	489.91	.537
K6 C3 Exhaust 6, F	909.79	.341	487.66	.190
K7-C3 Exhaust Comm, F	383.56	.380	195.31	.211
J1 C3 Water In, F	153.81	.099	67.672	.055
J2 C3 Water Out, F	168.22	.072	75.679	.040
J3 C3 Oil Sump, F	234.27	.168	112.37	.094
J4 C3 Fuel In, F	91.441	.066	33.023	.036
J5 C3 Inlet Air, F	100.35	.130	37.972	.072
J6 C3 Airbox, F	160.83	.318	71.574	.177
Horsepower	137.22	.336	102.31	.251
Corrected Horsepower	146.14	.358	108.96	.267
BSFC, lb/hp-hr	.456	.016	.277	.010
Corrected BSFC	.428	.015	.260	.009
Relative Humidity	87.345	.295	87.345	.295
Reference Pressure, inHg	32.144		108.85	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1132

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.14 in-Hg
Speed :	1800 RPM
Load :	400.5 lb-ft
Fuel Flow :	62.6 lb/hr
Brake Power :	137.26 bhp
BSFC :	.456 lb/bhp-hr
Indicated Power :	18.47 kW/cyl
Peak Pressure :	9.848 MPa
Peak Rate of Pressure Rise:	617.6 kPa/deg
Peak Heat Release Rate :	63.4 Joules/deg
Cumulative Heat Release :	1208.89 Joules
Apparent Combustion Efficiency :	64.3 %
Indicated Thermal Efficiency :	32.8 %
Brake Thermal Efficiency :	30.3 %
Ignition Delay :	6.5 degrees
Centroid Phasing :	195.8 degrees
Centroid Magnitude :	13.17 J/degree
Sensitivity :	27.3 degrees
Premixed/Diffusion Ratio :	.23968

870609.141845 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	80.860	.334	27.144	.186
Wet Bulb Temperature, F	77.043	.146	25.024	.081
P11-Baro (Vent), "Hg ABS	28.997	.000	98.194	.001
P3 C3 Fuel Pressure,psig	71.092	.312	490.16	2.151
P4 C3 Oil Pressure, psig	46.366	.013	319.68	.087
P5 C3 Airbox Pres., psig	1.555	.009	10.722	.062
P10 C3 Exh Comm, inH20g	12.283	.150	3.056	.037
P11 C3 Intake Vac,inH20v	6.445	.054	1.604	.013
P12 C3 Blowby, inH20g	.016	.001	.004	.000
C3 Speed, RPM	1800.2	1.185	1800.2	1.185
C3 Fuel Flow, lb/hr	36.665	1.663	16.631	.754
C3 Smoke, %	2.882	.054	2.882	.054
Cell 3 Load, lb-ft	274.67	.626	372.41	.849
K1 C3 Exhaust 1, F	495.03	.346	257.24	.192
K2 C3 Exhaust 2, F	534.04	.210	278.91	.117
K3 C3 Exhaust 3, F	588.47	.777	309.15	.432
K4 C3 Exhaust 4, F	523.93	.254	273.29	.141
K5 C3 Exhaust 5, F	637.40	.307	336.33	.171
K6 C3 Exhaust 6, F	618.37	.378	325.76	.210
K7-C3 Exhaust Comm, F	304.27	1.223	151.26	.679
J1 C3 Water In, F	158.68	.082	70.376	.046
J2 C3 Water Out, F	169.49	.090	76.382	.050
J3 C3 Oil Sump, F	222.27	.102	105.70	.057
J4 C3 Fuel In, F	89.756	.054	32.087	.030
J5 C3 Inlet Air, F	99.490	.139	37.494	.077
J6 C3 Airbox, F	153.45	.424	67.473	.235
Horsepower	94.151	.219	70.197	.163
Corrected Horsepower	100.18	.233	74.690	.173
BSFC, lb/hp-hr	.389	.018	.237	.011
Corrected BSFC	.366	.017	.223	.010
Relative Humidity	84.301	.800	84.301	.800
Reference Pressure, inHg	31.689		107.31	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1134

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.69 in-Hg
Speed :	1800 RPM
Load :	274.7 lb-ft
Fuel Flow :	36.7 lb/hr
Brake Power :	94.15 bhp
BSFC :	.390 lb/bhp-hr
Indicated Power :	12.66 kW/cyl
Peak Pressure :	8.166 MPa
Peak Rate of Pressure Rise:	599.0 kPa/deg
Peak Heat Release Rate :	61.8 Joules/deg
Cumulative Heat Release :	813.518 Joules
Apparent Combustion Efficiency :	73.8 %
Indicated Thermal Efficiency :	38.3 %
Brake Thermal Efficiency :	35.4 %
Ignition Delay :	9.2 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	12.06 J/degree
Sensitivity :	23.5 degrees
Premixed/Diffusion Ratio :	.39075

870609.142946 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	80.373	.088	26.874	.049
Wet Bulb Temperature, F	76.841	.029	24.912	.016
P11-Baro (Vent), "Hg ABS	28.990	.000	98.173	.001
P3 C3 Fuel Pressure,psig	71.891	.126	495.67	.869
P4 C3 Oil Pressure, psig	47.749	.031	329.22	.214
P5 C3 Airbox Pres., psig	1.553	.009	10.711	.059
P10 C3 Exh Comm, inH2Og	10.507	.080	2.614	.020
P11 C3 Intake Vac,inH2Ov	6.551	.053	1.630	.013
P12 C3 Blowby, inH2Og	.017	.001	.004	.000
C3 Speed, RPM	1798.4	1.172	1798.4	1.172
C3 Fuel Flow, lb/hr	23.483	1.383	10.652	.627
C3 Smoke, %	2.767	.104	2.767	.104
Cell 3 Load, lb-ft	146.89	.918	199.15	1.244
K1 C3 Exhaust 1, F	382.44	.318	194.69	.177
K2 C3 Exhaust 2, F	391.62	.941	199.79	.523
K3 C3 Exhaust 3, F	427.70	.686	219.83	.381
K4 C3 Exhaust 4, F	380.04	.504	193.36	.280
K5 C3 Exhaust 5, F	400.57	.451	204.76	.251
K6 C3 Exhaust 6, F	401.65	.530	205.36	.295
K7-C3 Exhaust Comm, F	251.65	2.058	122.03	1.143
J1 C3 Water In, F	161.13	.073	71.737	.041
J2 C3 Water Out, F	169.66	.032	76.476	.018
J3 C3 Oil Sump, F	214.34	.177	101.30	.098
J4 C3 Fuel In, F	89.512	.033	31.951	.019
J5 C3 Inlet Air, F	98.221	.207	36.789	.115
J6 C3 Airbox, F	150.26	.104	65.698	.058
Horsepower	50.296	.299	37.500	.223
Corrected Horsepower	53.461	.318	39.859	.237
BSFC, lb/hp-hr	.467	.027	.284	.016
Corrected BSFC	.439	.025	.267	.016
Relative Humidity	85.350	.267	85.350	.267
Reference Pressure, inHg	31.671		107.25	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1136

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.67 in-Hg
Speed :	1798 RPM
Load :	146.9 lb-ft
Fuel Flow :	23.5 lb/hr
Brake Power :	50.29 bhp
BSFC :	.467 lb/bhp-hr
Indicated Power :	8.32 kW/cyl
Peak Pressure :	7.171 MPa
Peak Rate of Pressure Rise:	688.1 kPa/deg
Peak Heat Release Rate :	77.3 Joules/deg
Cumulative Heat Release :	559.932 Joules
Apparent Combustion Efficiency :	79.3 %
Indicated Thermal Efficiency :	39.3 %
Brake Thermal Efficiency :	29.5 %
Ignition Delay :	11.0 degrees
Centroid Phasing :	195.3 degrees
Centroid Magnitude :	13.98 J/degree
Sensitivity :	22.3 degrees
Premixed/Diffusion Ratio :	.49248

870609.144322 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	80.526	.067	26.959	.037
Wet Bulb Temperature, F	76.534	.020	24.741	.011
P11-Baro (Vent), "Hg ABS	28.986	.000	98.157	.001
P3 C3 Fuel Pressure,psig	72.183	.202	497.69	1.391
P4 C3 Oil Pressure, psig	48.642	.067	335.38	.462
P5 C3 Airbox Pres., psig	1.634	.005	11.267	.032
P10 C3 Exh Comm, inH2Og	9.532	.138	2.372	.034
P11 C3 Intake Vac,inH2Ov	6.537	.081	1.627	.020
P12 C3 Blowby, inH2Og	.009	.001	.002	.000
C3 Speed, RPM	1793.2	6.792	1793.2	6.792
C3 Fuel Flow, lb/hr	15.480	1.595	7.022	.723
C3 Smoke, %	-.127	.044	-.127	.044
Cell 3 Load, lb-ft	60.022	.414	81.378	.561
K1 C3 Exhaust 1, F	324.51	1.608	162.51	.893
K2 C3 Exhaust 2, F	316.55	1.773	158.08	.985
K3 C3 Exhaust 3, F	348.38	.242	175.77	.134
K4 C3 Exhaust 4, F	265.34	.779	129.63	.433
K5 C3 Exhaust 5, F	265.68	.265	129.82	.147
K6 C3 Exhaust 6, F	279.00	.248	137.22	.138
K7-C3 Exhaust Comm, F	195.47	.877	90.815	.487
J1 C3 Water In, F	166.60	.089	74.779	.049
J2 C3 Water Out, F	173.74	.049	78.746	.027
J3 C3 Oil Sump, F	208.35	.173	97.971	.096
J4 C3 Fuel In, F	91.258	.018	32.921	.010
J5 C3 Inlet Air, F	97.543	.067	36.413	.037
J6 C3 Airbox, F	145.61	.290	63.114	.161
Horsepower	20.494	.206	15.280	.154
Corrected Horsepower	21.763	.219	16.226	.163
BSFC, lb/hp-hr	.756	.083	.460	.051
Corrected BSFC	.712	.078	.433	.048
Relative Humidity	83.547	.217	83.547	.217
Reference Pressure, inHg	31.832		107.80	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1138

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.83 in-Hg
Speed :	1793 RPM
Load :	60.0 lb-ft
Fuel Flow :	15.5 lb/hr
Brake Power :	20.48 bhp
BSFC :	.757 lb/bhp-hr
Indicated Power :	5.76 kW/cyl
Peak Pressure :	6.652 MPa
Peak Rate of Pressure Rise:	624.9 kPa/deg
Peak Heat Release Rate :	70.2 Joules/deg
Cumulative Heat Release :	422.158 Joules
Apparent Combustion Efficiency :	90.4 %
Indicated Thermal Efficiency :	41.3 %
Brake Thermal Efficiency :	18.2 %
Ignition Delay :	11.6 degrees
Centroid Phasing :	200.9 degrees
Centroid Magnitude :	13.24 J/degree
Sensitivity :	27.3 degrees
Premixed/Diffusion Ratio :	.42406

870609.145643 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	78.274	.076	25.708	.042
Wet Bulb Temperature, F	76.775	.108	24.875	.060
P11-Baro (Vent), "Hg ABS	28.986	.000	98.157	.001
P3 C3 Fuel Pressure,psig	68.311	.104	470.99	.714
P4 C3 Oil Pressure, psig	33.991	.038	234.36	.263
P5 C3 Airbox Pres., psig	1.202	.009	8.285	.061
P10 C3 Exh Comm, inH20g	10.357	.147	2.577	.037
P11 C3 Intake Vac,inH20v	3.318	.028	.826	.007
P12 C3 Blowby, inH20g	.021	.003	.005	.001
C3 Speed, RPM	1399.6	1.700	1399.6	1.700
C3 Fuel Flow, lb/hr	52.744	1.666	23.924	.756
C3 Smoke, %	62.428	.761	62.428	.761
Cell 3 Load, lb-ft	374.15	1.456	507.28	1.975
K1 C3 Exhaust 1, F	613.03	.327	322.79	.182
K2 C3 Exhaust 2, F	681.97	.337	361.09	.187
K3 C3 Exhaust 3, F	783.42	.691	417.46	.384
K4 C3 Exhaust 4, F	659.08	.613	348.38	.340
K5 C3 Exhaust 5, F	807.06	.686	430.59	.381
K6 C3 Exhaust 6, F	757.00	.741	402.78	.411
K7-C3 Exhaust Comm, F	328.29	1.629	164.60	.905
J1 C3 Water In, F	154.79	.050	68.217	.028
J2 C3 Water Out, F	170.09	.044	76.716	.025
J3 C3 Oil Sump, F	230.62	.123	110.34	.068
J4 C3 Fuel In, F	90.810	.027	32.672	.015
J5 C3 Inlet Air, F	97.978	.324	36.654	.180
J6 C3 Airbox, F	155.84	.179	68.800	.099
Horsepower	99.707	.435	74.339	.324
Corrected Horsepower	106.05	.463	79.068	.345
BSFC, lb/hp-hr	.529	.018	.322	.011
Corrected BSFC	.497	.017	.303	.010
Relative Humidity	93.494	.698	93.494	.698
Reference Pressure, inHg	31.188		105.62	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1140

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.19 in-Hg
Speed :	1400 RPM
Load :	374.2 lb-ft
Fuel Flow :	52.7 lb/hr
Brake Power :	99.75 bhp
BSFC :	.528 lb/bhp-hr
Indicated Power :	14.07 kW/cyl
Peak Pressure :	10.17 MPa
Peak Rate of Pressure Rise:	709.6 kPa/deg
Peak Heat Release Rate :	77.7 Joules/deg
Cumulative Heat Release :	1215.92 Joules
Apparent Combustion Efficiency :	59.8 %
Indicated Thermal Efficiency :	29.6 %
Brake Thermal Efficiency :	26.1 %
Ignition Delay :	5.7 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	14.26 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.20768

870609.150702 AL-15299-F AL-12920-L 6V-53 1

Dry Bulb Temperature, F	75.820	.054	24.345	.030
Wet Bulb Temperature, F	74.906	.022	23.837	.012
P11-Baro (Vent), "Hg ABS	28.987	.001	98.162	.002
P3 C3 Fuel Pressure,psig	69.694	.101	480.52	.695
P4 C3 Oil Pressure, psig	38.983	.069	268.78	.477
P5 C3 Airbox Pres., psig	1.152	.004	7.942	.030
P10 C3 Exh Comm, inH2Og	7.221	.076	1.797	.019
P11 C3 Intake Vac,inH2Ov	3.366	.038	.838	.010
P12 C3 Blowby, inH2Og	.030	.004	.008	.001
C3 Speed, RPM	1400.2	.781	1400.2	.781
C3 Fuel Flow, lb/hr	15.356	2.218	6.965	1.006
C3 Smoke, %	.484	.038	.484	.038
Cell 3 Load, lb-ft	97.086	.622	131.63	.843
K1 C3 Exhaust 1, F	336.88	.376	169.38	.209
K2 C3 Exhaust 2, F	322.11	1.006	161.17	.559
K3 C3 Exhaust 3, F	362.98	.619	183.88	.344
K4 C3 Exhaust 4, F	284.63	.302	140.35	.168
K5 C3 Exhaust 5, F	289.37	.321	142.98	.178
K6 C3 Exhaust 6, F	304.65	.317	151.47	.176
K7-C3 Exhaust Comm, F	236.75	3.694	113.75	2.052
J1 C3 Water In, F	160.01	.055	71.116	.031
J2 C3 Water Out, F	168.16	.101	75.645	.056
J3 C3 Oil Sump, F	206.23	.452	96.795	.251
J4 C3 Fuel In, F	90.339	.052	32.410	.029
J5 C3 Inlet Air, F	101.46	.286	38.589	.159
J6 C3 Airbox, F	147.95	.160	64.417	.089
Horsepower	25.883	.170	19.298	.126
Corrected Horsepower	27.565	.181	20.552	.135
BSFC, lb/hp-hr	.593	.086	.361	.053
Corrected BSFC	.557	.081	.339	.049
Relative Humidity	95.891	.257	95.891	.257
Reference Pressure, inHg	31.085		105.26	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1142

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.09 in-Hg
Speed :	1400 RPM
Load :	97.1 lb-ft
Fuel Flow :	15.4 lb/hr
Brake Power :	25.88 bhp
BSFC :	.595 lb/bhp-hr
Indicated Power :	5.21 kW/cyl
Peak Pressure :	6.792 MPa
Peak Rate of Pressure Rise:	727.9 kPa/deg
Peak Heat Release Rate :	83.3 Joules/deg
Cumulative Heat Release :	427.461 Joules
Apparent Combustion Efficiency :	71.9 %
Indicated Thermal Efficiency :	37.6 %
Brake Thermal Efficiency :	23.2 %
Ignition Delay :	10.6 degrees
Centroid Phasing :	190.6 degrees
Centroid Magnitude :	17.05 J/degree
Sensitivity :	18.0 degrees
Premixed/Diffusion Ratio :	.59006

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL BF-2 NL-1525-F DATE 6-10-87 PAGE 4

BF62V13L86

Operator Greg							
Time	10:25	10:40	10:55	11:10	11:25		
Test Hour							
Speed, RPM	2800	2500	2200	1810	1400		
Load, lb-ft	350.1	381.2	401.5	401.4	370.9		
Fuel Flow, lb/hr	78.2	74.5	69.7	67.0	50.3		
Exh. Opacity, %	3.0	4.0	7.5	22.0	57.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	760	730	660	600		
Exhaust Cyl. L2	780	800	790	750	670		
Exhaust Cyl. L3	860	900	900	850	750		
Exhaust Cyl. R1	790	780	750	690	620		
Exhaust Cyl. R2	870	890	910	890	770		
Exhaust Cyl. R3	900	900	910	890	720		
Exhaust Common	450	440	400	370	340		
Water In	157	154	154	154	154		
Water Out	170	167	169	169	169		
Oil Sump	243	241	240	235	236		
Fuel	92	92	92	91	90		
Inlet Air	97	99	100	98	100		
Airbox	184	180	174	158	156		
Wet Bulb	74.5	74.0	75.5	74.5	75.0		
Dry Bulb	78.5	78.0	78.0	78.8	79.0		
PRESSURES, PSIG							
Oil Gallery	53.2	52.0	48.5	44.0	33.5		
Air After Blower	5.0	4.0	2.9	2.0	1.3		
Fuel Transfer	75.5	74.0	73.0	71.0	69.		
LOW PRESSURES							
Intake Vac., in.water	16.8	14.6	12.0	8.0	4.7		
Exh. Comm., in.Water	26.5	21.5	17.0	12.5	8.0		
Blowby, in.water	.1	.1	.1	.1	.1		
Barometer, in.Hg	28.99	28.99	28.98	28.98	28.98		

870610.102617 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	79.649	.097	26.472	.054
Wet Bulb Temperature, F	77.898	.020	25.499	.011
P11-Baro (Vent), "Hg ABS	28.987	.000	98.162	.001
P3 C3 Fuel Pressure,psig	75.187	.377	518.40	2.597
P4 C3 Oil Pressure, psig	53.816	.010	371.05	.070
P5 C3 Airbox Pres., psig	4.771	.015	32.898	.103
P10 C3 Exh Comm, inH2Og	27.957	.241	6.957	.060
P11 C3 Intake Vac,inH2Ov	16.820	.093	4.185	.023
P12 C3 Blowby, inH2Og	.042	.002	.010	.001
C3 Speed, RPM	2800.6	3.237	2800.6	3.237
C3 Fuel Flow, lb/hr	78.659	2.894	35.679	1.313
C3 Smoke, %	2.256	.177	2.256	.177
Cell 3 Load, lb-ft	348.16	1.471	472.04	1.994
K1 C3 Exhaust 1, F	755.17	.825	401.76	.459
K2 C3 Exhaust 2, F	806.33	.366	430.18	.204
K3 C3 Exhaust 3, F	890.39	2.887	476.88	1.604
K4 C3 Exhaust 4, F	816.72	.812	435.96	.451
K5 C3 Exhaust 5, F	905.53	.418	485.29	.232
K6 C3 Exhaust 6, F	922.56	.389	494.75	.216
K7-C3 Exhaust Comm, F	462.99	.605	239.44	.336
J1 C3 Water In, F	157.28	.069	69.602	.038
J2 C3 Water Out, F	170.42	.037	76.899	.020
J3 C3 Oil Sump, F	243.73	.162	117.63	.090
J4 C3 Fuel In, F	92.440	.055	33.578	.031
J5 C3 Inlet Air, F	98.405	.248	36.892	.138
J6 C3 Airbox, F	184.52	.104	84.731	.058
Horsepower	185.66	.904	138.42	.674
Corrected Horsepower	197.76	.963	147.45	.718
BSFC, lb/hp-hr	.424	.016	.258	.010
Corrected BSFC	.398	.015	.242	.009
Relative Humidity	92.536	.383	92.536	.383
Reference Pressure, inHg	37.465		126.87	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1144

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.47 in-Hg
Speed :	2801 RPM
Load :	348.2 lb-ft
Fuel Flow :	78.7 lb/hr
Brake Power :	185.70 bhp
BSFC :	.424 lb/bhp-hr
Indicated Power :	27.34 kW/cyl
Peak Pressure :	9.327 MPa
Peak Rate of Pressure Rise:	472.9 kPa/deg
Peak Heat Release Rate :	40.1 Joules/deg
Cumulative Heat Release :	1135.17 Joules
Apparent Combustion Efficiency :	74.8 %
Indicated Thermal Efficiency :	38.6 %
Brake Thermal Efficiency :	32.6 %
Ignition Delay :	7.7 degrees
Centroid Phasing :	199.2 degrees
Centroid Magnitude :	11.32 J/degree
Sensitivity :	29.5 degrees
Premixed/Diffusion Ratio :	.26025

870610.104214 AL-15299-F AL-12920-L 6V-53 1

Dry Bulb Temperature, F	79.998	.061	26.665	.034
Wet Bulb Temperature, F	77.804	.060	25.447	.033
P11-Baro (Vent), "Hg ABS	28.986	.001	98.157	.002
P3 C3 Fuel Pressure,psig	73.928	.713	509.72	4.918
P4 C3 Oil Pressure, psig	52.276	.012	360.43	.084
P5 C3 Airbox Pres., psig	3.743	.019	25.810	.128
P10 C3 Exh Comm, inH2Og	23.600	.190	5.873	.047
P11 C3 Intake Vac,inH2Ov	13.138	.115	3.269	.029
P12 C3 Blowby, inH2Og	.024	.003	.006	.001
C3 Speed, RPM	2505.2	2.647	2505.2	2.647
C3 Fuel Flow, lb/hr	77.393	2.020	35.105	.916
C3 Smoke, %	3.553	.117	3.553	.117
Cell 3 Load, lb-ft	382.24	.874	518.24	1.185
K1 C3 Exhaust 1, F	790.38	6.636	421.32	3.687
K2 C3 Exhaust 2, F	824.01	.391	440.00	.217
K3 C3 Exhaust 3, F	927.01	4.502	497.23	2.501
K4 C3 Exhaust 4, F	812.71	.432	433.73	.240
K5 C3 Exhaust 5, F	920.26	.229	493.48	.127
K6 C3 Exhaust 6, F	935.40	.622	501.89	.346
K7-C3 Exhaust Comm, F	447.89	3.886	231.05	2.159
J1 C3 Water In, F	154.49	.221	68.047	.123
J2 C3 Water Out, F	168.17	.217	75.650	.121
J3 C3 Oil Sump, F	242.07	.229	116.71	.127
J4 C3 Fuel In, F	92.920	.147	33.845	.081
J5 C3 Inlet Air, F	99.780	.111	37.655	.062
J6 C3 Airbox, F	180.71	.164	82.616	.091
Horsepower	182.33	.475	135.94	.354
Corrected Horsepower	194.42	.507	144.95	.378
BSFC, lb/hp-hr	.424	.012	.258	.007
Corrected BSFC	.398	.011	.242	.007
Relative Humidity	90.731	.128	90.731	.128
Reference Pressure, inHg	35.641		120.69	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1146

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.64 in-Hg
Speed :	2505 RPM
Load :	382.2 lb-ft
Fuel Flow :	77.4 lb/hr
Brake Power :	182.29 bhp
BSFC :	.425 lb/bhp-hr
Indicated Power :	25.43 kW/cyl
Peak Pressure :	9.484 MPa
Peak Rate of Pressure Rise:	528.7 kPa/deg
Peak Heat Release Rate :	47.5 Joules/deg
Cumulative Heat Release :	1222.48 Joules
Apparent Combustion Efficiency :	73.2 %
Indicated Thermal Efficiency :	36.5 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	7.5 degrees
Centroid Phasing :	198.5 degrees
Centroid Magnitude :	11.63 J/degree
Sensitivity :	29.0 degrees
Premixed/Diffusion Ratio :	.25868

870610.105626 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	80.580	.092	26.989	.051
Wet Bulb Temperature, F	78.354	.017	25.752	.009
P11-Baro (Vent), "Hg ABS	28.982	.000	98.145	.002
P3 C3 Fuel Pressure,psig	72.425	.225	499.36	1.553
P4 C3 Oil Pressure, psig	49.024	.012	338.01	.082
P5 C3 Airbox Pres., psig	2.660	.010	18.339	.072
P10 C3 Exh Comm, inH20g	19.040	.188	4.738	.047
P11 C3 Intake Vac,inH20v	10.431	.078	2.596	.019
P12 C3 Blowby, inH20g	.012	.001	.003	.000
C3 Speed, RPM	2201.4	1.474	2201.4	1.474
C3 Fuel Flow, lb/hr	71.149	2.641	32.273	1.198
C3 Smoke, %	7.476	.139	7.476	.139
Cell 3 Load, lb-ft	400.40	.572	542.87	.776
K1 C3 Exhaust 1, F	751.54	7.589	399.74	4.216
K2 C3 Exhaust 2, F	807.82	8.248	431.01	4.582
K3 C3 Exhaust 3, F	929.76	2.869	498.76	1.594
K4 C3 Exhaust 4, F	791.32	.350	421.84	.194
K5 C3 Exhaust 5, F	949.77	.187	509.87	.104
K6 C3 Exhaust 6, F	950.31	.302	510.17	.168
K7-C3 Exhaust Comm, F	423.39	.437	217.44	.243
J1 C3 Water In, F	154.81	.172	68.227	.095
J2 C3 Water Out, F	169.28	.179	76.265	.099
J3 C3 Oil Sump, F	241.80	.201	116.56	.111
J4 C3 Fuel In, F	92.140	.083	33.411	.046
J5 C3 Inlet Air, F	100.48	.162	38.045	.090
J6 C3 Airbox, F	174.97	.106	79.429	.059
Horsepower	167.83	.281	125.13	.209
Corrected Horsepower	179.20	.300	133.61	.223
BSFC, lb/hp-hr	.424	.016	.258	.010
Corrected BSFC	.397	.015	.242	.009
Relative Humidity	90.658	.362	90.658	.362
Reference Pressure, inHg	33.631		113.89	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1148

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.63 in-Hg
Speed :	2201 RPM
Load :	400.4 lb-ft
Fuel Flow :	71.1 lb/hr
Brake Power :	167.80 bhp
BSFC :	.424 lb/bhp-hr
Indicated Power :	22.80 kW/cyl
Peak Pressure :	9.695 MPa
Peak Rate of Pressure Rise:	551.5 kPa/deg
Peak Heat Release Rate :	51.6 Joules/deg
Cumulative Heat Release :	1249.31 Joules
Apparent Combustion Efficiency :	71.6 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	32.6 %
Ignition Delay :	6.8 degrees
Centroid Phasing :	197.7 degrees
Centroid Magnitude :	11.93 J/degree
Sensitivity :	28.8 degrees
Premixed/Diffusion Ratio :	.23710

870610.111216 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	80.218	.132	26.788	.073
Wet Bulb Temperature, F	77.691	.028	25.384	.016
P11-Baro (Vent), "Hg ABS	28.985	.000	98.154	.001
P3 C3 Fuel Pressure,psig	70.482	.105	485.96	.726
P4 C3 Oil Pressure, psig	44.827	.091	309.07	.627
P5 C3 Airbox Pres., psig	1.791	.012	12.348	.085
P10 C3 Exh Comm, inH2Og	14.193	.107	3.532	.027
P11 C3 Intake Vac,inH2Ov	6.547	.080	1.629	.020
P12 C3 Blowby, inH2Og	.005	.001	.001	.000
C3 Speed, RPM	1815.8	7.136	1815.8	7.136
C3 Fuel Flow, lb/hr	61.471	1.703	27.883	.772
C3 Smoke, %	21.037	.517	21.037	.517
Cell 3 Load, lb-ft	400.56	.737	543.08	.999
K1 C3 Exhaust 1, F	677.54	.332	358.63	.185
K2 C3 Exhaust 2, F	785.32	.372	418.51	.206
K3 C3 Exhaust 3, F	873.91	.640	467.73	.355
K4 C3 Exhaust 4, F	711.02	6.958	377.23	3.865
K5 C3 Exhaust 5, F	915.75	.432	490.97	.240
K6 C3 Exhaust 6, F	915.83	1.681	491.02	.934
K7-C3 Exhaust Comm, F	383.45	.431	195.25	.240
J1 C3 Water In, F	154.57	.054	68.094	.030
J2 C3 Water Out, F	169.18	.043	76.214	.024
J3 C3 Oil Sump, F	236.38	.276	113.55	.153
J4 C3 Fuel In, F	91.563	.023	33.090	.013
J5 C3 Inlet Air, F	98.715	.108	37.064	.060
J6 C3 Airbox, F	160.90	.451	71.611	.250
Horsepower	138.49	.759	103.25	.566
Corrected Horsepower	147.49	.808	109.97	.603
BSFC, lb/hp-hr	.444	.012	.270	.007
Corrected BSFC	.417	.011	.254	.007
Relative Humidity	89.387	.434	89.387	.434
Reference Pressure, inHg	32.150		108.87	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1150

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.15 in-Hg
Speed :	1815 RPM
Load :	400.6 lb-ft
Fuel Flow :	61.5 lb/hr
Brake Power :	138.44 bhp
BSFC :	.444 lb/bhp-hr
Indicated Power :	18.60 kW/cyl
Peak Pressure :	9.866 MPa
Peak Rate of Pressure Rise:	630.0 kPa/deg
Peak Heat Release Rate :	65.2 Joules/deg
Cumulative Heat Release :	1241.90 Joules
Apparent Combustion Efficiency :	67.8 %
Indicated Thermal Efficiency :	33.6 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	6.4 degrees
Centroid Phasing :	197.0 degrees
Centroid Magnitude :	12.71 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.22441

870610.112847 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	80.249	.158	26.805	.088
Wet Bulb Temperature, F	78.356	.044	25.753	.024
P11-Baro (Vent), "Hg ABS	28.982	.000	98.144	.001
P3 C3 Fuel Pressure,psig	68.394	.117	471.56	.805
P4 C3 Oil Pressure, psig	33.921	.013	233.88	.089
P5 C3 Airbox Pres., psig	1.198	.013	8.259	.089
P10 C3 Exh Comm, inH2Og	9.753	.131	2.427	.033
P11 C3 Intake Vac,inH2Ov	3.295	.043	.820	.011
P12 C3 Blowby, inH2Og	-.003	.001	-.001	.000
C3 Speed, RPM	1399.5	.765	1399.5	.765
C3 Fuel Flow, lb/hr	52.860	2.685	23.977	1.218
C3 Smoke, %	56.748	.708	56.748	.708
Cell 3 Load, lb-ft	369.89	1.032	501.50	1.400
K1 C3 Exhaust 1, F	625.23	.877	329.57	.487
K2 C3 Exhaust 2, F	692.59	.363	366.99	.202
K3 C3 Exhaust 3, F	779.37	.637	415.20	.354
K4 C3 Exhaust 4, F	645.68	5.250	340.93	2.916
K5 C3 Exhaust 5, F	802.07	.423	427.82	.235
K6 C3 Exhaust 6, F	750.61	.416	399.23	.231
K7-C3 Exhaust Comm, F	338.96	.426	170.53	.237
J1 C3 Water In, F	154.20	.062	67.887	.035
J2 C3 Water Out, F	170.06	.057	76.703	.032
J3 C3 Oil Sump, F	236.55	.062	113.64	.034
J4 C3 Fuel In, F	90.608	.038	32.560	.021
J5 C3 Inlet Air, F	101.07	.095	38.371	.053
J6 C3 Airbox, F	157.02	.064	69.454	.036
Horsepower	98.563	.263	73.486	.196
Corrected Horsepower	105.31	.281	78.517	.210
BSFC, lb/hp-hr	.536	.026	.326	.016
Corrected BSFC	.502	.025	.305	.015
Relative Humidity	91.996	.474	91.996	.474
Reference Pressure, inHg	31.178		105.58	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1152

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.18 in-Hg
Speed :	1400 RPM
Load :	369.9 lb-ft
Fuel Flow :	52.9 lb/hr
Brake Power :	98.60 bhp
BSFC :	.536 lb/bhp-hr
Indicated Power :	13.92 kW/cyl
Peak Pressure :	10.18 MPa
Peak Rate of Pressure Rise:	701.9 kPa/deg
Peak Heat Release Rate :	76.4 Joules/deg
Cumulative Heat Release :	1208.90 Joules
Apparent Combustion Efficiency :	59.2 %
Indicated Thermal Efficiency :	29.2 %
Brake Thermal Efficiency :	25.7 %
Ignition Delay :	5.6 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	14.16 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.20463

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL BF-2 DATE 6-10-87 PAGE 5

AL-15299-F
BF02V13486

Operator GREG							
Time	11:55	12:10	12:25	12:45	1:00	1:15	1:30
Test Hour							
Speed, RPM	2800	2500	2500	2200	2200	1800	1800
Load, lb-ft	352.9	382.4	285.5	402.7	225.4	399.7	272.6
Fuel Flow, lb/hr	75.3	78.3	56.0	69.0	40.0	62.3	36.6
Exh. Opacity, %	4.0	3.0	2.0	6.0	0	2.0	4.0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	760	600	730	500	660	500
Exhaust Cyl. L2	790	800	610	790	500	750	510
Exhaust Cyl. L3	870	900	690	900	550	850	360
Exhaust Cyl. R1	790	780	610	750	500	640	500
Exhaust Cyl. R2	880	900	695	910	550	890	610
Exhaust Cyl. R3	890	900	870	910	550	870	600
Exhaust Common	450	440	350	400	270	360	290
Water In	155	155	159	153	159	154	158
Water Out	168	169	170	169	169	168	168
Oil Sump	242	242	232	241	221	235	222
Fuel	92	92	92	93	92	90	90
Inlet Air	98	100	100	101	98	101	100
Airbox	188	186	168	176	157	158	144
Wet Bulb	75.0	76.0	75.9	75.5	75.0	76.5	77.0
Dry Bulb	80.5	81.0	81.0	81.0	80.5	81.5	82.0
PRESSURES, PSIG							
Oil Gallery	[redacted]53.5	51.5	53.5	48.0	52.0	43.5	41.0
Air After Blower	5.0	3.9	3.7	3.0	2.8	1.9	1.6
Fuel Transfer	76.0	74.0	75.0	73.0	74.0	71.0	71.5
LOW PRESSURES						8.0	
Intake Vac., in.water	17.0	14.6	14.8	12.0	12.3	[redacted]	9.2
Exh. Comm., in.Water	26.5	21.5	18.5	17.0	14.0	12.0	10.0
Blowby, in.water	.1	.1	.1	.1	.1	.1	.1
Barometer, in.Hg	28.98	28.97	28.97	28.96	28.97	28.96	28.96

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL BF-2 AL-15299-P BF02V13L86 DATE 6-10-87 PAGE 6

Operator GREG							
Time	1:45	2:00	2:15	2:35			
Test Hour							
Speed, RPM	1800	1800	1400	1400			
Load, lb-ft	147.4	61.3	371.0	98.1			
Fuel Flow, lb/hr	26.1	14.3	57.6	11.9			
Exh. Opacity, %	3.0	2.0	61.0	.7			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	330	605	340			
Exhaust Cyl. L2	380	305	660	300			
Exhaust Cyl. L3	410	350	755	350			
Exhaust Cyl. R1	360	250	640	250			
Exhaust Cyl. R2	390	250	770	290			
Exhaust Cyl. R3	390	270	720	300			
Exhaust Common	220	200	330	160			
Water In	161	164	154	162			
Water Out	169	170	168	170			
Oil Sump	213	207	234	205			
Fuel	91	90	90	89			
Inlet Air	100	99	102	100			
Airbox	144	142	154	143			
Wet Bulb	76.5	76.2	77.3	72.0			
Dry Bulb	82.0	81.6	83.0	83.5			
PRESSURES, PSIG							
Oil Gallery	48.0	49.0	33.5	39.0			
Air After Blower	1.6	1.7	1.3	1.3			
Fuel Transfer	72.2	72.5	69.0	70.5			
LOW PRESSURES							
Intake Vac., in.water	8.2	8.1	4.8	4.9			
Exh. Comm., in.Water	9.0	7.5	8.0	4.5			
Blowby, in.water	.1	.1	.1	.1			
Barometer, in.Hg	28.95	28.94	28.94	28.93			

870610.115609 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	82.271	.062	27.928	.034
Wet Bulb Temperature, F	78.795	.032	25.997	.018
P11-Baro (Vent), "Hg ABS	28.977	.000	98.126	.001
P3 C3 Fuel Pressure,psig	75.680	.438	521.79	3.021
P4 C3 Oil Pressure, psig	53.900	.015	371.63	.100
P5 C3 Airbox Pres., psig	4.755	.008	32.782	.058
P10 C3 Exh Comm, inH20g	27.933	.305	6.951	.076
P11 C3 Intake Vac,inH20v	17.002	.051	4.231	.013
P12 C3 Blowby, inH20g	.041	.002	.010	.001
C3 Speed, RPM	2801.0	2.229	2801.0	2.229
C3 Fuel Flow, lb/hr	80.490	2.261	36.510	1.026
C3 Smoke, %	3.842	.099	3.842	.099
Cell 3 Load, lb-ft	350.95	1.170	475.82	1.587
K1 C3 Exhaust 1, F	760.41	6.655	404.67	3.697
K2 C3 Exhaust 2, F	804.01	4.302	428.90	2.390
K3 C3 Exhaust 3, F	890.16	4.800	476.76	2.667
K4 C3 Exhaust 4, F	807.17	2.014	430.65	1.119
K5 C3 Exhaust 5, F	905.50	.383	485.28	.213
K6 C3 Exhaust 6, F	922.37	.323	494.65	.179
K7-C3 Exhaust Comm, F	453.41	.676	234.12	.375
J1 C3 Water In, F	155.40	.077	68.557	.043
J2 C3 Water Out, F	168.33	.105	75.737	.058
J3 C3 Oil Sump, F	242.91	.324	117.17	.180
J4 C3 Fuel In, F	93.141	.166	33.967	.092
J5 C3 Inlet Air, F	99.201	.062	37.334	.034
J6 C3 Airbox, F	190.22	.241	87.902	.134
Horsepower	187.16	.708	139.55	.528
Corrected Horsepower	199.66	.756	148.86	.563
BSFC, lb/hp-hr	.430	.011	.262	.007
Corrected BSFC	.403	.011	.245	.006
Relative Humidity	85.870	.299	85.870	.299
Reference Pressure, inHg	37.406		126.67	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1154

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.41 in-Hg
Speed :	2801 RPM
Load :	351.0 lb-ft
Fuel Flow :	80.5 lb/hr
Brake Power :	187.20 bhp
BSFC :	.430 lb/bhp-hr
Indicated Power :	27.33 kW/cyl
Peak Pressure :	9.415 MPa
Peak Rate of Pressure Rise:	475.8 kPa/deg
Peak Heat Release Rate :	40.4 Joules/deg
Cumulative Heat Release :	1128.38 Joules
Apparent Combustion Efficiency :	72.7 %
Indicated Thermal Efficiency :	37.7 %
Brake Thermal Efficiency :	32.1 %
Ignition Delay :	7.5 degrees
Centroid Phasing :	198.5 degrees
Centroid Magnitude :	11.39 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.26090

870610.121155 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	82.188	.118	27.882	.065
Wet Bulb Temperature, F	79.098	.043	26.166	.024
P11-Baro (Vent), "Hg ABS	28.971	.000	98.106	.001
P3 C3 Fuel Pressure,psig	73.850	.444	509.18	3.063
P4 C3 Oil Pressure, psig	51.894	.011	357.79	.078
P5 C3 Airbox Pres., psig	3.675	.011	25.338	.078
P10 C3 Exh Comm, inH2Og	23.276	.136	5.792	.034
P11 C3 Intake Vac,inH2Ov	13.344	.061	3.320	.015
P12 C3 Blowby, inH2Og	.024	.002	.006	.001
C3 Speed, RPM	2500.4	2.045	2500.4	2.045
C3 Fuel Flow, lb/hr	73.299	1.767	33.248	.802
C3 Smoke, %	2.695	.115	2.695	.115
Cell 3 Load, lb-ft	382.21	1.179	518.20	1.598
K1 C3 Exhaust 1, F	777.33	6.982	414.07	3.879
K2 C3 Exhaust 2, F	824.17	.556	440.09	.309
K3 C3 Exhaust 3, F	918.57	7.389	492.54	4.105
K4 C3 Exhaust 4, F	804.17	8.453	428.98	4.696
K5 C3 Exhaust 5, F	920.23	.316	493.46	.176
K6 C3 Exhaust 6, F	930.52	.363	499.18	.202
K7-C3 Exhaust Comm, F	448.17	.527	231.20	.293
J1 C3 Water In, F	155.69	.050	68.717	.028
J2 C3 Water Out, F	168.97	.082	76.097	.046
J3 C3 Oil Sump, F	242.77	.223	117.10	.124
J4 C3 Fuel In, F	91.836	.069	33.242	.038
J5 C3 Inlet Air, F	101.32	.102	38.512	.057
J6 C3 Airbox, F	186.70	.225	85.943	.125
Horsepower	181.97	.655	135.67	.488
Corrected Horsepower	194.62	.700	145.11	.522
BSFC, lb/hp-hr	.403	.010	.245	.006
Corrected BSFC	.377	.010	.229	.006
Relative Humidity	87.376	.306	87.376	.306
Reference Pressure, inHg	35.471		120.12	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1156

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.47 in-Hg
Speed :	2500 RPM
Load :	382.2 lb-ft
Fuel Flow :	73.3 lb/hr
Brake Power :	181.93 bhp
BSFC :	.403 lb/bhp-hr
Indicated Power :	24.92 kW/cyl
Peak Pressure :	9.489 MPa
Peak Rate of Pressure Rise:	504.4 kPa/deg
Peak Heat Release Rate :	43.5 Joules/deg
Cumulative Heat Release :	1186.67 Joules
Apparent Combustion Efficiency :	74.9 %
Indicated Thermal Efficiency :	37.8 %
Brake Thermal Efficiency :	34.3 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	198.4 degrees
Centroid Magnitude :	11.44 J/degree
Sensitivity :	29.2 degrees
Premixed/Diffusion Ratio :	.24832

870610.122548 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	82.442	.078	28.023	.043
Wet Bulb Temperature, F	79.051	.039	26.140	.021
P11-Baro (Vent), "Hg ABS	28.969	.000	98.099	.002
P3 C3 Fuel Pressure,psig	74.482	.201	513.54	1.385
P4 C3 Oil Pressure, psig	53.889	.038	371.55	.259
P5 C3 Airbox Pres., psig	3.521	.019	24.278	.133
P10 C3 Exh Comm, inH2Og	20.465	.134	5.093	.033
P11 C3 Intake Vac,inH2Ov	13.572	.112	3.377	.028
P12 C3 Blowby, inH2Og	.025	.003	.006	.001
C3 Speed, RPM	2497.7	1.388	2497.7	1.388
C3 Fuel Flow, lb/hr	54.261	1.483	24.612	.673
C3 Smoke, %	2.578	.072	2.578	.072
Cell 3 Load, lb-ft	287.35	.916	389.59	1.242
K1 C3 Exhaust 1, F	608.05	.166	320.03	.092
K2 C3 Exhaust 2, F	631.13	.281	332.85	.156
K3 C3 Exhaust 3, F	707.63	2.043	375.35	1.135
K4 C3 Exhaust 4, F	641.79	.205	338.77	.114
K5 C3 Exhaust 5, F	716.44	.243	380.25	.135
K6 C3 Exhaust 6, F	721.92	.190	383.29	.106
K7-C3 Exhaust Comm, F	354.46	.565	179.15	.314
J1 C3 Water In, F	159.09	.421	70.606	.234
J2 C3 Water Out, F	170.01	.282	76.674	.157
J3 C3 Oil Sump, F	232.23	.154	111.24	.085
J4 C3 Fuel In, F	91.767	.044	33.204	.024
J5 C3 Inlet Air, F	100.37	.069	37.982	.038
J6 C3 Airbox, F	168.58	.398	75.875	.221
Horsepower	136.66	.473	101.89	.353
Corrected Horsepower	146.02	.505	108.87	.377
BSFC, lb/hp-hr	.397	.011	.242	.007
Corrected BSFC	.372	.010	.226	.006
Relative Humidity	86.229	.345	86.229	.345
Reference Pressure, inHg	35.140		119.00	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1158

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.14 in-Hg
Speed :	2498 RPM
Load :	287.4 lb-ft
Fuel Flow :	54.3 lb/hr
Brake Power :	136.70 bhp
BSFC :	.397 lb/bhp-hr
Indicated Power :	19.21 kW/cyl
Peak Pressure :	8.526 MPa
Peak Rate of Pressure Rise:	539.4 kPa/deg
Peak Heat Release Rate :	51.5 Joules/deg
Cumulative Heat Release :	893.972 Joules
Apparent Combustion Efficiency :	76.1 %
Indicated Thermal Efficiency :	39.3 %
Brake Thermal Efficiency :	34.7 %
Ignition Delay :	9.3 degrees
Centroid Phasing :	196.7 degrees
Centroid Magnitude :	10.85 J/degree
Sensitivity :	25.4 degrees
Premixed/Diffusion Ratio :	.36660

870610.124414 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	82.641	.064	28.134	.036
Wet Bulb Temperature, F	78.760	.040	25.978	.022
P11-Baro (Vent), "Hg ABS	28.965	.000	98.087	.001
P3 C3 Fuel Pressure,psig	72.652	.233	500.92	1.605
P4 C3 Oil Pressure, psig	48.724	.008	335.94	.058
P5 C3 Airbox Pres., psig	2.643	.011	18.222	.074
P10 C3 Exh Comm, inH2Og	19.103	.205	4.754	.051
P11 C3 Intake Vac,inH2Ov	10.698	.070	2.662	.017
P12 C3 Blowby, inH2Og	.015	.001	.004	.000
C3 Speed, RPM	2201.1	.889	2201.1	.889
C3 Fuel Flow, lb/hr	70.534	2.862	31.994	1.298
C3 Smoke, %	6.492	.212	6.492	.212
Cell 3 Load, lb-ft	401.93	.920	544.94	1.247
K1 C3 Exhaust 1, F	749.37	7.436	398.54	4.131
K2 C3 Exhaust 2, F	810.10	6.570	432.28	3.650
K3 C3 Exhaust 3, F	919.44	5.862	493.02	3.257
K4 C3 Exhaust 4, F	790.53	.769	421.41	.427
K5 C3 Exhaust 5, F	949.99	.365	510.00	.203
K6 C3 Exhaust 6, F	950.28	.225	510.15	.125
K7-C3 Exhaust Comm, F	420.42	.246	215.79	.137
J1 C3 Water In, F	155.27	.070	68.482	.039
J2 C3 Water Out, F	169.43	.051	76.347	.028
J3 C3 Oil Sump, F	241.85	.261	116.58	.145
J4 C3 Fuel In, F	92.501	.056	33.612	.031
J5 C3 Inlet Air, F	101.64	.062	38.687	.035
J6 C3 Airbox, F	177.45	.295	80.807	.164
Horsepower	168.44	.409	125.59	.305
Corrected Horsepower	180.12	.438	134.29	.326
BSFC, lb/hp-hr	.419	.017	.255	.011
Corrected BSFC	.392	.016	.238	.010
Relative Humidity	84.352	.257	84.352	.257
Reference Pressure, inHg	33.559		113.64	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1160

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.56 in-Hg
Speed :	2201 RPM
Load :	401.9 lb-ft
Fuel Flow :	70.5 lb/hr
Brake Power :	168.43 bhp
BSFC :	.419 lb/bhp-hr
Indicated Power :	22.35 kW/cyl
Peak Pressure :	9.701 MPa
Peak Rate of Pressure Rise:	547.7 kPa/deg
Peak Heat Release Rate :	50.8 Joules/deg
Cumulative Heat Release :	1216.84 Joules
Apparent Combustion Efficiency :	70.3 %
Indicated Thermal Efficiency :	35.2 %
Brake Thermal Efficiency :	33.0 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	11.80 J/degree
Sensitivity :	28.8 degrees
Premixed/Diffusion Ratio :	.23452

870610.130223 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	82.148	.164	27.860	.091
Wet Bulb Temperature, F	78.608	.064	25.893	.036
P11-Baro (Vent), "Hg ABS	28.965	.000	98.085	.002
P3 C3 Fuel Pressure,psig	73.441	.453	506.36	3.126
P4 C3 Oil Pressure, psig	52.455	.020	361.66	.140
P5 C3 Airbox Pres., psig	2.467	.013	17.007	.086
P10 C3 Exh Comm, inH2Og	15.221	.188	3.788	.047
P11 C3 Intake Vac,inH2Ov	10.988	.061	2.734	.015
P12 C3 Blowby, inH2Og	.010	.001	.002	.000
C3 Speed, RPM	2196.7	1.177	2196.7	1.177
C3 Fuel Flow, lb/hr	38.742	1.848	17.573	.838
C3 Smoke, %	.612	.635	.612	.635
Cell 3 Load, lb-ft	223.91	.920	303.57	1.248
K1 C3 Exhaust 1, F	512.19	.323	266.77	.180
K2 C3 Exhaust 2, F	515.03	.227	268.35	.126
K3 C3 Exhaust 3, F	569.51	.369	298.61	.205
K4 C3 Exhaust 4, F	514.73	.313	268.19	.174
K5 C3 Exhaust 5, F	568.70	.200	298.17	.111
K6 C3 Exhaust 6, F	568.07	.275	297.82	.153
K7-C3 Exhaust Comm, F	274.87	.669	134.93	.372
J1 C3 Water In, F	159.33	.057	70.740	.032
J2 C3 Water Out, F	169.46	.033	76.367	.019
J3 C3 Oil Sump, F	223.10	.178	106.17	.099
J4 C3 Fuel In, F	92.372	.034	33.540	.019
J5 C3 Inlet Air, F	98.292	.120	36.829	.067
J6 C3 Airbox, F	158.87	.260	70.486	.145
Horsepower	93.649	.398	69.822	.297
Corrected Horsepower	99.839	.424	74.437	.316
BSFC, lb/hp-hr	.414	.020	.252	.012
Corrected BSFC	.388	.019	.236	.011
Relative Humidity	85.603	.767	85.603	.767
Reference Pressure, inHg	33.178		112.35	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1162

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.18 in-Hg
Speed :	2197 RPM
Load :	223.9 lb-ft
Fuel Flow :	38.7 lb/hr
Brake Power :	93.66 bhp
BSFC :	.413 lb/bhp-hr
Indicated Power :	13.69 kW/cyl
Peak Pressure :	7.895 MPa
Peak Rate of Pressure Rise:	611.2 kPa/deg
Peak Heat Release Rate :	64.1 Joules/deg
Cumulative Heat Release :	710.164 Joules
Apparent Combustion Efficiency :	74.6 %
Indicated Thermal Efficiency :	39.3 %
Brake Thermal Efficiency :	33.4 %
Ignition Delay :	10.2 degrees
Centroid Phasing :	194.5 degrees
Centroid Magnitude :	11.99 J/degree
Sensitivity :	22.3 degrees
Premixed/Diffusion Ratio :	.45709

870610.131731 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	83.272	.042	28.484	.023
Wet Bulb Temperature, F	80.592	.026	26.996	.015
P11-Baro (Vent), "Hg ABS	28.961	.000	98.074	.001
P3 C3 Fuel Pressure,psig	70.543	.085	486.38	.589
P4 C3 Oil Pressure, psig	44.349	.006	305.78	.039
P5 C3 Airbox Pres., psig	1.748	.013	12.055	.088
P10 C3 Exh Comm, inH20g	13.916	.140	3.463	.035
P11 C3 Intake Vac,inH20v	6.756	.059	1.681	.015
P12 C3 Blowby, inH20g	.004	.001	.001	.000
C3 Speed, RPM	1800.1	1.629	1800.1	1.629
C3 Fuel Flow, lb/hr	62.337	7.289	28.276	3.306
C3 Smoke, %	27.381	.276	27.381	.276
Cell 3 Load, lb-ft	398.52	1.217	540.31	1.650
K1 C3 Exhaust 1, F	688.77	4.169	364.87	2.316
K2 C3 Exhaust 2, F	780.56	4.744	415.87	2.635
K3 C3 Exhaust 3, F	870.45	5.309	465.80	2.949
K4 C3 Exhaust 4, F	672.51	11.686	355.84	6.492
K5 C3 Exhaust 5, F	899.68	8.959	482.04	4.977
K6 C3 Exhaust 6, F	902.45	.879	483.58	.488
K7-C3 Exhaust Comm, F	376.80	.415	191.56	.231
J1 C3 Water In, F	153.70	.069	67.609	.038
J2 C3 Water Out, F	168.25	.040	75.693	.022
J3 C3 Oil Sump, F	235.58	.212	113.10	.118
J4 C3 Fuel In, F	90.395	.129	32.442	.071
J5 C3 Inlet Air, F	101.73	.084	38.737	.047
J6 C3 Airbox, F	158.77	.168	70.426	.094
Horsepower	136.59	.451	101.84	.336
Corrected Horsepower	146.48	.484	109.21	.361
BSFC, lb/hp-hr	.456	.054	.278	.033
Corrected BSFC	.426	.050	.259	.030
Relative Humidity	89.129	.119	89.129	.119
Reference Pressure, inHg	32.024		108.45	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1164

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.02 in-Hg
Speed :	1800 RPM
Load :	398.5 lb-ft
Fuel Flow :	62.3 lb/hr
Brake Power :	136.58 bhp
BSFC :	.456 lb/bhp-hr
Indicated Power :	18.24 kW/cyl
Peak Pressure :	9.869 MPa
Peak Rate of Pressure Rise:	621.7 kPa/deg
Peak Heat Release Rate :	63.0 Joules/deg
Cumulative Heat Release :	1214.46 Joules
Apparent Combustion Efficiency :	64.9 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	30.3 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	195.8 degrees
Centroid Magnitude :	13.16 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.24093

870610.133147 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	83.658	.140	28.699	.078
Wet Bulb Temperature, F	80.255	.117	26.808	.065
P11-Baro (Vent), "Hg ABS	28.955	.000	98.053	.002
P3 C3 Fuel Pressure,psig	71.202	.168	490.92	1.155
P4 C3 Oil Pressure, psig	46.687	.005	321.90	.036
P5 C3 Airbox Pres., psig	1.536	.010	10.590	.071
P10 C3 Exh Comm, inH2Og	11.811	.115	2.939	.029
P11 C3 Intake Vac,inH2Ov	7.172	.054	1.785	.014
P12 C3 Blowby, inH2Og	.003	.001	.001	.000
C3 Speed, RPM	1800.4	1.030	1800.4	1.030
C3 Fuel Flow, lb/hr	37.208	2.412	16.877	1.094
C3 Smoke, %	4.965	.101	4.965	.101
Cell 3 Load, lb-ft	272.59	.653	369.58	.886
K1 C3 Exhaust 1, F	499.79	3.990	259.88	2.217
K2 C3 Exhaust 2, F	534.02	.492	278.90	.273
K3 C3 Exhaust 3, F	586.76	4.596	308.20	2.554
K4 C3 Exhaust 4, F	520.33	1.753	271.29	.974
K5 C3 Exhaust 5, F	636.97	.273	336.09	.152
K6 C3 Exhaust 6, F	618.06	.218	325.59	.121
K7-C3 Exhaust Comm, F	294.63	1.187	145.91	.659
J1 C3 Water In, F	158.03	.083	70.018	.046
J2 C3 Water Out, F	168.81	.067	76.008	.037
J3 C3 Oil Sump, F	222.16	.161	105.64	.090
J4 C3 Fuel In, F	90.211	.170	32.339	.094
J5 C3 Inlet Air, F	101.64	.148	38.686	.082
J6 C3 Airbox, F	148.75	.183	64.859	.102
Horsepower	93.444	.252	69.670	.188
Corrected Horsepower	100.15	.270	74.672	.201
BSFC, lb/hp-hr	.398	.026	.242	.016
Corrected BSFC	.372	.024	.226	.015
Relative Humidity	86.359	.416	86.359	.416
Reference Pressure, inHg	31.555		106.86	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1166

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.56 in-Hg
Speed :	1800 RPM
Load :	272.6 lb-ft
Fuel Flow :	37.2 lb/hr
Brake Power :	93.43 bhp
BSFC :	.398 lb/bhp-hr
Indicated Power :	12.50 kW/cyl
Peak Pressure :	8.152 MPa
Peak Rate of Pressure Rise:	618.1 kPa/deg
Peak Heat Release Rate :	64.9 Joules/deg
Cumulative Heat Release :	764.193 Joules
Apparent Combustion Efficiency :	68.4 %
Indicated Thermal Efficiency :	37.3 %
Brake Thermal Efficiency :	34.7 %
Ignition Delay :	9.3 degrees
Centroid Phasing :	191.0 degrees
Centroid Magnitude :	12.81 J/degree
Sensitivity :	19.8 degrees
Premixed/Diffusion Ratio :	.46787

870610.134731 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	83.463	.052	28.591	.029
Wet Bulb Temperature, F	79.601	.040	26.445	.022
P11-Baro (Vent), "Hg ABS	28.947	.000	98.025	.001
P3 C3 Fuel Pressure,psig	71.895	.098	495.70	.674
P4 C3 Oil Pressure, psig	48.331	.016	333.23	.109
P5 C3 Airbox Pres., psig	1.529	.003	10.543	.023
P10 C3 Exh Comm, inH2Og	10.099	.098	2.513	.024
P11 C3 Intake Vac,inH2Ov	7.291	.067	1.814	.017
P12 C3 Blowby, inH2Og	.002	.000	.000	.000
C3 Speed, RPM	1800.2	.773	1800.2	.773
C3 Fuel Flow, lb/hr	22.944	1.655	10.407	.751
C3 Smoke, %	3.833	.052	3.833	.052
Cell 3 Load, lb-ft	146.18	.581	198.20	.788
K1 C3 Exhaust 1, F	383.45	.244	195.25	.135
K2 C3 Exhaust 2, F	387.47	.138	197.48	.077
K3 C3 Exhaust 3, F	427.82	.350	219.90	.194
K4 C3 Exhaust 4, F	378.93	.290	192.74	.161
K5 C3 Exhaust 5, F	398.44	.298	203.58	.166
K6 C3 Exhaust 6, F	399.69	.323	204.27	.179
K7-C3 Exhaust Comm, F	224.40	1.275	106.89	.708
J1 C3 Water In, F	161.26	.057	71.812	.031
J2 C3 Water Out, F	169.72	.049	76.511	.027
J3 C3 Oil Sump, F	213.43	.083	100.79	.046
J4 C3 Fuel In, F	90.929	.032	32.738	.018
J5 C3 Inlet Air, F	100.59	.199	38.105	.111
J6 C3 Airbox, F	143.40	.139	61.887	.077
Horsepower	50.106	.187	37.358	.139
Corrected Horsepower	53.618	.200	39.976	.149
BSFC, lb/hp-hr	.458	.033	.279	.020
Corrected BSFC	.428	.030	.260	.018
Relative Humidity	84.560	.180	84.560	.180
Reference Pressure, inHg	31.524		106.75	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1168

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.52 in-Hg
Speed :	1800 RPM
Load :	146.2 lb-ft
Fuel Flow :	22.9 lb/hr
Brake Power :	50.11 bhp
BSFC :	.457 lb/bhp-hr
Indicated Power :	8.12 kW/cyl
Peak Pressure :	7.172 MPa
Peak Rate of Pressure Rise:	671.6 kPa/deg
Peak Heat Release Rate :	75.0 Joules/deg
Cumulative Heat Release :	577.352 Joules
Apparent Combustion Efficiency :	84.0 %
Indicated Thermal Efficiency :	39.4 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	11.1 degrees
Centroid Phasing :	199.9 degrees
Centroid Magnitude :	13.29 J/degree
Sensitivity :	26.8 degrees
Premixed/Diffusion Ratio :	.41232

870610.140119 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	83.385	.123	28.547	.068
Wet Bulb Temperature, F	79.524	.100	26.402	.055
P11-Baro (Vent), "Hg ABS	28.944	.000	98.015	.001
P3 C3 Fuel Pressure,psig	72.172	.187	497.61	1.291
P4 C3 Oil Pressure, psig	49.348	.008	340.24	.058
P5 C3 Airbox Pres., psig	1.611	.004	11.109	.028
P10 C3 Exh Comm, inH20g	9.113	.102	2.268	.025
P11 C3 Intake Vac,inH20v	7.274	.064	1.810	.016
P12 C3 Blowby, inH20g	.003	.001	.001	.000
C3 Speed, RPM	1800.2	.700	1800.2	.700
C3 Fuel Flow, lb/hr	14.953	2.523	6.783	1.144
C3 Smoke, %	2.362	.129	2.362	.129
Cell 3 Load, lb-ft	61.145	.434	82.901	.589
K1 C3 Exhaust 1, F	330.68	2.531	165.93	1.406
K2 C3 Exhaust 2, F	319.73	.197	159.85	.110
K3 C3 Exhaust 3, F	348.75	2.378	175.97	1.321
K4 C3 Exhaust 4, F	266.79	.452	130.44	.251
K5 C3 Exhaust 5, F	264.59	1.395	129.22	.775
K6 C3 Exhaust 6, F	277.56	2.635	136.42	1.464
K7-C3 Exhaust Comm, F	190.03	.918	87.793	.510
J1 C3 Water In, F	164.40	.105	73.554	.059
J2 C3 Water Out, F	171.56	.035	77.535	.019
J3 C3 Oil Sump, F	207.60	.139	97.556	.077
J4 C3 Fuel In, F	89.744	.070	32.080	.039
J5 C3 Inlet Air, F	100.03	.108	37.792	.060
J6 C3 Airbox, F	141.91	.064	61.061	.035
Horsepower	20.958	.149	15.626	.111
Corrected Horsepower	22.416	.160	16.713	.119
BSFC, lb/hp-hr	.714	.122	.434	.074
Corrected BSFC	.667	.114	.406	.069
Relative Humidity	84.556	.367	84.556	.367
Reference Pressure, inHg	31.689		107.31	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1170

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.69 in-Hg
Speed :	1800 RPM
Load :	61.2 lb-ft
Fuel Flow :	15.0 lb/hr
Brake Power :	20.97 bhp
BSFC :	.715 lb/bhp-hr
Indicated Power :	5.68 kW/cyl
Peak Pressure :	6.678 MPa
Peak Rate of Pressure Rise:	633.0 kPa/deg
Peak Heat Release Rate :	71.3 Joules/deg
Cumulative Heat Release :	422.768 Joules
Apparent Combustion Efficiency :	93.9 %
Indicated Thermal Efficiency :	42.0 %
Brake Thermal Efficiency :	19.3 %
Ignition Delay :	11.7 degrees
Centroid Phasing :	200.8 degrees
Centroid Magnitude :	13.51 J/degree
Sensitivity :	27.1 degrees
Premixed/Diffusion Ratio :	.43034

870610.141554 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	84.466	.101	29.148	.056
Wet Bulb Temperature, F	80.780	.107	27.100	.059
P11-Baro (Vent), "Hg ABS	28.940	.000	98.003	.001
P3 C3 Fuel Pressure,psig	68.381	.200	471.47	1.376
P4 C3 Oil Pressure, psig	34.027	.015	234.61	.104
P5 C3 Airbox Pres., psig	1.180	.013	8.139	.087
P10 C3 Exh Comm, inH2Og	9.853	.124	2.452	.031
P11 C3 Intake Vac,inH2Ov	3.997	.059	.995	.015
P12 C3 Blowby, inH2Og	.004	.002	.001	.001
C3 Speed, RPM	1400.6	4.864	1400.6	4.864
C3 Fuel Flow, lb/hr	54.119	2.892	24.548	1.312
C3 Smoke, %	62.840	.915	62.840	.915
Cell 3 Load, lb-ft	369.43	3.331	500.87	4.517
K1 C3 Exhaust 1, F	616.49	3.411	324.72	1.895
K2 C3 Exhaust 2, F	686.06	3.840	363.37	2.133
K3 C3 Exhaust 3, F	783.79	.402	417.66	.223
K4 C3 Exhaust 4, F	659.26	.995	348.48	.553
K5 C3 Exhaust 5, F	799.79	.829	426.55	.461
K6 C3 Exhaust 6, F	747.62	1.229	397.57	.683
K7-C3 Exhaust Comm, F	330.49	1.345	165.83	.747
J1 C3 Water In, F	154.27	.164	67.928	.091
J2 C3 Water Out, F	169.55	.122	76.417	.068
J3 C3 Oil Sump, F	234.62	.100	112.57	.055
J4 C3 Fuel In, F	90.490	.139	32.494	.077
J5 C3 Inlet Air, F	102.86	.134	39.364	.075
J6 C3 Airbox, F	154.22	.509	67.900	.283
Horsepower	98.522	1.144	73.456	.853
Corrected Horsepower	105.82	1.229	78.899	.916
BSFC, lb/hp-hr	.549	.031	.334	.019
Corrected BSFC	.512	.029	.311	.018
Relative Humidity	85.391	.083	85.391	.083
Reference Pressure, inHg	31.050		105.15	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1172

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.05 in-Hg
Speed :	1401 RPM
Load :	369.4 lb-ft
Fuel Flow :	54.1 lb/hr
Brake Power :	98.54 bhp
BSFC :	.549 lb/bhp-hr
Indicated Power :	13.93 kW/cyl
Peak Pressure :	10.23 MPa
Peak Rate of Pressure Rise:	678.7 kPa/deg
Peak Heat Release Rate :	74.6 Joules/deg
Cumulative Heat Release :	1200.29 Joules
Apparent Combustion Efficiency :	57.5 %
Indicated Thermal Efficiency :	28.6 %
Brake Thermal Efficiency :	25.1 %
Ignition Delay :	5.6 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	14.06 J/degree
Sensitivity :	27.1 degrees
Premixed/Diffusion Ratio :	.20474

870610.143723 AL-15299-F AL-12920-L 6V-53				1
Dry Bulb Temperature, F	86.129	.147	30.072	.082
Wet Bulb Temperature, F	80.066	.069	26.704	.038
P11-Baro (Vent), "Hg ABS	28.929	.000	97.965	.001
P3 C3 Fuel Pressure,psig	69.788	.127	481.17	.876
P4 C3 Oil Pressure, psig	39.771	.018	274.21	.121
P5 C3 Airbox Pres., psig	1.116	.008	7.694	.055
P10 C3 Exh Comm, inH20g	6.737	.061	1.676	.015
P11 C3 Intake Vac,inH20v	4.250	.040	1.058	.010
P12 C3 Blowby, inH20g	-.001	.001	-.000	.000
C3 Speed, RPM	1400.2	2.019	1400.2	2.019
C3 Fuel Flow, lb/hr	14.638	2.195	6.640	.996
C3 Smoke, %	5.146	.486	5.146	.486
Cell 3 Load, lb-ft	97.939	1.159	132.79	1.571
K1 C3 Exhaust 1, F	339.06	2.763	170.59	1.535
K2 C3 Exhaust 2, F	307.35	3.025	152.97	1.681
K3 C3 Exhaust 3, F	356.33	1.846	180.18	1.025
K4 C3 Exhaust 4, F	264.48	8.677	129.16	4.821
K5 C3 Exhaust 5, F	291.12	.109	143.95	.061
K6 C3 Exhaust 6, F	304.12	.113	151.18	.063
K7-C3 Exhaust Comm, F	172.54	1.036	78.078	.576
J1 C3 Water In, F	163.00	.064	72.775	.036
J2 C3 Water Out, F	170.66	.100	77.034	.056
J3 C3 Oil Sump, F	205.82	.102	96.566	.057
J4 C3 Fuel In, F	88.915	.067	31.619	.037
J5 C3 Inlet Air, F	100.80	.139	38.222	.077
J6 C3 Airbox, F	143.62	.043	62.009	.024
Horsepower	26.112	.327	19.468	.244
Corrected Horsepower	27.956	.350	20.843	.261
BSFC, lb/hp-hr	.561	.086	.341	.053
Corrected BSFC	.524	.081	.319	.049
Relative Humidity	76.976	.373	76.976	.373
Reference Pressure, inHg	30.889		104.60	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1174

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	30.89 in-Hg
Speed :	1400 RPM
Load :	97.9 lb-ft
Fuel Flow :	14.6 lb/hr
Brake Power :	26.10 bhp
BSFC :	.559 lb/bhp-hr
Indicated Power :	5.03 kW/cyl
Peak Pressure :	6.803 MPa
Peak Rate of Pressure Rise:	745.7 kPa/deg
Peak Heat Release Rate :	85.1 Joules/deg
Cumulative Heat Release :	415.127 Joules
Apparent Combustion Efficiency :	73.7 %
Indicated Thermal Efficiency :	38.2 %
Brake Thermal Efficiency :	24.7 %
Ignition Delay :	10.7 degrees
Centroid Phasing :	190.2 degrees
Centroid Magnitude :	17.58 J/degree
Sensitivity :	17.5 degrees
Premixed/Diffusion Ratio :	.60724

APPENDIX F2
DDC 6V-53N DATA SHEETS
FUEL BLEND TF26

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Test Procedure Checklist

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: JP-5 Date: 6-30-87
TF26P22Y87

Step	Initials	Test Procedure
1.	G.L.P.	Flush Fuel System with BF-2
2.	G.L.P.	Engine Warmup
3.	G.L.P.	Clean Smokemeter Lenses
4.	G.L.P.	Full Rack Power Check with BF-2
5.	G.L.P.	Compute Corrected Power Levels
6.	G.L.P.	Compare to 95% Confidence Bands of BF-2 Performance
7.	G.L.P.	Determine Action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush Fuel System with JP5(HO-14) Blend TF26P22Y87
9.	G.L.P.	Engine Warmup
10.	G.L.P.	Clean Smokemeter Lenses
11.	G.L.P.	Complete Performance Testing Load-Speed Matrix
12.	G.L.P.	Flush Fuel System with BF-2
13.	G.L.P.	Engine Warmup
14.	G.L.P.	Clean Smokemeter Lenses
15.	G.L.P.	Full Rack Power Check on BF-2
16.	G.L.P.	Compute Corrected Power Levels
17.	G.L.P.	Compare to 95% Confidence Bands of BF-2 Performance
18.	G.L.P.	Determine Action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush Fuel System with JP5(HO-14 Blend TF26P22Y87
20.	G.L.P.	Engine Warmup
21.	G.L.P.	Clean Smokemeter Lenses
22.	G.L.P.	Complete Performance Testing Load-Speed Matrix

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 (AL-15299-F) Date: 6-30-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	34	DN1175	DN1176
2500	35	DN1177	DN1178
2200	36	DN1179	DN1180
1800	37	DN1181	DN1182
1400	38	DN1183	DN1184

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: JP-3 (HD-14) AL-16086-F TF26P22Y87

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	39	DN1185	DN1186
2500	Full-Rack	40	DN1187	DN1188
2500	145	41	DN1189	DN1190
2200	Full-Rack	42	DN1191	DN1192
2200	100	43	DN1193	DN1194
1800	Full-Rack	44	DN1195	DN1196
1800	100	45	DN1197	DN1198
1800	54	46	DN1199	DN1200
1800	20	47	DN1201	DN1202
1400	Full-Rack	48	DN1203	DN1204
1400	28	49	DN1205	DN1206

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 AL-15299-F Date: 7-1-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	55	DN1207	DN1208
2500	56	DN1209	DN1210
2200	57	DN1211	DN1212
1800	58	DN1213	DN1214
1400	59	DN1215	DN1216

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: JP-5 (HD-14) AL-16086-F TF26P22Y87

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	60	DN1217	DN1218
2500	Full-Rack	61	DN1219	DN1220
2500	145	62	DN1221	DN1222
2200	Full-Rack	63	DN1223	DN1224
2200	100	64	DN1225	DN1226
1800	Full-Rack	65	DN1227	DN1228
1800	100	66	DN1229	DN1230
1800	54	67	DN1231	DN1232
1800	20	68	DN1233	DN1234
1400	Full-Rack	69	DN1235	DN1236
1400	28	70	DN1237	DN1238

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 2 FUEL BF-2 DATE 6-30-87 PAGE 7

AL-15299-P

BF02530U87

Operator Greg							
Time							
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	352.1	382.9	401.4	397.8	372.1		
Fuel Flow, lb/hr	79.4	75.5	70.6	61.8	54.8		
Exh. Opacity, %	2.5	5.5	12.0	40.0	69.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	770	740	680	610		
Exhaust Cyl. L2	800	810	800	770	690		
Exhaust Cyl. L3	870	900	900	850	750		
Exhaust Cyl. R1	800	800	750	610	590		
Exhaust Cyl. R2	890	900	900	890	790		
Exhaust Cyl. R3	900	905	910	880	740		
Exhaust Common	460	450	410	390	350		
Water In	156	156	155	155	154		
Water Out	169	168	169	169	169		
Oil Sump	244	242	240	236	234		
Fuel	91	90	91	91	90		
Inlet Air	101	101	103	103	103		
Airbox	150	196	187	168	162		
Wet Bulb	79.0	78.9	77.2	78.9	77.6		
Dry Bulb	90.2	90.8	91.2	92.0	91.5		
PRESSURES, PSIG							
Oil Gallery	53.0	51.5	49.2	43.5	33.5		
Air After Blower	4.9	3.9	2.9	2.0	1.3		
Fuel Transfer	75.0	74.3	73.0	71.0	69.0		
LOW PRESSURES							
Intake Vac., in.water	18.2	14.7	12.0	8.0	4.9		
Exh. Comm., in.Water	26.5	21.5	17.0	12.0	8.0		
Blowby, in.water	.2	.2	.2	.2	.2		
Barometer, in.Hg	28.95	28.94	28.96	28.96	28.96		

870630.132313 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	89.533	.071	31.963	.039
Wet Bulb Temperature, F	78.049	.002	25.583	.001
P11-Baro (Vent), "Hg ABS	28.945	.000	98.019	.001
P3 C3 Fuel Pressure,psig	75.628	.584	521.44	4.024
P4 C3 Oil Pressure, psig	53.328	.017	367.68	.114
P5 C3 Airbox Pres., psig	4.725	.013	32.579	.087
P10 C3 Exh Comm, inH20g	22.081	.171	5.495	.042
P11 C3 Intake Vac,inH20v	18.276	.101	4.548	.025
P12 C3 Blowby, inH20g	.083	.007	.021	.002
C3 Speed, RPM	2799.9	1.701	2799.9	1.701
C3 Fuel Flow, lb/hr	79.808	1.197	36.200	.543
C3 Smoke, %	6.615	.265	6.615	.265
Cell 3 Load, lb-ft	351.21	1.441	476.18	1.953
K1 C3 Exhaust 1, F	763.85	.516	406.58	.287
K2 C3 Exhaust 2, F	817.13	.707	436.18	.393
K3 C3 Exhaust 3, F	902.96	.722	483.87	.401
K4 C3 Exhaust 4, F	822.95	.777	439.42	.432
K5 C3 Exhaust 5, F	916.70	1.314	491.50	.730
K6 C3 Exhaust 6, F	931.16	1.249	499.53	.694
K7-C3 Exhaust Comm, F	472.91	.641	244.95	.356
J1 C3 Water In, F	157.05	.195	69.473	.109
J2 C3 Water Out, F	170.12	.202	76.735	.112
J3 C3 Oil Sump, F	245.90	.103	118.83	.057
J4 C3 Fuel In, F	91.323	.087	32.957	.048
J5 C3 Inlet Air, F	102.21	.373	39.006	.207
J6 C3 Airbox, F	202.10	.313	94.498	.174
Horsepower	187.24	.854	139.60	.637
Corrected Horsepower	199.71	.911	148.90	.679
BSFC, lb/hp-hr	.426	.006	.259	.004
Corrected BSFC	.400	.006	.243	.003
Relative Humidity	60.173	.190	60.173	.190
Reference Pressure, inHg	37.221		126.05	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1176

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.22 in-Hg
Speed :	2800 RPM
Load :	351.2 lb-ft
Fuel Flow :	79.8 lb/hr
Brake Power :	187.24 bhp
BSFC :	.426 lb/bhp-hr
Indicated Power :	27.09 kW/cyl
Peak Pressure :	9.360 MPa
Peak Rate of Pressure Rise:	474.9 kPa/deg
Peak Heat Release Rate :	37.8 Joules/deg
Cumulative Heat Release :	1133.48 Joules
Apparent Combustion Efficiency :	73.6 %
Indicated Thermal Efficiency :	37.7 %
Brake Thermal Efficiency :	32.4 %
Ignition Delay :	7.3 degrees
Centroid Phasing :	199.2 degrees
Centroid Magnitude :	10.74 J/degree
Sensitivity :	29.9 degrees
Premixed/Diffusion Ratio :	.24306

870630.133922 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	89.646	.172	32.025	.096
Wet Bulb Temperature, F	77.516	.142	25.286	.079
P11-Baro (Vent), "Hg ABS	28.945	.000	98.018	.001
P3 C3 Fuel Pressure,psig	74.054	.259	510.58	1.788
P4 C3 Oil Pressure, psig	51.735	.011	356.70	.079
P5 C3 Airbox Pres., psig	3.685	.021	25.409	.147
P10 C3 Exh Comm, inH20g	17.665	.220	4.396	.055
P11 C3 Intake Vac,inH20v	14.712	.088	3.661	.022
P12 C3 Blowby, inH20g	.065	.004	.016	.001
C3 Speed, RPM	2500.3	1.700	2500.3	1.700
C3 Fuel Flow, lb/hr	75.470	.644	34.233	.292
C3 Smoke, %	5.151	.163	5.151	.163
Cell 3 Load, lb-ft	381.53	.823	517.28	1.116
K1 C3 Exhaust 1, F	780.65	.473	415.92	.263
K2 C3 Exhaust 2, F	835.53	.473	446.40	.263
K3 C3 Exhaust 3, F	931.27	.481	499.60	.267
K4 C3 Exhaust 4, F	818.16	.356	436.76	.198
K5 C3 Exhaust 5, F	927.44	.626	497.47	.348
K6 C3 Exhaust 6, F	942.26	.777	505.70	.432
K7-C3 Exhaust Comm, F	462.87	.726	239.37	.404
J1 C3 Water In, F	155.75	.132	68.748	.073
J2 C3 Water Out, F	169.05	.129	76.139	.071
J3 C3 Oil Sump, F	243.20	.153	117.34	.085
J4 C3 Fuel In, F	90.530	.072	32.517	.040
J5 C3 Inlet Air, F	102.93	.113	39.406	.063
J6 C3 Airbox, F	197.03	.254	91.683	.141
Horsepower	181.63	.443	135.42	.331
Corrected Horsepower	193.69	.473	144.41	.353
BSFC, lb/hp-hr	.416	.004	.253	.002
Corrected BSFC	.390	.003	.237	.002
Relative Humidity	58.262	.243	58.262	.243
Reference Pressure, inHg	35.366		119.76	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1178

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.37 in-Hg
Speed :	2500 RPM
Load :	381.5 lb-ft
Fuel Flow :	75.5 lb/hr
Brake Power :	181.60 bhp
BSFC :	.416 lb/bhp-hr
Indicated Power :	24.61 kW/cyl
Peak Pressure :	9.414 MPa
Peak Rate of Pressure Rise:	509.5 kPa/deg
Peak Heat Release Rate :	44.8 Joules/deg
Cumulative Heat Release :	1183.93 Joules
Apparent Combustion Efficiency :	72.6 %
Indicated Thermal Efficiency :	36.2 %
Brake Thermal Efficiency :	33.2 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	11.13 J/degree
Sensitivity :	29.7 degrees
Premixed/Diffusion Ratio :	.24365

870630.141006 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	91.027	.147	32.793	.081
Wet Bulb Temperature, F	76.888	.138	24.938	.077
P11-Baro (Vent), "Hg ABS	28.958	.000	98.064	.001
P3 C3 Fuel Pressure,psig	72.647	.177	500.89	1.220
P4 C3 Oil Pressure, psig	48.636	.024	335.33	.163
P5 C3 Airbox Pres., psig	2.640	.010	18.202	.070
P10 C3 Exh Comm, inH20g	13.294	.139	3.308	.035
P11 C3 Intake Vac,inH20v	11.755	.050	2.925	.012
P12 C3 Blowby, inH20g	.060	.007	.015	.002
C3 Speed, RPM	2200.5	2.506	2200.5	2.506
C3 Fuel Flow, lb/hr	69.596	1.588	31.568	.720
C3 Smoke, %	12.120	.402	12.120	.402
Cell 3 Load, lb-ft	400.17	.774	542.55	1.049
K1 C3 Exhaust 1, F	745.42	.437	396.35	.243
K2 C3 Exhaust 2, F	821.07	.547	438.37	.304
K3 C3 Exhaust 3, F	932.67	.586	500.37	.325
K4 C3 Exhaust 4, F	789.07	1.955	420.59	1.086
K5 C3 Exhaust 5, F	949.10	.278	509.50	.154
K6 C3 Exhaust 6, F	953.30	.482	511.83	.268
K7-C3 Exhaust Comm, F	429.11	.406	220.62	.226
J1 C3 Water In, F	156.19	.084	68.994	.047
J2 C3 Water Out, F	170.11	.049	76.730	.027
J3 C3 Oil Sump, F	241.27	.206	116.26	.114
J4 C3 Fuel In, F	91.405	.131	33.003	.073
J5 C3 Inlet Air, F	103.90	.093	39.945	.052
J6 C3 Airbox, F	187.93	.197	86.627	.109
Horsepower	167.66	.432	125.01	.322
Corrected Horsepower	178.60	.460	133.16	.343
BSFC, lb/hp-hr	.415	.010	.253	.006
Corrected BSFC	.390	.009	.237	.006
Relative Humidity	52.972	.120	52.972	.120
Reference Pressure, inHg	33.469		113.34	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1180

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.47 in-Hg
Speed :	2201 RPM
Load :	400.2 lb-ft
Fuel Flow :	69.6 lb/hr
Brake Power :	167.72 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	29.13 kW/cyl
Peak Pressure :	9.543 MPa
Peak Rate of Pressure Rise:	410.0 kPa/deg
Peak Heat Release Rate :	54.6 Joules/deg
Cumulative Heat Release :	1509.73 Joules
Apparent Combustion Efficiency :	88.4 %
Indicated Thermal Efficiency :	46.5 %
Brake Thermal Efficiency :	33.3 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	194.1 degrees
Centroid Magnitude :	17.09 J/degree
Sensitivity :	25.0 degrees
Premixed/Diffusion Ratio :	.28630

870630.145450 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	91.654	.056	33.141	.031
Wet Bulb Temperature, F	78.291	.034	25.717	.019
P11-Baro (Vent), "Hg ABS	28.959	.000	98.068	.002
P3 C3 Fuel Pressure,psig	70.425	.159	485.56	1.099
P4 C3 Oil Pressure, psig	44.100	.018	304.06	.124
P5 C3 Airbox Pres., psig	1.766	.013	12.174	.090
P10 C3 Exh Comm, inH2Og	8.085	.140	2.012	.035
P11 C3 Intake Vac,inH2Ov	7.829	.031	1.948	.008
P12 C3 Blowby, inH2Og	.040	.006	.010	.001
C3 Speed, RPM	1800.6	1.356	1800.6	1.356
C3 Fuel Flow, lb/hr	61.444	2.730	27.871	1.238
C3 Smoke, %	39.270	.340	39.270	.340
Cell 3 Load, lb-ft	396.69	.906	537.84	1.228
K1 C3 Exhaust 1, F	680.49	.295	360.27	.164
K2 C3 Exhaust 2, F	794.94	.563	423.86	.313
K3 C3 Exhaust 3, F	874.55	.365	468.08	.203
K4 C3 Exhaust 4, F	624.91	16.616	329.39	9.231
K5 C3 Exhaust 5, F	919.58	.608	493.10	.338
K6 C3 Exhaust 6, F	915.51	.415	490.84	.230
K7-C3 Exhaust Comm, F	394.04	.596	201.13	.331
J1 C3 Water In, F	156.22	.053	69.009	.029
J2 C3 Water Out, F	170.56	.032	76.980	.018
J3 C3 Oil Sump, F	236.47	.162	113.60	.090
J4 C3 Fuel In, F	91.734	.148	33.186	.082
J5 C3 Inlet Air, F	104.16	.078	40.089	.044
J6 C3 Airbox, F	168.91	.393	76.061	.219
Horsepower	136.00	.362	101.40	.270
Corrected Horsepower	145.17	.387	108.23	.288
BSFC, lb/hp-hr	.452	.020	.275	.012
Corrected BSFC	.423	.018	.257	.011
Relative Humidity	55.456	.200	55.456	.200
Reference Pressure, inHg	31.979		108.29	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1182

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.98 in-Hg
Speed :	1801 RPM
Load :	396.7 lb-ft
Fuel Flow :	61.4 lb/hr
Brake Power :	136.04 bhp
BSFC :	.451 lb/bhp-hr
Indicated Power :	22.76 kW/cyl
Peak Pressure :	9.792 MPa
Peak Rate of Pressure Rise:	463.5 kPa/deg
Peak Heat Release Rate :	56.2 Joules/deg
Cumulative Heat Release :	1442.05 Joules
Apparent Combustion Efficiency :	78.3 %
Indicated Thermal Efficiency :	41.2 %
Brake Thermal Efficiency :	30.6 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	16.52 J/degree
Sensitivity :	24.9 degrees
Premixed/Diffusion Ratio :	.28381

870630.151206 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	91.910	.167	33.283	.093
Wet Bulb Temperature, F	77.786	.091	25.436	.051
P11-Baro (Vent), "Hg ABS	28.964	.000	98.083	.001
P3 C3 Fuel Pressure,psig	68.043	.187	469.14	1.286
P4 C3 Oil Pressure, psig	33.813	.008	233.13	.054
P5 C3 Airbox Pres., psig	1.204	.009	8.302	.059
P10 C3 Exh Comm, inH20g	3.971	.106	.988	.026
P11 C3 Intake Vac,inH20v	4.619	.054	1.149	.014
P12 C3 Blowby, inH20g	.037	.007	.009	.002
C3 Speed, RPM	1401.1	.912	1401.1	.912
C3 Fuel Flow, lb/hr	53.977	2.457	24.484	1.114
C3 Smoke, %	70.172	.464	70.172	.464
Cell 3 Load, lb-ft	372.23	.713	504.67	.967
K1 C3 Exhaust 1, F	619.44	.338	326.35	.188
K2 C3 Exhaust 2, F	698.59	.478	370.33	.265
K3 C3 Exhaust 3, F	781.75	1.189	416.53	.661
K4 C3 Exhaust 4, F	586.00	24.177	307.78	13.432
K5 C3 Exhaust 5, F	805.00	.592	429.45	.329
K6 C3 Exhaust 6, F	755.63	.739	402.02	.411
K7-C3 Exhaust Comm, F	350.71	.602	177.06	.334
J1 C3 Water In, F	154.93	.154	68.293	.085
J2 C3 Water Out, F	170.28	.152	76.824	.084
J3 C3 Oil Sump, F	234.66	.134	112.59	.075
J4 C3 Fuel In, F	91.099	.131	32.833	.073
J5 C3 Inlet Air, F	103.46	.112	39.699	.062
J6 C3 Airbox, F	163.25	.083	72.915	.046
Horsepower	99.301	.176	74.037	.131
Corrected Horsepower	105.82	.187	78.896	.140
BSFC, lb/hp-hr	.544	.025	.331	.015
Corrected BSFC	.510	.023	.310	.014
Relative Humidity	53.401	.634	53.401	.634
Reference Pressure, inHg	31.076		105.23	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1184

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.08 in-Hg
Speed :	1401 RPM
Load :	372.2 lb-ft
Fuel Flow :	54.0 lb/hr
Brake Power :	99.29 bhp
BSFC :	.544 lb/bhp-hr
Indicated Power :	18.19 kW/cyl
Peak Pressure :	10.12 MPa
Peak Rate of Pressure Rise:	559.8 kPa/deg
Peak Heat Release Rate :	61.6 Joules/deg
Cumulative Heat Release :	1472.19 Joules
Apparent Combustion Efficiency :	70.7 %
Indicated Thermal Efficiency :	37.4 %
Brake Thermal Efficiency :	25.4 %
Ignition Delay :	6.5 degrees
Centroid Phasing :	191.4 degrees
Centroid Magnitude :	18.18 J/degree
Sensitivity :	22.9 degrees
Premixed/Diffusion Ratio :	.28229

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 2 FUEL JP-5 DATE 7-1-87 PAGE 8

AL-16086-F

TF26P22Y87

Operator Greg							
Time							
Test Hour							
Speed, RPM	2800	2500	2500	2200	2200	1800	1800
Load, lb-ft	325.2	358.0	28.6	380.6	223.9	388.9	273.1
Fuel Flow, lb/hr	73.5	69.6	35.8	64.8	39.5	57.2	36.9
Exh. Opacity, %	2.0	3.0	2.0	5.5	2.0	26.0	2.0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	700	710	600	700	500	630	500
Exhaust Cyl. L2	750	750	610	750	500	740	520
Exhaust Cyl. L3	830	840	700	830	550	810	580
Exhaust Cyl. R1	740	745	610	710	500	690	500
Exhaust Cyl. R2	810	830	700	850	550	860	610
Exhaust Cyl. R3	840	850	700	855	550	860	600
Exhaust Common	420	410	350	390	300	360	300
Water In	157	155	158	154	159	154	159
Water Out	170	168	169	167	169	168	170
Oil Sump	242	239	233	237	224	234	225
Fuel	87	93	92	92	91	90	91
Inlet Air	98	100	100	100	101	103	101
Airbox	185	186	173	176	163	164	156
Wet Bulb	78.0	78.0	78.2	78.2	78.5	78.6	78.0
Dry Bulb	83.5	84.0	85.0	85.2	86.5	87.4	87.6
PRESSURES, PSIG							
Oil Gallery	53.5	52.5	53.5	49.5	52.0	44.0	46.0
Air After Blower	4.8	3.9	3.7	2.9	2.8	1.9	1.9
Fuel Transfer	74.0	76.0	76.5	74.0	75.0	71.0	72.0
LOW PRESSURES							
Intake Vac., in.water	17.6	15.2	15.2	12.5	12.7	8.3	8.5
Exh. Comm., in.Water	26.0	20.5	18.5	16.5	14.0	12.0	10.0
Blowby, in.water	.2	.2	.2	.2	.2	.2	.2
Barometer, in.Hg	29.04	29.04	29.04	29.03	29.03	29.03	29.03

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 2 FUEL JP-5 AL-16076-F DATE 7-1-87 PAGE 9

TF26P22Y87

Operator Greg							
Time							
Test Hour							
Speed, RPM	1800	1800	1400	1400			
Load, lb-ft	149.1	79.1	370.1	98.8			
Fuel Flow, lb/hr	23.5	16.8	49.8	14.3			
Exh. Opacity, %	2.0	2.0	54.0	3.0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	330	600	340			
Exhaust Cyl. L2	380	310	650	300			
Exhaust Cyl. L3	405	350	750	350			
Exhaust Cyl. R1	380	300	650	290			
Exhaust Cyl. R2	400	300	800	300			
Exhaust Cyl. R3	400	300	750	300			
Exhaust Common	220	200	330	190			
Water In	158	160	153	160			
Water Out	167	167	168	168			
Oil Sump	215	208	234	206			
Fuel	90	89	89	88			
Inlet Air	100	101	101	100			
Airbox	149	147	157	145			
Wet Bulb	78.5	80.5	79.5	79.2			
Dry Bulb	88.0	89.0	89.3	89.0			
PRESSURES, PSIG							
Oil Gallery	48.0	49.0	34.0	39.5			
Air After Blower	1.8	1.7	1.3	1.2			
Fuel Transfer	72.8	72.5	69.0	70.0			
LOW PRESSURES							
Intake Vac., in.water	8.5	8.5	5.0	5.1			
Exh. Comm., in.Water	8.5	7.5	8.0	4.0			
Blowby, in.water	.2	.2	.2	.2			
Barometer, in.Hg	29.03	29.02	29.03	29.03			

870701.092108 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	84.454	.032	29.141	.018
Wet Bulb Temperature, F	78.041	.012	25.578	.007
P11-Baro (Vent), "Hg ABS	29.039	.000	98.338	.001
P3 C3 Fuel Pressure,psig	75.766	.325	522.39	2.241
P4 C3 Oil Pressure, psig	54.223	.011	373.86	.076
P5 C3 Airbox Pres., psig	4.711	.014	32.484	.095
P10 C3 Exh Comm, inH2Og	20.131	.239	5.009	.059
P11 C3 Intake Vac,inH2Ov	17.662	.112	4.395	.028
P12 C3 Blowby, inH2Og	.056	.003	.014	.001
C3 Speed, RPM	2800.6	1.458	2800.6	1.458
C3 Fuel Flow, lb/hr	73.792	.166	33.471	.075
C3 Smoke, %	1.709	.304	1.709	.304
Cell 3 Load, lb-ft	323.92	.676	439.17	.916
K1 C3 Exhaust 1, F	722.59	.333	383.66	.185
K2 C3 Exhaust 2, F	779.60	.671	415.33	.373
K3 C3 Exhaust 3, F	849.94	.390	454.41	.217
K4 C3 Exhaust 4, F	760.85	.298	404.92	.166
K5 C3 Exhaust 5, F	849.40	.772	454.11	.429
K6 C3 Exhaust 6, F	867.07	.953	463.93	.529
K7-C3 Exhaust Comm, F	438.62	.844	225.90	.469
J1 C3 Water In, F	159.14	.328	70.635	.182
J2 C3 Water Out, F	171.77	.225	77.649	.125
J3 C3 Oil Sump, F	242.69	.285	117.05	.158
J4 C3 Fuel In, F	85.973	.192	29.985	.107
J5 C3 Inlet Air, F	99.625	.238	37.569	.132
J6 C3 Airbox, F	183.70	.915	84.278	.508
Horsepower	172.73	.313	128.78	.233
Corrected Horsepower	183.55	.332	136.85	.248
BSFC, lb/hp-hr	.427	.001	.260	.000
Corrected BSFC	.402	.001	.245	.000
Relative Humidity	75.294	.096	75.294	.096
Reference Pressure, inHg	37.333		126.42	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1186

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.33 in-Hg
Speed :	2801 RPM
Load :	323.9 lb-ft
Fuel Flow :	73.8 lb/hr
Brake Power :	172.74 bhp
BSFC :	.427 lb/bhp-hr
Indicated Power :	26.57 kW/cyl
Peak Pressure :	9.304 MPa
Peak Rate of Pressure Rise:	632.4 kPa/deg
Peak Heat Release Rate :	61.1 Joules/deg
Cumulative Heat Release :	1099.65 Joules
Apparent Combustion Efficiency :	76.9 %
Indicated Thermal Efficiency :	39.8 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	8.5 degrees
Centroid Phasing :	198.0 degrees
Centroid Magnitude :	11.86 J/degree
Sensitivity :	27.5 degrees
Premixed/Diffusion Ratio :	.30991

870701.094446 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	84.432	.030	29.129	.017
Wet Bulb Temperature, F	78.044	:020	25.580	.011
P11-Baro (Vent), "Hg ABS	29.039	.000	98.338	.002
P3 C3 Fuel Pressure,psig	75.757	.236	522.32	1.630
P4 C3 Oil Pressure, psig	52.837	.019	364.30	.134
P5 C3 Airbox Pres., psig	3.697	.019	25.487	.129
P10 C3 Exh Comm, inH20g	16.051	.176	3.994	.044
P11 C3 Intake Vac,inH20v	13.781	.144	3.429	.036
P12 C3 Blowby, inH20g	.049	.007	.012	.002
C3 Speed, RPM	2500.3	1.341	2500.3	1.341
C3 Fuel Flow, lb/hr	70.252	.200	31.866	.091
C3 Smoke, %	3.979	.082	3.979	.082
Cell 3 Load, lb-ft	358.36	.797	485.87	1.081
K1 C3 Exhaust 1, F	730.32	.333	387.96	.185
K2 C3 Exhaust 2, F	774.99	.484	412.77	.269
K3 C3 Exhaust 3, F	860.20	.278	460.11	.155
K4 C3 Exhaust 4, F	765.77	.317	407.65	.176
K5 C3 Exhaust 5, F	857.72	.193	458.73	.107
K6 C3 Exhaust 6, F	873.56	.307	467.53	.170
K7-C3 Exhaust Comm, F	433.40	.424	223.00	.236
J1 C3 Water In, F	155.56	.171	68.647	.095
J2 C3 Water Out, F	168.49	.151	75.830	.084
J3 C3 Oil Sump, F	240.32	.134	115.73	.075
J4 C3 Fuel In, F	93.271	.147	34.039	.082
J5 C3 Inlet Air, F	100.38	.101	37.991	.056
J6 C3 Airbox, F	186.97	.120	86.096	.066
Horsepower	170.60	.414	127.20	.309
Corrected Horsepower	181.42	.440	135.26	.328
BSFC, lb/hp-hr	.412	.002	.251	.001
Corrected BSFC	.387	.002	.236	.001
Relative Humidity	75.381	.134	75.381	.134
Reference Pressure, inHg	35.552		120.39	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1188

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.55 in-Hg
Speed :	2500 RPM
Load :	358.4 lb-ft
Fuel Flow :	70.3 lb/hr
Brake Power :	170.60 bhp
BSFC :	.412 lb/bhp-hr
Indicated Power :	24.20 kW/cyl
Peak Pressure :	9.391 MPa
Peak Rate of Pressure Rise:	677.6 kPa/deg
Peak Heat Release Rate :	69.3 Joules/deg
Cumulative Heat Release :	1148.70 Joules
Apparent Combustion Efficiency :	75.3 %
Indicated Thermal Efficiency :	38.1 %
Brake Thermal Efficiency :	33.3 %
Ignition Delay :	8.6 degrees
Centroid Phasing :	198.2 degrees
Centroid Magnitude :	12.55 J/degree
Sensitivity :	27.6 degrees
Premixed/Diffusion Ratio :	.31069

870701.100757 AL-16086-F AL-12920-L 6V-53 2

Dry Bulb Temperature, F	85.709	.077	29.838	.043
Wet Bulb Temperature, F	78.511	.044	25.839	.024
P11-Baro (Vent), "Hg ABS	29.039	.000	98.338	.001
P3 C3 Fuel Pressure,psig	76.203	.189	525.40	1.300
P4 C3 Oil Pressure, psig	54.028	.011	372.51	.073
P5 C3 Airbox Pres., psig	3.564	.011	24.576	.076
P10 C3 Exh Comm, inH20g	13.868	.193	3.451	.048
P11 C3 Intake Vac,inH20v	13.921	.142	3.464	.035
P12 C3 Blowby, inH20g	.053	.008	.013	.002
C3 Speed, RPM	2500.4	1.510	2500.4	1.510
C3 Fuel Flow, lb/hr	56.025	.217	25.413	.098
C3 Smoke, %	2.255	.043	2.255	.043
Cell 3 Load, lb-ft	286.04	1.006	387.82	1.364
K1 C3 Exhaust 1, F	598.61	.468	314.78	.260
K2 C3 Exhaust 2, F	633.23	.497	334.02	.276
K3 C3 Exhaust 3, F	713.08	.326	378.38	.181
K4 C3 Exhaust 4, F	638.84	.168	337.13	.093
K5 C3 Exhaust 5, F	717.14	.405	380.64	.225
K6 C3 Exhaust 6, F	725.75	.546	385.42	.304
K7-C3 Exhaust Comm, F	366.32	.583	185.74	.324
J1 C3 Water In, F	159.10	.105	70.609	.059
J2 C3 Water Out, F	170.37	.085	76.871	.047
J3 C3 Oil Sump, F	233.71	.300	112.06	.167
J4 C3 Fuel In, F	92.408	.136	33.560	.076
J5 C3 Inlet Air, F	101.20	.199	38.442	.110
J6 C3 Airbox, F	174.35	.138	79.084	.076
Horsepower	136.18	.443	101.53	.330
Corrected Horsepower	144.95	.471	108.07	.351
BSFC, lb/hp-hr	.411	.002	.250	.001
Corrected BSFC	.387	.002	.235	.001
Relative Humidity	72.854	.178	72.854	.178
Reference Pressure, inHg	35.273		119.45	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1190

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.27 in-Hg
Speed :	2500 RPM
Load :	286.0 lb-ft
Fuel Flow :	56.0 lb/hr
Brake Power :	136.14 bhp
BSFC :	.411 lb/bhp-hr
Indicated Power :	19.46 kW/cyl
Peak Pressure :	8.575 MPa
Peak Rate of Pressure Rise:	649.2 kPa/deg
Peak Heat Release Rate :	68.0 Joules/deg
Cumulative Heat Release :	895.890 Joules
Apparent Combustion Efficiency :	73.7 %
Indicated Thermal Efficiency :	38.4 %
Brake Thermal Efficiency :	33.4 %
Ignition Delay :	10.4 degrees
Centroid Phasing :	196.9 degrees
Centroid Magnitude :	12.46 J/degree
Sensitivity :	24.5 degrees
Premixed/Diffusion Ratio :	.42434

870701.102957 AL-16086-F AL-12920-L 6V-53 2

Dry Bulb Temperature, F	85.748	.057	29.860	.032
Wet Bulb Temperature, F	78.154	.025	25.641	.014
P11-Baro (Vent), "Hg ABS	29.032	.000	98.313	.001
P3 C3 Fuel Pressure,psig	73.612	.224	507.54	1.547
P4 C3 Oil Pressure, psig	49.895	.015	344.01	.102
P5 C3 Airbox Pres., psig	2.637	.013	18.182	.088
P10 C3 Exh Comm, inH2Og	12.065	.191	3.002	.048
P11 C3 Intake Vac,inH2Ov	11.209	.057	2.789	.014
P12 C3 Blowby, inH2Og	.039	.004	.010	.001
C3 Speed, RPM	2199.5	.790	2199.5	.790
C3 Fuel Flow, lb/hr	65.064	.176	29.512	.080
C3 Smoke, %	4.957	.201	4.957	.201
Cell 3 Load, lb-ft	379.92	.684	515.10	.927
K1 C3 Exhaust 1, F	711.52	.228	377.51	.127
K2 C3 Exhaust 2, F	772.23	.358	411.24	.199
K3 C3 Exhaust 3, F	875.66	.539	468.70	.299
K4 C3 Exhaust 4, F	748.84	.195	398.25	.108
K5 C3 Exhaust 5, F	893.31	.259	478.51	.144
K6 C3 Exhaust 6, F	896.69	.569	480.39	.316
K7-C3 Exhaust Comm, F	397.70	.482	203.16	.268
J1 C3 Water In, F	153.93	.140	67.742	.078
J2 C3 Water Out, F	167.39	.171	75.215	.095
J3 C3 Oil Sump, F	237.93	.203	114.41	.113
J4 C3 Fuel In, F	92.135	.101	33.408	.056
J5 C3 Inlet Air, F	101.19	.125	38.440	.069
J6 C3 Airbox, F	176.61	.349	80.339	.194
Horsepower	159.10	.315	118.62	.235
Corrected Horsepower	169.30	.335	126.22	.250
BSFC, lb/hp-hr	.409	.002	.249	.001
Corrected BSFC	.384	.002	.234	.001
Relative Humidity	71.494	.186	71.494	.186
Reference Pressure, inHg	33.576		113.70	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1192

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.58 in-Hg
Speed :	2200 RPM
Load :	379.9 lb-ft
Fuel Flow :	65.1 lb/hr
Brake Power :	159.14 bhp
BSFC :	.409 lb/bhp-hr
Indicated Power :	21.63 kW/cyl
Peak Pressure :	9.466 MPa
Peak Rate of Pressure Rise:	689.4 kPa/deg
Peak Heat Release Rate :	71.6 Joules/deg
Cumulative Heat Release :	1169.89 Joules
Apparent Combustion Efficiency :	72.8 %
Indicated Thermal Efficiency :	36.7 %
Brake Thermal Efficiency :	33.6 %
Ignition Delay :	8.3 degrees
Centroid Phasing :	197.3 degrees
Centroid Magnitude :	13.20 J/degree
Sensitivity :	26.9 degrees
Premixed/Diffusion Ratio :	.30950

870701.104710 AL-16086-F AL-12920-L 6V-53 2

Dry Bulb Temperature, F	86.855	.042	30.475	.023
Wet Bulb Temperature, F	78.534	.047	25.852	.026
P11-Baro (Vent), "Hg ABS	29.029	.000	98.305	.001
P3 C3 Fuel Pressure,psig	74.610	.209	514.42	1.438
P4 C3 Oil Pressure, psig	52.608	.027	362.72	.185
P5 C3 Airbox Pres., psig	2.500	.007	17.235	.047
P10 C3 Exh Comm, inH2Og	8.965	.112	2.231	.028
P11 C3 Intake Vac,inH2Ov	11.447	.081	2.849	.020
P12 C3 Blowby, inH2Og	.034	.015	.008	.004
C3 Speed, RPM	2200.2	1.011	2200.2	1.011
C3 Fuel Flow, lb/hr	39.611	.266	17.967	.121
C3 Smoke, %	2.176	.029	2.176	.029
Cell 3 Load, lb-ft	224.01	.548	303.71	.743
K1 C3 Exhaust 1, F	509.12	5.475	265.07	3.041
K2 C3 Exhaust 2, F	522.40	.539	272.44	.300
K3 C3 Exhaust 3, F	573.48	3.163	300.82	1.757
K4 C3 Exhaust 4, F	516.11	5.750	268.95	3.195
K5 C3 Exhaust 5, F	569.75	.295	298.75	.164
K6 C3 Exhaust 6, F	571.97	.347	299.98	.193
K7-C3 Exhaust Comm, F	302.96	1.096	150.53	.609
J1 C3 Water In, F	159.98	.138	71.100	.077
J2 C3 Water Out, F	170.11	.143	76.728	.080
J3 C3 Oil Sump, F	224.44	.187	106.91	.104
J4 C3 Fuel In, F	90.849	.118	32.694	.065
J5 C3 Inlet Air, F	101.63	.115	38.686	.064
J6 C3 Airbox, F	164.74	.465	73.742	.258
Horsepower	93.844	.254	69.968	.190
Corrected Horsepower	99.919	.271	74.497	.202
BSFC, lb/hp-hr	.422	.003	.257	.002
Corrected BSFC	.396	.003	.241	.002
Relative Humidity	69.348	.135	69.348	.135
Reference Pressure, inHg	33.277		112.69	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1194

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.28 in-Hg
Speed :	2200 RPM
Load :	224.0 lb-ft
Fuel Flow :	39.6 lb/hr
Brake Power :	93.83 bhp
BSFC :	.422 lb/bhp-hr
Indicated Power :	13.99 kW/cyl
Peak Pressure :	8.085 MPa
Peak Rate of Pressure Rise:	775.6 kPa/deg
Peak Heat Release Rate :	88.6 Joules/deg
Cumulative Heat Release :	731.295 Joules
Apparent Combustion Efficiency :	74.9 %
Indicated Thermal Efficiency :	39.1 %
Brake Thermal Efficiency :	32.6 %
Ignition Delay :	11.6 degrees
Centroid Phasing :	195.1 degrees
Centroid Magnitude :	16.49 J/degree
Sensitivity :	21.6 degrees
Premixed/Diffusion Ratio :	.53613

870701.110141 AL-16086-F AL-12920-L 6V-53 2

Dry Bulb Temperature, F	87.475	.045	30.820	.025
Wet Bulb Temperature, F	78.381	.033	25.767	.018
P11-Baro (Vent), "Hg ABS	29.028	.000	98.300	.002
P3 C3 Fuel Pressure,psig	70.816	.118	488.26	.811
P4 C3 Oil Pressure, psig	44.957	.028	309.97	.195
P5 C3 Airbox Pres., psig	1.749	.006	12.058	.040
P10 C3 Exh Comm, inH20g	7.566	.138	1.883	.034
P11 C3 Intake Vac,inH20v	7.074	.085	1.760	.021
P12 C3 Blowby, inH20g	.030	.003	.008	.001
C3 Speed, RPM	1800.4	1.512	1800.4	1.512
C3 Fuel Flow, lb/hr	57.346	.145	26.012	.066
C3 Smoke, %	26.036	.462	26.036	.462
Cell 3 Load, lb-ft	388.58	.850	526.84	1.152
K1 C3 Exhaust 1, F	652.48	.511	344.71	.284
K2 C3 Exhaust 2, F	753.23	.555	400.68	.308
K3 C3 Exhaust 3, F	843.84	.346	451.02	.192
K4 C3 Exhaust 4, F	711.29	3.280	377.38	1.822
K5 C3 Exhaust 5, F	896.45	.300	480.25	.166
K6 C3 Exhaust 6, F	898.21	.541	481.23	.300
K7-C3 Exhaust Comm, F	369.26	.981	187.37	.545
J1 C3 Water In, F	154.72	.039	68.180	.022
J2 C3 Water Out, F	168.52	.060	75.842	.033
J3 C3 Oil Sump, F	235.53	.226	113.07	.125
J4 C3 Fuel In, F	90.890	.164	32.717	.091
J5 C3 Inlet Air, F	103.82	.209	39.902	.116
J6 C3 Airbox, F	164.41	.218	73.561	.121
Horsepower	133.21	.356	99.315	.265
Corrected Horsepower	142.04	.379	105.90	.283
BSFC, lb/hp-hr	.431	.002	.262	.001
Corrected BSFC	.404	.002	.246	.001
Relative Humidity	66.979	.149	66.979	.149
Reference Pressure, inHg	32.068		108.60	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1196

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.07 in-Hg
Speed :	1800 RPM
Load :	388.6 lb-ft
Fuel Flow :	57.3 lb/hr
Brake Power :	133.18 bhp
BSFC :	.430 lb/bhp-hr
Indicated Power :	17.55 kW/cyl
Peak Pressure :	9.645 MPa
Peak Rate of Pressure Rise:	771.4 kPa/deg
Peak Heat Release Rate :	85.0 Joules/deg
Cumulative Heat Release :	1243.52 Joules
Apparent Combustion Efficiency :	72.0 %
Indicated Thermal Efficiency :	33.8 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	7.9 degrees
Centroid Phasing :	200.2 degrees
Centroid Magnitude :	13.72 J/degree
Sensitivity :	30.2 degrees
Premixed/Diffusion Ratio :	.26239

870701.111632 AL-16086-F AL-12920-L 6V-53 2

Dry Bulb Temperature, F	86.672	.030	30.373	.016
Wet Bulb Temperature, F	76.958	.046	24.976	.025
P11-Baro (Vent), "Hg ABS	29.030	.000	98.308	.001
P3 C3 Fuel Pressure,psig	71.529	.216	493.17	1.492
P4 C3 Oil Pressure, psig	46.594	.009	321.26	.059
P5 C3 Airbox Pres., psig	1.583	.006	10.912	.044
P10 C3 Exh Comm, inH20g	5.675	.082	1.412	.020
P11 C3 Intake Vac,inH20v	7.287	.062	1.813	.015
P12 C3 Blowby, inH20g	.029	.003	.007	.001
C3 Speed, RPM	1800.6	.924	1800.6	.924
C3 Fuel Flow, lb/hr	37.287	.101	16.913	.046
C3 Smoke, %	1.683	.067	1.683	.067
Cell 3 Load, lb-ft	272.46	.733	369.40	.994
K1 C3 Exhaust 1, F	503.06	.429	261.70	.239
K2 C3 Exhaust 2, F	540.23	.473	282.35	.263
K3 C3 Exhaust 3, F	595.37	.507	312.98	.282
K4 C3 Exhaust 4, F	527.14	.335	275.08	.186
K5 C3 Exhaust 5, F	638.58	.342	336.99	.190
K6 C3 Exhaust 6, F	618.09	.446	325.61	.248
K7-C3 Exhaust Comm, F	303.54	1.353	150.85	.752
J1 C3 Water In, F	159.60	.047	70.887	.026
J2 C3 Water Out, F	170.44	.076	76.912	.042
J3 C3 Oil Sump, F	225.88	.124	107.71	.069
J4 C3 Fuel In, F	90.876	.130	32.709	.072
J5 C3 Inlet Air, F	102.55	.075	39.194	.042
J6 C3 Airbox, F	157.58	.172	69.765	.096
Horsepower	93.410	.275	69.645	.205
Corrected Horsepower	99.305	.292	74.039	.218
BSFC, lb/hp-hr	.399	.002	.243	.001
Corrected BSFC	.375	.002	.228	.001
Relative Humidity	64.677	.222	64.677	.222
Reference Pressure, inHg	31.717		107.40	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1198

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.72 in-Hg
Speed :	1801 RPM
Load :	272.5 lb-ft
Fuel Flow :	37.3 lb/hr
Brake Power :	93.44 bhp
BSFC :	.399 lb/bhp-hr
Indicated Power :	12.41 kW/cyl
Peak Pressure :	8.274 MPa
Peak Rate of Pressure Rise:	753.6 kPa/deg
Peak Heat Release Rate :	84.1 Joules/deg
Cumulative Heat Release :	866.790 Joules
Apparent Combustion Efficiency :	77.1 %
Indicated Thermal Efficiency :	36.8 %
Brake Thermal Efficiency :	34.4 %
Ignition Delay :	10.4 degrees
Centroid Phasing :	198.8 degrees
Centroid Magnitude :	14.30 J/degree
Sensitivity :	26.3 degrees
Premixed/Diffusion Ratio :	.39565

870701.113034 AL-16086-F AL-12920-L 6V-53 2

Dry Bulb Temperature, F	87.447	.284	30.804	.158
Wet Bulb Temperature, F	77.948	.165	25.527	.092
P11-Baro (Vent), "Hg ABS	29.027	.000	98.296	.001
P3 C3 Fuel Pressure,psig	72.062	.144	496.85	.991
P4 C3 Oil Pressure, psig	48.470	.014	334.19	.097
P5 C3 Airbox Pres., psig	1.584	.006	10.924	.038
P10 C3 Exh Comm, inH2Og	4.084	.088	1.016	.022
P11 C3 Intake Vac,inH2Ov	7.349	.053	1.829	.013
P12 C3 Blowby, inH2Og	.030	.003	.007	.001
C3 Speed, RPM	1800.7	.690	1800.7	.690
C3 Fuel Flow, lb/hr	23.958	.086	10.867	.039
C3 Smoke, %	2.033	.026	2.033	.026
Cell 3 Load, lb-ft	149.99	.614	203.35	.832
K1 C3 Exhaust 1, F	384.28	.191	195.71	.106
K2 C3 Exhaust 2, F	387.41	.330	197.45	.183
K3 C3 Exhaust 3, F	425.72	.234	218.73	.130
K4 C3 Exhaust 4, F	390.81	.384	199.34	.213
K5 C3 Exhaust 5, F	410.41	.518	210.23	.288
K6 C3 Exhaust 6, F	410.90	.266	210.50	.148
K7-C3 Exhaust Comm, F	233.62	1.205	112.01	.670
J1 C3 Water In, F	159.46	.037	70.809	.021
J2 C3 Water Out, F	168.29	.077	75.719	.043
J3 C3 Oil Sump, F	215.86	.118	102.15	.065
J4 C3 Fuel In, F	89.908	.084	32.171	.047
J5 C3 Inlet Air, F	101.84	.066	38.800	.037
J6 C3 Airbox, F	150.04	.171	65.579	.095
Horsepower	51.426	.206	38.342	.154
Corrected Horsepower	54.709	.219	40.789	.163
BSFC, lb/hp-hr	.466	.002	.283	.001
Corrected BSFC	.438	.002	.266	.001
Relative Humidity	65.648	.335	65.648	.335
Reference Pressure, inHg	31.712		107.39	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1200

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.71 in-Hg
Speed :	1801 RPM
Load :	150.0 lb-ft
Fuel Flow :	24.0 lb/hr
Brake Power :	51.44 bhp
BSFC :	.467 lb/bhp-hr
Indicated Power :	8.00 kW/cyl
Peak Pressure :	7.390 MPa
Peak Rate of Pressure Rise:	792.6 kPa/deg
Peak Heat Release Rate :	93.2 Joules/deg
Cumulative Heat Release :	516.334 Joules
Apparent Combustion Efficiency :	71.4 %
Indicated Thermal Efficiency :	36.9 %
Brake Thermal Efficiency :	29.4 %
Ignition Delay :	12.2 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	20.19 J/degree
Sensitivity :	20.7 degrees
Premixed/Diffusion Ratio :	.58908

870701.115341 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	89.516	.212	31.954	.118
Wet Bulb Temperature, F	78.521	.023	25.845	.013
P11-Baro (Vent), "Hg ABS	29.021	.000	98.276	.001
P3 C3 Fuel Pressure,psig	72.137	.224	497.37	1.546
P4 C3 Oil Pressure, psig	49.661	.015	342.40	.104
P5 C3 Airbox Pres., psig	1.647	.015	11.354	.104
P10 C3 Exh Comm, inH2Og	3.236	.132	.805	.033
P11 C3 Intake Vac,inH2Ov	7.429	.140	1.849	.035
P12 C3 Blowby, inH2Og	.032	.004	.008	.001
C3 Speed, RPM	1800.5	11.159	1800.5	11.159
C3 Fuel Flow, lb/hr	17.295	.042	7.845	.019
C3 Smoke, %	2.110	.037	2.110	.037
Cell 3 Load, lb-ft	78.968	4.933	107.07	6.688
K1 C3 Exhaust 1, F	332.46	.147	166.92	.082
K2 C3 Exhaust 2, F	323.35	.190	161.86	.105
K3 C3 Exhaust 3, F	355.12	.276	179.51	.153
K4 C3 Exhaust 4, F	299.91	.236	148.84	.131
K5 C3 Exhaust 5, F	300.67	.206	149.26	.114
K6 C3 Exhaust 6, F	310.63	.286	154.79	.159
K7-C3 Exhaust Comm, F	195.28	1.117	90.709	.620
J1 C3 Water In, F	160.61	.060	71.448	.033
J2 C3 Water Out, F	168.18	.073	75.656	.041
J3 C3 Oil Sump, F	209.06	.094	98.366	.052
J4 C3 Fuel In, F	89.131	.038	31.740	.021
J5 C3 Inlet Air, F	102.32	.067	39.064	.037
J6 C3 Airbox, F	148.17	.213	64.542	.118
Horsepower	27.079	1.819	20.189	1.356
Corrected Horsepower	28.827	1.937	21.493	1.444
BSFC, lb/hp-hr	.641	.043	.390	.026
Corrected BSFC	.602	.040	.366	.025
Relative Humidity	61.644	.525	61.644	.525
Reference Pressure, inHg	31.827		107.78	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1202

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.83 in-Hg
Speed :	1801 RPM
Load :	79.0 lb-ft
Fuel Flow :	17.3 lb/hr
Brake Power :	27.09 bhp
BSFC :	.639 lb/bhp-hr
Indicated Power :	5.69 kW/cyl
Peak Pressure :	6.949 MPa
Peak Rate of Pressure Rise:	738.9 kPa/deg
Peak Heat Release Rate :	87.7 Joules/deg
Cumulative Heat Release :	358.482 Joules
Apparent Combustion Efficiency :	68.8 %
Indicated Thermal Efficiency :	36.4 %
Brake Thermal Efficiency :	21.5 %
Ignition Delay :	13.0 degrees
Centroid Phasing :	193.3 degrees
Centroid Magnitude :	22.57 J/degree
Sensitivity :	18.2 degrees
Premixed/Diffusion Ratio :	.71440

870701.120845 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	89.102	.093	31.724	.052
Wet Bulb Temperature, F	77.224	.091	25.124	.051
P11-Baro (Vent), "Hg ABS	29.029	.000	98.302	.001
P3 C3 Fuel Pressure,psig	67.993	.090	468.79	.618
P4 C3 Oil Pressure, psig	34.546	.024	238.18	.167
P5 C3 Airbox Pres., psig	1.225	.009	8.445	.060
P10 C3 Exh Comm, inH20g	3.849	.118	.958	.029
P11 C3 Intake Vac,inH20v	3.854	.039	.959	.010
P12 C3 Blowby, inH20g	.018	.004	.004	.001
C3 Speed, RPM	1401.0	.479	1401.0	.479
C3 Fuel Flow, lb/hr	50.082	.058	22.717	.026
C3 Smoke, %	53.835	.483	53.835	.483
Cell 3 Load, lb-ft	369.45	.707	500.90	.959
K1 C3 Exhaust 1, F	608.18	.189	320.10	.105
K2 C3 Exhaust 2, F	673.55	.336	356.42	.187
K3 C3 Exhaust 3, F	774.47	.238	412.49	.132
K4 C3 Exhaust 4, F	663.17	1.003	350.65	.557
K5 C3 Exhaust 5, F	817.40	.563	436.34	.313
K6 C3 Exhaust 6, F	766.57	.319	408.09	.177
K7-C3 Exhaust Comm, F	330.31	1.033	165.73	.574
J1 C3 Water In, F	153.42	.102	67.455	.057
J2 C3 Water Out, F	168.56	.079	75.869	.044
J3 C3 Oil Sump, F	234.98	.105	112.77	.058
J4 C3 Fuel In, F	89.762	.158	32.090	.088
J5 C3 Inlet Air, F	102.13	.100	38.962	.056
J6 C3 Airbox, F	158.01	.033	70.005	.019
Horsepower	98.553	.190	73.479	.142
Corrected Horsepower	104.68	.202	78.048	.151
BSFC, lb/hp-hr	.508	.001	.309	.001
Corrected BSFC	.478	.001	.291	.001
Relative Humidity	58.776	.080	58.776	.080
Reference Pressure, inHg	31.239		105.79	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1204

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.24 in-Hg
Speed :	1401 RPM
Load :	369.5 lb-ft
Fuel Flow :	50.1 lb/hr
Brake Power :	98.57 bhp
BSFC :	.508 lb/bhp-hr
Indicated Power :	13.83 kW/cyl
Peak Pressure :	10.09 MPa
Peak Rate of Pressure Rise:	851.6 kPa/deg
Peak Heat Release Rate :	97.4 Joules/deg
Cumulative Heat Release :	1192.24 Joules
Apparent Combustion Efficiency :	61.4 %
Indicated Thermal Efficiency :	30.5 %
Brake Thermal Efficiency :	27.0 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	16.06 J/degree
Sensitivity :	26.2 degrees
Premixed/Diffusion Ratio :	.25634

870701.122651 AL-16086-F AL-12920-L 6V-53 2

Dry Bulb Temperature, F	89.909	.062	32.171	.034
Wet Bulb Temperature, F	77.693	.032	25.385	.018
P11-Baro (Vent), "Hg ABS	29.027	.000	98.298	.001
P3 C3 Fuel Pressure,psig	69.377	.089	478.33	.616
P4 C3 Oil Pressure, psig	40.041	.011	276.07	.077
P5 C3 Airbox Pres., psig	1.188	.006	8.188	.041
P10 C3 Exh Comm, inH2Og	.785	.072	.195	.018
P11 C3 Intake Vac,inH2Ov	3.999	.023	.995	.006
P12 C3 Blowby, inH2Og	.019	.003	.005	.001
C3 Speed, RPM	1400.3	.968	1400.3	.968
C3 Fuel Flow, lb/hr	14.745	.030	6.688	.013
C3 Smoke, %	1.991	.034	1.991	.034
Cell 3 Load, lb-ft	98.514	.582	133.57	.789
K1 C3 Exhaust 1, F	332.70	.124	167.05	.069
K2 C3 Exhaust 2, F	308.81	.151	153.78	.084
K3 C3 Exhaust 3, F	350.92	.372	177.18	.206
K4 C3 Exhaust 4, F	291.58	.204	144.21	.113
K5 C3 Exhaust 5, F	295.15	.285	146.19	.158
K6 C3 Exhaust 6, F	307.89	.199	153.27	.111
K7-C3 Exhaust Comm, F	187.82	.774	86.566	.430
J1 C3 Water In, F	161.12	.054	71.733	.030
J2 C3 Water Out, F	168.98	.053	76.102	.029
J3 C3 Oil Sump, F	206.98	.097	97.208	.054
J4 C3 Fuel In, F	88.539	.096	31.410	.053
J5 C3 Inlet Air, F	101.01	.125	38.339	.070
J6 C3 Airbox, F	144.84	.024	62.687	.013
Horsepower	26.266	.164	19.584	.122
Corrected Horsepower	27.884	.174	20.790	.130
BSFC, lb/hp-hr	.561	.004	.342	.003
Corrected BSFC	.529	.004	.322	.002
Relative Humidity	58.085	.190	58.085	.190
Reference Pressure, inHg	31.151		105.49	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1206

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.15 in-Hg
Speed :	1400 RPM
Load :	98.5 lb-ft
Fuel Flow :	14.7 lb/hr
Brake Power :	26.26 bhp
BSFC :	.560 lb/bhp-hr
Indicated Power :	4.83 kW/cyl
Peak Pressure :	6.993 MPa
Peak Rate of Pressure Rise:	902.4 kPa/deg
Peak Heat Release Rate :	107.8 Joules/deg
Cumulative Heat Release :	395.665 Joules
Apparent Combustion Efficiency :	69.4 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	24.5 %
Ignition Delay :	11.8 degrees
Centroid Phasing :	190.3 degrees
Centroid Magnitude :	25.39 J/degree
Sensitivity :	16.6 degrees
Premixed/Diffusion Ratio :	.71034

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 2 FUEL BF-2 DATE 7-2-87 PAGE 9

AL-15399-F
BF02502187

Operator Greg							
Time							
Test Hour							
Speed, RPM	2800	2500	2200	1800	1398		
Load, lb-ft	350.4	381.0	401.4	398.2	372.4		
Fuel Flow, lb/hr	78.1	73.7	69.5	60.3	51.7		
Exh. Opacity, %	2.5	3.5	6.0	24.0	52.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	760	740	660	600		
Exhaust Cyl. L2	790	800	790	760	660		
Exhaust Cyl. L3	860	900	900	850	750		
Exhaust Cyl. R1	790	780	750	650	640		
Exhaust Cyl. R2	880	890	905	890	770		
Exhaust Cyl. R3	890	900	910	890	730		
Exhaust Common	450	440	400	360	340		
Water In	154	154	154	154	154		
Water Out	167	167	168	169	169		
Oil Sump	242	241	240	236	234		
Fuel	87	87	87	86	90		
Inlet Air	100	99	100	102	100		
Airbox	198	192	184	162	154		
Wet Bulb	78.5	78.8	79.0	79.2	79.5		
Dry Bulb	84.5	85.0	85.8	86.3	87.0		
PRESSURES, PSIG							
Oil Gallery	53.5	51.0	48.5	43.5	33.5		
Air After Blower	4.9	4.0	3.0	1.9	1.3		
Fuel Transfer	73.0	74.0	73.0	71.0	69.0		
LOW PRESSURES							
Intake Vac., in.water	18.4	15.3	12.4	8.2	4.9		
Exh. Comm., in.Water	26.5	21.5	17.5	12.0	8.0		
Blowby, in.water	.2	.2	.2	.2	.2		
Barometer, in.Hg	28.97	28.98	28.97	28.97	28.97		

870702.092413 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	84.081	.071	28.934	.039
Wet Bulb Temperature, F	77.745	.025	25.414	.014
P11-Baro (Vent), "Hg ABS	28.974	.000	98.117	.002
P3 C3 Fuel Pressure,psig	76.158	.567	525.09	3.910
P4 C3 Oil Pressure, psig	54.026	.027	372.49	.183
P5 C3 Airbox Pres., psig	4.728	.013	32.595	.089
P10 C3 Exh Comm, inH2Og	20.831	.232	5.184	.058
P11 C3 Intake Vac,inH2Ov	18.419	.123	4.583	.031
P12 C3 Blowby, inH2Og	.067	.003	.017	.001
C3 Speed, RPM	2799.5	1.142	2799.5	1.142
C3 Fuel Flow, lb/hr	78.655	2.458	35.677	1.115
C3 Smoke, %	2.453	.105	2.453	.105
Cell 3 Load, lb-ft	348.74	.689	472.83	.934
K1 C3 Exhaust 1, F	757.30	.337	402.95	.187
K2 C3 Exhaust 2, F	808.30	.475	431.28	.264
K3 C3 Exhaust 3, F	897.79	.228	481.00	.127
K4 C3 Exhaust 4, F	812.26	.521	433.48	.290
K5 C3 Exhaust 5, F	907.89	.570	486.60	.317
K6 C3 Exhaust 6, F	919.58	1.025	493.10	.570
K7-C3 Exhaust Comm, F	468.99	.585	242.77	.325
J1 C3 Water In, F	155.58	.043	68.654	.024
J2 C3 Water Out, F	168.50	.047	75.835	.026
J3 C3 Oil Sump, F	243.21	.225	117.34	.125
J4 C3 Fuel In, F	88.327	.113	31.293	.063
J5 C3 Inlet Air, F	100.88	.269	38.266	.149
J6 C3 Airbox, F	197.43	.355	91.906	.197
Horsepower	185.89	.387	138.59	.289
Corrected Horsepower	198.16	.413	147.74	.308
BSFC, lb/hp-hr	.423	.013	.257	.008
Corrected BSFC	.397	.012	.241	.008
Relative Humidity	75.488	.189	75.488	.189
Reference Pressure, inHg	37.244		126.12	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1208

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.24 in-Hg
Speed :	2800 RPM
Load :	348.7 lb-ft
Fuel Flow :	78.7 lb/hr
Brake Power :	185.90 bhp
BSFC :	.423 lb/bhp-hr
Indicated Power :	27.82 kW/cyl
Peak Pressure :	9.408 MPa
Peak Rate of Pressure Rise:	491.2 kPa/deg
Peak Heat Release Rate :	39.8 Joules/deg
Cumulative Heat Release :	1158.93 Joules
Apparent Combustion Efficiency :	76.3 %
Indicated Thermal Efficiency :	39.3 %
Brake Thermal Efficiency :	32.6 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	198.6 degrees
Centroid Magnitude :	10.78 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.24587

870702.095215 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	84.549	.098	29.194	.054
Wet Bulb Temperature, F	77.874	.057	25.486	.032
P11-Baro (Vent), "Hg ABS	28.976	.000	98.124	.001
P3 C3 Fuel Pressure,psig	73.717	.215	508.26	1.486
P4 C3 Oil Pressure, psig	52.192	.016	359.85	.113
P5 C3 Airbox Pres., psig	3.732	.016	25.734	.109
P10 C3 Exh Comm, inH2Og	16.606	.176	4.132	.044
P11 C3 Intake Vac,inH2Ov	14.524	.112	3.614	.028
P12 C3 Blowby, inH2Og	.063	.002	.016	.000
C3 Speed, RPM	2499.7	.734	2499.7	.734
C3 Fuel Flow, lb/hr	76.983	4.887	34.919	2.217
C3 Smoke, %	2.883	.168	2.883	.168
Cell 3 Load, lb-ft	380.07	.667	515.31	.904
K1 C3 Exhaust 1, F	776.22	.425	413.45	.236
K2 C3 Exhaust 2, F	822.60	.304	439.22	.169
K3 C3 Exhaust 3, F	925.91	.504	496.62	.280
K4 C3 Exhaust 4, F	808.53	.359	431.41	.199
K5 C3 Exhaust 5, F	920.00	.441	493.33	.245
K6 C3 Exhaust 6, F	931.55	.557	499.75	.310
K7-C3 Exhaust Comm, F	451.94	.228	233.30	.126
J1 C3 Water In, F	154.30	.058	67.942	.032
J2 C3 Water Out, F	167.78	.079	75.433	.044
J3 C3 Oil Sump, F	242.06	.193	116.70	.107
J4 C3 Fuel In, F	87.127	.251	30.626	.139
J5 C3 Inlet Air, F	100.49	.099	38.052	.055
J6 C3 Airbox, F	193.05	.081	89.473	.045
Horsepower	180.90	.322	134.88	.240
Corrected Horsepower	192.76	.343	143.72	.256
BSFC, lb/hp-hr	.426	.027	.259	.016
Corrected BSFC	.399	.025	.243	.015
Relative Humidity	74.399	.152	74.399	.152
Reference Pressure, inHg	35.507		120.24	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1210

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.51 in-Hg
Speed :	2500 RPM
Load :	380.1 lb-ft
Fuel Flow :	77.0 lb/hr
Brake Power :	180.93 bhp
BSFC :	.426 lb/bhp-hr
Indicated Power :	25.19 kW/cyl
Peak Pressure :	9.499 MPa
Peak Rate of Pressure Rise:	522.0 kPa/deg
Peak Heat Release Rate :	45.8 Joules/deg
Cumulative Heat Release :	1195.55 Joules
Apparent Combustion Efficiency :	71.8 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	32.4 %
Ignition Delay :	7.0 degrees
Centroid Phasing :	198.4 degrees
Centroid Magnitude :	11.04 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.23920

870702.100708 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	85.148	.110	29.527	.061
Wet Bulb Temperature, F	78.156	.043	25.642	.024
P11-Baro (Vent), "Hg ABS	28.972	.000	98.111	.001
P3 C3 Fuel Pressure,psig	72.266	.262	498.26	1.810
P4 C3 Oil Pressure, psig	49.057	.016	338.24	.111
P5 C3 Airbox Pres., psig	2.636	.012	18.172	.081
P10 C3 Exh Comm, inH2Og	12.108	.225	3.013	.056
P11 C3 Intake Vac,inH2Ov	11.768	.073	2.928	.018
P12 C3 Blowby, inH2Og	.046	.003	.011	.001
C3 Speed, RPM	2198.3	1.055	2198.3	1.055
C3 Fuel Flow, lb/hr	69.355	2.761	31.459	1.252
C3 Smoke, %	6.366	.140	6.366	.140
Cell 3 Load, lb-ft	399.65	.574	541.85	.779
K1 C3 Exhaust 1, F	743.07	.308	395.04	.171
K2 C3 Exhaust 2, F	814.47	.492	434.70	.273
K3 C3 Exhaust 3, F	931.73	.345	499.85	.192
K4 C3 Exhaust 4, F	791.12	.482	421.73	.268
K5 C3 Exhaust 5, F	949.35	1.157	509.64	.643
K6 C3 Exhaust 6, F	953.65	.449	512.03	.250
K7-C3 Exhaust Comm, F	421.42	.532	216.34	.296
J1 C3 Water In, F	153.84	.071	67.688	.039
J2 C3 Water Out, F	167.82	.053	75.458	.029
J3 C3 Oil Sump, F	241.62	.207	116.46	.115
J4 C3 Fuel In, F	86.540	.026	30.300	.014
J5 C3 Inlet Air, F	101.71	.060	38.727	.033
J6 C3 Airbox, F	184.55	.186	84.751	.103
Horsepower	167.28	.272	124.72	.203
Corrected Horsepower	178.50	.290	133.08	.216
BSFC, lb/hp-hr	.415	.017	.252	.010
Corrected BSFC	.389	.016	.236	.010
Relative Humidity	73.435	.309	73.435	.309
Reference Pressure, inHg	33.473		113.35	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1212

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.47 in-Hg
Speed :	2198 RPM
Load :	399.7 lb-ft
Fuel Flow :	69.4 lb/hr
Brake Power :	167.28 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	22.68 kW/cyl
Peak Pressure :	9.671 MPa
Peak Rate of Pressure Rise:	542.2 kPa/deg
Peak Heat Release Rate :	49.9 Joules/deg
Cumulative Heat Release :	1241.00 Joules
Apparent Combustion Efficiency :	72.7 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	33.3 %
Ignition Delay :	6.8 degrees
Centroid Phasing :	197.8 degrees
Centroid Magnitude :	11.67 J/degree
Sensitivity :	29.0 degrees
Premixed/Diffusion Ratio :	.23368

870702.104351 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	86.461	.081	30.256	.045
Wet Bulb Temperature, F	78.716	.033	25.953	.018
P11-Baro (Vent), "Hg ABS	28.973	.000	98.112	.001
P3 C3 Fuel Pressure,psig	70.688	.215	487.37	1.480
P4 C3 Oil Pressure, psig	44.382	.067	306.00	.459
P5 C3 Airbox Pres., psig	1.770	.011	12.203	.075
P10 C3 Exh Comm, inH2Og	7.267	.219	1.808	.054
P11 C3 Intake Vac,inH2Ov	7.714	.100	1.920	.025
P12 C3 Blowby, inH2Og	.036	.004	.009	.001
C3 Speed, RPM	1805.0	4.289	1805.0	4.289
C3 Fuel Flow, lb/hr	61.796	1.765	28.030	.800
C3 Smoke, %	25.520	.293	25.520	.293
Cell 3 Load, lb-ft	398.39	.493	540.14	.669
K1 C3 Exhaust 1, F	675.59	.297	357.55	.165
K2 C3 Exhaust 2, F	791.08	.534	421.71	.296
K3 C3 Exhaust 3, F	871.86	.638	466.59	.354
K4 C3 Exhaust 4, F	654.82	13.881	346.01	7.712
K5 C3 Exhaust 5, F	914.22	1.929	490.12	1.072
K6 C3 Exhaust 6, F	914.36	.746	490.20	.414
K7-C3 Exhaust Comm, F	382.26	.519	194.59	.289
J1 C3 Water In, F	154.61	.118	68.117	.065
J2 C3 Water Out, F	169.03	.143	76.127	.080
J3 C3 Oil Sump, F	237.29	.224	114.05	.124
J4 C3 Fuel In, F	86.914	.207	30.508	.115
J5 C3 Inlet Air, F	102.93	.095	39.406	.053
J6 C3 Airbox, F	161.59	.288	71.996	.160
Horsepower	136.92	.432	102.08	.322
Corrected Horsepower	146.31	.462	109.08	.344
BSFC, lb/hp-hr	.451	.014	.275	.008
Corrected BSFC	.422	.013	.257	.008
Relative Humidity	71.196	.183	71.196	.183
Reference Pressure, inHg	32.009		108.39	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1214

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.01 in-Hg
Speed :	1805 RPM
Load :	398.4 lb-ft
Fuel Flow :	61.8 lb/hr
Brake Power :	136.92 bhp
BSFC :	.451 lb/bhp-hr
Indicated Power :	18.16 kW/cyl
Peak Pressure :	9.818 MPa
Peak Rate of Pressure Rise:	616.4 kPa/deg
Peak Heat Release Rate :	63.3 Joules/deg
Cumulative Heat Release :	1187.68 Joules
Apparent Combustion Efficiency :	64.2 %
Indicated Thermal Efficiency :	32.6 %
Brake Thermal Efficiency :	30.6 %
Ignition Delay :	6.4 degrees
Centroid Phasing :	196.2 degrees
Centroid Magnitude :	12.75 J/degree
Sensitivity :	27.8 degrees
Premixed/Diffusion Ratio :	.22943

870702.110711 AL-15299-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	87.075	.227	30.597	.126
Wet Bulb Temperature, F	78.989	.068	26.105	.038
P11-Baro (Vent), "Hg ABS	28.968	.000	98.097	.001
P3 C3 Fuel Pressure,psig	68.498	.077	472.28	.534
P4 C3 Oil Pressure, psig	34.026	.006	234.60	.040
P5 C3 Airbox Pres., psig	1.199	.011	8.267	.078
P10 C3 Exh Comm, inH2Og	3.279	.059	.816	.015
P11 C3 Intake Vac,inH2Ov	4.478	.042	1.114	.010
P12 C3 Blowby, inH2Og	.035	.004	.009	.001
C3 Speed, RPM	1397.8	.935	1397.8	.935
C3 Fuel Flow, lb/hr	52.381	.357	23.759	.162
C3 Smoke, %	51.626	.852	51.626	.852
Cell 3 Load, lb-ft	371.23	1.132	503.32	1.535
K1 C3 Exhaust 1, F	611.36	.469	321.87	.260
K2 C3 Exhaust 2, F	690.39	.423	365.77	.235
K3 C3 Exhaust 3, F	779.49	.460	415.27	.255
K4 C3 Exhaust 4, F	659.70	4.263	348.72	2.368
K5 C3 Exhaust 5, F	802.91	.580	428.28	.322
K6 C3 Exhaust 6, F	756.48	.498	402.49	.277
K7-C3 Exhaust Comm, F	336.14	.323	168.97	.180
J1 C3 Water In, F	154.96	.038	68.310	.021
J2 C3 Water Out, F	170.30	.053	76.831	.029
J3 C3 Oil Sump, F	235.13	.153	112.85	.085
J4 C3 Fuel In, F	90.058	.142	32.255	.079
J5 C3 Inlet Air, F	102.03	.291	38.908	.161
J6 C3 Airbox, F	155.22	.202	68.457	.112
Horsepower	98.802	.331	73.665	.247
Corrected Horsepower	105.53	.353	78.682	.263
BSFC, lb/hp-hr	.530	.005	.323	.003
Corrected BSFC	.496	.005	.302	.003
Relative Humidity	70.224	.505	70.224	.505
Reference Pressure, inHg	31.080		105.25	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1216

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.08 in-Hg
Speed :	1398 RPM
Load :	371.2 lb-ft
Fuel Flow :	52.4 lb/hr
Brake Power :	98.81 bhp
BSFC :	.530 lb/bhp-hr
Indicated Power :	13.70 kW/cyl
Peak Pressure :	10.09 MPa
Peak Rate of Pressure Rise:	696.2 kPa/deg
Peak Heat Release Rate :	75.5 Joules/deg
Cumulative Heat Release :	1189.39 Joules
Apparent Combustion Efficiency :	58.7 %
Indicated Thermal Efficiency :	29.0 %
Brake Thermal Efficiency :	26.0 %
Ignition Delay :	5.6 degrees
Centroid Phasing :	195.1 degrees
Centroid Magnitude :	13.91 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.20588

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 2 FUEL JP-5 DATE 7-2-87 PAGE 10

AL-16086-F
TF26P22Y87

Operator GREG							
Time							
Test Hour							
Speed, RPM	2800	2500	2500	2200	2199	1800	1800
Load, lb-ft	376.3	380.7	284.2	382.2	223.1	389.4	273.2
Fuel Flow, lb/hr	74.1	69.2	55.5	65.0	38.9	57.2	36.4
Exh. Opacity, %	2.0	2.0	1.0	2.5	3.0	16.0	4.5
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	710	720	600	700	500	650	500
Exhaust Cyl. L2	750	750	605	740	500	710	510
Exhaust Cyl. L3	830	840	700	850	550	820	590
Exhaust Cyl. R1	740	740	620	710	500	600	460
Exhaust Cyl. R2	830	840	700	855	550	855	620
Exhaust Cyl. R3	850	850	700	860	555	860	600
Exhaust Common	400	400	340	360	270	350	260
Water In	154	156	159	153	160	153	152
Water Out	167	168	171	167	170	167	167
Oil Sump	239	238	233	236	224	231	221
Fuel	86	87	82	86	87	87	87
Inlet Air	100	100	100	100	101	101	102
Airbox	184	182	162	172	161	163	153
Wet Bulb	82.2	80.5	81.5	81.0	81.5	81.0	80.4
Dry Bulb	92.5	92.0	92.5	92.0	92.6	91.5	92.0
PRESSURES, PSIG							
Oil Gallery	54.0	52.0	53.0	49.5	51.5	44.0	46.0
Air After Blower	4.4	3.4	3.8	2.4	2.8	1.9	1.7
Fuel Transfer	76.0	76.0	76.0	74.0	75.0	71.0	72.5
LOW PRESSURES							
Intake Vac., in.water	18.4	15.5	15.5	12.6	12.8	8.4	8.6
Exh. Comm., in.Water	26.0	20.5	19.0	17.0	13.5	12.0	10.5
Blowby, in.water	.2	.2	.2	.2	.2	.2	.2
Barometer, in.Hg	28.96	28.96	28.96	28.96	28.96	28.93	28.95

DETROIT DIESEL 6V–53N LOG SHEET

TEST NO. 2 FUEL JP-5 DATE 7-2-87 PAGE 11

AL-16086F
TF26P22Y87

Operator	Greg						
Time							
Test Hour							
Speed, RPM	1800	1800	1400	1400			
Load, lb–ft	148.6	85.7	368.7	92.6			
Fuel Flow, lb/hr	23.5	16.7	47.8	14.0			
Exh. Opacity, %	4.5	5.0	42.0	5.0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	340	600	340			
Exhaust Cyl. L2	360	300	640	300			
Exhaust Cyl. L3	410	350	750	350			
Exhaust Cyl. R1	370	300	560	260			
Exhaust Cyl. R2	400	300	790	300			
Exhaust Cyl. R3	400	300	750	300			
Exhaust Common	200	170	490	160			
Water In	160	161	154	156			
Water Out	169	169	168	168			
Oil Sump	212	208	231	206			
Fuel	86	87	91	90			
Inlet Air	101	100	102	102			
Airbox	149	146	162	147			
Wet Bulb	81.0	82.0	80.8	80.8			
Dry Bulb	92.5	92.0	92.5	92.8			
PRESSURES, PSIG							
Oil Gallery	49.0	49.0	34.0	34.0			
Air After Blower	1.7	1.8	1.3	1.2			
Fuel Transfer	72.5	72.5	68.5	70.0			
LOW PRESSURES							
Intake Vac., in.water	8.6	8.6	5.0	5.1			
Exh. Comm., in.Water	9.0	8.0	8.0	5.0			
Blowby, in.water	.2	.2	.2	.2			
Barometer, in.Hg	28.93	28.94	28.94	28.94			

S70702.125729 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	92.718	.058	33.732	.032
Wet Bulb Temperature, F	80.578	.092	26.988	.051
P11-Baro (Vent), "Hg ABS	28.962	.000	98.077	.001
P3 C3 Fuel Pressure,psig	75.781	.626	522.49	4.318
P4 C3 Oil Pressure, psig	54.431	.022	375.29	.151
P5 C3 Airbox Pres., psig	4.681	.011	32.277	.073
P10 C3 Exh Comm, inH20g	21.142	.300	5.261	.075
P11 C3 Intake Vac,inH20v	18.927	.138	4.710	.034
P12 C3 Blowby, inH20g	.066	.003	.016	.001
C3 Speed, RPM	2800.8	1.232	2800.8	1.232
C3 Fuel Flow, lb/hr	74.163	.439	33.640	.199
C3 Smoke, %	1.029	.103	1.029	.103
Cell 3 Load, lb-ft	325.93	.458	441.90	.621
K1 C3 Exhaust 1, F	723.57	.417	384.21	.232
K2 C3 Exhaust 2, F	774.15	.844	412.31	.469
K3 C3 Exhaust 3, F	850.24	.460	454.58	.256
K4 C3 Exhaust 4, F	764.83	.535	407.13	.297
K5 C3 Exhaust 5, F	857.43	.495	458.58	.275
K6 C3 Exhaust 6, F	872.17	.392	466.76	.218
K7-C3 Exhaust Comm, F	414.39	.703	212.44	.391
J1 C3 Water In, F	155.43	.042	68.574	.023
J2 C3 Water Out, F	167.73	.069	75.406	.038
J3 C3 Oil Sump, F	239.92	.210	115.51	.117
J4 C3 Fuel In, F	86.284	.139	30.158	.077
J5 C3 Inlet Air, F	101.07	.056	38.374	.031
J6 C3 Airbox, F	185.27	.173	85.152	.096
Horsepower	173.81	.210	129.59	.157
Corrected Horsepower	185.59	.225	138.37	.167
BSFC, lb/hp-hr	.427	.003	.260	.002
Corrected BSFC	.400	.002	.243	.001
Relative Humidity	59.408	.307	59.408	.307
Reference Pressure, inHg	37.101		125.64	

HAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1218

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.10 in-Hg
Speed :	2801 RPM
Load :	325.9 lb-ft
Fuel Flow :	74.2 lb/hr
Brake Power :	173.81 bhp
BSFC :	.427 lb/bhp-hr
Indicated Power :	26.83 kW/cyl
Peak Pressure :	9.271 MPa
Peak Rate of Pressure Rise:	617.5 kPa/deg
Peak Heat Release Rate :	59.2 Joules/deg
Cumulative Heat Release :	1099.73 Joules
Apparent Combustion Efficiency :	76.5 %
Indicated Thermal Efficiency :	40.0 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	8.2 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	11.66 J/degree
Sensitivity :	27.3 degrees
Premixed/Diffusion Ratio :	.30102

870702.131343 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	92.570	.084	33.650	.047
Wet Bulb Temperature, F	79.658	.177	26.477	.098
P11-Baro (Vent), "Hg ABS	28.963	.000	98.081	.002
P3 C3 Fuel Pressure,psig	75.177	.241	518.33	1.663
P4 C3 Oil Pressure, psig	52.550	.021	362.32	.144
P5 C3 Airbox Pres., psig	3.636	.006	25.072	.039
P10 C3 Exh Comm, inH2Og	16.906	.118	4.207	.029
P11 C3 Intake Vac,inH2Ov	15.022	.098	3.738	.025
P12 C3 Blowby, inH2Og	.049	.003	.012	.001
C3 Speed, RPM	2498.1	.661	2498.1	.661
C3 Fuel Flow, lb/hr	69.743	.292	31.635	.133
C3 Smoke, %	1.439	.073	1.439	.073
Cell 3 Load, lb-ft	359.62	.678	487.58	.919
K1 C3 Exhaust 1, F	729.92	.317	387.73	.176
K2 C3 Exhaust 2, F	767.37	.612	408.54	.340
K3 C3 Exhaust 3, F	861.38	.603	460.77	.335
K4 C3 Exhaust 4, F	766.61	.290	408.11	.161
K5 C3 Exhaust 5, F	863.42	.451	461.90	.250
K6 C3 Exhaust 6, F	875.89	.504	468.83	.280
K7-C3 Exhaust Comm, F	406.24	.500	207.91	.278
J1 C3 Water In, F	156.47	.151	69.150	.084
J2 C3 Water Out, F	168.98	.140	76.099	.078
J3 C3 Oil Sump, F	238.89	.250	114.94	.139
J4 C3 Fuel In, F	87.084	.165	30.602	.092
J5 C3 Inlet Air, F	101.61	.062	38.672	.035
J6 C3 Airbox, F	182.50	.150	83.613	.083
Horsepower	171.05	.358	127.53	.267
Corrected Horsepower	182.47	.382	136.04	.285
BSFC, lb/hp-hr	.408	.002	.248	.001
Corrected BSFC	.382	.002	.233	.001
Relative Humidity	57.118	.341	57.118	.341
Reference Pressure, inHg	35.262		119.41	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1220

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.26 in-Hg
Speed :	2498 RPM
Load :	359.6 lb-ft
Fuel Flow :	69.7 lb/hr
Brake Power :	171.04 bhp
BSFC :	.408 lb/bhp-hr
Indicated Power :	24.00 kW/cyl
Peak Pressure :	9.383 MPa
Peak Rate of Pressure Rise:	662.2 kPa/deg
Peak Heat Release Rate :	67.4 Joules/deg
Cumulative Heat Release :	1126.25 Joules
Apparent Combustion Efficiency :	74.4 %
Indicated Thermal Efficiency :	38.1 %
Brake Thermal Efficiency :	33.7 %
Ignition Delay :	8.4 degrees
Centroid Phasing :	197.9 degrees
Centroid Magnitude :	12.44 J/degree
Sensitivity :	27.6 degrees
Premixed/Diffusion Ratio :	.30327

870702.132736 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	92.137	.083	33.410	.046
Wet Bulb Temperature, F	79.919	.088	26.622	.049
P11-Baro (Vent), "Hg ABS	28.964	.000	98.084	.001
P3 C3 Fuel Pressure,psig	75.507	.205	520.60	1.415
P4 C3 Oil Pressure, psig	53.576	.016	369.39	.107
P5 C3 Airbox Pres., psig	3.556	.020	24.516	.137
P10 C3 Exh Comm, inH2Og	14.754	.085	3.671	.021
P11 C3 Intake Vac,inH2Ov	15.131	.077	3.765	.019
P12 C3 Blowby, inH2Og	.052	.005	.013	.001
C3 Speed, RPM	2498.6	.946	2498.6	.946
C3 Fuel Flow, lb/hr	56.008	.149	25.405	.068
C3 Smoke, %	.571	.111	.571	.111
Cell 3 Load, lb-ft	286.38	1.191	388.28	1.615
K1 C3 Exhaust 1, F	600.28	.875	315.71	.486
K2 C3 Exhaust 2, F	627.50	.958	330.83	.532
K3 C3 Exhaust 3, F	712.43	.574	378.02	.319
K4 C3 Exhaust 4, F	641.63	.245	338.68	.136
K5 C3 Exhaust 5, F	720.22	.299	382.35	.166
K6 C3 Exhaust 6, F	726.95	.485	386.08	.270
K7-C3 Exhaust Comm, F	346.34	.688	174.63	.382
J1 C3 Water In, F	160.54	.081	71.411	.045
J2 C3 Water Out, F	171.65	.102	77.583	.057
J3 C3 Oil Sump, F	233.65	.129	112.03	.072
J4 C3 Fuel In, F	87.497	.164	30.832	.091
J5 C3 Inlet Air, F	100.76	.071	38.197	.039
J6 C3 Airbox, F	172.59	.193	78.108	.107
Horsepower	136.24	.567	101.58	.423
Corrected Horsepower	145.30	.605	108.33	.451
BSFC, lb/hp-hr	.411	.002	.250	.001
Corrected BSFC	.385	.002	.235	.001
Relative Humidity	58.963	.246	58.963	.246
Reference Pressure, inHg	35.091		118.83	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1222

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.09 in-Hg
Speed :	2499 RPM
Load :	286.4 lb-ft
Fuel Flow :	56.0 lb/hr
Brake Power :	136.27 bhp
BSFC :	.411 lb/bhp-hr
Indicated Power :	19.26 kW/cyl
Peak Pressure :	8.587 MPa
Peak Rate of Pressure Rise:	665.6 kPa/deg
Peak Heat Release Rate :	69.9 Joules/deg
Cumulative Heat Release :	880.040 Joules
Apparent Combustion Efficiency :	72.4 %
Indicated Thermal Efficiency :	38.0 %
Brake Thermal Efficiency :	33.4 %
Ignition Delay :	10.3 degrees
Centroid Phasing :	196.7 degrees
Centroid Magnitude :	12.43 J/degree
Sensitivity :	24.5 degrees
Premixed/Diffusion Ratio :	.41873

970702.133803 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	92.830	.196	33.795	.109
Wet Bulb Temperature, F	80.147	.049	26.748	.027
P11-Baro (Vent), "Hg ABS	28.964	.000	98.083	.001
P3 C3 Fuel Pressure,psig	73.416	.166	506.19	1.146
P4 C3 Oil Pressure, psig	49.647	.016	342.30	.112
P5 C3 Airbox Pres., psig	2.618	.013	18.049	.087
P10 C3 Exh Comm, inH20g	12.828	.176	3.192	.044
P11 C3 Intake Vac,inH20v	12.173	.055	3.029	.014
P12 C3 Blowby, inH20g	.044	.005	.011	.001
C3 Speed, RPM	2199.6	1.080	2199.6	1.080
C3 Fuel Flow, lb/hr	65.065	.253	29.513	.115
C3 Smoke, %	2.895	.200	2.895	.200
Cell 3 Load, lb-ft	381.91	.830	517.79	1.125
K1 C3 Exhaust 1, F	709.56	.513	376.42	.285
K2 C3 Exhaust 2, F	766.96	.425	408.31	.236
K3 C3 Exhaust 3, F	876.93	.439	469.40	.244
K4 C3 Exhaust 4, F	748.96	.690	398.31	.383
K5 C3 Exhaust 5, F	896.49	.390	480.27	.217
K6 C3 Exhaust 6, F	901.47	.746	483.04	.414
K7-C3 Exhaust Comm, F	374.22	.872	190.12	.484
J1 C3 Water In, F	154.08	.059	67.824	.033
J2 C3 Water Out, F	167.42	.113	75.236	.063
J3 C3 Oil Sump, F	237.79	.316	114.33	.176
J4 C3 Fuel In, F	86.394	.160	30.219	.089
J5 C3 Inlet Air, F	101.89	.125	38.830	.069
J6 C3 Airbox, F	173.61	.074	78.672	.041
Horsepower	159.95	.404	119.25	.301
Corrected Horsepower	170.77	.431	127.32	.321
BSFC, lb/hp-hr	.407	.001	.247	.001
Corrected BSFC	.381	.001	.232	.001
Relative Humidity	57.875	.366	57.875	.366
Reference Pressure, inHg	33.398		113.10	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1224

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.40 in-Hg
Speed :	2200 RPM
Load :	381.9 lb-ft
Fuel Flow :	65.1 lb/hr
Brake Power :	159.97 bhp
BSFC :	.407 lb/bhp-hr
Indicated Power :	21.55 kW/cyl
Peak Pressure :	9.499 MPa
Peak Rate of Pressure Rise:	695.1 kPa/deg
Peak Heat Release Rate :	72.2 Joules/deg
Cumulative Heat Release :	1167.01 Joules
Apparent Combustion Efficiency :	72.7 %
Indicated Thermal Efficiency :	36.6 %
Brake Thermal Efficiency :	33.8 %
Ignition Delay :	8.2 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	13.19 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.30259

870702.135545 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	93.594	.221	34.219	.123
Wet Bulb Temperature, F	80.325	.153	26.847	.085
P11-Baro (Vent), "Hg ABS	28.957	.001	98.059	.002
P3 C3 Fuel Pressure,psig	74.398	.145	512.96	1.001
P4 C3 Oil Pressure, psig	52.154	.009	359.59	.063
P5 C3 Airbox Pres., psig	2.466	.011	17.005	.079
P10 C3 Exh Comm, inH20g	9.412	.119	2.342	.030
P11 C3 Intake Vac,inH20v	12.544	.099	3.121	.025
P12 C3 Blowby, inH20g	.040	.005	.010	.001
C3 Speed, RPM	2197.4	1.372	2197.4	1.372
C3 Fuel Flow, lb/hr	39.576	.251	17.952	.114
C3 Smoke, %	3.846	.219	3.846	.219
Cell 3 Load, lb-ft	222.29	1.283	301.38	1.740
K1 C3 Exhaust 1, F	504.69	.539	262.61	.299
K2 C3 Exhaust 2, F	513.66	.415	267.59	.231
K3 C3 Exhaust 3, F	572.84	.255	300.47	.142
K4 C3 Exhaust 4, F	517.99	2.247	269.99	1.249
K5 C3 Exhaust 5, F	572.41	.661	300.23	.367
K6 C3 Exhaust 6, F	574.65	.541	301.47	.300
K7-C3 Exhaust Comm, F	274.13	.870	134.51	.483
J1 C3 Water In, F	160.93	.036	71.629	.020
J2 C3 Water Out, F	171.02	.043	77.235	.024
J3 C3 Oil Sump, F	225.13	.202	107.30	.112
J4 C3 Fuel In, F	87.828	.032	31.016	.018
J5 C3 Inlet Air, F	102.18	.042	38.986	.023
J6 C3 Airbox, F	162.09	.193	72.275	.107
Horsepower	93.005	.574	69.342	.428
Corrected Horsepower	99.350	.613	74.072	.457
BSFC, lb/hp-hr	.426	.004	.259	.002
Corrected BSFC	.398	.004	.242	.002
Relative Humidity	56.503	.164	56.503	.164
Reference Pressure, inHg	33.056		111.94	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1226

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.06 in-Hg
Speed :	2197 RPM
Load :	222.3 lb-ft
Fuel Flow :	39.6 lb/hr
Brake Power :	92.99 bhp
BSFC :	.426 lb/bhp-hr
Indicated Power :	13.74 kW/cyl
Peak Pressure :	8.012 MPa
Peak Rate of Pressure Rise:	780.3 kPa/deg
Peak Heat Release Rate :	89.3 Joules/deg
Cumulative Heat Release :	717.881 Joules
Apparent Combustion Efficiency :	73.4 %
Indicated Thermal Efficiency :	38.3 %
Brake Thermal Efficiency :	32.3 %
Ignition Delay :	11.5 degrees
Centroid Phasing :	195.3 degrees
Centroid Magnitude :	16.31 J/degree
Sensitivity :	21.8 degrees
Premixed/Diffusion Ratio :	.52948

870702.140804 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	93.044	.089	33.914	.050
Wet Bulb Temperature, F	80.301	.023	26.834	.013
P11-Baro (Vent), "Hg ABS	28.953	.000	98.045	.001
P3 C3 Fuel Pressure,psig	70.452	.178	485.75	1.229
P4 C3 Oil Pressure, psig	44.932	.019	309.80	.134
P5 C3 Airbox Pres., psig	1.720	.013	11.860	.090
P10 C3 Exh Comm, inH2Og	8.057	.126	2.005	.031
P11 C3 Intake Vac,inH2Ov	8.188	.046	2.038	.012
P12 C3 Blowby, inH2Og	.036	.005	.009	.001
C3 Speed, RPM	1800.0	.551	1800.0	.551
C3 Fuel Flow, lb/hr	57.252	.166	25.969	.075
C3 Smoke, %	16.466	.234	16.466	.234
Cell 3 Load, lb-ft	389.12	.548	527.57	.742
K1 C3 Exhaust 1, F	650.78	.245	343.77	.136
K2 C3 Exhaust 2, F	745.06	.341	396.15	.190
K3 C3 Exhaust 3, F	842.42	.330	450.23	.183
K4 C3 Exhaust 4, F	613.62	17.044	323.12	9.469
K5 C3 Exhaust 5, F	893.35	.514	478.53	.286
K6 C3 Exhaust 6, F	902.62	.241	483.68	.134
K7-C3 Exhaust Comm, F	347.30	.928	175.16	.515
J1 C3 Water In, F	154.88	.088	68.267	.049
J2 C3 Water Out, F	168.60	.067	75.888	.037
J3 C3 Oil Sump, F	232.75	.287	111.53	.160
J4 C3 Fuel In, F	87.141	.174	30.634	.097
J5 C3 Inlet Air, F	102.23	.087	39.017	.049
J6 C3 Airbox, F	163.47	.118	73.038	.066
Horsepower	133.36	.199	99.431	.149
Corrected Horsepower	142.51	.213	106.25	.159
BSFC, lb/hp-hr	.429	.001	.261	.001
Corrected BSFC	.402	.001	.244	.001
Relative Humidity	57.787	.269	57.787	.269
Reference Pressure, inHg	31.853		107.86	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1228

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.85 in-Hg
Speed :	1800 RPM
Load :	389.1 lb-ft
Fuel Flow :	57.3 lb/hr
Brake Power :	133.35 bhp
BSFC :	.430 lb/bhp-hr
Indicated Power :	17.48 kW/cyl
Peak Pressure :	9.650 MPa
Peak Rate of Pressure Rise:	770.2 kPa/deg
Peak Heat Release Rate :	84.5 Joules/deg
Cumulative Heat Release :	1212.73 Joules
Apparent Combustion Efficiency :	70.2 %
Indicated Thermal Efficiency :	33.7 %
Brake Thermal Efficiency :	32.0 %
Ignition Delay :	7.8 degrees
Centroid Phasing :	199.2 degrees
Centroid Magnitude :	13.91 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.26425

870702.142743 AL-16086-F AL-12920-L 6V-53 2

Dry Bulb Temperature, F	94.250	.124	34.583	.069
Wet Bulb Temperature, F	79.914	.041	26.619	.023
P11-Baro (Vent), "Hg ABS	28.951	.000	98.039	.001
P3 C3 Fuel Pressure,psig	71.342	.249	491.89	1.717
P4 C3 Oil Pressure, psig	46.817	.013	322.79	.088
P5 C3 Airbox Pres., psig	1.548	.006	10.670	.040
P10 C3 Exh Comm, inH2Og	6.034	.064	1.501	.016
P11 C3 Intake Vac,inH2Ov	8.422	.045	2.096	.011
P12 C3 Blowby, inH2Og	.023	.003	.006	.001
C3 Speed, RPM	1800.4	.652	1800.4	.652
C3 Fuel Flow, lb/hr	36.970	.085	16.769	.038
C3 Smoke, %	6.171	.237	6.171	.237
Cell 3 Load, lb-ft	272.23	1.165	369.09	1.579
K1 C3 Exhaust 1, F	501.44	2.981	260.80	1.656
K2 C3 Exhaust 2, F	528.84	.415	276.02	.231
K3 C3 Exhaust 3, F	591.41	3.165	310.78	1.758
K4 C3 Exhaust 4, F	467.38	13.940	241.88	7.744
K5 C3 Exhaust 5, F	639.73	.353	337.63	.196
K6 C3 Exhaust 6, F	612.76	1.473	322.64	.818
K7-C3 Exhaust Comm, F	271.20	.380	132.89	.211
J1 C3 Water In, F	157.58	.096	69.765	.053
J2 C3 Water Out, F	168.16	.065	75.644	.036
J3 C3 Oil Sump, F	221.67	.196	105.37	.109
J4 C3 Fuel In, F	86.352	.170	30.196	.095
J5 C3 Inlet Air, F	102.41	.105	39.115	.058
J6 C3 Airbox, F	154.31	.060	67.951	.034
Horsepower	93.318	.392	69.576	.292
Corrected Horsepower	99.635	.419	74.285	.312
BSFC, lb/hp-hr	.396	.002	.241	.001
Corrected BSFC	.371	.001	.226	.001
Relative Humidity	53.801	.215	53.801	.215
Reference Pressure, inHg	31.482		106.61	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1230

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.48 in-Hg
Speed :	1800 RPM
Load :	272.2 lb-ft
Fuel Flow :	37.0 lb/hr
Brake Power :	93.29 bhp
BSFC :	.397 lb/bhp-hr
Indicated Power :	12.32 kW/cyl
Peak Pressure :	8.258 MPa
Peak Rate of Pressure Rise:	772.2 kPa/deg
Peak Heat Release Rate :	86.7 Joules/deg
Cumulative Heat Release :	783.921 Joules
Apparent Combustion Efficiency :	70.3 %
Indicated Thermal Efficiency :	36.8 %
Brake Thermal Efficiency :	34.6 %
Ignition Delay :	10.2 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	15.59 J/degree
Sensitivity :	21.8 degrees
Premixed/Diffusion Ratio :	.47026

870702.143853 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	94.469	.107	34.705	.060
Wet Bulb Temperature, F	79.986	.023	26.659	.013
P11-Baro (Vent), "Hg ABS	28.949	.001	98.031	.002
P3 C3 Fuel Pressure,psig	71.773	.191	494.86	1.318
P4 C3 Oil Pressure, psig	48.268	.017	332.79	.114
P5 C3 Airbox Pres., psig	1.552	.005	10.698	.037
P10 C3 Exh Comm, inH20g	4.432	.065	1.103	.016
P11 C3 Intake Vac,inH20v	8.530	.039	2.123	.010
P12 C3 Blowby, inH20g	.027	.003	.007	.001
C3 Speed, RPM	1800.2	.858	1800.2	.858
C3 Fuel Flow, lb/hr	23.994	.087	10.884	.040
C3 Smoke, %	4.390	.181	4.390	.181
Cell 3 Load, lb-ft	148.57	.570	201.43	.772
K1 C3 Exhaust 1, F	382.87	.102	194.93	.057
K2 C3 Exhaust 2, F	376.21	.242	191.23	.134
K3 C3 Exhaust 3, F	424.68	.283	218.16	.157
K4 C3 Exhaust 4, F	379.36	2.943	192.98	1.635
K5 C3 Exhaust 5, F	411.54	.182	210.85	.101
K6 C3 Exhaust 6, F	412.38	.325	211.32	.181
K7-C3 Exhaust Comm, F	207.53	1.257	97.515	.699
J1 C3 Water In, F	161.21	.054	71.784	.030
J2 C3 Water Out, F	169.67	.088	76.485	.049
J3 C3 Oil Sump, F	214.05	.145	101.14	.081
J4 C3 Fuel In, F	86.718	.241	30.399	.134
J5 C3 Inlet Air, F	102.17	.100	38.984	.055
J6 C3 Airbox, F	149.97	.045	65.538	.025
Horsepower	50.922	.216	37.966	.161
Corrected Horsepower	54.364	.231	40.532	.172
BSFC, lb/hp-hr	.471	.003	.287	.002
Corrected BSFC	.441	.003	.269	.002
Relative Humidity	53.489	.230	53.489	.230
Reference Pressure, inHg	31.480		106.60	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1232

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.48 in-Hg
Speed :	1800 RPM
Load :	148.6 lb-ft
Fuel Flow :	24.0 lb/hr
Brake Power :	50.93 bhp
BSFC :	.471 lb/bhp-hr
Indicated Power :	7.87 kW/cyl
Peak Pressure :	7.361 MPa
Peak Rate of Pressure Rise:	805.1 kPa/deg
Peak Heat Release Rate :	94.9 Joules/deg
Cumulative Heat Release :	518.833 Joules
Apparent Combustion Efficiency :	71.7 %
Indicated Thermal Efficiency :	36.2 %
Brake Thermal Efficiency :	29.2 %
Ignition Delay :	12.2 degrees
Centroid Phasing :	196.3 degrees
Centroid Magnitude :	20.35 J/degree
Sensitivity :	22.1 degrees
Premixed/Diffusion Ratio :	.55024

870702.145355 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	93.799	.228	34.333	.127
Wet Bulb Temperature, F	80.080	.074	26.711	.041
P11-Baro (Vent), "Hg ABS	28.942	.000	98.010	.001
P3 C3 Fuel Pressure,psig	71.784	.139	494.93	.961
P4 C3 Oil Pressure, psig	49.298	.011	339.90	.075
P5 C3 Airbox Pres., psig	1.606	.008	11.076	.053
P10 C3 Exh Comm, inH20g	3.706	.101	.922	.025
P11 C3 Intake Vac,inH20v	8.565	.056	2.131	.014
P12 C3 Blowby, inH20g	.030	.002	.008	.000
C3 Speed, RPM	1799.9	1.892	1799.9	1.892
C3 Fuel Flow, lb/hr	17.280	.074	7.838	.033
C3 Smoke, %	5.208	.143	5.208	.143
Cell 3 Load, lb-ft	85.280	1.188	115.62	1.611
K1 C3 Exhaust 1, F	335.62	.212	168.68	.118
K2 C3 Exhaust 2, F	317.49	.186	158.61	.103
K3 C3 Exhaust 3, F	358.17	.191	181.21	.106
K4 C3 Exhaust 4, F	310.18	.184	154.54	.102
K5 C3 Exhaust 5, F	313.77	.124	156.54	.069
K6 C3 Exhaust 6, F	322.19	.106	161.21	.059
K7-C3 Exhaust Comm, F	170.24	.942	76.802	.523
J1 C3 Water In, F	162.03	.066	72.237	.036
J2 C3 Water Out, F	169.63	.057	76.460	.031
J3 C3 Oil Sump, F	208.85	.097	98.248	.054
J4 C3 Fuel In, F	86.855	.023	30.475	.013
J5 C3 Inlet Air, F	101.48	.124	38.597	.069
J6 C3 Airbox, F	147.18	.064	63.988	.036
Horsepower	29.226	.426	21.790	.317
Corrected Horsepower	31.202	.455	23.263	.339
BSFC, lb/hp-hr	.591	.009	.360	.005
Corrected BSFC	.554	.008	.337	.005
Relative Humidity	55.326	.358	55.326	.358
Reference Pressure, inHg	31.583		106.95	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1234

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.58 in-Hg
Speed :	1800 RPM
Load :	85.3 lb-ft
Fuel Flow :	17.3 lb/hr
Brake Power :	29.23 bhp
BSFC :	.592 lb/bhp-hr
Indicated Power :	5.76 kW/cyl
Peak Pressure :	6.934 MPa
Peak Rate of Pressure Rise:	749.5 kPa/deg
Peak Heat Release Rate :	89.2 Joules/deg
Cumulative Heat Release :	407.773 Joules
Apparent Combustion Efficiency :	78.2 %
Indicated Thermal Efficiency :	36.8 %
Brake Thermal Efficiency :	23.2 %
Ignition Delay :	13.0 degrees
Centroid Phasing :	198.3 degrees
Centroid Magnitude :	20.56 J/degree
Sensitivity :	23.3 degrees
Premixed/Diffusion Ratio :	.55752

970702.150934 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	94.688	.142	34.827	.079
Wet Bulb Temperature, F	80.464	.173	26.924	.096
P11-Baro (Vent), "Hg ABS	28.938	.001	97.997	.002
P3 C3 Fuel Pressure,psig	67.446	.099	465.02	.683
P4 C3 Oil Pressure, psig	34.616	.019	238.67	.133
P5 C3 Airbox Pres., psig	1.181	.007	8.140	.051
P10 C3 Exh Comm, inH20g	4.199	.128	1.045	.032
P11 C3 Intake Vac,inH20v	5.100	.044	1.269	.011
P12 C3 Blowby, inH20g	.024	.002	.006	.001
C3 Speed, RPM	1401.8	.862	1401.8	.862
C3 Fuel Flow, lb/hr	51.761	7.756	23.478	3.518
C3 Smoke, %	41.988	.682	41.988	.682
Cell 3 Load, lb-ft	367.24	1.199	497.90	1.626
K1 C3 Exhaust 1, F	607.41	4.899	319.67	2.721
K2 C3 Exhaust 2, F	654.00	.558	345.56	.310
K3 C3 Exhaust 3, F	773.13	.539	411.74	.299
K4 C3 Exhaust 4, F	582.75	14.180	305.97	7.878
K5 C3 Exhaust 5, F	810.20	.792	432.34	.440
K6 C3 Exhaust 6, F	767.48	.429	408.60	.238
K7-C3 Exhaust Comm, F	288.83	.544	142.68	.302
J1 C3 Water In, F	154.40	.056	68.000	.031
J2 C3 Water Out, F	169.42	.045	76.342	.025
J3 C3 Oil Sump, F	232.27	.111	111.26	.062
J4 C3 Fuel In, F	91.780	.086	33.211	.048
J5 C3 Inlet Air, F	103.60	.075	39.776	.041
J6 C3 Airbox, F	163.92	.118	73.290	.066
Horsepower	98.020	.345	73.082	.257
Corrected Horsepower	104.89	.369	78.201	.275
BSFC, lb/hp-hr	.528	.079	.321	.048
Corrected BSFC	.493	.074	.300	.045
Relative Humidity	54.288	.235	54.288	.235
Reference Pressure, inHg	30.967		104.87	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1236

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	30.97 in-Hg
Speed :	1402 RPM
Load :	367.2 lb-ft
Fuel Flow :	51.8 lb/hr
Brake Power :	98.02 bhp
BSFC :	.528 lb/bhp-hr
Indicated Power :	13.65 kW/cyl
Peak Pressure :	9.970 MPa
Peak Rate of Pressure Rise:	842.9 kPa/deg
Peak Heat Release Rate :	97.0 Joules/deg
Cumulative Heat Release :	1180.51 Joules
Apparent Combustion Efficiency :	58.9 %
Indicated Thermal Efficiency :	29.1 %
Brake Thermal Efficiency :	26.0 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	195.3 degrees
Centroid Magnitude :	15.99 J/degree
Sensitivity :	26.4 degrees
Premixed/Diffusion Ratio :	.26304

870702.152304 AL-16086-F AL-12920-L 6V-53				2
Dry Bulb Temperature, F	94.279	.120	34.600	.067
Wet Bulb Temperature, F	79.853	.023	26.585	.013
P11-Baro (Vent), "Hg ABS	28.935	.000	97.986	.001
P3 C3 Fuel Pressure,psig	69.108	.157	476.48	1.085
P4 C3 Oil Pressure, psig	39.650	.042	273.38	.288
P5 C3 Airbox Pres., psig	1.147	.003	7.911	.024
P10 C3 Exh Comm, inH2Og	1.065	.046	.265	.011
P11 C3 Intake Vac,inH2Ov	5.237	.049	1.303	.012
P12 C3 Blowby, inH2Og	.028	.003	.007	.001
C3 Speed, RPM	1401.8	1.298	1401.8	1.298
C3 Fuel Flow, lb/hr	14.366	.066	6.516	.030
C3 Smoke, %	5.911	.255	5.911	.255
Cell 3 Load, lb-ft	97.079	1.802	131.62	2.443
K1 C3 Exhaust 1, F	331.12	.337	166.18	.187
K2 C3 Exhaust 2, F	298.55	.269	148.09	.150
K3 C3 Exhaust 3, F	348.41	.264	175.78	.147
K4 C3 Exhaust 4, F	263.11	4.375	128.40	2.431
K5 C3 Exhaust 5, F	295.37	.907	146.32	.504
K6 C3 Exhaust 6, F	308.89	.601	153.83	.334
K7-C3 Exhaust Comm, F	168.96	1.313	76.089	.730
J1 C3 Water In, F	160.47	.118	71.370	.066
J2 C3 Water Out, F	168.58	.152	75.876	.084
J3 C3 Oil Sump, F	207.49	.140	97.497	.078
J4 C3 Fuel In, F	89.948	.107	32.193	.060
J5 C3 Inlet Air, F	103.00	.056	39.447	.031
J6 C3 Airbox, F	148.98	.281	64.988	.156
Horsepower	25.911	.483	19.318	.360
Corrected Horsepower	27.692	.516	20.646	.385
BSFC, lb/hp-hr	.555	.009	.337	.006
Corrected BSFC	.519	.009	.316	.005
Relative Humidity	53.572	.308	53.572	.308
Reference Pressure, inHg	30.886		104.59	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1238

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	30.89 in-Hg
Speed :	1402 RPM
Load :	97.1 lb-ft
Fuel Flow :	14.4 lb/hr
Brake Power :	25.92 bhp
BSFC :	.556 lb/bhp-hr
Indicated Power :	4.71 kW/cyl
Peak Pressure :	6.949 MPa
Peak Rate of Pressure Rise:	900.0 kPa/deg
Peak Heat Release Rate :	107.7 Joules/deg
Cumulative Heat Release :	387.618 Joules
Apparent Combustion Efficiency :	69.5 %
Indicated Thermal Efficiency :	36.1 %
Brake Thermal Efficiency :	24.7 %
Ignition Delay :	11.9 degrees
Centroid Phasing :	190.7 degrees
Centroid Magnitude :	25.44 J/degree
Sensitivity :	16.8 degrees
Premixed/Diffusion Ratio :	.70815

APPENDIX F3
DDC 6V-53N DATA SHEETS
FUEL BLEND TF10

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: DDA 6V-53N Engine Tester:
Test Fuel: TF10N18Y87 Date: 8-17-87

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressure:
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF10N18Y87 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressure:
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF10N18Y87 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF1DN18X87 Date: 8-17-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	71	DN1239	DN1240
2500	72	DN1241	DN1242
2200	73	DN1243	DN1244
1800	74	DN1245	DN1246
1400	75	DN1247	DN1248

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF1DN18X87

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	76	DN1249	DN1250
2500	Full-Rack	77	DN1251	DN1252
2500	145	78	DN1253	DN1254
2200	Full-Rack	79	DN1255	DN1256
2200	100	80	DN1257	DN1258
1800	Full-Rack	81	DN1259	DN1260
1800	100	82	DN1261	DN1262
1800	54	83	DN1263	DN1264
1800	20	84	DN1265	DN1266
1400	Full-Rack	85	DN1267	DN1268
1400	28	86	DN1269	DN1270

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF10N18Y87 Date: 8-18-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	87	DN1271	DN1272
2500	88	DN1273	DN1274
2200	89	DN1275	DN1276
1800	90	DN1277	DN1278
1400	91	DN1279	DN1280

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF10N18Y87

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	92	DN1281	DN1282
2500	Full-Rack	93	DN1283	DN1284
2500	145	94	DN1285	DN1286
2200	Full-Rack	95	DN1287	DN1288
2200	100	96	DN1289	DN1290
1800	Full-Rack	97	DN1291	DN1292
1800	100	98	DN1293	DN1294
1800	54	99	DN1295	DN1296
1800	20	100	DN1297	DN1298
1400	Full-Rack	101	DN1299	DN1300
1400	28	102	DN1301	DN1302

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 3 FUEL BF-2 DATE 9-17-87 PAGE 12
BFO2U13286

Operator GREG							
Time	10:30	10:50	10:10	11:30	11:50		
Test Hour	30	15	15	15	15		
Speed, RPM	2799	2499	2200	1800	1400		
Load, lb-ft	347.0	380.5	401.5	403.9	374.6		
Fuel Flow, lb/hr	77.9	71.2	68.1	62.2	49.8		
Exh. Opacity, %	7.0	4.5	7.0	20.0	52.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	745	750	730	660	610		
Exhaust Cyl. L2	780	790	780	760	660		
Exhaust Cyl. L3	860	900	900	850	750		
Exhaust Cyl. R1	740	780	750	610	640		
Exhaust Cyl. R2	870	890	900	890	790		
Exhaust Cyl. R3	890	900	910	900	740		
Exhaust Common	410	400	380	350	330		
Water In	157	155	154	154	156		
Water Out	170	168	168	169	171		
Oil Sump	245	241	240	234	234		
Fuel	88	87	87	87	88		
Inlet Air	99	100	100	101	102		
Airbox	189	184	179	162	160		
Wet Bulb	78.3	78.1	78.1	78.1	78.9		
Dry Bulb	87.0	88.0	89.0	90	91.0		
PRESSURES, PSIG							
Oil Gallery	53.0	51.9	48.5	43.5	33.1		
Air After Blower	5.0	3.9	3.9	2.0	1.3		
Fuel Transfer	76.0	74.0	73.5	71.0	69.0		
LOW PRESSURES							
Intake Vac., in.water	18.0	16.0	12.6	8.5	5.0		
Exh. Comm., in.Water	27.0	22.0	18.0	13.0	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.05	29.06	29.06	29.05	29.05		

870817.102949 AL-15299-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	85.580	.022	29.767	.012
Wet Bulb Temperature, F	76.353	.006	24.640	.003
P11-Baro (Vent), "Hg ABS	29.049	.000	98.371	.001
P3 C3 Fuel Pressure,psig	76.007	.439	524.05	3.028
P4 C3 Oil Pressure, psig	53.351	.019	367.84	.133
P5 C3 Airbox Pres., psig	4.795	.018	33.062	.122
P10 C3 Exh Comm, inH20g	27.156	.179	6.757	.044
P11 C3 Intake Vac,inH20v	17.971	.124	4.472	.031
P12 C3 Blowby, inH20g	.075	.006	.019	.001
C3 Speed, RPM	2799.6	1.180	2799.6	1.180
C3 Fuel Flow, lb/hr	78.103	2.903	35.427	1.317
C3 Smoke, %	14.438	.724	14.438	.724
Cell 3 Load, lb-ft	346.51	.775	469.81	1.051
K1 C3 Exhaust 1, F	750.25	.644	399.03	.358
K2 C3 Exhaust 2, F	803.26	.765	428.48	.425
K3 C3 Exhaust 3, F	888.53	.564	475.85	.313
K4 C3 Exhaust 4, F	786.98	6.204	419.43	3.447
K5 C3 Exhaust 5, F	902.35	.658	483.53	.365
K6 C3 Exhaust 6, F	913.62	.599	489.79	.333
K7 C3 Exhaust Comm, F	429.70	.683	220.94	.379
J1 C3 Water In, F	157.75	.045	69.860	.025
J2 C3 Water Out, F	170.45	.036	76.916	.020
J3 C3 Oil Sump, F	245.51	.242	118.62	.134
J4 C3 Fuel In, F	88.004	.050	31.113	.028
J5 C3 Inlet Air, F	99.067	.442	37.259	.245
J6 C3 Airbox, F	190.41	.506	88.005	.281
Horsepower	184.71	.411	137.72	.306
Corrected Horsepower	195.54	.435	145.79	.324
BSFC, lb/hp-hr	.423	.016	.257	.010
Corrected BSFC	.399	.015	.243	.009
Relative Humidity	65.892	.072	65.892	.072
Reference Pressure, inHg	37.490		126.96	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1240

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.49 in-Hg
Speed :	2800 RPM
Load :	346.5 lb-ft
Fuel Flow :	78.1 lb/hr
Brake Power :	184.73 bhp
BSFC :	.423 lb/bhp-hr
Indicated Power :	27.32 kW/cyl
Peak Pressure :	9.311 MPa
Peak Rate of Pressure Rise:	479.7 kPa/deg
Peak Heat Release Rate :	38.4 Joules/deg
Cumulative Heat Release :	1140.66 Joules
Apparent Combustion Efficiency :	75.7 %
Indicated Thermal Efficiency :	38.8 %
Brake Thermal Efficiency :	32.6 %
Ignition Delay :	7.3 degrees
Centroid Phasing :	198.2 degrees
Centroid Magnitude :	10.54 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.25341

970817.104846 AL-15299-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	86.158	.086	30.088	.048
Wet Bulb Temperature, F	76.496	.060	24.720	.033
P11-Baro (Vent), "Hg ABS	29.054	.000	98.387	.001
P3 C3 Fuel Pressure,psig	74.214	.340	511.69	2.343
P4 C3 Oil Pressure, psig	52.039	.016	358.80	.109
P5 C3 Airbox Pres., psig	3.776	.017	26.032	.119
P10 C3 Exh Comm, inH20g	22.930	.210	5.706	.052
P11 C3 Intake Vac,inH20v	14.112	.133	3.512	.033
P12 C3 Blowby, inH20g	.058	.002	.014	.000
C3 Speed, RPM	2499.4	1.005	2499.4	1.005
C3 Fuel Flow, lb/hr	75.286	4.705	34.149	2.134
C3 Smoke, %	7.201	.622	7.201	.622
Cell 3 Load, lb-ft	379.64	.655	514.72	.888
K1 C3 Exhaust 1, F	766.91	.437	408.28	.243
K2 C3 Exhaust 2, F	813.81	.257	434.34	.143
K3 C3 Exhaust 3, F	919.65	.329	493.14	.183
K4 C3 Exhaust 4, F	699.24	11.592	370.69	6.440
K5 C3 Exhaust 5, F	918.04	.348	492.24	.193
K6 C3 Exhaust 6, F	926.88	.591	497.16	.328
K7 C3 Exhaust Comm, F	416.67	.427	213.71	.237
J1 C3 Water In, F	154.60	.152	68.110	.084
J2 C3 Water Out, F	167.44	.147	75.245	.082
J3 C3 Oil Sump, F	242.04	.115	116.69	.064
J4 C3 Fuel In, F	87.425	.095	30.792	.053
J5 C3 Inlet Air, F	101.23	.127	38.462	.071
J6 C3 Airbox, F	185.80	.328	85.446	.182
Horsepower	180.67	.349	134.70	.260
Corrected Horsepower	191.60	.370	142.85	.276
BSFC, lb/hp-hr	.417	.026	.254	.016
Corrected BSFC	.393	.024	.239	.015
Relative Humidity	64.659	.139	64.659	.139
Reference Pressure, inHg	35.703		120.90	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1242

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.70 in-Hg
Speed :	2499 RPM
Load :	379.6 lb-ft
Fuel Flow :	75.3 lb/hr
Brake Power :	180.62 bhp
BSFC :	.417 lb/bhp-hr
Indicated Power :	25.05 kW/cyl
Peak Pressure :	9.474 MPa
Peak Rate of Pressure Rise:	494.6 kPa/deg
Peak Heat Release Rate :	42.1 Joules/deg
Cumulative Heat Release :	1179.02 Joules
Apparent Combustion Efficiency :	72.4 %
Indicated Thermal Efficiency :	36.9 %
Brake Thermal Efficiency :	33.1 %
Ignition Delay :	6.8 degrees
Centroid Phasing :	198.5 degrees
Centroid Magnitude :	10.92 J/degree
Sensitivity :	29.7 degrees
Premixed/Diffusion Ratio :	.23051

870817.110701 AL-15299-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	87.409	.055	30.783	.030
Wet Bulb Temperature, F	76.485	.042	24.714	.023
P11-Baro (Vent), "Hg ABS	29.055	.000	98.391	.001
P3 C3 Fuel Pressure,psig	72.441	.163	499.47	1.125
P4 C3 Oil Pressure, psig	48.993	.011	337.79	.078
P5 C3 Airbox Pres., psig	2.725	.015	18.789	.104
P10 C3 Exh Comm, inH2Og	18.588	.158	4.625	.039
P11 C3 Intake Vac,inH2Ov	11.213	.087	2.790	.022
P12 C3 Blowby, inH2Og	.040	.003	.010	.001
C3 Speed, RPM	2201.6	1.698	2201.6	1.698
C3 Fuel Flow, lb/hr	69.964	2.191	31.735	.994
C3 Smoke, %	8.440	.196	8.440	.196
Cell 3 Load, lb-ft	401.29	.504	544.07	.683
K1 C3 Exhaust 1, F	739.54	.288	393.08	.160
K2 C3 Exhaust 2, F	809.38	.370	431.88	.206
K3 C3 Exhaust 3, F	929.34	.187	498.52	.104
K4 C3 Exhaust 4, F	786.28	1.137	419.05	.632
K5 C3 Exhaust 5, F	945.86	.526	507.70	.292
K6 C3 Exhaust 6, F	950.83	.578	510.46	.321
K7 C3 Exhaust Comm, F	387.45	.205	197.47	.114
J1 C3 Water In, F	155.02	.080	68.345	.044
J2 C3 Water Out, F	168.66	.066	75.921	.037
J3 C3 Oil Sump, F	240.60	.194	115.89	.108
J4 C3 Fuel In, F	87.646	.240	30.914	.133
J5 C3 Inlet Air, F	100.58	.151	38.102	.084
J6 C3 Airbox, F	180.09	.096	82.274	.053
Horsepower	168.22	.267	125.42	.199
Corrected Horsepower	178.19	.283	132.85	.211
BSFC, lb/hp-hr	.416	.013	.253	.008
Corrected BSFC	.393	.012	.239	.007
Relative Humidity	61.058	.237	61.058	.237
Reference Pressure, inHg	33.779		114.39	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1244

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.78 in-Hg
Speed :	2202 RPM
Load :	401.3 lb-ft
Fuel Flow :	70.0 lb/hr
Brake Power :	168.25 bhp
BSFC :	.416 lb/bhp-hr
Indicated Power :	22.43 kW/cyl
Peak Pressure :	9.689 MPa
Peak Rate of Pressure Rise:	531.7 kPa/deg
Peak Heat Release Rate :	48.7 Joules/deg
Cumulative Heat Release :	1219.04 Joules
Apparent Combustion Efficiency :	71.0 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	33.2 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	197.7 degrees
Centroid Magnitude :	11.90 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.23799

870817.112825 AL-15299-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	88.701	.074	31.501	.041
Wet Bulb Temperature, F	76.869	.017	24.927	.009
P11-Baro (Vent), "Hg ABS	29.054	.000	98.387	.001
P3 C3 Fuel Pressure,psig	70.446	.102	485.71	.703
P4 C3 Oil Pressure, psig	44.256	.010	305.13	.066
P5 C3 Airbox Pres., psig	1.817	.014	12.525	.093
P10 C3 Exh Comm, inH20g	13.200	.112	3.285	.028
P11 C3 Intake Vac,inH20v	7.017	.051	1.746	.013
P12 C3 Blowby, inH20g	.039	.003	.010	.001
C3 Speed, RPM	1800.2	1.718	1800.2	1.718
C3 Fuel Flow, lb/hr	61.430	1.373	27.864	.623
C3 Smoke, %	21.372	.317	21.372	.317
Cell 3 Load, lb-ft	401.86	.735	544.85	.997
K1 C3 Exhaust 1, F	681.38	6.322	360.77	3.512
K2 C3 Exhaust 2, F	784.53	4.435	418.07	2.464
K3 C3 Exhaust 3, F	865.82	6.334	463.23	3.519
K4 C3 Exhaust 4, F	736.24	5.502	391.25	3.057
K5 C3 Exhaust 5, F	915.57	.605	490.87	.336
K6 C3 Exhaust 6, F	922.50	.596	494.72	.331
K7 C3 Exhaust Comm, F	364.77	.184	184.87	.102
J1 C3 Water In, F	155.46	.092	68.589	.051
J2 C3 Water Out, F	169.79	.126	76.548	.070
J3 C3 Oil Sump, F	235.73	.184	113.18	.102
J4 C3 Fuel In, F	87.625	.249	30.903	.139
J5 C3 Inlet Air, F	102.15	.186	38.971	.104
J6 C3 Airbox, F	162.81	.080	72.673	.044
Horsepower	137.75	.298	102.70	.222
Corrected Horsepower	146.13	.316	108.95	.235
BSFC, lb/hp-hr	.446	.011	.271	.006
Corrected BSFC	.420	.010	.256	.006
Relative Humidity	58.748	.203	58.748	.203
Reference Pressure, inHg	32.236		109.16	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1246

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.24 in-Hg
Speed :	1800 RPM
Load :	401.9 lb-ft
Fuel Flow :	61.4 lb/hr
Brake Power :	137.74 bhp
BSFC :	.446 lb/bhp-hr
Indicated Power :	18.01 kW/cyl
Peak Pressure :	9.833 MPa
Peak Rate of Pressure Rise:	600.8 kPa/deg
Peak Heat Release Rate :	60.2 Joules/deg
Cumulative Heat Release :	1178.85 Joules
Apparent Combustion Efficiency :	64.0 %
Indicated Thermal Efficiency :	32.6 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	6.1 degrees
Centroid Phasing :	195.8 degrees
Centroid Magnitude :	12.43 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.22188

870817.115102 AL-15299-F AL-12920-L 6V53 3

Dry Bulb Temperature, F	89.659	.110	32.033	.061
Wet Bulb Temperature, F	76.837	.054	24.909	.030
P11-Baro (Vent), "Hg ABS	29.051	.000	98.378	.001
P3 C3 Fuel Pressure,psig	68.254	.086	470.59	.591
P4 C3 Oil Pressure, psig	33.611	.017	231.74	.114
P5 C3 Airbox Pres., psig	1.249	.012	8.613	.079
P10 C3 Exh Comm, inH2Og	8.555	.169	2.129	.042
P11 C3 Intake Vac,inH2Ov	3.777	.049	.940	.012
P12 C3 Blowby, inH2Og	.033	.001	.008	.000
C3 Speed, RPM	1401.9	1.209	1401.9	1.209
C3 Fuel Flow, lb/hr	53.597	1.603	24.311	.727
C3 Smoke, %	54.296	.837	54.296	.837
Cell 3 Load, lb-ft	372.94	1.224	505.63	1.660
K1 C3 Exhaust 1, F	617.05	.255	325.03	.142
K2 C3 Exhaust 2, F	695.22	.274	368.46	.152
K3 C3 Exhaust 3, F	782.57	1.088	416.98	.605
K4 C3 Exhaust 4, F	655.00	3.555	346.11	1.975
K5 C3 Exhaust 5, F	803.58	.441	428.66	.245
K6 C3 Exhaust 6, F	758.32	.870	403.51	.483
K7 C3 Exhaust Comm, F	332.77	.374	167.09	.208
J1 C3 Water In, F	156.17	.140	68.982	.078
J2 C3 Water Out, F	171.75	.159	77.640	.088
J3 C3 Oil Sump, F	235.00	.126	112.78	.070
J4 C3 Fuel In, F	87.916	.243	31.065	.135
J5 C3 Inlet Air, F	102.70	.075	39.278	.042
J6 C3 Airbox, F	161.10	.146	71.721	.081
Horsepower	99.548	.380	74.221	.283
Corrected Horsepower	105.63	.403	78.751	.301
BSFC, lb/hp-hr	.538	.018	.328	.011
Corrected BSFC	.507	.017	.309	.010
Relative Humidity	56.166	.198	56.166	.198
Reference Pressure, inHg	31.316		106.05	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1248

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.32 in-Hg
Speed :	1402 RPM
Load :	372.9 lb-ft
Fuel Flow :	53.6 lb/hr
Brake Power :	99.54 bhp
BSFC :	.538 lb/bhp-hr
Indicated Power :	13.68 kW/cyl
Peak Pressure :	10.16 MPa
Peak Rate of Pressure Rise:	660.1 kPa/deg
Peak Heat Release Rate :	71.7 Joules/deg
Cumulative Heat Release :	1190.85 Joules
Apparent Combustion Efficiency :	57.6 %
Indicated Thermal Efficiency :	28.3 %
Brake Thermal Efficiency :	25.6 %
Ignition Delay :	5.5 degrees
Centroid Phasing :	195.5 degrees
Centroid Magnitude :	13.65 J/degree
Sensitivity :	28.0 degrees
Premixed/Diffusion Ratio :	.19674

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 3 FUEL TF10N18Y87 DATE 8-17-87 PAGE 13

Operator Greg							
Time	12:45	1:05	1:20	1:35	1:55	2:15	2:30
Test Hour	20	15	10	10	15	15	10
Speed, RPM	2800	2500	2501	2200	2200	1800	1801
Load, lb-ft	366.2	397.7	286.9	416.2	226.0	409.3	275.5
Fuel Flow, lb/hr	90.4	82.3	57.0	74.1	39.9	67.0	37.8
Exh. Opacity, %	5.0	3.0	1.0	11.0	0	30.0	1.0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	780	800	600	750	500	690	500
Exhaust Cyl. L2	810	840	640	800	500	760	510
Exhaust Cyl. L3	900	940	700	940	550	860	570
Exhaust Cyl. R1	820	810	620	760	500	700	500
Exhaust Cyl. R2	910	945	700	950	550	900	620
Exhaust Cyl. R3	940	930	700	950	550	890	600
Exhaust Common	440	410	320	400	250	350	260
Water In	156	156	157	154	160	155	158
Water Out	170	169	169	169	170	168	169
Oil Sump	246	244	232	242	225	236	222
Fuel	88	89	89	89	89	88	89
Inlet Air	102	100	99	101	100	101	102
Airbox	194	191	171	184	162	164	154
Wet Bulb	79.9	79.0	78.0	78.9	78.5	78.2	78.5
Dry Bulb	93.0	93.0	93.0	94.0	94.8	95.1	96.0
PRESSURES, PSIG							
Oil Gallery	53.0	51.0	53.1	48.0	51.5	43.5	46.0
Air After Blower	5.0	4.0	3.8	3.0	2.7	2.0	1.7
Fuel Transfer	77.5	75.0	73.0	74.5	76.0	720	72.0
LOW PRESSURES							
Intake Vac., in.water	18.0	16.0	16.0	12.7	13.0	13.5	8.9
Exh. Comm., in.Water	27.0	23.5	19.5	19.5	14.5	8.6	11.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.04	29.04	29.03	29.02	29.02	29.01	29.01

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 3 FUEL TF1ON18X87 DATE 8-17-87 PAGE 14

Operator GRSG							
Time	2:50	3:05	3:30	3:50			
Test Hour	15	10	20	15			
Speed, RPM	1800	1800	1400	1400			
Load, lb-ft	148.9	80.5	368.8	94.9			
Fuel Flow, lb/hr	25.4	17.2	56.1	15.1			
Exh. Opacity, %	2.0	2.0	65.0	3.0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	400	350	610	350			
Exhaust Cyl. L2	370	340	660	300			
Exhaust Cyl. L3	410	360	790	350			
Exhaust Cyl. R1	360	300	590	260			
Exhaust Cyl. R2	390	300	730	290			
Exhaust Cyl. R3	390	300	710	300			
Exhaust Common	200	190	300	200			
Water In	160	162	151	157			
Water Out	169	170	168	167			
Oil Sump	214	208	234	206			
Fuel	89	88	87	88			
Inlet Air	101	101	103	103			
Airbox	148	147	162	147			
Wet Bulb	79.0	78.0	78.5	78.5			
Dry Bulb	95.9	96.0	96.5	97.0			
PRESSURES, PSIG							
Oil Gallery	47.5	48.5	33.2	38.5			
Air After Blower	1.6	1.8	1.3	1.3			
Fuel Transfer	73.0	73.0	69.5	71.0			
LOW PRESSURES							
Intake Vac., in.water	8.4	8.8	5.0	5.1			
Exh. Comm., in.Water	9.5	9.0	9.0	5.5			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	29.0	29.0	28.98	28.98			

870817.124432 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	92.055	.068	33.364	.038
Wet Bulb Temperature, F	77.279	.026	25.155	.014
P11-Baro (Vent), "Hg ABS	29.034	.000	98.320	.002
P3 C3 Fuel Pressure,psig	76.716	.437	528.94	3.011
P4 C3 Oil Pressure, psig	52.734	.018	363.58	.122
P5 C3 Airbox Pres., psig	4.845	.020	33.405	.140
P10 C3 Exh Comm, inH20g	28.117	.252	6.997	.063
P11 C3 Intake Vac,inH20v	18.186	.139	4.526	.035
P12 C3 Blowby, inH20g	.080	.004	.020	.001
C3 Speed, RPM	2801.0	.835	2801.0	.835
C3 Fuel Flow, lb/hr	87.926	2.133	39.883	.968
C3 Smoke, %	6.292	.245	6.292	.245
Cell 3 Load, lb-ft	366.03	.277	496.27	.376
K1 C3 Exhaust 1, F	787.16	6.568	419.53	3.649
K2 C3 Exhaust 2, F	836.12	4.900	446.73	2.722
K3 C3 Exhaust 3, F	926.60	5.385	497.00	2.991
K4 C3 Exhaust 4, F	846.05	.552	452.25	.307
K5 C3 Exhaust 5, F	946.07	.820	507.82	.455
K6 C3 Exhaust 6, F	958.95	.405	514.97	.225
K7 C3 Exhaust Comm, F	449.06	1.032	231.70	.573
J1 C3 Water In, F	157.53	.172	69.738	.096
J2 C3 Water Out, F	170.89	.156	77.161	.087
J3 C3 Oil Sump, F	247.08	.291	119.49	.162
J4 C3 Fuel In, F	89.306	.171	31.836	.095
J5 C3 Inlet Air, F	102.01	.057	38.895	.031
J6 C3 Airbox, F	193.85	.145	89.915	.080
Horsepower	195.21	.126	145.55	.094
Corrected Horsepower	207.07	.134	154.39	.100
BSFC, lb/hp-hr	.450	.011	.274	.007
Corrected BSFC	.425	.010	.258	.006
Relative Humidity	51.618	.189	51.618	.189
Reference Pressure, inHg	37.561		127.19	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1250

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.56 in-Hg
Speed :	2801 RPM
Load :	366.0 lb-ft
Fuel Flow :	87.9 lb/hr
Brake Power :	195.20 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	28.12 kW/cyl
Peak Pressure :	9.576 MPa
Peak Rate of Pressure Rise:	662.4 kPa/deg
Peak Heat Release Rate :	65.2 Joules/deg
Cumulative Heat Release :	1177.09 Joules
Apparent Combustion Efficiency :	70.9 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	8.5 degrees
Centroid Phasing :	198.3 degrees
Centroid Magnitude :	12.03 J/degree
Sensitivity :	27.8 degrees
Premixed/Diffusion Ratio :	.30674

870817.130140 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	92.367	.053	33.537	.030
Wet Bulb Temperature, F	76.908	.021	24.949	.012
P11-Baro (Vent), "Hg ABS	29.031	.001	98.310	.002
P3 C3 Fuel Pressure,psig	73.933	.307	509.75	2.117
P4 C3 Oil Pressure, psig	51.257	.025	353.41	.172
P5 C3 Airbox Pres., psig	3.826	.017	26.381	.120
P10 C3 Exh Comm, inH20g	23.769	.193	5.915	.048
P11 C3 Intake Vac,inH20v	14.610	.080	3.635	.020
P12 C3 Blowby, inH20g	.056	.002	.014	.001
C3 Speed, RPM	2502.1	.924	2502.1	.924
C3 Fuel Flow, lb/hr	82.764	1.108	37.541	.502
C3 Smoke, %	3.108	.139	3.108	.139
Cell 3 Load, lb-ft	397.67	.491	539.17	.666
K1 C3 Exhaust 1, F	813.47	7.800	434.15	4.333
K2 C3 Exhaust 2, F	853.12	4.950	456.18	2.750
K3 C3 Exhaust 3, F	958.69	5.836	514.83	3.242
K4 C3 Exhaust 4, F	836.28	6.776	446.82	3.765
K5 C3 Exhaust 5, F	964.54	6.737	518.08	3.743
K6 C3 Exhaust 6, F	971.13	.378	521.74	.210
K7 C3 Exhaust Comm, F	427.52	.749	219.73	.416
J1 C3 Water In, F	156.24	.119	69.022	.066
J2 C3 Water Out, F	169.51	.166	76.396	.092
J3 C3 Oil Sump, F	244.52	.146	118.07	.081
J4 C3 Fuel In, F	89.655	.184	32.030	.102
J5 C3 Inlet Air, F	100.59	.239	38.107	.133
J6 C3 Airbox, F	192.00	.125	88.890	.069
Horsepower	189.45	.277	141.25	.207
Corrected Horsepower	200.59	.293	149.56	.219
BSFC, lb/hp-hr	.437	.006	.266	.004
Corrected BSFC	.413	.006	.251	.003
Relative Humidity	49.882	.082	49.882	.082
Reference Pressure, inHg	35.747		121.05	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1252

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.75 in-Hg
Speed :	2502 RPM
Load :	397.7 lb-ft
Fuel Flow :	82.8 lb/hr
Brake Power :	189.46 bhp
BSFC :	.437 lb/bhp-hr
Indicated Power :	25.81 kW/cyl
Peak Pressure :	9.715 MPa
Peak Rate of Pressure Rise:	702.2 kPa/deg
Peak Heat Release Rate :	72.6 Joules/deg
Cumulative Heat Release :	1213.71 Joules
Apparent Combustion Efficiency :	69.4 %
Indicated Thermal Efficiency :	35.4 %
Brake Thermal Efficiency :	32.3 %
Ignition Delay :	8.3 degrees
Centroid Phasing :	198.6 degrees
Centroid Magnitude :	13.07 J/degree
Sensitivity :	28.4 degrees
Premixed/Diffusion Ratio :	.29234

870817.131541 AL-16083-F AL-12920-L 6V53 3

Dry Bulb Temperature, F	92.879	.060	33.822	.033
Wet Bulb Temperature, F	76.222	.088	24.568	.049
P11-Baro (Vent), "Hg ABS	29.030	.001	98.305	.002
P3 C3 Fuel Pressure,psig	74.514	.163	513.75	1.120
P4 C3 Oil Pressure, psig	53.580	.017	369.42	.119
P5 C3 Airbox Pres., psig	3.625	.016	24.993	.112
P10 C3 Exh Comm, inH2Og	19.961	.151	4.967	.038
P11 C3 Intake Vac,inH2Ov	14.961	.106	3.723	.026
P12 C3 Blowby, inH2Og	.053	.003	.013	.001
C3 Speed, RPM	2501.1	1.301	2501.1	1.301
C3 Fuel Flow, lb/hr	57.495	.172	26.079	.078
C3 Smoke, %	2.286	.135	2.286	.135
Cell 3 Load, lb-ft	287.10	1.014	389.25	1.375
K1 C3 Exhaust 1, F	603.37	5.930	317.43	3.294
K2 C3 Exhaust 2, F	623.41	3.607	328.56	2.004
K3 C3 Exhaust 3, F	707.52	4.146	375.29	2.304
K4 C3 Exhaust 4, F	636.70	4.790	335.94	2.661
K5 C3 Exhaust 5, F	714.39	.308	379.11	.171
K6 C3 Exhaust 6, F	719.09	6.234	381.71	3.463
K7 C3 Exhaust Comm, F	328.50	2.418	164.72	1.344
J1 C3 Water In, F	158.42	.116	70.233	.065
J2 C3 Water Out, F	169.27	.100	76.262	.056
J3 C3 Oil Sump, F	233.26	.287	111.81	.159
J4 C3 Fuel In, F	89.206	.132	31.781	.074
J5 C3 Inlet Air, F	99.579	.173	37.544	.096
J6 C3 Airbox, F	172.55	.132	78.084	.073
Horsepower	136.72	.504	101.94	.376
Corrected Horsepower	144.46	.533	107.71	.397
BSFC, lb/hp-hr	.421	.002	.256	.001
Corrected BSFC	.398	.002	.242	.001
Relative Humidity	46.911	.197	46.911	.197
Reference Pressure, inHg	35.309		119.57	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1254

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.31 in-Hg
Speed :	2501 RPM
Load :	287.1 lb-ft
Fuel Flow :	57.5 lb/hr
Brake Power :	136.72 bhp
BSFC :	.421 lb/bhp-hr
Indicated Power :	19.37 kW/cyl
Peak Pressure :	8.681 MPa
Peak Rate of Pressure Rise:	790.3 kPa/deg
Peak Heat Release Rate :	87.8 Joules/deg
Cumulative Heat Release :	873.093 Joules
Apparent Combustion Efficiency :	71.8 %
Indicated Thermal Efficiency :	38.2 %
Brake Thermal Efficiency :	33.5 %
Ignition Delay :	11.0 degrees
Centroid Phasing :	196.4 degrees
Centroid Magnitude :	14.91 J/degree
Sensitivity :	23.5 degrees
Premixed/Diffusion Ratio :	.46711

970817.133341 AL-16083-F	AL-12920-L 6V53			3
Dry Bulb Temperature, F	93.647	.048	34.248	.027
Wet Bulb Temperature, F	76.649	.063	24.805	.035
P11-Baro (Vent), "Hg ABS	29.021	.000	98.276	.001
P3 C3 Fuel Pressure,psig	73.385	.263	505.97	1.813
P4 C3 Oil Pressure, psig	48.334	.028	333.25	.194
P5 C3 Airbox Pres., psig	2.735	.010	18.858	.070
P10 C3 Exh Comm, inH20g	19.034	.137	4.736	.034
P11 C3 Intake Vac,inH20v	11.764	.142	2.927	.035
P12 C3 Blowby, inH20g	.042	.002	.011	.001
C3 Speed, RPM	2201.4	1.331	2201.4	1.331
C3 Fuel Flow, lb/hr	76.742	1.979	34.810	.898
C3 Smoke, %	12.246	.312	12.246	.312
Cell 3 Load, lb-ft	414.47	.687	561.94	.931
K1 C3 Exhaust 1, F	772.46	8.060	411.36	4.478
K2 C3 Exhaust 2, F	834.09	.739	445.61	.411
K3 C3 Exhaust 3, F	961.93	5.941	516.63	3.300
K4 C3 Exhaust 4, F	791.60	10.564	422.00	5.869
K5 C3 Exhaust 5, F	971.47	8.656	521.93	4.809
K6 C3 Exhaust 6, F	979.12	.609	526.18	.339
K7 C3 Exhaust Comm, F	397.14	.222	202.85	.123
J1 C3 Water In, F	155.35	.272	68.528	.151
J2 C3 Water Out, F	169.60	.174	76.447	.097
J3 C3 Oil Sump, F	243.36	.058	117.42	.032
J4 C3 Fuel In, F	89.670	.212	32.039	.118
J5 C3 Inlet Air, F	101.50	.046	38.611	.026
J6 C3 Airbox, F	183.86	.124	84.369	.069
Horsepower	173.73	.339	129.53	.253
Corrected Horsepower	183.99	.359	137.18	.268
BSFC, lb/hp-hr	.442	.011	.269	.007
Corrected BSFC	.417	.011	.254	.007
Relative Humidity	46.394	.117	46.394	.117
Reference Pressure, inHg	33.724		114.20	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1256

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.72 in-Hg
Speed :	2201 RPM
Load :	414.5 lb-ft
Fuel Flow :	76.7 lb/hr
Brake Power :	173.71 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	22.96 kW/cyl
Peak Pressure :	9.940 MPa
Peak Rate of Pressure Rise:	821.9 kPa/deg
Peak Heat Release Rate :	89.8 Joules/deg
Cumulative Heat Release :	1251.78 Joules
Apparent Combustion Efficiency :	67.9 %
Indicated Thermal Efficiency :	34.0 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	8.6 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	15.34 J/degree
Sensitivity :	26.9 degrees
Premixed/Diffusion Ratio :	.32093

DDC 6V-53N

2200 RPM
100 CBHP

DATA SHEET MISSING

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1258

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.97 in-Hg
Speed :	2201 RPM
Load :	224.6 lb-ft
Fuel Flow :	40.5 lb/hr
Brake Power :	94.13 bhp
BSFC :	.430 lb/bhp-hr
Indicated Power :	13.51 kW/cyl
Peak Pressure :	8.180 MPa
Peak Rate of Pressure Rise:	955.8 kPa/deg
Peak Heat Release Rate :	115.3 Joules/deg
Cumulative Heat Release :	694.936 Joules
Apparent Combustion Efficiency :	71.4 %
Indicated Thermal Efficiency :	37.9 %
Brake Thermal Efficiency :	32.8 %
Ignition Delay :	12.6 degrees
Centroid Phasing :	194.1 degrees
Centroid Magnitude :	23.18 J/degree
Sensitivity :	19.5 degrees
Premixed/Diffusion Ratio :	.64398

870817.141605 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	94.993	.077	34.996	.043
Wet Bulb Temperature, F	76.183	.099	24.546	.055
P11-Baro (Vent), "Hg ABS	29.010	.001	98.240	.002
P3 C3 Fuel Pressure,psig	71.038	.070	489.79	.485
P4 C3 Oil Pressure, psig	44.090	.022	303.99	.152
P5 C3 Airbox Pres., psig	1.819	.012	12.544	.085
P10 C3 Exh Comm, inH2Og	13.387	.126	3.331	.031
P11 C3 Intake Vac,inH2Ov	7.821	.075	1.946	.019
P12 C3 Blowby, inH2Og	.033	.004	.008	.001
C3 Speed, RPM	1802.4	1.371	1802.4	1.371
C3 Fuel Flow, lb/hr	66.770	.517	30.286	.235
C3 Smoke, %	32.406	.490	32.406	.490
Cell 3 Load, lb-ft	407.94	.727	553.09	.986
K1 C3 Exhaust 1, F	701.03	7.305	371.68	4.059
K2 C3 Exhaust 2, F	788.53	.549	420.29	.305
K3 C3 Exhaust 3, F	876.45	8.425	469.14	4.680
K4 C3 Exhaust 4, F	722.48	3.353	383.60	1.863
K5 C3 Exhaust 5, F	923.62	.426	495.35	.237
K6 C3 Exhaust 6, F	914.94	.596	490.52	.331
K7 C3 Exhaust Comm, F	354.01	.551	178.90	.306
J1 C3 Water In, F	154.74	.145	68.187	.080
J2 C3 Water Out, F	169.14	.130	76.190	.072
J3 C3 Oil Sump, F	236.98	.150	113.88	.083
J4 C3 Fuel In, F	88.813	.229	31.563	.127
J5 C3 Inlet Air, F	102.16	.088	38.976	.049
J6 C3 Airbox, F	164.66	.066	73.699	.037
Horsepower	140.00	.281	104.38	.209
Corrected Horsepower	148.24	.297	110.52	.222
BSFC, lb/hp-hr	.477	.004	.290	.002
Corrected BSFC	.450	.004	.274	.002
Relative Humidity	42.474	.380	42.474	.380
Reference Pressure, inHg	32.139		108.84	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1260

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.14 in-Hg
Speed :	1802 RPM
Load :	407.9 lb-ft
Fuel Flow :	66.8 lb/hr
Brake Power :	139.95 bhp
BSFC :	.477 lb/bhp-hr
Indicated Power :	18.09 kW/cyl
Peak Pressure :	10.04 MPa
Peak Rate of Pressure Rise:	979.8 kPa/deg
Peak Heat Release Rate :	113.1 Joules/deg
Cumulative Heat Release :	1189.41 Joules
Apparent Combustion Efficiency :	60.7 %
Indicated Thermal Efficiency :	30.7 %
Brake Thermal Efficiency :	29.5 %
Ignition Delay :	8.1 degrees
Centroid Phasing :	195.8 degrees
Centroid Magnitude :	18.13 J/degree
Sensitivity :	25.7 degrees
Premixed/Diffusion Ratio :	.31542

870817.143134 AL-16083-F AL-12920-L 6V53 3

Dry Bulb Temperature, F	95.537	.192	35.299	.107
Wet Bulb Temperature, F	76.176	.039	24.542	.022
P11-Baro (Vent), "Hg ABS	29.007	.000	98.230	.001
P3 C3 Fuel Pressure,psig	71.251	.132	491.26	.911
P4 C3 Oil Pressure, psig	46.345	.012	319.54	.083
P5 C3 Airbox Pres., psig	1.587	.007	10.944	.045
P10 C3 Exh Comm, inH20g	10.883	.125	2.708	.031
P11 C3 Intake Vac,inH20v	8.259	.066	2.055	.016
P12 C3 Blowby, inH20g	.029	.002	.007	.000
C3 Speed, RPM	1801.7	1.078	1801.7	1.078
C3 Fuel Flow, lb/hr	39.811	2.720	18.058	1.234
C3 Smoke, %	6.660	.855	6.660	.855
Cell 3 Load, lb-ft	273.61	.512	370.96	.694
K1 C3 Exhaust 1, F	503.10	4.361	261.72	2.423
K2 C3 Exhaust 2, F	522.78	1.331	272.65	.739
K3 C3 Exhaust 3, F	587.01	.664	308.34	.369
K4 C3 Exhaust 4, F	518.50	6.361	270.28	3.534
K5 C3 Exhaust 5, F	638.41	4.269	336.89	2.372
K6 C3 Exhaust 6, F	617.01	4.269	325.01	2.372
K7 C3 Exhaust Comm, F	268.73	2.125	131.52	1.181
J1 C3 Water In, F	159.15	.058	70.641	.032
J2 C3 Water Out, F	169.86	.036	76.587	.020
J3 C3 Oil Sump, F	223.27	.139	106.26	.077
J4 C3 Fuel In, F	88.937	.080	31.632	.044
J5 C3 Inlet Air, F	102.34	.054	39.077	.030
J6 C3 Airbox, F	154.82	.222	68.232	.123
Horsepower	93.860	.165	69.980	.123
Corrected Horsepower	99.390	.174	74.102	.130
BSFC, lb/hp-hr	.424	.028	.258	.017
Corrected BSFC	.401	.027	.244	.016
Relative Humidity	41.401	.290	41.401	.290
Reference Pressure, inHg	31.632		107.12	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1262

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.63 in-Hg
Speed :	1802 RPM
Load :	273.6 lb-ft
Fuel Flow :	39.8 lb/hr
Brake Power :	93.87 bhp
BSFC :	.424 lb/bhp-hr
Indicated Power :	12.18 kW/cyl
Peak Pressure :	8.364 MPa
Peak Rate of Pressure Rise:	937.2 kPa/deg
Peak Heat Release Rate :	109.7 Joules/deg
Cumulative Heat Release :	759.073 Joules
Apparent Combustion Efficiency :	65.0 %
Indicated Thermal Efficiency :	34.7 %
Brake Thermal Efficiency :	33.3 %
Ignition Delay :	11.1 degrees
Centroid Phasing :	192.2 degrees
Centroid Magnitude :	20.99 J/degree
Sensitivity :	19.2 degrees
Premixed/Diffusion Ratio :	.57800

870817.145039 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	95.495	.078	35.275	.043
Wet Bulb Temperature, F	75.919	.067	24.400	.037
P11-Baro (Vent), "Hg ABS	28.996	.000	98.193	.001
P3 C3 Fuel Pressure,psig	71.904	.073	495.76	.506
P4 C3 Oil Pressure, psig	48.007	.007	330.99	.051
P5 C3 Airbox Pres., psig	1.596	.004	11.006	.029
P10 C3 Exh Comm, inH2Og	8.992	.084	2.238	.021
P11 C3 Intake Vac,inH2Ov	8.401	.046	2.091	.011
P12 C3 Blowby, inH2Og	.026	.003	.007	.001
C3 Speed, RPM	1802.3	.755	1802.3	.755
C3 Fuel Flow, lb/hr	24.241	.197	10.996	.089
C3 Smoke, %	11.393	.298	11.393	.298
Cell 3 Load, lb-ft	147.54	.528	200.04	.716
K1 C3 Exhaust 1, F	387.52	.304	197.51	.169
K2 C3 Exhaust 2, F	378.84	.272	192.69	.151
K3 C3 Exhaust 3, F	425.88	.396	218.82	.220
K4 C3 Exhaust 4, F	374.24	.284	190.13	.158
K5 C3 Exhaust 5, F	392.55	.300	200.30	.166
K6 C3 Exhaust 6, F	396.19	.202	202.33	.112
K7 C3 Exhaust Comm, F	193.80	.603	89.886	.335
J1 C3 Water In, F	161.67	.048	72.039	.027
J2 C3 Water Out, F	169.97	.058	76.648	.032
J3 C3 Oil Sump, F	214.39	.119	101.33	.066
J4 C3 Fuel In, F	89.304	.024	31.836	.013
J5 C3 Inlet Air, F	101.48	.078	38.598	.043
J6 C3 Airbox, F	148.20	.036	64.557	.020
Horsepower	50.631	.196	37.749	.146
Corrected Horsepower	53.574	.207	39.943	.154
BSFC, lb/hp-hr	.479	.004	.291	.002
Corrected BSFC	.452	.004	.275	.002
Relative Humidity	40.864	.076	40.864	.076
Reference Pressure, inHg	31.628		107.11	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1264

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.63 in-Hg
Speed :	1802 RPM
Load :	147.5 lb-ft
Fuel Flow :	24.2 lb/hr
Brake Power :	50.61 bhp
BSFC :	.478 lb/bhp-hr
Indicated Power :	8.05 kW/cyl
Peak Pressure :	7.565 MPa
Peak Rate of Pressure Rise:	978.8 kPa/deg
Peak Heat Release Rate :	119.4 Joules/deg
Cumulative Heat Release :	513.517 Joules
Apparent Combustion Efficiency :	72.3 %
Indicated Thermal Efficiency :	37.8 %
Brake Thermal Efficiency :	29.5 %
Ignition Delay :	12.9 degrees
Centroid Phasing :	193.0 degrees
Centroid Magnitude :	27.81 J/degree
Sensitivity :	18.1 degrees
Premixed/Diffusion Ratio :	.70964

870817.150610 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	95.542	.087	35.301	.048
Wet Bulb Temperature, F	75.875	.055	24.375	.030
P11-Baro (Vent), "Hg ABS	28.990	.001	98.170	.003
P3 C3 Fuel Pressure,psig	72.230	.068	498.01	.468
P4 C3 Oil Pressure, psig	48.836	.016	336.71	.109
P5 C3 Airbox Pres., psig	1.647	.007	11.356	.046
P10 C3 Exh Comm, inH20g	8.267	.092	2.057	.023
P11 C3 Intake Vac,inH20v	8.464	.052	2.106	.013
P12 C3 Blowby, inH20g	.032	.003	.008	.001
C3 Speed, RPM	1801.9	2.200	1801.9	2.200
C3 Fuel Flow, lb/hr	18.092	.160	8.206	.072
C3 Smoke, %	3.863	.220	3.863	.220
Cell 3 Load, lb-ft	86.400	.974	117.14	1.321
K1 C3 Exhaust 1, F	345.29	1.696	174.05	.942
K2 C3 Exhaust 2, F	333.07	.218	167.26	.121
K3 C3 Exhaust 3, F	369.14	1.968	187.30	1.093
K4 C3 Exhaust 4, F	299.87	.285	148.82	.159
K5 C3 Exhaust 5, F	301.30	.109	149.61	.061
K6 C3 Exhaust 6, F	310.83	.280	154.91	.155
K7 C3 Exhaust Comm, F	175.60	.181	79.776	.101
J1 C3 Water In, F	163.60	.073	73.113	.040
J2 C3 Water Out, F	171.12	.048	77.286	.027
J3 C3 Oil Sump, F	209.61	.071	98.674	.039
J4 C3 Fuel In, F	88.954	.037	31.641	.020
J5 C3 Inlet Air, F	102.30	.114	39.058	.063
J6 C3 Airbox, F	147.76	.081	64.309	.045
Horsepower	29.643	.360	22.101	.269
Corrected Horsepower	31.394	.381	23.406	.284
BSFC, lb/hp-hr	.610	.008	.371	.005
Corrected BSFC	.576	.008	.351	.005
Relative Humidity	40.670	.106	40.670	.106
Reference Pressure, inHg	31.721		107.42	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1266

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.72 in-Hg
Speed :	1802 RPM
Load :	86.4 lb-ft
Fuel Flow :	18.1 lb/hr
Brake Power :	29.64 bhp
BSFC :	.611 lb/bhp-hr
Indicated Power :	6.24 kW/cyl
Peak Pressure :	7.157 MPa
Peak Rate of Pressure Rise:	880.7 kPa/deg
Peak Heat Release Rate :	107.7 Joules/deg
Cumulative Heat Release :	391.594 Joules
Apparent Combustion Efficiency :	73.7 %
Indicated Thermal Efficiency :	39.1 %
Brake Thermal Efficiency :	23.1 %
Ignition Delay :	13.4 degrees
Centroid Phasing :	192.7 degrees
Centroid Magnitude :	28.34 J/degree
Sensitivity :	17.3 degrees
Premixed/Diffusion Ratio :	.77227

870817.153259 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	96.460	.138	35.811	.077
Wet Bulb Temperature, F	75.709	.062	24.283	.034
P11-Baro (Vent), "Hg ABS	28.980	.001	98.138	.002
P3 C3 Fuel Pressure,psig	68.575	.107	472.81	.741
P4 C3 Oil Pressure, psig	33.770	.014	232.83	.098
P5 C3 Airbox Pres., psig	1.237	.006	8.530	.042
P10 C3 Exh Comm, inH2Og	8.562	.158	2.131	.039
P11 C3 Intake Vac,inH2Ov	5.006	.070	1.246	.017
P12 C3 Blowby, inH2Og	.028	.003	.007	.001
C3 Speed, RPM	1402.7	1.547	1402.7	1.547
C3 Fuel Flow, lb/hr	55.963	.506	25.384	.230
C3 Smoke, %	67.854	.872	67.854	.872
Cell 3 Load, lb-ft	367.72	1.395	498.56	1.891
K1 C3 Exhaust 1, F	625.79	6.429	329.88	3.572
K2 C3 Exhaust 2, F	682.41	3.722	361.34	2.068
K3 C3 Exhaust 3, F	778.22	7.592	414.57	4.218
K4 C3 Exhaust 4, F	587.73	9.337	308.74	5.187
K5 C3 Exhaust 5, F	775.07	.684	412.82	.380
K6 C3 Exhaust 6, F	735.74	1.668	390.97	.927
K7 C3 Exhaust Comm, F	311.44	.338	155.24	.188
J1 C3 Water In, F	152.52	.114	66.958	.063
J2 C3 Water Out, F	160.00	.060	75.556	.033
J3 C3 Oil Sump, F	234.69	.102	112.61	.057
J4 C3 Fuel In, F	87.601	.120	30.889	.067
J5 C3 Inlet Air, F	104.10	.050	40.054	.028
J6 C3 Airbox, F	161.87	1.557	72.150	.865
Horsepower	98.209	.398	73.222	.297
Corrected Horsepower	104.15	.422	77.651	.315
BSFC, lb/hp-hr	.570	.006	.347	.004
Corrected BSFC	.537	.006	.327	.003
Relative Humidity	38.587	.384	38.587	.384
Reference Pressure, inHg	31.131		105.42	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1268

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.13 in-Hg
Speed :	1403 RPM
Load :	367.7 lb-ft
Fuel Flow :	56.0 lb/hr
Brake Power :	98.23 bhp
BSFC :	.570 lb/bhp-hr
Indicated Power :	13.77 kW/cyl
Peak Pressure :	10.32 MPa
Peak Rate of Pressure Rise:	1137. kPa/deg
Peak Heat Release Rate :	138.7 Joules/deg
Cumulative Heat Release :	1196.09 Joules
Apparent Combustion Efficiency :	56.7 %
Indicated Thermal Efficiency :	27.9 %
Brake Thermal Efficiency :	24.7 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	21.55 J/degree
Sensitivity :	25.5 degrees
Premixed/Diffusion Ratio :	.28304

870817.155226 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	97.248	.075	36.249	.042
Wet Bulb Temperature, F	75.889	.026	24.383	.014
P11-Baro (Vent), "Hg ABS	28.975	.000	98.120	.001
P3 C3 Fuel Pressure,psig	69.938	.060	482.21	.411
P4 C3 Oil Pressure, psig	39.731	.042	273.93	.292
P5 C3 Airbox Pres., psig	1.194	.006	8.234	.038
P10 C3 Exh Comm, inH2Og	5.267	.091	1.311	.023
P11 C3 Intake Vac,inH2Ov	5.165	.040	1.285	.010
P12 C3 Blowby, inH2Og	.022	.004	.006	.001
C3 Speed, RPM	1402.7	1.890	1402.7	1.890
C3 Fuel Flow, lb/hr	15.362	.188	6.968	.085
C3 Smoke, %	3.568	.237	3.568	.237
Cell 3 Load, lb-ft	96.046	1.068	130.22	1.449
K1 C3 Exhaust 1, F	338.88	2.910	170.49	1.617
K2 C3 Exhaust 2, F	312.07	1.603	155.60	.891
K3 C3 Exhaust 3, F	359.72	.521	182.07	.289
K4 C3 Exhaust 4, F	270.63	3.863	132.57	2.146
K5 C3 Exhaust 5, F	290.73	.413	143.74	.230
K6 C3 Exhaust 6, F	305.65	2.026	152.03	1.126
K7 C3 Exhaust Comm, F	200.92	2.312	93.845	1.284
J1 C3 Water In, F	157.66	.052	69.809	.029
J2 C3 Water Out, F	165.59	.039	74.216	.022
J3 C3 Oil Sump, F	205.75	.253	96.529	.141
J4 C3 Fuel In, F	88.808	.053	31.560	.029
J5 C3 Inlet Air, F	103.29	.038	39.604	.021
J6 C3 Airbox, F	148.40	.222	64.664	.123
Horsepower	25.653	.315	19.126	.235
Corrected Horsepower	27.189	.334	20.271	.249
BSFC, lb/hp-hr	.599	.012	.364	.007
Corrected BSFC	.565	.011	.344	.007
Relative Humidity	37.600	.166	37.600	.166
Reference Pressure, inHg	31.026		105.07	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1270

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.03 in-Hg
Speed :	1403 RPM
Load :	96.0 lb-ft
Fuel Flow :	15.4 lb/hr
Brake Power :	25.65 bhp
BSFC :	.601 lb/bhp-hr
Indicated Power :	4.79 kW/cyl
Peak Pressure :	7.238 MPa
Peak Rate of Pressure Rise:	1063. kPa/deg
Peak Heat Release Rate :	130.1 Joules/deg
Cumulative Heat Release :	387.729 Joules
Apparent Combustion Efficiency :	66.8 %
Indicated Thermal Efficiency :	35.3 %
Brake Thermal Efficiency :	23.5 %
Ignition Delay :	12.4 degrees
Centroid Phasing :	189.5 degrees
Centroid Magnitude :	35.62 J/degree
Sensitivity :	15.1 degrees
Premixed/Diffusion Ratio :	.82169

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 3 FUEL BF-2 DATE 8-18-87 PAGE 15

BF02V13L86

Operator Greg							
Time	9:15	9:35	9:55	10:10	10:35	~~[illegible]~~	
Test Hour	30	15	15	10	20	~~[illegible]~~	
Speed, RPM	2799	2499	2200	1799	1400		
Load, lb-ft	348.6	380.8	400.1	400.2	378.7		
Fuel Flow, lb/hr	76.6	77.4	70.4	59.4	53.4		
Exh. Opacity, %	4.0	2.0	3.5	24.0	55.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	750	710	660	610		
Exhaust Cyl. L2	770	800	760	750	660		
Exhaust Cyl. L3	850	900	900	840	750		
Exhaust Cyl. R1	770	760	710	650	640		
Exhaust Cyl. R2	870	890	900	890	780		
Exhaust Cyl. R3	890	900	900	870	740		
Exhaust Common	410	400	390	350	310		
Water In	156	155	154	155	154		
Water Out	169	168	169	169	169		
Oil Sump	243	242	240	237	236		
Fuel	87	89	88	87	86		
Inlet Air	99	101	100	100	101		
Airbox	188	181	175	162	159		
Wet Bulb	77.0	77.0	77.0	77.0	77.2		
Dry Bulb	82.8	84.2	85.0	85.4	86.0		
PRESSURES, PSIG							
Oil Gallery	53.5	52.0	49.0	43.5	33.5		
Air After Blower	4.9	3.9	3.0	2.0	1.3		
Fuel Transfer	76.0	74.0	73.0	71.0	69.0		
LOW PRESSURES							
Intake Vac., in.water	17.0	16.0	12.8	8.6	5.1		
Exh. Comm., in.Water	26.5	22.0	18.0	13.0	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.08	29.08	29.08	29.08	29.08		

870818.091502 AL-15299-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	84.247	.268	29.026	.149
Wet Bulb Temperature, F	76.756	.060	24.864	.033
P11-Baro (Vent), "Hg ABS	29.078	.000	98.469	.002
P3 C3 Fuel Pressure,psig	75.941	.271	523.59	1.869
P4 C3 Oil Pressure, psig	53.986	.019	372.22	.132
P5 C3 Airbox Pres., psig	4.784	.010	32.985	.068
P10 C3 Exh Comm, inH20g	23.047	.201	5.735	.050
P11 C3 Intake Vac,inH20v	17.555	.138	4.368	.034
P12 C3 Blowby, inH20g	.051	.002	.013	.001
C3 Speed, RPM	2797.5	1.542	2797.5	1.542
C3 Fuel Flow, lb/hr	80.263	2.739	36.407	1.243
C3 Smoke, %	4.517	.103	4.517	.103
Cell 3 Load, lb-ft	347.12	.470	470.62	.637
K1 C3 Exhaust 1, F	765.68	4.724	407.60	2.624
K2 C3 Exhaust 2, F	799.41	.634	426.34	.352
K3 C3 Exhaust 3, F	885.42	.656	474.12	.364
K4 C3 Exhaust 4, F	802.01	3.089	427.78	1.716
K5 C3 Exhaust 5, F	901.22	.582	482.90	.323
K6 C3 Exhaust 6, F	917.15	.748	491.75	.415
K7 C3 Exhaust Comm, F	420.89	2.964	216.05	1.646
J1 C3 Water In, F	156.93	.081	69.405	.045
J2 C3 Water Out, F	169.69	.057	76.494	.032
J3 C3 Oil Sump, F	244.39	.274	118.00	.152
J4 C3 Fuel In, F	88.458	.080	31.366	.044
J5 C3 Inlet Air, F	99.688	.185	37.604	.103
J6 C3 Airbox, F	188.69	.180	87.050	.100
Horsepower	184.89	.271	137.85	.202
Corrected Horsepower	195.85	.287	146.02	.214
BSFC, lb/hp-hr	.434	.015	.264	.009
Corrected BSFC	.410	.014	.249	.009
Relative Humidity	71.403	.685	71.403	.685
Reference Pressure, inHg	37.527		127.08	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1272

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.53 in-Hg
Speed :	2798 RPM
Load :	347.1 lb-ft
Fuel Flow :	80.3 lb/hr
Brake Power :	184.92 bhp
BSFC :	.434 lb/bhp-hr
Indicated Power :	26.69 kW/cyl
Peak Pressure :	9.216 MPa
Peak Rate of Pressure Rise:	478.0 kPa/deg
Peak Heat Release Rate :	38.7 Joules/deg
Cumulative Heat Release :	1115.70 Joules
Apparent Combustion Efficiency :	71.9 %
Indicated Thermal Efficiency :	36.9 %
Brake Thermal Efficiency :	31.8 %
Ignition Delay :	7.4 degrees
Centroid Phasing :	198.2 degrees
Centroid Magnitude :	10.47 J/degree
Sensitivity :	28.8 degrees
Premixed/Diffusion Ratio :	.25570

870818.093355 AL-15299-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	84.889	.026	29.383	.015
Wet Bulb Temperature, F	76.855	.021	24.920	.011
P11-Baro (Vent), "Hg ABS	29.075	.000	98.459	.001
P3 C3 Fuel Pressure,psig	74.187	.468	511.50	3.230
P4 C3 Oil Pressure, psig	52.232	.017	360.13	.116
P5 C3 Airbox Pres., psig	3.752	.021	25.866	.142
P10 C3 Exh Comm, inH2Og	18.727	.186	4.660	.046
P11 C3 Intake Vac,inH2Ov	13.819	.147	3.439	.036
P12 C3 Blowby, inH2Og	.042	.002	.011	.000
C3 Speed, RPM	2500.8	1.204	2500.8	1.204
C3 Fuel Flow, lb/hr	75.590	1.873	34.287	.849
C3 Smoke, %	4.700	.471	4.700	.471
Cell 3 Load, lb-ft	378.42	.447	513.06	.607
K1 C3 Exhaust 1, F	780.93	4.647	416.07	2.582
K2 C3 Exhaust 2, F	809.69	4.706	432.05	2.614
K3 C3 Exhaust 3, F	917.85	.499	492.14	.277
K4 C3 Exhaust 4, F	777.92	6.052	414.40	3.362
K5 C3 Exhaust 5, F	913.41	.256	489.67	.142
K6 C3 Exhaust 6, F	930.44	.385	499.13	.214
K7 C3 Exhaust Comm, F	419.94	.636	215.52	.353
J1 C3 Water In, F	156.14	.114	68.967	.063
J2 C3 Water Out, F	169.13	.110	76.182	.061
J3 C3 Oil Sump, F	242.77	.129	117.09	.072
J4 C3 Fuel In, F	89.929	.051	32.183	.028
J5 C3 Inlet Air, F	102.11	.098	38.949	.054
J6 C3 Airbox, F	182.55	.149	83.640	.083
Horsepower	180.19	.249	134.34	.186
Corrected Horsepower	191.28	.265	142.61	.197
BSFC, lb/hp-hr	.420	.010	.255	.006
Corrected BSFC	.395	.009	.240	.006
Relative Humidity	69.708	.066	69.708	.066
Reference Pressure, inHg	35.697		120.88	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1274

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.70 in-Hg
Speed :	2501 RPM
Load :	378.4 lb-ft
Fuel Flow :	75.6 lb/hr
Brake Power :	180.19 bhp
BSFC :	.420 lb/bhp-hr
Indicated Power :	24.62 kW/cyl
Peak Pressure :	9.344 MPa
Peak Rate of Pressure Rise:	481.5 kPa/deg
Peak Heat Release Rate :	40.4 Joules/deg
Cumulative Heat Release :	1156.15 Joules
Apparent Combustion Efficiency :	70.8 %
Indicated Thermal Efficiency :	36.2 %
Brake Thermal Efficiency :	32.9 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	198.7 degrees
Centroid Magnitude :	10.81 J/degree
Sensitivity :	29.9 degrees
Premixed/Diffusion Ratio :	.23044

870818.095241 AL-15299-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	85.383	.034	29.657	.019
Wet Bulb Temperature, F	77.141	.019	25.078	.011
P11-Baro (Vent), "Hg ABS	29.076	.000	98.462	.001
P3 C3 Fuel Pressure,psig	72.229	.192	498.00	1.323
P4 C3 Oil Pressure, psig	49.128	.011	338.72	.074
P5 C3 Airbox Pres., psig	2.711	.011	18.693	.076
P10 C3 Exh Comm, inH20g	14.380	.186	3.578	.046
P11 C3 Intake Vac,inH20v	10.880	.138	2.707	.034
P12 C3 Blowby, inH20g	.035	.003	.009	.001
C3 Speed, RPM	2201.5	1.831	2201.5	1.831
C3 Fuel Flow, lb/hr	68.578	1.684	31.106	.764
C3 Smoke, %	6.531	.104	6.531	.104
Cell 3 Load, lb-ft	399.51	1.060	541.66	1.437
K1 C3 Exhaust 1, F	749.22	6.120	398.45	3.400
K2 C3 Exhaust 2, F	805.14	.218	429.52	.121
K3 C3 Exhaust 3, F	926.16	.365	496.76	.203
K4 C3 Exhaust 4, F	743.24	12.126	395.13	6.737
K5 C3 Exhaust 5, F	930.42	10.314	499.12	5.730
K6 C3 Exhaust 6, F	945.17	.560	507.32	.311
K7 C3 Exhaust Comm, F	397.36	.447	202.98	.248
J1 C3 Water In, F	156.08	.245	68.933	.136
J2 C3 Water Out, F	169.69	.206	76.493	.115
J3 C3 Oil Sump, F	241.19	.121	116.22	.067
J4 C3 Fuel In, F	89.074	.041	31.708	.023
J5 C3 Inlet Air, F	100.65	.189	38.140	.105
J6 C3 Airbox, F	176.73	.135	80.404	.075
Horsepower	167.47	.528	124.86	.394
Corrected Horsepower	177.58	.560	132.40	.418
BSFC, lb/hp-hr	.410	.010	.249	.006
Corrected BSFC	.386	.010	.235	.006
Relative Humidity	69.149	.102	69.149	.102
Reference Pressure, inHg	33.796		114.44	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1276

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.80 in-Hg
Speed :	2202 RPM
Load :	399.5 lb-ft
Fuel Flow :	68.6 lb/hr
Brake Power :	167.50 bhp
BSFC :	.410 lb/bhp-hr
Indicated Power :	22.02 kW/cyl
Peak Pressure :	9.550 MPa
Peak Rate of Pressure Rise:	526.0 kPa/deg
Peak Heat Release Rate :	48.2 Joules/deg
Cumulative Heat Release :	1196.17 Joules
Apparent Combustion Efficiency :	71.1 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	33.7 %
Ignition Delay :	7.0 degrees
Centroid Phasing :	197.7 degrees
Centroid Magnitude :	11.76 J/degree
Sensitivity :	28.7 degrees
Premixed/Diffusion Ratio :	.24396

870818.101755 AL-15299-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	84.738	.050	29.299	.028
Wet Bulb Temperature, F	76.334	.024	24.630	.014
P11-Baro (Vent), "Hg ABS	29.074	.000	98.454	.002
P3 C3 Fuel Pressure,psig	70.587	.068	486.68	.469
P4 C3 Oil Pressure, psig	44.378	.022	305.98	.152
P5 C3 Airbox Pres., psig	1.810	.012	12.478	.085
P10 C3 Exh Comm, inH2Og	9.081	.169	2.260	.042
P11 C3 Intake Vac,inH2Ov	6.842	.056	1.703	.014
P12 C3 Blowby, inH2Og	.027	.002	.007	.001
C3 Speed, RPM	1799.9	1.142	1799.9	1.142
C3 Fuel Flow, lb/hr	62.049	4.239	28.145	1.923
C3 Smoke, %	25.683	.370	25.683	.370
Cell 3 Load, lb-ft	399.27	.782	541.33	1.061
K1 C3 Exhaust 1, F	686.87	.300	363.82	.167
K2 C3 Exhaust 2, F	777.55	.455	414.19	.253
K3 C3 Exhaust 3, F	864.85	.320	462.69	.178
K4 C3 Exhaust 4, F	709.46	.338	376.37	.188
K5 C3 Exhaust 5, F	913.62	.723	489.79	.401
K6 C3 Exhaust 6, F	907.04	.777	486.13	.432
K7 C3 Exhaust Comm, F	358.85	.415	181.58	.231
J1 C3 Water In, F	155.78	.093	68.765	.051
J2 C3 Water Out, F	169.89	.075	76.607	.042
J3 C3 Oil Sump, F	238.05	.064	114.47	.036
J4 C3 Fuel In, F	87.461	.156	30.812	.087
J5 C3 Inlet Air, F	101.26	.080	38.476	.044
J6 C3 Airbox, F	162.71	.173	72.619	.096
Horsepower	136.83	.255	102.02	.190
Corrected Horsepower	145.05	.271	108.15	.202
BSFC, lb/hp-hr	.453	.031	.276	.019
Corrected BSFC	.428	.029	.260	.018
Relative Humidity	68.386	.220	68.386	.220
Reference Pressure, inHg	32.255		109.23	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1278

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.26 in-Hg
Speed :	1800 RPM
Load :	399.3 lb-ft
Fuel Flow :	62.0 lb/hr
Brake Power :	136.85 bhp
BSFC :	.453 lb/bhp-hr
Indicated Power :	17.66 kW/cyl
Peak Pressure :	9.703 MPa
Peak Rate of Pressure Rise:	602.7 kPa/deg
Peak Heat Release Rate :	61.0 Joules/deg
Cumulative Heat Release :	1165.18 Joules
Apparent Combustion Efficiency :	62.6 %
Indicated Thermal Efficiency :	31.6 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	6.2 degrees
Centroid Phasing :	195.7 degrees
Centroid Magnitude :	12.36 J/degree
Sensitivity :	27.5 degrees
Premixed/Diffusion Ratio :	.22643

870818.103132 AL-15299-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	84.515	.064	29.175	.036
Wet Bulb Temperature, F	76.025	.015	24.458	.008
P11-Baro (Vent), "Hg ABS	29.075	.000	98.461	.001
P3 C3 Fuel Pressure,psig	68.431	.045	471.82	.309
P4 C3 Oil Pressure, psig	34.105	.016	235.14	.110
P5 C3 Airbox Pres., psig	1.256	.007	8.661	.048
P10 C3 Exh Comm, inH2Og	4.568	.124	1.137	.031
P11 C3 Intake Vac,inH2Ov	3.419	.047	.851	.012
P12 C3 Blowby, inH2Og	.016	.002	.004	.000
C3 Speed, RPM	1401.8	1.502	1401.8	1.502
C3 Fuel Flow, lb/hr	52.433	1.574	23.783	.714
C3 Smoke, %	53.933	.658	53.933	.658
Cell 3 Load, lb-ft	374.37	1.010	507.58	1.369
K1 C3 Exhaust 1, F	627.13	5.593	330.63	3.107
K2 C3 Exhaust 2, F	688.62	.350	364.79	.194
K3 C3 Exhaust 3, F	778.04	6.019	414.47	3.344
K4 C3 Exhaust 4, F	658.83	5.828	348.24	3.238
K5 C3 Exhaust 5, F	797.13	7.876	425.07	4.376
K6 C3 Exhaust 6, F	754.23	.259	401.24	.144
K7 C3 Exhaust Comm, F	326.49	.517	163.61	.287
J1 C3 Water In, F	154.67	.189	68.150	.105
J2 C3 Water Out, F	169.98	.147	76.656	.082
J3 C3 Oil Sump, F	236.83	.137	113.79	.076
J4 C3 Fuel In, F	86.866	.039	29.926	.022
J5 C3 Inlet Air, F	101.73	.110	38.742	.061
J6 C3 Airbox, F	160.77	.147	71.539	.082
Horsepower	99.921	.342	74.499	.255
Corrected Horsepower	105.92	.362	78.973	.270
BSFC, lb/hp-hr	.525	.016	.319	.010
Corrected BSFC	.495	.015	.301	.009
Relative Humidity	68.017	.208	68.017	.208
Reference Pressure, inHg	31.382		106.27	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1280

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.38 in-Hg
Speed :	1402 RPM
Load :	374.4 lb-ft
Fuel Flow :	52.4 lb/hr
Brake Power :	99.94 bhp
BSFC :	.524 lb/bhp-hr
Indicated Power :	13.68 kW/cyl
Peak Pressure :	10.06 MPa
Peak Rate of Pressure Rise:	678.1 kPa/deg
Peak Heat Release Rate :	75.0 Joules/deg
Cumulative Heat Release :	1192.90 Joules
Apparent Combustion Efficiency :	59.1 %
Indicated Thermal Efficiency :	29.0 %
Brake Thermal Efficiency :	26.3 %
Ignition Delay :	5.5 degrees
Centroid Phasing :	195.3 degrees
Centroid Magnitude :	13.80 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.19957

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 3 FUEL TF10N18Y87 DATE 8-18-87 PAGE 16

Operator Grey							
Time	12:00	12:15	12:30	12:45	1:00	1:15	1:35
Test Hour	30	10	10	10	10	10	15
Speed, RPM	2800	2500	2500	2200	2200	1800	1800
Load, lb-ft	368.4	398.9	288.3	414.7	225.2	406.1	277.2
Fuel Flow, lb/hr	86.5	83.8	57.7	73.1	40.6	65.8	39.2
Exh. Opacity, %	6.5	7.0	0	13.0	0	35.0	.5
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	770	800	600	730	500	690	500
Exhaust Cyl. L2	800	840	610	800	500	750	510
Exhaust Cyl. L3	900	950	700	940	560	860	590
Exhaust Cyl. R1	820	810	630	760	500	700	510
Exhaust Cyl. R2	910	940	700	950	550	890	620
Exhaust Cyl. R3	930	950	700	950	550	880	600
Exhaust Common	440	420	330	400	270	340	260
Water In	157	156	159	153	157	153	158
Water Out	170	170	170	167	167	168	169
Oil Sump	247	246	234	242	224	239	226
Fuel	89	89	88	88	87	89	87
Inlet Air	99	100	99	101	101	102	102
Airbox	196	190	173	193	161	163	153
Wet Bulb	77.8	77.8	77.5	77.5	77.5	77.5	77.0
Dry Bulb	89.5	90.5	91.0	91.4	92.0	92.2	92.8
PRESSURES, PSIG							
Oil Gallery	53.0	51.0	53.0	48.0	52.0	43.5	46.0
Air After Blower	5.0	4.0	3.8	3.0	2.8	2.0	1.7
Fuel Transfer	77.0	75.0	75.0	74.0	75.0	720	72.5
LOW PRESSURES							
Intake Vac., in.water	17.0	16.0	16.0	12.8	13.0	8.6	8.9
Exh. Comm., in.Water	27.0	23.5	19.5	18.5	14.0	13.5	11.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.08	29.08	29.08	29.07	29.07	29.06	29.0

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 3 FUEL ____ DATE 8-18-87 PAGE 17
TF10N18X8)

Operator Greg							
Time	1:50	2:05	2:20	2:35			
Test Hour	10	10	10	10			
Speed, RPM	1800	1800	1400	1400			
Load, lb-ft	149.0	83.5	376.7	99.2			
Fuel Flow, lb/hr	24.2	17.5	55.5	15.1			
Exh. Opacity, %	0	.5	62.0	.5			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	400	340	610	340			
Exhaust Cyl. L2	380	320	660	300			
Exhaust Cyl. L3	410	350	750	350			
Exhaust Cyl. R1	360	300	630	270			
Exhaust Cyl. R2	390	240	250	280			
Exhaust Cyl. R3	400	300	710	300			
Exhaust Common	200	170	300	180			
Water In	162	161	154	160			
Water Out	170	169	168	169			
Oil Sump	217	210	237	206			
Fuel	89	88	88	87			
Inlet Air	102	98	99	99			
Airbox	148	145	158	147			
Wet Bulb	76.9	76.5	76.6	77.1			
Dry Bulb	93.0	93.2	94.0	94.2			
PRESSURES, PSIG							
Oil Gallery	47.5	49.0	33.5	38.5			
Air After Blower	1.8	1.7	1.3	1.3			
Fuel Transfer	72.5	73.0	69.5	70.5			
LOW PRESSURES							
Intake Vac., in.water	8.9	8.9	5.2	5.3			
Exh. Comm., in.Water	9.5	9.0	9.0	6.0			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	29.05	29.05	29.05	29.04			

870818.120045 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	88.310	.049	31.284	.027
Wet Bulb Temperature, F	76.222	.025	24.568	.014
P11-Baro (Vent), "Hg ABS	29.077	.000	98.464	.001
P3 C3 Fuel Pressure,psig	76.770	.340	529.31	2.347
P4 C3 Oil Pressure, psig	53.055	.029	365.80	.198
P5 C3 Airbox Pres., psig	4.891	.017	33.724	.117
P10 C3 Exh Comm, inH20g	25.486	.155	6.342	.039
P11 C3 Intake Vac,inH20v	17.826	.111	4.436	.028
P12 C3 Blowby, inH20g	.070	.004	.017	.001
C3 Speed, RPM	2800.7	.984	2800.7	.984
C3 Fuel Flow, lb/hr	88.255	.844	40.032	.383
C3 Smoke, %	7.660	.197	7.660	.197
Cell 3 Load, lb-ft	367.97	.576	498.90	.781
K1 C3 Exhaust 1, F	782.26	.417	416.81	.231
K2 C3 Exhaust 2, F	829.17	.777	442.87	.432
K3 C3 Exhaust 3, F	931.47	.341	499.71	.189
K4 C3 Exhaust 4, F	844.23	.681	451.24	.378
K5 C3 Exhaust 5, F	942.87	.448	506.04	.249
K6 C3 Exhaust 6, F	958.27	.702	514.60	.390
K7 C3 Exhaust Comm, F	442.44	.920	228.02	.511
J1 C3 Water In, F	155.74	.206	68.745	.114
J2 C3 Water Out, F	169.00	.143	76.109	.080
J3 C3 Oil Sump, F	241.04	20.013	116.14	11.118
J4 C3 Fuel In, F	88.676	.170	31.487	.095
J5 C3 Inlet Air, F	99.585	.178	37.547	.099
J6 C3 Airbox, F	198.98	.524	92.764	.291
Horsepower	196.22	.357	146.30	.266
Corrected Horsepower	207.36	.378	154.60	.281
BSFC, lb/hp-hr	.450	.005	.274	.003
Corrected BSFC	.426	.004	.259	.003
Relative Humidity	57.799	.096	57.799	.096
Reference Pressure, inHg	37.724		127.75	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1282

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.72 in-Hg
Speed :	2801 RPM
Load :	368.0 lb-ft
Fuel Flow :	88.3 lb/hr
Brake Power :	196.26 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	27.90 kW/cyl
Peak Pressure :	9.449 MPa
Peak Rate of Pressure Rise:	657.3 kPa/deg
Peak Heat Release Rate :	65.1 Joules/deg
Cumulative Heat Release :	1169.80 Joules
Apparent Combustion Efficiency :	70.2 %
Indicated Thermal Efficiency :	35.8 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	8.6 degrees
Centroid Phasing :	198.5 degrees
Centroid Magnitude :	12.03 J/degree
Sensitivity :	27.9 degrees
Premixed/Diffusion Ratio :	.30949

870818.121630 AL-16083-F AL-12920-L 6V53 3

Dry Bulb Temperature, F	89.027	.065	31.681	.036
Wet Bulb Temperature, F	76.350	.087	24.639	.049
P11-Baro (Vent), "Hg ABS	29.076	.000	98.462	.001
P3 C3 Fuel Pressure,psig	74.392	.478	512.91	3.296
P4 C3 Oil Pressure, psig	51.091	.025	352.26	.175
P5 C3 Airbox Pres., psig	3.841	.021	26.480	.141
P10 C3 Exh Comm, inH2Og	21.227	.347	5.282	.086
P11 C3 Intake Vac,inH2Ov	13.959	.132	3.474	.033
P12 C3 Blowby, inH2Og	.057	.002	.014	.001
C3 Speed, RPM	2500.2	1.202	2500.2	1.202
C3 Fuel Flow, lb/hr	82.766	.505	37.542	.229
C3 Smoke, %	8.917	.129	8.917	.129
Cell 3 Load, lb-ft	398.24	.684	539.94	.927
K1 C3 Exhaust 1, F	819.81	7.029	437.67	3.905
K2 C3 Exhaust 2, F	854.86	.432	457.14	.240
K3 C3 Exhaust 3, F	966.89	5.550	519.38	3.083
K4 C3 Exhaust 4, F	831.59	8.315	444.22	4.620
K5 C3 Exhaust 5, F	966.96	.465	519.42	.258
K6 C3 Exhaust 6, F	970.03	11.155	521.13	6.197
K7 C3 Exhaust Comm, F	434.71	3.220	223.73	1.789
J1 C3 Water In, F	157.56	.097	69.754	.054
J2 C3 Water Out, F	170.95	.111	77.192	.061
J3 C3 Oil Sump, F	246.77	.122	119.32	.068
J4 C3 Fuel In, F	89.561	.155	31.978	.086
J5 C3 Inlet Air, F	100.94	.059	38.300	.033
J6 C3 Airbox, F	191.18	.067	88.431	.037
Horsepower	189.58	.386	141.35	.287
Corrected Horsepower	200.57	.408	149.54	.304
BSFC, lb/hp-hr	.437	.003	.266	.002
Corrected BSFC	.413	.003	.251	.002
Relative Humidity	56.325	.208	56.325	.208
Reference Pressure, inHg	35.869		121.46	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1284

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.87 in-Hg
Speed :	2500 RPM
Load :	398.2 lb-ft
Fuel Flow :	82.8 lb/hr
Brake Power :	189.55 bhp
BSFC :	.437 lb/bhp-hr
Indicated Power :	25.99 kW/cyl
Peak Pressure :	9.546 MPa
Peak Rate of Pressure Rise:	687.9 kPa/deg
Peak Heat Release Rate :	69.9 Joules/deg
Cumulative Heat Release :	1218.66 Joules
Apparent Combustion Efficiency :	69.6 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	32.3 %
Ignition Delay :	8.3 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	13.03 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.29272

870818.122915 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	89.335	.102	31.853	.057
Wet Bulb Temperature, F	75.945	.039	24.414	.021
P11-Baro (Vent), "Hg ABS	29.071	.000	98.444	.002
P3 C3 Fuel Pressure,psig	74.597	.220	514.33	1.515
P4 C3 Oil Pressure, psig	53.458	.017	368.58	.119
P5 C3 Airbox Pres., psig	3.619	.010	24.953	.066
P10 C3 Exh Comm, inH20g	17.374	.131	4.323	.033
P11 C3 Intake Vac,inH20v	14.341	.110	3.569	.027
P12 C3 Blowby, inH20g	.051	.002	.013	.001
C3 Speed, RPM	2499.6	.858	2499.6	.858
C3 Fuel Flow, lb/hr	58.471	.915	26.522	.415
C3 Smoke, %	1.390	.191	1.390	.191
Cell 3 Load, lb-ft	289.62	.651	392.67	.883
K1 C3 Exhaust 1, F	606.74	6.370	319.30	3.539
K2 C3 Exhaust 2, F	629.64	.573	332.02	.318
K3 C3 Exhaust 3, F	716.18	4.120	380.10	2.289
K4 C3 Exhaust 4, F	640.94	6.480	338.30	3.600
K5 C3 Exhaust 5, F	719.43	.294	381.91	.163
K6 C3 Exhaust 6, F	729.02	4.610	387.23	2.561
K7 C3 Exhaust Comm, F	336.83	1.942	169.35	1.079
J1 C3 Water In, F	159.99	.057	71.107	.032
J2 C3 Water Out, F	171.00	.090	77.224	.050
J3 C3 Oil Sump, F	234.50	.223	112.50	.124
J4 C3 Fuel In, F	89.005	.142	31.669	.079
J5 C3 Inlet Air, F	101.15	1.778	38.419	.988
J6 C3 Airbox, F	173.89	.093	78.828	.051
Horsepower	137.84	.325	102.77	.242
Corrected Horsepower	145.78	.343	108.69	.256
BSFC, lb/hp-hr	.424	.007	.258	.004
Corrected BSFC	.401	.007	.244	.004
Relative Humidity	54.346	.201	54.346	.201
Reference Pressure, inHg	35.384		119.82	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1286

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.38 in-Hg
Speed :	2500 RPM
Load :	289.6 lb-ft
Fuel Flow :	58.5 lb/hr
Brake Power :	137.85 bhp
BSFC :	.424 lb/bhp-hr
Indicated Power :	19.60 kW/cyl
Peak Pressure :	8.519 MPa
Peak Rate of Pressure Rise:	760.3 kPa/deg
Peak Heat Release Rate :	83.9 Joules/deg
Cumulative Heat Release :	888.639 Joules
Apparent Combustion Efficiency :	71.8 %
Indicated Thermal Efficiency :	38.0 %
Brake Thermal Efficiency :	33.2 %
Ignition Delay :	10.8 degrees
Centroid Phasing :	196.9 degrees
Centroid Magnitude :	14.44 J/degree
Sensitivity :	24.1 degrees
Premixed/Diffusion Ratio :	.44752

870818.124555 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	89.568	.112	31.982	.062
Wet Bulb Temperature, F	76.016	.078	24.453	.044
P11-Baro (Vent), "Hg ABS	29.070	.000	98.443	.001
P3 C3 Fuel Pressure,psig	73.558	.140	507.17	.963
P4 C3 Oil Pressure, psig	48.512	.018	334.48	.126
P5 C3 Airbox Pres., psig	2.749	.012	18.952	.082
P10 C3 Exh Comm, inH2Og	16.370	.141	4.074	.035
P11 C3 Intake Vac,inH2Ov	11.148	.134	2.774	.033
P12 C3 Blowby, inH2Og	.044	.002	.011	.000
C3 Speed, RPM	2200.4	1.649	2200.4	1.649
C3 Fuel Flow, lb/hr	76.658	.926	34.771	.420
C3 Smoke, %	15.521	.416	15.521	.416
Cell 3 Load, lb-ft	414.31	.732	561.73	.993
K1 C3 Exhaust 1, F	768.47	6.041	409.15	3.356
K2 C3 Exhaust 2, F	833.22	4.740	445.12	2.633
K3 C3 Exhaust 3, F	968.49	.347	520.27	.193
K4 C3 Exhaust 4, F	802.48	6.122	428.05	3.401
K5 C3 Exhaust 5, F	976.05	.627	524.47	.348
K6 C3 Exhaust 6, F	984.47	.860	529.15	.478
K7 C3 Exhaust Comm, F	402.19	.387	205.66	.215
J1 C3 Water In, F	153.68	.099	67.601	.055
J2 C3 Water Out, F	168.00	.111	75.558	.061
J3 C3 Oil Sump, F	242.99	.127	117.22	.071
J4 C3 Fuel In, F	88.365	.235	31.314	.131
J5 C3 Inlet Air, F	102.31	.068	39.059	.038
J6 C3 Airbox, F	184.12	.054	84.511	.030
Horsepower	173.58	.355	129.42	.265
Corrected Horsepower	183.77	.376	137.01	.280
BSFC, lb/hp-hr	.442	.006	.269	.004
Corrected BSFC	.417	.006	.254	.003
Relative Humidity	53.976	.159	53.976	.159
Reference Pressure, inHg	33.847		114.62	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1288

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.85 in-Hg
Speed :	2200 RPM
Load :	414.3 lb-ft
Fuel Flow :	76.7 lb/hr
Brake Power :	173.55 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	22.69 kW/cyl
Peak Pressure :	9.708 MPa
Peak Rate of Pressure Rise:	805.3 kPa/deg
Peak Heat Release Rate :	87.9 Joules/deg
Cumulative Heat Release :	1247.48 Joules
Apparent Combustion Efficiency :	67.7 %
Indicated Thermal Efficiency :	33.6 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	8.6 degrees
Centroid Phasing :	198.2 degrees
Centroid Magnitude :	14.86 J/degree
Sensitivity :	27.6 degrees
Premixed/Diffusion Ratio :	.31258

870818.130023 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	91.362	.053	32.979	.030
Wet Bulb Temperature, F	76.583	.055	24.769	.030
P11-Baro (Vent), "Hg ABS	29.063	.000	98.418	.001
P3 C3 Fuel Pressure,psig	74.752	.164	515.40	1.128
P4 C3 Oil Pressure, psig	52.230	.016	360.12	.109
P5 C3 Airbox Pres., psig	2.544	.011	17.542	.073
P10 C3 Exh Comm, inH20g	11.789	.180	2.933	.045
P11 C3 Intake Vac,inH20v	11.548	.136	2.874	.034
P12 C3 Blowby, inH20g	.037	.003	.009	.001
C3 Speed, RPM	2200.6	.885	2200.6	.885
C3 Fuel Flow, lb/hr	41.048	.645	18.619	.293
C3 Smoke, %	-.690	.066	-.690	.066
Cell 3 Load, lb-ft	223.96	.801	303.65	1.086
K1 C3 Exhaust 1, F	507.31	4.868	264.06	2.705
K2 C3 Exhaust 2, F	508.47	.555	264.70	.309
K3 C3 Exhaust 3, F	573.29	.376	300.72	.209
K4 C3 Exhaust 4, F	511.41	3.675	266.34	2.042
K5 C3 Exhaust 5, F	564.25	3.521	295.69	1.956
K6 C3 Exhaust 6, F	564.40	3.545	295.78	1.969
K7 C3 Exhaust Comm, F	270.37	2.149	132.43	1.194
J1 C3 Water In, F	158.22	.129	70.122	.072
J2 C3 Water Out, F	168.12	.090	75.625	.050
J3 C3 Oil Sump, F	225.13	.198	107.29	.110
J4 C3 Fuel In, F	87.458	.125	30.810	.070
J5 C3 Inlet Air, F	101.58	.141	38.654	.078
J6 C3 Airbox, F	162.03	.136	72.238	.076
Horsepower	93.840	.328	69.965	.245
Corrected Horsepower	99.324	.347	74.053	.259
BSFC, lb/hp-hr	.437	.007	.266	.004
Corrected BSFC	.413	.007	.251	.004
Relative Humidity	51.285	.103	51.285	.103
Reference Pressure, inHg	33.394		113.08	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1290

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.39 in-Hg
Speed :	2201 RPM
Load :	224.0 lb-ft
Fuel Flow :	41.0 lb/hr
Brake Power :	93.87 bhp
BSFC :	.437 lb/bhp-hr
Indicated Power :	13.33 kW/cyl
Peak Pressure :	7.979 MPa
Peak Rate of Pressure Rise:	973.7 kPa/deg
Peak Heat Release Rate :	118.2 Joules/deg
Cumulative Heat Release :	694.520 Joules
Apparent Combustion Efficiency :	70.5 %
Indicated Thermal Efficiency :	36.9 %
Brake Thermal Efficiency :	32.3 %
Ignition Delay :	12.6 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	22.92 J/degree
Sensitivity :	20.3 degrees
Premixed/Diffusion Ratio :	.61938

870818.131845 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	91.452	.083	33.029	.046
Wet Bulb Temperature, F	76.243	.062	24.579	.034
P11-Baro (Vent), "Hg ABS	29.060	.000	98.407	.001
P3 C3 Fuel Pressure,psig	71.064	.081	489.97	.556
P4 C3 Oil Pressure, psig	43.911	.013	302.75	.088
P5 C3 Airbox Pres., psig	1.838	.008	12.675	.054
P10 C3 Exh Comm, inH2Og	10.524	.120	2.619	.030
P11 C3 Intake Vac,inH2Ov	7.198	.059	1.791	.015
P12 C3 Blowby, inH2Og	.028	.002	.007	.000
C3 Speed, RPM	1800.9	1.643	1800.9	1.643
C3 Fuel Flow, lb/hr	66.900	.902	30.345	.409
C3 Smoke, %	36.615	.259	36.615	.259
Cell 3 Load, lb-ft	405.94	.472	550.38	.640
K1 C3 Exhaust 1, F	702.72	4.418	372.62	2.454
K2 C3 Exhaust 2, F	778.73	4.590	414.85	2.550
K3 C3 Exhaust 3, F	887.43	.819	475.24	.455
K4 C3 Exhaust 4, F	716.46	7.390	380.25	4.106
K5 C3 Exhaust 5, F	916.48	.708	491.38	.394
K6 C3 Exhaust 6, F	909.62	.529	487.56	.294
K7 C3 Exhaust Comm, F	344.28	.903	173.49	.501
J1 C3 Water In, F	154.06	.176	67.811	.098
J2 C3 Water Out, F	168.91	.142	76.060	.079
J3 C3 Oil Sump, F	240.65	.127	115.92	.071
J4 C3 Fuel In, F	89.656	.168	32.031	.093
J5 C3 Inlet Air, F	102.61	.242	39.228	.135
J6 C3 Airbox, F	164.30	.078	73.499	.043
Horsepower	139.20	.249	103.78	.185
Corrected Horsepower	147.41	.263	109.90	.196
BSFC, lb/hp-hr	.481	.006	.292	.004
Corrected BSFC	.454	.006	.276	.004
Relative Humidity	50.133	.272	50.133	.272
Reference Pressure, inHg	32.273		109.29	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1292

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.27 in-Hg
Speed :	1801 RPM
Load :	405.9 lb-ft
Fuel Flow :	66.9 lb/hr
Brake Power :	139.19 bhp
BSFC :	.481 lb/bhp-hr
Indicated Power :	17.92 kW/cyl
Peak Pressure :	9.877 MPa
Peak Rate of Pressure Rise:	972.6 kPa/deg
Peak Heat Release Rate :	112.6 Joules/deg
Cumulative Heat Release :	1173.96 Joules
Apparent Combustion Efficiency :	59.8 %
Indicated Thermal Efficiency :	30.4 %
Brake Thermal Efficiency :	29.3 %
Ignition Delay :	8.1 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	18.04 J/degree
Sensitivity :	24.8 degrees
Premixed/Diffusion Ratio :	.32487

870818.133535 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	91.652	.142	33.140	.079
Wet Bulb Temperature, F	76.473	.105	24.707	.059
P11-Baro (Vent), "Hg ABS	29.054	.000	98.389	.001
P3 C3 Fuel Pressure,psig	71.560	.121	493.39	.831
P4 C3 Oil Pressure, psig	46.305	.012	319.26	.080
P5 C3 Airbox Pres., psig	1.613	.004	11.120	.026
P10 C3 Exh Comm, inH20g	8.212	.148	2.043	.037
P11 C3 Intake Vac,inH20v	7.567	.071	1.883	.018
P12 C3 Blowby, inH20g	.029	.003	.007	.001
C3 Speed, RPM	1800.7	.876	1800.7	.876
C3 Fuel Flow, lb/hr	38.717	.127	17.562	.057
C3 Smoke, %	.528	.094	.528	.094
Cell 3 Load, lb-ft	276.71	.613	375.16	.831
K1 C3 Exhaust 1, F	508.87	4.726	264.93	2.625
K2 C3 Exhaust 2, F	528.92	2.657	276.07	1.476
K3 C3 Exhaust 3, F	596.46	.234	313.59	.130
K4 C3 Exhaust 4, F	526.59	3.760	274.77	2.089
K5 C3 Exhaust 5, F	640.73	3.967	338.18	2.204
K6 C3 Exhaust 6, F	620.13	5.691	326.74	3.162
K7 C3 Exhaust Comm, F	267.61	1.226	130.89	.681
J1 C3 Water In, F	158.73	.159	70.406	.088
J2 C3 Water Out, F	169.53	.082	76.407	.046
J3 C3 Oil Sump, F	226.33	.111	107.96	.062
J4 C3 Fuel In, F	87.555	.176	30.864	.098
J5 C3 Inlet Air, F	102.95	.160	39.418	.089
J6 C3 Airbox, F	153.81	.168	67.674	.093
Horsepower	94.872	.206	70.734	.153
Corrected Horsepower	100.54	.218	74.961	.163
BSFC, lb/hp-hr	.408	.002	.248	.001
Corrected BSFC	.385	.001	.234	.001
Relative Humidity	50.309	.260	50.309	.260
Reference Pressure, inHg	31.782		107.62	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1294

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.78 in-Hg
Speed :	1801 RPM
Load :	276.7 lb-ft
Fuel Flow :	38.7 lb/hr
Brake Power :	94.89 bhp
BSFC :	.408 lb/bhp-hr
Indicated Power :	11.96 kW/cyl
Peak Pressure :	8.180 MPa
Peak Rate of Pressure Rise:	938.9 kPa/deg
Peak Heat Release Rate :	110.4 Joules/deg
Cumulative Heat Release :	768.866 Joules
Apparent Combustion Efficiency :	67.7 %
Indicated Thermal Efficiency :	35.1 %
Brake Thermal Efficiency :	34.6 %
Ignition Delay :	11.1 degrees
Centroid Phasing :	194.5 degrees
Centroid Magnitude :	20.39 J/degree
Sensitivity :	21.4 degrees
Premixed/Diffusion Ratio :	.51664

870818.135037 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	91.996	.114	33.331	.064
Wet Bulb Temperature, F	76.258	.100	24.588	.055
P11-Baro (Vent), "Hg ABS	29.047	.000	98.366	.001
P3 C3 Fuel Pressure,psig	71.864	.191	495.49	1.318
P4 C3 Oil Pressure, psig	47.849	.006	329.91	.043
P5 C3 Airbox Pres., psig	1.616	.008	11.145	.054
P10 C3 Exh Comm, inH20g	6.329	.075	1.575	.019
P11 C3 Intake Vac,inH20v	7.682	.079	1.912	.020
P12 C3 Blowby, inH20g	.030	.002	.007	.001
C3 Speed, RPM	1801.4	.614	1801.4	.614
C3 Fuel Flow, lb/hr	24.676	.107	11.193	.049
C3 Smoke, %	.454	.258	.454	.258
Cell 3 Load, lb-ft	149.77	.554	203.05	.751
K1 C3 Exhaust 1, F	397.84	2.909	203.24	1.616
K2 C3 Exhaust 2, F	388.00	.216	197.78	.120
K3 C3 Exhaust 3, F	433.79	.309	223.22	.172
K4 C3 Exhaust 4, F	376.75	3.399	191.53	1.888
K5 C3 Exhaust 5, F	397.47	.325	203.04	.181
K6 C3 Exhaust 6, F	399.39	3.154	204.11	1.752
K7 C3 Exhaust Comm, F	202.22	1.375	94.565	.764
J1 C3 Water In, F	162.50	.058	72.501	.032
J2 C3 Water Out, F	171.05	.052	77.249	.029
J3 C3 Oil Sump, F	217.79	.102	103.22	.056
J4 C3 Fuel In, F	89.061	.011	31.700	.006
J5 C3 Inlet Air, F	102.84	.054	39.354	.030
J6 C3 Airbox, F	149.69	.066	65.382	.036
Horsepower	51.370	.189	38.300	.141
Corrected Horsepower	54.423	.200	40.576	.149
BSFC, lb/hp-hr	.480	.002	.292	.001
Corrected BSFC	.453	.002	.276	.001
Relative Humidity	48.942	.090	48.942	.090
Reference Pressure, inHg	31.774		107.60	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1296

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.77 in-Hg
Speed :	1801 RPM
Load :	149.8 lb-ft
Fuel Flow :	24.7 lb/hr
Brake Power :	51.37 bhp
BSFC :	.481 lb/bhp-hr
Indicated Power :	7.91 kW/cyl
Peak Pressure :	7.404 MPa
Peak Rate of Pressure Rise:	958.3 kPa/deg
Peak Heat Release Rate :	117.0 Joules/deg
Cumulative Heat Release :	513.401 Joules
Apparent Combustion Efficiency :	70.8 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	29.3 %
Ignition Delay :	12.9 degrees
Centroid Phasing :	193.2 degrees
Centroid Magnitude :	27.17 J/degree
Sensitivity :	18.2 degrees
Premixed/Diffusion Ratio :	.70857

870818.140627 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	92.590	.054	33.661	.030
Wet Bulb Temperature, F	75.974	.033	24.430	.019
P11-Baro (Vent), "Hg ABS	29.042	.000	98.346	.001
P3 C3 Fuel Pressure,psig	72.232	.079	498.03	.541
P4 C3 Oil Pressure, psig	49.125	.010	338.70	.071
P5 C3 Airbox Pres., psig	1.681	.006	11.593	.042
P10 C3 Exh Comm, inH2Og	5.495	.106	1.367	.026
P11 C3 Intake Vac,inH2Ov	7.769	.070	1.933	.017
P12 C3 Blowby, inH2Og	.033	.004	.008	.001
C3 Speed, RPM	1801.2	.923	1801.2	.923
C3 Fuel Flow, lb/hr	18.469	.893	8.377	.405
C3 Smoke, %	3.639	.318	3.639	.318
Cell 3 Load, lb-ft	84.354	.624	114.37	.846
K1 C3 Exhaust 1, F	343.66	3.013	173.14	1.674
K2 C3 Exhaust 2, F	329.22	1.741	165.12	.967
K3 C3 Exhaust 3, F	365.70	.289	185.39	.160
K4 C3 Exhaust 4, F	293.28	1.874	145.16	1.041
K5 C3 Exhaust 5, F	293.57	1.574	145.32	.874
K6 C3 Exhaust 6, F	303.56	1.666	150.87	.926
K7 C3 Exhaust Comm, F	173.19	.609	78.441	.338
J1 C3 Water In, F	162.16	.101	72.313	.056
J2 C3 Water Out, F	169.68	.086	76.488	.048
J3 C3 Oil Sump, F	210.80	.071	99.333	.040
J4 C3 Fuel In, F	88.823	.018	31.568	.010
J5 C3 Inlet Air, F	98.267	.064	36.815	.035
J6 C3 Airbox, F	145.74	.050	63.188	.028
Horsepower	28.930	.226	21.570	.169
Corrected Horsepower	30.512	.239	22.749	.178
BSFC, lb/hp-hr	.638	.028	.388	.017
Corrected BSFC	.605	.027	.368	.016
Relative Humidity	46.873	.073	46.873	.073
Reference Pressure, inHg	31.894		108.00	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1298

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.89 in-Hg
Speed :	1801 RPM
Load :	84.4 lb-ft
Fuel Flow :	18.5 lb/hr
Brake Power :	28.94 bhp
BSFC :	.639 lb/bhp-hr
Indicated Power :	5.92 kW/cyl
Peak Pressure :	6.966 MPa
Peak Rate of Pressure Rise:	857.2 kPa/deg
Peak Heat Release Rate :	105.3 Joules/deg
Cumulative Heat Release :	353.913 Joules
Apparent Combustion Efficiency :	65.2 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	22.1 %
Ignition Delay :	13.5 degrees
Centroid Phasing :	190.3 degrees
Centroid Magnitude :	30.64 J/degree
Sensitivity :	14.7 degrees
Premixed/Diffusion Ratio :	.92031

870818.142155 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	93.863	.363	34.368	.202
Wet Bulb Temperature, F	76.220	.066	24.567	.037
P11-Baro (Vent), "Hg ABS	29.034	.000	98.322	.002
P3 C3 Fuel Pressure,psig	68.608	.115	473.04	.795
P4 C3 Oil Pressure, psig	33.866	.038	233.50	.260
P5 C3 Airbox Pres., psig	1.269	.007	8.749	.046
P10 C3 Exh Comm, inH20g	5.790	.129	1.441	.032
P11 C3 Intake Vac,inH20v	4.225	.051	1.051	.013
P12 C3 Blowby, inH20g	.024	.004	.006	.001
C3 Speed, RPM	1402.5	1.237	1402.5	1.237
C3 Fuel Flow, lb/hr	56.868	2.254	25.795	1.022
C3 Smoke, %	65.270	.467	65.270	.467
Cell 3 Load, lb-ft	373.11	1.052	505.86	1.426
K1 C3 Exhaust 1, F	629.62	3.818	332.01	2.121
K2 C3 Exhaust 2, F	667.74	5.189	353.19	2.883
K3 C3 Exhaust 3, F	782.76	.307	417.09	.170
K4 C3 Exhaust 4, F	647.98	1.102	342.21	.612
K5 C3 Exhaust 5, F	780.30	4.974	415.72	2.763
K6 C3 Exhaust 6, F	735.24	.316	390.69	.175
K7 C3 Exhaust Comm, F	303.49	.926	150.83	.514
J1 C3 Water In, F	154.34	.119	67.968	.066
J2 C3 Water Out, F	169.59	.144	76.439	.080
J3 C3 Oil Sump, F	237.65	.120	114.25	.067
J4 C3 Fuel In, F	88.324	.169	31.291	.094
J5 C3 Inlet Air, F	100.24	.057	37.913	.032
J6 C3 Airbox, F	159.03	.080	70.573	.044
Horsepower	99.635	.286	74.286	.213
Corrected Horsepower	105.28	.302	78.494	.225
BSFC, lb/hp-hr	.571	.023	.347	.014
Corrected BSFC	.540	.022	.329	.013
Relative Humidity	44.833	.636	44.833	.636
Reference Pressure, inHg	31.307		106.02	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1300

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.31 in-Hg
Speed :	1403 RPM
Load :	373.1 lb-ft
Fuel Flow :	56.9 lb/hr
Brake Power :	99.67 bhp
BSFC :	.571 lb/bhp-hr
Indicated Power :	13.61 kW/cyl
Peak Pressure :	10.20 MPa
Peak Rate of Pressure Rise:	1099. kPa/deg
Peak Heat Release Rate :	133.1 Joules/deg
Cumulative Heat Release :	1186.58 Joules
Apparent Combustion Efficiency :	55.3 %
Indicated Thermal Efficiency :	27.1 %
Brake Thermal Efficiency :	24.7 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	20.92 J/degree
Sensitivity :	25.8 degrees
Premixed/Diffusion Ratio :	.27820

870818.143717 AL-16083-F AL-12920-L 6V53				3
Dry Bulb Temperature, F	93.373	.064	34.096	.036
Wet Bulb Temperature, F	75.972	.043	24.429	.024
P11-Baro (Vent), "Hg ABS	29.031	.000	98.310	.001
P3 C3 Fuel Pressure,psig	70.000	.106	482.63	.733
P4 C3 Oil Pressure, psig	39.422	.016	271.81	.108
P5 C3 Airbox Pres., psig	1.221	.006	8.416	.038
P10 C3 Exh Comm, inH20g	2.525	.085	.628	.021
P11 C3 Intake Vac,inH20v	4.388	.044	1.092	.011
P12 C3 Blowby, inH20g	.025	.001	.006	.000
C3 Speed, RPM	1402.5	1.237	1402.5	1.237
C3 Fuel Flow, lb/hr	15.049	.129	6.826	.058
C3 Smoke, %	8.138	.676	8.138	.676
Cell 3 Load, lb-ft	98.347	.727	133.34	.986
K1 C3 Exhaust 1, F	339.23	3.022	170.68	1.679
K2 C3 Exhaust 2, F	311.11	.099	155.06	.055
K3 C3 Exhaust 3, F	358.26	.248	181.25	.138
K4 C3 Exhaust 4, F	278.59	2.535	137.00	1.408
K5 C3 Exhaust 5, F	282.46	1.623	139.15	.901
K6 C3 Exhaust 6, F	299.42	.183	148.57	.102
K7 C3 Exhaust Comm, F	176.81	1.334	80.450	.741
J1 C3 Water In, F	161.27	.058	71.819	.032
J2 C3 Water Out, F	169.02	.071	76.123	.039
J3 C3 Oil Sump, F	208.83	.080	98.241	.044
J4 C3 Fuel In, F	87.135	.167	30.630	.093
J5 C3 Inlet Air, F	99.662	.023	37.590	.013
J6 C3 Airbox, F	146.24	.167	63.467	.093
Horsepower	26.263	.213	19.581	.158
Corrected Horsepower	27.736	.224	20.679	.167
BSFC, lb/hp-hr	.573	.007	.349	.005
Corrected BSFC	.543	.007	.330	.004
Relative Humidity	45.210	.135	45.210	.135
Reference Pressure, inHg	31.193		105.63	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1302

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.19 in-Hg
Speed :	1403 RPM
Load :	98.3 lb-ft
Fuel Flow :	15.0 lb/hr
Brake Power :	26.26 bhp
BSFC :	.571 lb/bhp-hr
Indicated Power :	4.72 kW/cyl
Peak Pressure :	7.014 MPa
Peak Rate of Pressure Rise:	990.5 kPa/deg
Peak Heat Release Rate :	121.1 Joules/deg
Cumulative Heat Release :	387.997 Joules
Apparent Combustion Efficiency :	68.6 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	24.7 %
Ignition Delay :	12.5 degrees
Centroid Phasing :	190.4 degrees
Centroid Magnitude :	33.05 J/degree
Sensitivity :	15.8 degrees
Premixed/Diffusion Ratio :	.78925

APPENDIX F4
DDC 6V-53N DATA SHEETS
FUEL BLEND TF09

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: DDA 6V-53N Engine Tester: SwRI
Test Fuel: JF09N14587 Date: 11-4-87

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressure:
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with JF09N14587 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressure:
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with JF09N14587 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF09N14587 Date: 11-4-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	109	DN1313	DN1314
2500	110	DN1315	DN1316
2200	111	DN1317	DN1318
1800	112	DN1319	DN1320
1400	113	DN1321	DN1322

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF09N14587

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	115	DN1323	DN1324
2500	Full-Rack	116	DN1325	DN1326
2500	145	117	DN1327	DN1328
2200	Full-Rack	118	DN1329	DN1330
2200	100	119	DN1331	DN1332
1800	Full-Rack	120	DN1333	DN1334
1800	100	121	DN1335	DN1336
1800	54	122	DN1337	DN1338
1800	20	123	DN1339	DN1340
1400	Full-Rack	124	DN1341	DN1342
1400	28	125	DN1343	DN1344

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF09N14587 Date: 11-5-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	126	DN1345	DN1346
2500	127	DN1347	DN1348
2200	128	DN1349	DN1350
1800	129	DN1351	DN1352
1400	130	DN1353	DN1354

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF09N14587

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	131	DN1355	DN1356
2500	Full-Rack	132	DN1357	DN1358
2500	145	133	DN1359	DN1360
2200	Full-Rack	134	DN1361	DN1362
2200	100	135	DN1363	DN1364
1800	Full-Rack	136	DN1365	DN1366
1800	100	137	DN1367	DN1368
1800	54	138	DN1369	DN1370
1800	20	139	DN1371	DN1372
1400	Full-Rack	140	DN1373	DN1374
1400	28	141	DN1375	DN1376

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 4 FUEL BFP2V132L86 DATE 11-4-87 PAGE 18

Operator GREG							
Time	9:40	10:15	10:30	10:45	11:00		
Test Hour	40min	35min	15min	15min	15min		
Speed, RPM	2800	2800	2199	1800	1399		
Load, lb-ft	349.5	383.1	401.8	406.0	380.1		
Fuel Flow, lb/hr	78.7	74.5	69.1	60.9	51.9		
Exh. Opacity, %	1.0	4.0	4.0	18.5	4.5		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	740	750	720	660	610		
Exhaust Cyl. L2	760	770	770	750	670		
Exhaust Cyl. L3	850	870	900	840	760		
Exhaust Cyl. R1	770	760	750	710	650.		
Exhaust Cyl. R2	860	880	900	890	800		
Exhaust Cyl. R3	880	895	910	900	750		
Exhaust Common	410	405	395	350	340		
Water In	153	154	153	153	153		
Water Out	167	168	167	169	168		
Oil Sump	242	238	238	235	235		
Fuel	90	89	89	87	86		
Inlet Air	99	100	103	101	100		
Airbox	186	182	176	161	157		
Wet Bulb	68.5	69.0	69.8	69.9	69.8		
Dry Bulb	78.0	80.7	81.1	81.5	82.0		
PRESSURES, PSIG							
Oil Gallery	53.0	51.0	48.0	43.0	33.0		
Air After Blower	5.0	4.0	3.0	2.0	1.4		
Fuel Transfer	78.0	75.0	74.0	71.5	70.0		
LOW PRESSURES							
Intake Vac., in.water	20.0	16.0	12.6	8.5	5.0		
Exh. Comm., in.Water	27.0	22.5	18.0	13.5	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.07	29.07	29.07	29.07	29.06		

971104.094135 AL-15299-F AL-12920-L DD6V53				4
Dry Bulb Temperature, F	72.477	.146	22.487	.081
Wet Bulb Temperature, F	65.384	.059	18.547	.033
P11-Baro (Vent), "Hg ABS	29.073	.000	98.453	.001
P3 C3 Fuel Pressure,psig	76.776	.389	529.35	2.680
P4 C3 Oil Pressure, psig	53.268	.038	367.27	.261
P5 C3 Airbox Pres., psig	4.838	.009	33.357	.059
P10 C3 Exh Comm, inH2Og	23.109	.203	5.751	.051
P11 C3 Intake Vac,inH2Ov	20.150	.123	5.014	.031
P12 C3 Blowby, inH2Og	.035	.002	.009	.000
C3 Speed, RPM	2802.3	1.840	2802.3	1.840
C3 Fuel Flow, lb/hr	79.295	.045	35.967	.021
C3 Smoke, %	.481	.137	.481	.137
Cell 3 Load, lb-ft	349.72	.407	474.16	.552
K1 C3 Exhaust 1, F	765.71	.472	407.62	.262
K2 C3 Exhaust 2, F	799.74	.598	426.52	.332
K3 C3 Exhaust 3, F	884.22	.716	473.45	.398
K4 C3 Exhaust 4, F	805.60	.720	429.78	.400
K5 C3 Exhaust 5, F	903.18	1.195	483.99	.664
K6 C3 Exhaust 6, F	913.07	.486	489.49	.270
K7-C3 Exhaust Comm, F	424.53	1.136	218.07	.631
J1 C3 Water In, F	153.88	.193	67.713	.107
J2 C3 Water Out, F	167.16	.222	75.088	.123
J3 C3 Oil Sump, F	243.03	.582	117.24	.323
J4 C3 Fuel In, F	90.736	.070	32.631	.039
J5 C3 Inlet Air, F	98.204	.278	36.780	.154
J6 C3 Airbox, F	185.84	.281	85.464	.156
Horsepower	186.60	.291	139.13	.217
Corrected Horsepower	195.41	.305	145.69	.227
BSFC, lb/hp-hr	.425	.001	.259	.000
Corrected BSFC	.406	.001	.247	.000
Relative Humidity	68.843	.308	68.843	.308
Reference Pressure, inHg	37.441		126.79	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1314

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.44 in-Hg
Speed :	2802 RPM
Load :	349.7 lb-ft
Fuel Flow :	79.3 lb/hr
Brake Power :	186.57 bhp
BSFC :	.425 lb/bhp-hr
Indicated Power :	26.77 kW/cyl
Peak Pressure :	9.359 MPa
Peak Rate of Pressure Rise:	460.2 kPa/deg
Peak Heat Release Rate :	37.0 Joules/deg
Cumulative Heat Release :	1127.11 Joules
Apparent Combustion Efficiency :	73.7 %
Indicated Thermal Efficiency :	37.5 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	197.8 degrees
Centroid Magnitude :	10.63 J/degree
Sensitivity :	28.6 degrees
Premixed/Diffusion Ratio :	.25242

971104.101611 AL-15299-F AL-12920-L DD6V53				4
Dry Bulb Temperature, F	74.518	.129	23.621	.072
Wet Bulb Temperature, F	66.530	.022	19.184	.012
P11-Baro (Vent), "Hg ABS	29.074	.000	98.456	.001
P3 C3 Fuel Pressure,psig	75.345	.397	519.49	2.739
P4 C3 Oil Pressure, psig	51.441	.017	354.67	.118
P5 C3 Airbox Pres., psig	3.808	.027	26.255	.188
P10 C3 Exh Comm, inH20g	19.053	.119	4.741	.030
P11 C3 Intake Vac,inH20v	16.684	.144	4.152	.036
P12 C3 Blowby, inH20g	.022	.003	.006	.001
C3 Speed, RPM	2501.2	1.433	2501.2	1.433
C3 Fuel Flow, lb/hr	75.156	.020	34.090	.009
C3 Smoke, %	3.667	.151	3.667	.151
Cell 3 Load, lb-ft	383.04	.328	519.33	.445
K1 C3 Exhaust 1, F	764.23	.539	406.79	.300
K2 C3 Exhaust 2, F	807.70	.290	430.94	.161
K3 C3 Exhaust 3, F	915.92	.639	491.06	.355
K4 C3 Exhaust 4, F	800.67	.522	427.04	.290
K5 C3 Exhaust 5, F	911.69	.407	488.72	.226
K6 C3 Exhaust 6, F	926.72	.547	497.06	.304
K7-C3 Exhaust Comm, F	434.21	.724	223.45	.402
J1 C3 Water In, F	154.55	.112	68.083	.062
J2 C3 Water Out, F	167.65	.137	75.360	.076
J3 C3 Oil Sump, F	239.88	.218	115.49	.121
J4 C3 Fuel In, F	89.547	.041	31.970	.023
J5 C3 Inlet Air, F	100.76	.154	38.201	.085
J6 C3 Airbox, F	181.18	.131	82.877	.073
Horsepower	182.42	.189	136.01	.141
Corrected Horsepower	191.56	.199	142.82	.148
BSFC, lb/hp-hr	.412	.000	.251	.000
Corrected BSFC	.392	.000	.239	.000
Relative Humidity	66.117	.393	66.117	.393
Reference Pressure, inHg	35.600		120.56	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1316

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.60 in-Hg
Speed :	2501 RPM
Load :	383.0 lb-ft
Fuel Flow :	75.2 lb/hr
Brake Power :	182.38 bhp
BSFC :	.412 lb/bhp-hr
Indicated Power :	25.26 kW/cyl
Peak Pressure :	9.451 MPa
Peak Rate of Pressure Rise:	482.6 kPa/deg
Peak Heat Release Rate :	39.7 Joules/deg
Cumulative Heat Release :	1182.18 Joules
Apparent Combustion Efficiency :	72.8 %
Indicated Thermal Efficiency :	37.3 %
Brake Thermal Efficiency :	33.5 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	11.04 J/degree
Sensitivity :	30.2 degrees
Premixed/Diffusion Ratio :	.21987

871104.103130 AL-15299-F	AL-12920-L	DD6V53		4
Dry Bulb Temperature, F	75.091	.066	23.939	.037
Wet Bulb Temperature, F	66.878	.040	19.377	.022
P11-Baro (Vent), "Hg ABS	29.071	.001	98.446	.002
P3 C3 Fuel Pressure,psig	73.340	.189	505.66	1.301
P4 C3 Oil Pressure, psig	48.218	.014	332.45	.099
P5 C3 Airbox Pres., psig	2.714	.010	18.714	.066
P10 C3 Exh Comm, inH20g	14.499	.148	3.608	.037
P11 C3 Intake Vac,inH20v	13.623	.085	3.390	.021
P12 C3 Blowby, inH20g	.016	.003	.004	.001
C3 Speed, RPM	2200.7	1.269	2200.7	1.269
C3 Fuel Flow, lb/hr	69.732	.038	31.630	.017
C3 Smoke, %	3.950	.204	3.950	.204
Cell 3 Load, lb-ft	402.71	.870	546.00	1.179
K1 C3 Exhaust 1, F	738.19	.340	392.33	.189
K2 C3 Exhaust 2, F	810.40	.461	432.44	.256
K3 C3 Exhaust 3, F	932.02	.678	500.01	.377
K4 C3 Exhaust 4, F	783.45	.487	417.47	.271
K5 C3 Exhaust 5, F	942.33	.476	505.74	.265
K6 C3 Exhaust 6, F	948.77	.550	509.32	.306
K7-C3 Exhaust Comm, F	401.60	.481	205.33	.267
J1 C3 Water In, F	153.78	.144	67.655	.080
J2 C3 Water Out, F	167.45	.137	75.250	.076
J3 C3 Oil Sump, F	239.96	.211	115.53	.117
J4 C3 Fuel In, F	89.242	.069	31.801	.038
J5 C3 Inlet Air, F	103.10	.085	39.498	.047
J6 C3 Airbox, F	176.49	.134	80.271	.074
Horsepower	168.74	.395	125.81	.294
Corrected Horsepower	177.62	.415	132.43	.310
BSFC, lb/hp-hr	.413	.001	.251	.001
Corrected BSFC	.393	.001	.239	.001
Relative Humidity	65.486	.122	65.486	.122
Reference Pressure, inHg	33.595		113.77	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1318

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.60 in-Hg
Speed :	2201 RPM
Load :	402.7 lb-ft
Fuel Flow :	69.7 lb/hr
Brake Power :	168.76 bhp
BSFC :	.413 lb/bhp-hr
Indicated Power :	22.28 kW/cyl
Peak Pressure :	9.692 MPa
Peak Rate of Pressure Rise:	519.6 kPa/deg
Peak Heat Release Rate :	47.1 Joules/deg
Cumulative Heat Release :	1220.92 Joules
Apparent Combustion Efficiency :	71.4 %
Indicated Thermal Efficiency :	35.5 %
Brake Thermal Efficiency :	33.4 %
Ignition Delay :	6.8 degrees
Centroid Phasing :	197.9 degrees
Centroid Magnitude :	12.11 J/degree
Sensitivity :	29.1 degrees
Premixed/Diffusion Ratio :	.23429

S71104.104806 AL-15299-F AL-12920-L DD6V53				4
Dry Bulb Temperature, F	76.765	.094	24.870	.052
Wet Bulb Temperature, F	67.433	.031	19.685	.017
P11-Baro (Vent), "Hg ABS	29.067	.000	98.433	.001
P3 C3 Fuel Pressure,psig	70.872	.256	488.64	1.763
P4 C3 Oil Pressure, psig	43.730	.016	301.51	.114
P5 C3 Airbox Pres., psig	1.831	.009	12.627	.064
P10 C3 Exh Comm, inH2Og	9.316	.146	2.318	.036
P11 C3 Intake Vac,inH2Ov	9.689	.043	2.411	.011
P12 C3 Blowby, inH2Og	.009	.002	.002	.001
C3 Speed, RPM	1800.3	1.233	1800.3	1.233
C3 Fuel Flow, lb/hr	61.270	.081	27.791	.037
C3 Smoke, %	16.369	.156	16.369	.156
Cell 3 Load, lb-ft	404.27	.557	548.12	.755
K1 C3 Exhaust 1, F	673.79	.378	356.55	.210
K2 C3 Exhaust 2, F	778.36	.398	414.64	.221
K3 C3 Exhaust 3, F	867.44	.634	464.13	.352
K4 C3 Exhaust 4, F	747.08	.526	397.27	.292
K5 C3 Exhaust 5, F	923.13	.601	495.07	.334
K6 C3 Exhaust 6, F	934.48	.458	501.38	.255
K7-C3 Exhaust Comm, F	369.81	.490	187.67	.272
J1 C3 Water In, F	154.65	.341	68.140	.189
J2 C3 Water Out, F	168.85	.225	76.027	.125
J3 C3 Oil Sump, F	235.26	.149	112.92	.083
J4 C3 Fuel In, F	87.984	.075	31.102	.042
J5 C3 Inlet Air, F	101.38	.291	38.543	.162
J6 C3 Airbox, F	161.62	.156	72.012	.087
Horsepower	138.58	.263	103.32	.196
Corrected Horsepower	145.67	.277	108.61	.206
BSFC, lb/hp-hr	.442	.001	.269	.000
Corrected BSFC	.421	.001	.256	.000
Relative Humidity	62.012	.232	62.012	.232
Reference Pressure, inHg	32.084		108.65	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1320

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.08 in-Hg
Speed :	1800 RPM
Load :	404.3 lb-ft
Fuel Flow :	61.3 lb/hr
Brake Power :	138.56 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	17.83 kW/cyl
Peak Pressure :	9.779 MPa
Peak Rate of Pressure Rise:	601.5 kPa/deg
Peak Heat Release Rate :	60.6 Joules/deg
Cumulative Heat Release :	1184.94 Joules
Apparent Combustion Efficiency :	64.4 %
Indicated Thermal Efficiency :	32.3 %
Brake Thermal Efficiency :	31.2 %
Ignition Delay :	6.1 degrees
Centroid Phasing :	196.4 degrees
Centroid Magnitude :	12.41 J/degree
Sensitivity :	28.3 degrees
Premixed/Diffusion Ratio :	.21575

871104.110446 AL-15299-F AL-12920-L DD6V53				4
Dry Bulb Temperature, F	76.785	.288	24.881	.160
Wet Bulb Temperature, F	67.124	.187	19.513	.104
P11-Baro (Vent), "Hg ABS	29.062	.000	98.416	.001
P3 C3 Fuel Pressure,psig	69.203	.076	477.14	.524
P4 C3 Oil Pressure, psig	33.142	.012	228.51	.080
P5 C3 Airbox Pres., psig	1.272	.008	8.768	.054
P10 C3 Exh Comm, inH2Og	5.176	.196	1.288	.049
P11 C3 Intake Vac,inH2Ov	6.516	.039	1.621	.010
P12 C3 Blowby, inH2Og	.002	.001	.001	.000
C3 Speed, RPM	1400.9	.784	1400.9	.784
C3 Fuel Flow, lb/hr	52.370	.068	23.755	.031
C3 Smoke, %	44.968	.753	44.968	.753
Cell 3 Load, lb-ft	378.89	1.158	513.71	1.571
K1 C3 Exhaust 1, F	621.25	.309	327.36	.172
K2 C3 Exhaust 2, F	696.02	.415	368.90	.231
K3 C3 Exhaust 3, F	786.64	.377	419.25	.209
K4 C3 Exhaust 4, F	669.66	.412	354.25	.229
K5 C3 Exhaust 5, F	818.45	1.311	436.92	.728
K6 C3 Exhaust 6, F	772.69	.628	411.50	.349
K7-C3 Exhaust Comm, F	338.29	.319	170.16	.177
J1 C3 Water In, F	153.01	.098	67.226	.054
J2 C3 Water Out, F	168.71	.094	75.948	.052
J3 C3 Oil Sump, F	235.29	.096	112.94	.053
J4 C3 Fuel In, F	86.384	.104	30.213	.058
J5 C3 Inlet Air, F	99.879	.117	37.710	.065
J6 C3 Airbox, F	158.29	.205	70.163	.114
Horsepower	101.07	.347	75.352	.259
Corrected Horsepower	106.07	.365	79.085	.272
BSFC, lb/hp-hr	.518	.002	.315	.001
Corrected BSFC	.494	.002	.300	.001
Relative Humidity	60.815	.345	60.815	.345
Reference Pressure, inHg	31.172		105.56	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1322

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.17 in-Hg
Speed :	1401 RPM
Load :	378.9 lb-ft
Fuel Flow :	52.4 lb/hr
Brake Power :	101.07 bhp
BSFC :	.518 lb/bhp-hr
Indicated Power :	13.64 kW/cyl
Peak Pressure :	10.08 MPa
Peak Rate of Pressure Rise:	666.0 kPa/deg
Peak Heat Release Rate :	72.4 Joules/deg
Cumulative Heat Release :	1181.99 Joules
Apparent Combustion Efficiency :	58.5 %
Indicated Thermal Efficiency :	28.9 %
Brake Thermal Efficiency :	26.6 %
Ignition Delay :	5.3 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	13.63 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.19116

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 4 FUEL TF09N14587 DATE 11-4-87 PAGE 19

Operator Greg							
Time	1:00	1:15	1:30	2:00	2:15	2:35	2:50
Test Hour	45 min	15 min	15 min	30 min	15 min	20 min	15 min
Speed, RPM	2800	2500	2500	2200	2200	1799	1798
Load, lb-ft	383.6	410.0	288.0	425.9	226.7	413.9	277.3
Fuel Flow, lb/hr	98.1	92.3	61.7	84.6	43.5	73.1	40.4
Exh. Opacity, %	5.0	7.0	0	11.0	0	38.0	0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	800	820	595	760	500	700	500
Exhaust Cyl. L2	840	870	610	840	510	800	540
Exhaust Cyl. L3	950	980	700	950	560	880	590
Exhaust Cyl. R1	830	850	610	800	500	700	510
Exhaust Cyl. R2	955	990	695	960	550	900	620
Exhaust Cyl. R3	955	990	700	970	550	895	600
Exhaust Common	460	450	340	410	290	370	280
Water In	157	152	161	154	160	153	157
Water Out	171	167	172	168	170	167	168
Oil Sump	249	246	231	242	224	237	220
Fuel	93	93	93	92	90	90	89
Inlet Air	103	103	99	101	100	103	102
Airbox	198	192	168	187	163	164	152
Wet Bulb	69.1	70.0	70.0	70.0	69.6	69.0	70.0
Dry Bulb	83.0	84	83.5	83.0	84.2	85.0	85.7
PRESSURES, PSIG							
Oil Gallery	51.5	49.5	52.5	47.0	51.0	42.8	45.5
Air After Blower	5.0	4.0	3.8	3.0	2.8	2.0	2.8
Fuel Transfer	70.5	69.0	70.0	67	68.5	65.0	67.0
LOW PRESSURES							
Intake Vac., in.water	21.0	17.0	18.0	12.6	12.9	8.5	8.8
Exh. Comm., in.Water	27.5	24.0	19.5	19.0	14.5	13.8	11.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.01	29.0	28.99	28.98	28.98	28.97	28.97

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 4 FUEL ____ DATE 4-4-87 PAGE 20

TFP9N14587

Operator GREG							
Time	3:20	3:30	3:50	4:00			
Test Hour	30 MIN	10 MIN	20 MIN	10 MIN			
Speed, RPM	1748	1799	1398	1399			
Load, lb-ft	149.6	78.8	376.2	100.7			
Fuel Flow, lb/hr	25.5	20.0	62.8	16.1			
Exh. Opacity, %	0	0	71.0	0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	400	360	610	350			
Exhaust Cyl. L2	400	350	690	330			
Exhaust Cyl. L3	420	380	760	350			
Exhaust Cyl. R1	360	300	610	260			
Exhaust Cyl. R2	390	300	750	270			
Exhaust Cyl. R3	390	310	710	290			
Exhaust Common	210	200	340	210			
Water In	162	162	153	162			
Water Out	171	169	168	167			
Oil Sump	211	207	234	204			
Fuel	88	88	87	86			
Inlet Air	101	101	103	103			
Airbox	144	144	160	147			
Wet Bulb	69.8	69.9	70.2	70.5			
Dry Bulb	85.0	85.0	85.1	83.0			
PRESSURES, PSIG							
Oil Gallery	47.5	48.5	33.0	38.5			
Air After Blower	1.8	2.7	1.3	1.2			
Fuel Transfer	67.9	68.0	64.0	66.5			
LOW PRESSURES							
Intake Vac., in.water	8.8	9.8	5.1	5.2			
Exh. Comm., in.Water	9.0	8.5	8.5	5.5			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	28.97	28.97	28.97	28.96			

871104.130235 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	79.172	.028	26.207	.016
Wet Bulb Temperature, F	67.687	.015	19.826	.008
P11-Baro (Vent), "Hg ABS	29.012	.001	98.246	.003
P3 C3 Fuel Pressure,psig	70.329	.127	484.90	.878
P4 C3 Oil Pressure, psig	52.049	.086	358.86	.595
P5 C3 Airbox Pres., psig	4.905	.025	33.820	.171
P10 C3 Exh Comm, inH2Og	24.664	.216	6.137	.054
P11 C3 Intake Vac,inH2Ov	20.924	.149	5.207	.037
P12 C3 Blowby, inH2Og	.046	.001	.011	.000
C3 Speed, RPM	2799.8	1.203	2799.8	1.203
C3 Fuel Flow, lb/hr	98.426	.136	44.645	.062
C3 Smoke, %	4.849	.183	4.849	.183
Cell 3 Load, lb-ft	382.60	.640	518.74	.868
K1 C3 Exhaust 1, F	809.63	1.086	432.02	.603
K2 C3 Exhaust 2, F	861.43	.367	460.80	.204
K3 C3 Exhaust 3, F	968.43	.715	520.24	.397
K4 C3 Exhaust 4, F	888.07	.857	475.59	.476
K5 C3 Exhaust 5, F	990.99	.576	532.77	.320
K6 C3 Exhaust 6, F	998.81	.817	537.12	.454
K7-C3 Exhaust Comm, F	474.46	1.068	245.81	.593
J1 C3 Water In, F	156.60	.333	69.220	.185
J2 C3 Water Out, F	170.09	.335	76.715	.186
J3 C3 Oil Sump, F	247.89	.365	119.94	.203
J4 C3 Fuel In, F	93.359	.089	34.088	.049
J5 C3 Inlet Air, F	102.43	.285	39.127	.159
J6 C3 Airbox, F	197.03	.198	91.683	.110
Horsepower	203.96	.367	152.07	.274
Corrected Horsepower	214.89	.387	160.21	.288
BSFC, lb/hp-hr	.483	.001	.294	.001
Corrected BSFC	.458	.001	.279	.001
Relative Humidity	55.564	.076	55.564	.076
Reference Pressure, inHg	37.460		126.85	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1324

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.46 in-Hg
Speed :	2800 RPM
Load :	382.6 lb-ft
Fuel Flow :	98.4 lb/hr
Brake Power :	203.98 bhp
BSFC :	.482 lb/bhp-hr
Indicated Power :	28.65 kW/cyl
Peak Pressure :	9.607 MPa
Peak Rate of Pressure Rise:	452.3 kPa/deg
Peak Heat Release Rate :	37.8 Joules/deg
Cumulative Heat Release :	1226.82 Joules
Apparent Combustion Efficiency :	65.2 %
Indicated Thermal Efficiency :	32.6 %
Brake Thermal Efficiency :	28.9 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	199.3 degrees
Centroid Magnitude :	10.62 J/degree
Sensitivity :	30.6 degrees
Premixed/Diffusion Ratio :	.21901

871104.131918 AL-16090-F	AL-12920-L	DD6V53N		4
Dry Bulb Temperature, F	79.627	.207	26.460	.115
Wet Bulb Temperature, F	67.874	.104	19.930	.058
P11-Baro (Vent), "Hg ABS	29.002	.000	98.213	.001
P3 C3 Fuel Pressure,psig	68.557	.122	472.69	.842
P4 C3 Oil Pressure, psig	49.332	.147	340.13	1.013
P5 C3 Airbox Pres., psig	3.837	.015	26.452	.101
P10 C3 Exh Comm, inH2Og	20.140	.199	5.012	.050
P11 C3 Intake Vac,inH2Ov	17.559	.144	4.369	.036
P12 C3 Blowby, inH2Og	.027	.001	.007	.000
C3 Speed, RPM	2502.9	1.576	2502.9	1.576
C3 Fuel Flow, lb/hr	92.656	.123	42.028	.056
C3 Smoke, %	6.775	.124	6.775	.124
Cell 3 Load, lb-ft	409.63	1.054	555.38	1.429
K1 C3 Exhaust 1, F	832.05	.832	444.47	.462
K2 C3 Exhaust 2, F	898.17	.623	481.21	.346
K3 C3 Exhaust 3, F	1006.1	.670	541.18	.372
K4 C3 Exhaust 4, F	873.09	.456	467.27	.253
K5 C3 Exhaust 5, F	1012.7	.493	544.82	.274
K6 C3 Exhaust 6, F	1018.9	.703	548.29	.391
K7-C3 Exhaust Comm, F	462.64	.666	239.24	.370
J1 C3 Water In, F	152.29	.707	66.827	.393
J2 C3 Water Out, F	166.97	.796	74.981	.442
J3 C3 Oil Sump, F	249.19	.692	120.66	.384
J4 C3 Fuel In, F	93.697	.018	34.276	.010
J5 C3 Inlet Air, F	103.07	.140	39.484	.078
J6 C3 Airbox, F	193.35	.339	89.638	.189
Horsepower	195.21	.590	145.55	.440
Corrected Horsepower	205.87	.622	153.49	.464
BSFC, lb/hp-hr	.475	.001	.289	.001
Corrected BSFC	.450	.001	.274	.001
Relative Humidity	54.891	.266	54.891	.266
Reference Pressure, inHg	35.522		120.29	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1326

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.52 in-Hg
Speed :	2503 RPM
Load :	409.6 lb-ft
Fuel Flow :	92.7 lb/hr
Brake Power :	195.21 bhp
BSFC :	.475 lb/bhp-hr
Indicated Power :	26.77 kW/cyl
Peak Pressure :	9.771 MPa
Peak Rate of Pressure Rise:	470.3 kPa/deg
Peak Heat Release Rate :	38.9 Joules/deg
Cumulative Heat Release :	1264.91 Joules
Apparent Combustion Efficiency :	63.8 %
Indicated Thermal Efficiency :	32.3 %
Brake Thermal Efficiency :	29.3 %
Ignition Delay :	6.0 degrees
Centroid Phasing :	199.6 degrees
Centroid Magnitude :	11.22 J/degree
Sensitivity :	31.6 degrees
Premixed/Diffusion Ratio :	.19074

871104.133223 AL-16090-F	AL-12920-L	DD6V53N		4
Dry Bulb Temperature, F	81.067	.221	27.259	.123
Wet Bulb Temperature, F	68.304	.065	20.169	.036
P11-Baro (Vent), "Hg ABS	28.994	.000	98.184	.001
P3 C3 Fuel Pressure,psig	69.499	.139	479.18	.962
P4 C3 Oil Pressure, psig	53.360	.109	367.90	.750
P5 C3 Airbox Pres., psig	3.602	.017	24.836	.118
P10 C3 Exh Comm, inH2Og	16.089	.153	4.004	.038
P11 C3 Intake Vac,inH2Ov	18.062	.147	4.495	.037
P12 C3 Blowby, inH2Og	.022	.001	.006	.000
C3 Speed, RPM	2501.1	.873	2501.1	.873
C3 Fuel Flow, lb/hr	62.096	.091	28.166	.041
C3 Smoke, %	-.651	.118	-.651	.118
Cell 3 Load, lb-ft	287.09	.813	389.24	1.102
K1 C3 Exhaust 1, F	592.69	.511	311.50	.284
K2 C3 Exhaust 2, F	632.89	.297	333.83	.165
K3 C3 Exhaust 3, F	711.59	.366	377.55	.203
K4 C3 Exhaust 4, F	638.63	.751	337.01	.417
K5 C3 Exhaust 5, F	710.43	.523	376.91	.291
K6 C3 Exhaust 6, F	720.02	.467	382.23	.259
K7-C3 Exhaust Comm, F	353.03	2.101	178.35	1.167
J1 C3 Water In, F	159.67	.681	70.926	.378
J2 C3 Water Out, F	170.35	.707	76.859	.393
J3 C3 Oil Sump, F	229.98	.278	109.99	.155
J4 C3 Fuel In, F	92.090	.059	33.383	.033
J5 C3 Inlet Air, F	100.28	.520	37.933	.289
J6 C3 Airbox, F	169.32	.484	76.288	.269
Horsepower	136.72	.385	101.93	.287
Corrected Horsepower	143.86	.405	107.26	.302
BSFC, lb/hp-hr	.454	.001	.276	.001
Corrected BSFC	.432	.001	.263	.001
Relative Humidity	52.308	.447	52.308	.447
Reference Pressure, inHg	34.999		118.52	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1328

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.00 in-Hg
Speed :	2501 RPM
Load :	287.1 lb-ft
Fuel Flow :	62.1 lb/hr
Brake Power :	136.72 bhp
BSFC :	.454 lb/bhp-hr
Indicated Power :	19.78 kW/cyl
Peak Pressure :	8.566 MPa
Peak Rate of Pressure Rise:	529.4 kPa/deg
Peak Heat Release Rate :	48.9 Joules/deg
Cumulative Heat Release :	898.922 Joules
Apparent Combustion Efficiency :	67.6 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	30.7 %
Ignition Delay :	8.8 degrees
Centroid Phasing :	197.2 degrees
Centroid Magnitude :	10.73 J/degree
Sensitivity :	26.5 degrees
Premixed/Diffusion Ratio :	.33093

871104.135938 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	81.224	.143	27.346	.080
Wet Bulb Temperature, F	68.427	.060	20.237	.033
P11-Baro (Vent), "Hg ABS	28.978	.001	98.130	.002
P3 C3 Fuel Pressure,psig	66.379	.144	457.66	.996
P4 C3 Oil Pressure, psig	47.683	.032	328.76	.220
P5 C3 Airbox Pres., psig	2.742	.009	18.905	.061
P10 C3 Exh Comm, inH20g	15.311	.188	3.810	.047
P11 C3 Intake Vac,inH20v	15.036	.057	3.742	.014
P12 C3 Blowby, inH20g	.024	.001	.006	.000
C3 Speed, RPM	2201.7	1.855	2201.7	1.855
C3 Fuel Flow, lb/hr	84.635	.076	38.390	.034
C3 Smoke, %	10.865	.249	10.865	.249
Cell 3 Load, lb-ft	425.40	.422	576.77	.572
K1 C3 Exhaust 1, F	780.25	.518	415.70	.288
K2 C3 Exhaust 2, F	868.15	.421	464.53	.234
K3 C3 Exhaust 3, F	991.94	.651	533.30	.362
K4 C3 Exhaust 4, F	828.22	.421	442.35	.234
K5 C3 Exhaust 5, F	1003.4	.294	539.64	.163
K6 C3 Exhaust 6, F	1010.2	.438	543.46	.243
K7-C3 Exhaust Comm, F	425.38	.460	218.55	.255
J1 C3 Water In, F	153.32	.102	67.402	.056
J2 C3 Water Out, F	167.43	.117	75.236	.065
J3 C3 Oil Sump, F	241.72	.222	116.51	.123
J4 C3 Fuel In, F	91.663	.085	33.146	.047
J5 C3 Inlet Air, F	101.37	.170	38.538	.095
J6 C3 Airbox, F	186.94	.233	86.080	.129
Horsepower	178.33	.216	132.96	.161
Corrected Horsepower	187.96	.227	140.14	.169
BSFC, lb/hp-hr	.475	.001	.289	.000
Corrected BSFC	.450	.001	.274	.000
Relative Humidity	52.287	.243	52.287	.243
Reference Pressure, inHg	33.455		113.29	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1330

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.46 in-Hg
Speed :	2202 RPM
Load :	425.4 lb-ft
Fuel Flow :	84.6 lb/hr
Brake Power :	178.36 bhp
BSFC :	.474 lb/bhp-hr
Indicated Power :	23.23 kW/cyl
Peak Pressure :	9.995 MPa
Peak Rate of Pressure Rise:	525.9 kPa/deg
Peak Heat Release Rate :	47.8 Joules/deg
Cumulative Heat Release :	1265.69 Joules
Apparent Combustion Efficiency :	61.5 %
Indicated Thermal Efficiency :	30.8 %
Brake Thermal Efficiency :	29.4 %
Ignition Delay :	6.4 degrees
Centroid Phasing :	197.6 degrees
Centroid Magnitude :	12.38 J/degree
Sensitivity :	29.1 degrees
Premixed/Diffusion Ratio :	.22024

871104.141444 AL-16090-F	AL-12920-L	DD6V53N		4
Dry Bulb Temperature, F	80.894	.255	27.163	.142
Wet Bulb Temperature, F	67.755	.077	19.864	.043
P11-Baro (Vent), "Hg ABS	28.975	.000	98.121	.001
P3 C3 Fuel Pressure,psig	67.986	.098	468.75	.678
P4 C3 Oil Pressure, psig	51.504	.017	355.11	.118
P5 C3 Airbox Pres., psig	2.522	.008	17.388	.055
P10 C3 Exh Comm, inH2Og	10.748	.219	2.675	.055
P11 C3 Intake Vac,inH2Ov	15.485	.087	3.853	.022
P12 C3 Blowby, inH2Og	.014	.001	.004	.000
C3 Speed, RPM	2201.6	1.227	2201.6	1.227
C3 Fuel Flow, lb/hr	44.056	.066	19.983	.030
C3 Smoke, %	-2.239	.175	-2.239	.175
Cell 3 Load, lb-ft	225.96	.852	306.35	1.155
K1 C3 Exhaust 1, F	507.43	.788	264.13	.438
K2 C3 Exhaust 2, F	527.08	.698	275.05	.388
K3 C3 Exhaust 3, F	579.59	.874	304.21	.486
K4 C3 Exhaust 4, F	514.14	1.118	267.85	.621
K5 C3 Exhaust 5, F	567.91	1.029	297.73	.572
K6 C3 Exhaust 6, F	567.41	1.411	297.45	.784
K7-C3 Exhaust Comm, F	297.71	1.242	147.61	.690
J1 C3 Water In, F	159.33	.146	70.736	.081
J2 C3 Water Out, F	168.86	.127	76.036	.071
J3 C3 Oil Sump, F	223.94	.163	106.63	.091
J4 C3 Fuel In, F	91.159	.081	32.866	.045
J5 C3 Inlet Air, F	99.824	.109	37.680	.060
J6 C3 Airbox, F	162.60	.058	72.556	.032
Horsepower	94.720	.375	70.621	.280
Corrected Horsepower	99.634	.395	74.284	.294
BSFC, lb/hp-hr	.465	.002	.283	.001
Corrected BSFC	.442	.002	.269	.001
Relative Humidity	51.004	.445	51.004	.445
Reference Pressure, inHg	32.971		111.65	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1332

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.97 in-Hg
Speed :	2202 RPM
Load :	226.0 lb-ft
Fuel Flow :	44.1 lb/hr
Brake Power :	94.75 bhp
BSFC :	.465 lb/bhp-hr
Indicated Power :	13.52 kW/cyl
Peak Pressure :	7.961 MPa
Peak Rate of Pressure Rise:	609.9 kPa/deg
Peak Heat Release Rate :	63.7 Joules/deg
Cumulative Heat Release :	708.714 Joules
Apparent Combustion Efficiency :	66.1 %
Indicated Thermal Efficiency :	34.3 %
Brake Thermal Efficiency :	29.9 %
Ignition Delay :	10.0 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	12.08 J/degree
Sensitivity :	22.9 degrees
Premixed/Diffusion Ratio :	.43542

871104.143615 AL-16090-F	AL-12920-L	DD6V53N		4
Dry Bulb Temperature, F	81.510	.096	27.506	.053
Wet Bulb Temperature, F	68.320	.104	20.178	.058
P11-Baro (Vent), "Hg ABS	28.973	.000	98.112	.001
P3 C3 Fuel Pressure,psig	64.230	.051	442.85	.351
P4 C3 Oil Pressure, psig	43.479	.033	299.78	.227
P5 C3 Airbox Pres., psig	1.835	.011	12.653	.079
P10 C3 Exh Comm, inH2Og	9.602	.127	2.389	.032
P11 C3 Intake Vac,inH2Ov	11.073	.052	2.755	.013
P12 C3 Blowby, inH2Og	.008	.002	.002	.000
C3 Speed, RPM	1799.5	1.276	1799.5	1.276
C3 Fuel Flow, lb/hr	73.480	.261	33.330	.118
C3 Smoke, %	37.234	.376	37.234	.376
Cell 3 Load, lb-ft	411.65	.678	558.12	.919
K1 C3 Exhaust 1, F	707.74	.966	375.41	.537
K2 C3 Exhaust 2, F	826.44	.319	441.35	.177
K3 C3 Exhaust 3, F	903.27	.752	484.04	.418
K4 C3 Exhaust 4, F	748.37	.596	397.98	.331
K5 C3 Exhaust 5, F	933.33	1.451	500.74	.806
K6 C3 Exhaust 6, F	927.32	1.014	497.40	.563
K7-C3 Exhaust Comm, F	384.15	.454	195.64	.252
J1 C3 Water In, F	152.81	.167	67.115	.093
J2 C3 Water Out, F	167.41	.142	75.226	.079
J3 C3 Oil Sump, F	235.59	.240	113.11	.133
J4 C3 Fuel In, F	89.527	.065	31.959	.036
J5 C3 Inlet Air, F	103.09	.153	39.495	.085
J6 C3 Airbox, F	163.87	.110	73.264	.061
Horsepower	141.04	.247	105.16	.184
Corrected Horsepower	148.87	.260	110.99	.194
BSFC, lb/hp-hr	.521	.002	.317	.001
Corrected BSFC	.494	.002	.300	.001
Relative Humidity	51.174	.209	51.174	.209
Reference Pressure, inHg	31.895		108.01	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1334

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.90 in-Hg
Speed :	1800 RPM
Load :	411.7 lb-ft
Fuel Flow :	73.5 lb/hr
Brake Power :	141.10 bhp
BSFC :	.521 lb/bhp-hr
Indicated Power :	18.13 kW/cyl
Peak Pressure :	10.12 MPa
Peak Rate of Pressure Rise:	662.9 kPa/deg
Peak Heat Release Rate :	70.6 Joules/deg
Cumulative Heat Release :	1216.44 Joules
Apparent Combustion Efficiency :	55.6 %
Indicated Thermal Efficiency :	27.6 %
Brake Thermal Efficiency :	26.7 %
Ignition Delay :	5.8 degrees
Centroid Phasing :	196.3 degrees
Centroid Magnitude :	13.21 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.20257

971104.145008 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	81.803	.126	27.668	.070
Wet Bulb Temperature, F	68.552	.025	20.307	.014
P11-Baro (Vent), "Hg ABS	28.972	.000	98.111	.001
P3 C3 Fuel Pressure,psig	66.102	.061	455.76	.424
P4 C3 Oil Pressure, psig	46.138	.008	318.11	.054
P5 C3 Airbox Pres., psig	1.587	.007	10.939	.046
P10 C3 Exh Comm, inH2Og	7.169	.078	1.784	.019
P11 C3 Intake Vac,inH2Ov	11.428	.063	2.844	.016
P12 C3 Blowby, inH2Og	.005	.001	.001	.000
C3 Speed, RPM	1799.8	.757	1799.8	.757
C3 Fuel Flow, lb/hr	41.455	.206	18.804	.094
C3 Smoke, %	-1.129	.470	-1.129	.470
Cell 3 Load, lb-ft	277.02	.735	375.59	.997
K1 C3 Exhaust 1, F	506.35	.450	263.53	.250
K2 C3 Exhaust 2, F	544.76	.477	284.87	.265
K3 C3 Exhaust 3, F	602.00	.749	316.67	.416
K4 C3 Exhaust 4, F	527.96	.461	275.53	.256
K5 C3 Exhaust 5, F	641.42	.445	338.57	.247
K6 C3 Exhaust 6, F	618.12	.405	325.62	.225
K7-C3 Exhaust Comm, F	293.96	1.047	145.53	.581
J1 C3 Water In, F	157.06	.135	69.480	.075
J2 C3 Water Out, F	167.55	.156	75.303	.087
J3 C3 Oil Sump, F	220.92	.171	104.95	.095
J4 C3 Fuel In, F	88.573	.026	31.430	.014
J5 C3 Inlet Air, F	102.51	.111	39.172	.062
J6 C3 Airbox, F	152.53	.144	66.962	.080
Horsepower	94.934	.234	70.781	.174
Corrected Horsepower	100.17	.247	74.685	.184
BSFC, lb/hp-hr	.437	.003	.266	.002
Corrected BSFC	.414	.002	.252	.001
Relative Humidity	51.139	.284	51.139	.284
Reference Pressure, inHg	31.362		106.20	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1336

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.36 in-Hg
Speed :	1800 RPM
Load :	277.0 lb-ft
Fuel Flow :	41.5 lb/hr
Brake Power :	94.94 bhp
BSFC :	.437 lb/bhp-hr
Indicated Power :	12.06 kW/cyl
Peak Pressure :	8.249 MPa
Peak Rate of Pressure Rise:	641.7 kPa/deg
Peak Heat Release Rate :	67.9 Joules/deg
Cumulative Heat Release :	770.763 Joules
Apparent Combustion Efficiency :	62.4 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	8.9 degrees
Centroid Phasing :	193.4 degrees
Centroid Magnitude :	12.46 J/degree
Sensitivity :	22.5 degrees
Premixed/Diffusion Ratio :	.39401

871104.152333 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	81.849	.278	27.694	.154
Wet Bulb Temperature, F	68.440	.069	20.244	.038
P11-Baro (Vent), "Hg ABS	28.969	.000	98.099	.001
P3 C3 Fuel Pressure,psig	67.044	.084	462.25	.577
P4 C3 Oil Pressure, psig	47.954	.031	330.63	.214
P5 C3 Airbox Pres., psig	1.586	.006	10.933	.040
P10 C3 Exh Comm, inH2Og	5.369	.106	1.336	.026
P11 C3 Intake Vac,inH2Ov	11.507	.043	2.863	.011
P12 C3 Blowby, inH2Og	.003	.002	.001	.000
C3 Speed, RPM	1799.6	1.673	1799.6	1.673
C3 Fuel Flow, lb/hr	25.923	.043	11.758	.020
C3 Smoke, %	-2.195	.530	-2.195	.530
Cell 3 Load, lb-ft	148.07	3.070	200.76	4.162
K1 C3 Exhaust 1, F	396.04	.095	202.25	.053
K2 C3 Exhaust 2, F	401.51	.253	205.28	.141
K3 C3 Exhaust 3, F	439.66	.290	226.48	.161
K4 C3 Exhaust 4, F	375.11	.144	190.61	.080
K5 C3 Exhaust 5, F	395.05	.426	201.70	.237
K6 C3 Exhaust 6, F	396.53	.509	202.52	.283
K7-C3 Exhaust Comm, F	212.29	.412	100.16	.229
J1 C3 Water In, F	162.22	.268	72.345	.149
J2 C3 Water Out, F	170.76	.192	77.091	.106
J3 C3 Oil Sump, F	211.03	.176	99.459	.098
J4 C3 Fuel In, F	88.219	.054	31.233	.030
J5 C3 Inlet Air, F	101.20	.093	38.445	.052
J6 C3 Airbox, F	143.93	.156	62.181	.087
Horsepower	50.737	1.095	37.828	.816
Corrected Horsepower	53.473	1.154	39.868	.860
BSFC, lb/hp-hr	.511	.012	.311	.007
Corrected BSFC	.485	.011	.295	.007
Relative Humidity	50.663	.523	50.663	.523
Reference Pressure, inHg	31.351		106.17	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1338

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.35 in-Hg
Speed :	1800 RPM
Load :	148.1 lb-ft
Fuel Flow :	25.9 lb/hr
Brake Power :	50.76 bhp
BSFC :	.510 lb/bhp-hr
Indicated Power :	8.05 kW/cyl
Peak Pressure :	7.237 MPa
Peak Rate of Pressure Rise:	713.3 kPa/deg
Peak Heat Release Rate :	80.0 Joules/deg
Cumulative Heat Release :	506.751 Joules
Apparent Combustion Efficiency :	65.8 %
Indicated Thermal Efficiency :	34.8 %
Brake Thermal Efficiency :	27.3 %
Ignition Delay :	10.6 degrees
Centroid Phasing :	192.2 degrees
Centroid Magnitude :	15.41 J/degree
Sensitivity :	19.5 degrees
Premixed/Diffusion Ratio :	.54440

871104.153304 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	82.322	.150	27.957	.083
Wet Bulb Temperature, F	68.699	.032	20.388	.018
P11-Baro (Vent), "Hg ABS	28.968	.000	98.095	.001
P3 C3 Fuel Pressure,psig	67.425	.078	464.88	.537
P4 C3 Oil Pressure, psig	48.632	.020	335.31	.135
P5 C3 Airbox Pres., psig	1.616	.008	11.139	.054
P10 C3 Exh Comm, inH2Og	4.697	.126	1.169	.031
P11 C3 Intake Vac,inH2Ov	11.462	.054	2.852	.014
P12 C3 Blowby, inH2Og	.006	.002	.002	.000
C3 Speed, RPM	1799.6	1.015	1799.6	1.015
C3 Fuel Flow, lb/hr	19.765	.582	8.965	.264
C3 Smoke, %	-1.851	1.425	-1.851	1.425
Cell 3 Load, lb-ft	99.484	.625	134.88	.847
K1 C3 Exhaust 1, F	363.60	.232	184.22	.129
K2 C3 Exhaust 2, F	361.40	.377	183.00	.209
K3 C3 Exhaust 3, F	391.53	.269	199.74	.149
K4 C3 Exhaust 4, F	313.08	.307	156.15	.171
K5 C3 Exhaust 5, F	313.45	.380	156.36	.211
K6 C3 Exhaust 6, F	322.73	.467	161.52	.259
K7-C3 Exhaust Comm, F	202.23	.645	94.574	.358
J1 C3 Water In, F	160.03	.227	71.127	.126
J2 C3 Water Out, F	167.62	.177	75.343	.099
J3 C3 Oil Sump, F	207.60	.218	97.558	.121
J4 C3 Fuel In, F	88.105	.032	31.170	.018
J5 C3 Inlet Air, F	101.62	.049	38.677	.027
J6 C3 Airbox, F	143.71	.115	62.063	.064
Horsepower	34.088	.227	25.415	.169
Corrected Horsepower	35.946	.240	26.800	.179
BSFC, lb/hp-hr	.580	.020	.353	.012
Corrected BSFC	.550	.019	.335	.011
Relative Humidity	50.242	.298	50.242	.298
Reference Pressure, inHg	31.414		106.38	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1340

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.41 in-Hg
Speed :	1800 RPM
Load :	99.5 lb-ft
Fuel Flow :	19.8 lb/hr
Brake Power :	34.10 bhp
BSFC :	.581 lb/bhp-hr
Indicated Power :	6.77 kW/cyl
Peak Pressure :	6.957 MPa
Peak Rate of Pressure Rise:	708.6 kPa/deg
Peak Heat Release Rate :	80.0 Joules/deg
Cumulative Heat Release :	427.524 Joules
Apparent Combustion Efficiency :	72.6 %
Indicated Thermal Efficiency :	38.3 %
Brake Thermal Efficiency :	24.0 %
Ignition Delay :	11.0 degrees
Centroid Phasing :	192.0 degrees
Centroid Magnitude :	15.99 J/degree
Sensitivity :	19.0 degrees
Premixed/Diffusion Ratio :	.57832

871104.155249 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	82.886	.081	28.270	.045
Wet Bulb Temperature, F	68.948	.043	20.527	.024
P11-Baro (Vent), "Hg ABS	28.965	.000	98.086	.001
P3 C3 Fuel Pressure,psig	63.253	.066	436.11	.453
P4 C3 Oil Pressure, psig	33.352	.038	229.95	.261
P5 C3 Airbox Pres., psig	1.248	.009	8.603	.064
P10 C3 Exh Comm, inH2Og	4.965	.157	1.236	.039
P11 C3 Intake Vac,inH2Ov	7.942	.020	1.976	.005
P12 C3 Blowby, inH2Og	.003	.001	.001	.000
C3 Speed, RPM	1401.3	1.147	1401.3	1.147
C3 Fuel Flow, lb/hr	62.963	.186	28.560	.084
C3 Smoke, %	70.444	.797	70.444	.797
Cell 3 Load, lb-ft	374.67	1.937	507.98	2.627
K1 C3 Exhaust 1, F	623.03	.510	328.35	.283
K2 C3 Exhaust 2, F	702.45	1.185	372.47	.659
K3 C3 Exhaust 3, F	788.54	.754	420.30	.419
K4 C3 Exhaust 4, F	634.31	5.308	334.62	2.949
K5 C3 Exhaust 5, F	777.43	.687	414.13	.381
K6 C3 Exhaust 6, F	740.27	2.516	393.48	1.398
K7-C3 Exhaust Comm, F	334.54	.920	168.08	.511
J1 C3 Water In, F	152.90	.086	67.169	.048
J2 C3 Water Out, F	168.41	.086	75.781	.048
J3 C3 Oil Sump, F	232.79	.199	111.55	.110
J4 C3 Fuel In, F	86.957	.058	30.532	.032
J5 C3 Inlet Air, F	103.24	.036	39.579	.020
J6 C3 Airbox, F	159.71	.239	70.948	.133
Horsepower	99.964	.548	74.531	.409
Corrected Horsepower	105.58	.579	78.720	.432
BSFC, lb/hp-hr	.630	.005	.383	.003
Corrected BSFC	.596	.005	.363	.003
Relative Humidity	49.568	.094	49.568	.094
Reference Pressure, inHg	30.921		104.71	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1342

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	30.92 in-Hg
Speed :	1401 RPM
Load :	374.7 lb-ft
Fuel Flow :	63.0 lb/hr
Brake Power :	99.95 bhp
BSFC :	.630 lb/bhp-hr
Indicated Power :	13.85 kW/cyl
Peak Pressure :	10.47 MPa
Peak Rate of Pressure Rise:	733.0 kPa/deg
Peak Heat Release Rate :	83.4 Joules/deg
Cumulative Heat Release :	1204.98 Joules
Apparent Combustion Efficiency :	50.0 %
Indicated Thermal Efficiency :	24.6 %
Brake Thermal Efficiency :	22.1 %
Ignition Delay :	5.1 degrees
Centroid Phasing :	194.3 degrees
Centroid Magnitude :	15.18 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.18641

871104.160409 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	82.205	.141	27.892	.078
Wet Bulb Temperature, F	68.463	.033	20.257	.018
P11-Baro (Vent), "Hg ABS	28.964	.000	98.085	.001
P3 C3 Fuel Pressure,psig	65.939	.068	454.63	.466
P4 C3 Oil Pressure, psig	38.871	.076	268.01	.525
P5 C3 Airbox Pres., psig	1.170	.005	8.068	.035
P10 C3 Exh Comm, inH2Og	1.797	.090	.447	.022
P11 C3 Intake Vac,inH2Ov	8.030	.045	1.998	.011
P12 C3 Blowby, inH2Og	.001	.000	.000	.000
C3 Speed, RPM	1401.9	.607	1401.9	.607
C3 Fuel Flow, lb/hr	16.543	.022	7.504	.010
C3 Smoke, %	-1.727	.076	-1.727	.076
Cell 3 Load, lb-ft	100.48	.464	136.23	.629
K1 C3 Exhaust 1, F	353.78	.274	178.77	.152
K2 C3 Exhaust 2, F	334.33	.655	167.96	.364
K3 C3 Exhaust 3, F	368.00	.316	186.67	.176
K4 C3 Exhaust 4, F	266.42	2.309	130.23	1.283
K5 C3 Exhaust 5, F	283.59	.295	139.77	.164
K6 C3 Exhaust 6, F	298.90	.262	148.28	.146
K7-C3 Exhaust Comm, F	228.74	2.900	109.30	1.611
J1 C3 Water In, F	157.10	.304	69.499	.169
J2 C3 Water Out, F	167.48	.333	74.157	.185
J3 C3 Oil Sump, F	205.92	.374	96.623	.208
J4 C3 Fuel In, F	87.520	2.827	30.844	1.571
J5 C3 Inlet Air, F	103.13	.043	39.516	.024
J6 C3 Airbox, F	148.76	.294	64.864	.163
Horsepower	26.820	.127	19.996	.095
Corrected Horsepower	28.316	.134	21.111	.100
BSFC, lb/hp-hr	.617	.003	.375	.002
Corrected BSFC	.584	.002	.355	.001
Relative Humidity	49.806	.275	49.806	.275
Reference Pressure, inHg	30.756		104.15	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1344

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	30.76 in-Hg
Speed :	1402 RPM
Load :	100.5 lb-ft
Fuel Flow :	16.5 lb/hr
Brake Power :	26.83 bhp
BSFC :	.615 lb/bhp-hr
Indicated Power :	4.99 kW/cyl
Peak Pressure :	6.887 MPa
Peak Rate of Pressure Rise:	772.3 kPa/deg
Peak Heat Release Rate :	89.0 Joules/deg
Cumulative Heat Release :	412.915 Joules
Apparent Combustion Efficiency :	65.5 %
Indicated Thermal Efficiency :	33.9 %
Brake Thermal Efficiency :	22.6 %
Ignition Delay :	10.2 degrees
Centroid Phasing :	190.7 degrees
Centroid Magnitude :	18.93 J/degree
Sensitivity :	18.5 degrees
Premixed/Diffusion Ratio :	.54906

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 4 FUEL BF#2V13L86 DATE 11-5-87 PAGE 21

Operator Lacy							
Time	9:25	9:40	9:55	10:10	10:25		
Test Hour	25min	15min	15min	15min	15min		
Speed, RPM	2800	2500	2200	1799	1400		
Load, lb-ft	350.2	381.8	408.4	403.8	381.9		
Fuel Flow, lb/hr	79.3	74.3	69.1	60.8	51.7		
Exh. Opacity, %	2.0	2.0	5.0	20.5	50.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	745	730	710	660	610		
Exhaust Cyl. L2	780	780	760	750	670		
Exhaust Cyl. L3	810	890	900	845	760		
Exhaust Cyl. R1	770	760	700	670	610		
Exhaust Cyl. R2	870	880	900	890	800		
Exhaust Cyl. R3	880	890	900	900	750		
Exhaust Common	410	400	380	350	330		
Water In	154	156	155	154	154		
Water Out	167	169	168	169	170		
Oil Sump	241	239	238	233	232		
Fuel	90	90	89	87	86		
Inlet Air	101	102	101	100	101		
Airbox	183	178	169	155	152		
Wet Bulb	65.5	66.0	66.5	66.0	66.8		
Dry Bulb	78.0	78.1	79.0	79.0	80.0		
PRESSURES, PSIG							
Oil Gallery	52.5	50.5	47.5	43.0	32.5		
Air After Blower	5.0	4.0	3.0	2.0	1.3		
Fuel Transfer	77.0	75.0	73.5	71.0	69.2		
LOW PRESSURES							
Intake Vac., in.water	14.0	15.5	12.7	8.6	5.1		
Exh. Comm., in.Water	22.0	22.0	18.0	13.5	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.19	29.19	29.19	29.19	29.2		

871105.092547 AL-15299-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	74.242	.030	23.468	.017
Wet Bulb Temperature, F	64.087	.025	17.826	.014
P11-Baro (Vent), "Hg ABS	29.192	.001	98.857	.002
P3 C3 Fuel Pressure,psig	76.617	.410	528.25	2.825
P4 C3 Oil Pressure, psig	53.145	.019	366.42	.129
P5 C3 Airbox Pres., psig	4.882	.010	33.659	.069
P10 C3 Exh Comm, inH2Og	21.966	.203	5.466	.050
P11 C3 Intake Vac,inH2Ov	18.838	.089	4.688	.022
P12 C3 Blowby, inH2Og	.019	.007	.005	.002
C3 Speed, RPM	2800.1	1.761	2800.1	1.761
C3 Fuel Flow, lb/hr	79.988	.126	36.282	.057
C3 Smoke, %	1.768	.110	1.768	.110
Cell 3 Load, lb-ft	350.57	.400	475.30	.543
K1 C3 Exhaust 1, F	770.16	.289	410.09	.161
K2 C3 Exhaust 2, F	804.09	.513	428.94	.285
K3 C3 Exhaust 3, F	892.95	.571	478.31	.317
K4 C3 Exhaust 4, F	804.58	2.051	429.21	1.139
K5 C3 Exhaust 5, F	903.24	.895	484.02	.497
K6 C3 Exhaust 6, F	919.39	1.207	492.99	.670
K7-C3 Exhaust Comm, F	426.12	1.130	218.96	.628
J1 C3 Water In, F	155.28	.117	68.488	.065
J2 C3 Water Out, F	168.35	.086	75.750	.048
J3 C3 Oil Sump, F	241.87	.318	116.60	.176
J4 C3 Fuel In, F	90.550	.047	32.528	.026
J5 C3 Inlet Air, F	100.69	1.261	38.159	.700
J6 C3 Airbox, F	183.93	.183	84.404	.102
Horsepower	186.90	.306	139.35	.228
Corrected Horsepower	194.92	.319	145.33	.238
BSFC, lb/hp-hr	.428	.001	.260	.001
Corrected BSFC	.410	.001	.250	.001
Relative Humidity	57.664	.085	57.664	.085
Reference Pressure, inHg	37.746		127.82	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1346

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.75 in-Hg
Speed :	2800 RPM
Load :	350.6 lb-ft
Fuel Flow :	80.0 lb/hr
Brake Power :	186.92 bhp
BSFC :	.428 lb/bhp-hr
Indicated Power :	26.67 kW/cyl
Peak Pressure :	9.387 MPa
Peak Rate of Pressure Rise:	471.3 kPa/deg
Peak Heat Release Rate :	37.6 Joules/deg
Cumulative Heat Release :	1119.22 Joules
Apparent Combustion Efficiency :	72.5 %
Indicated Thermal Efficiency :	37.0 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	10.66 J/degree
Sensitivity :	28.3 degrees
Premixed/Diffusion Ratio :	.25469

871105.094039 AL-15299-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	74.734	.041	23.741	.023
Wet Bulb Temperature, F	64.337	.002	17.965	.001
P11-Baro (Vent), "Hg ABS	29.193	.000	98.858	.001
P3 C3 Fuel Pressure,psig	74.738	.433	515.30	2.988
P4 C3 Oil Pressure, psig	50.904	.013	350.97	.090
P5 C3 Airbox Pres., psig	3.860	.024	26.613	.167
P10 C3 Exh Comm, inH20g	17.731	.139	4.412	.035
P11 C3 Intake Vac,inH20v	15.328	.114	3.814	.028
P12 C3 Blowby, inH20g	.006	.002	.001	.001
C3 Speed, RPM	2500.8	1.754	2500.8	1.754
C3 Fuel Flow, lb/hr	74.936	.072	33.991	.032
C3 Smoke, %	2.052	.093	2.052	.093
Cell 3 Load, lb-ft	381.53	.581	517.28	.788
K1 C3 Exhaust 1, F	763.12	.403	406.18	.224
K2 C3 Exhaust 2, F	805.81	.233	429.90	.129
K3 C3 Exhaust 3, F	916.58	.421	491.43	.234
K4 C3 Exhaust 4, F	797.81	.870	425.45	.483
K5 C3 Exhaust 5, F	911.98	.332	488.88	.184
K6 C3 Exhaust 6, F	923.20	.656	495.11	.364
K7-C3 Exhaust Comm, F	419.49	.413	215.27	.229
J1 C3 Water In, F	156.68	.071	69.264	.040
J2 C3 Water Out, F	169.86	.055	76.590	.030
J3 C3 Oil Sump, F	240.56	.195	115.87	.108
J4 C3 Fuel In, F	90.178	.092	32.321	.051
J5 C3 Inlet Air, F	102.18	.073	38.991	.041
J6 C3 Airbox, F	178.55	.202	81.415	.112
Horsepower	181.67	.366	135.45	.273
Corrected Horsepower	189.73	.382	141.45	.285
BSFC, lb/hp-hr	.412	.001	.251	.001
Corrected BSFC	.395	.001	.240	.001
Relative Humidity	57.027	.127	57.027	.127
Reference Pressure, inHg	35.924		121.65	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1348

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.92 in-Hg
Speed :	2501 RPM
Load :	381.5 lb-ft
Fuel Flow :	74.9 lb/hr
Brake Power :	181.67 bhp
BSFC :	.412 lb/bhp-hr
Indicated Power :	24.94 kW/cyl
Peak Pressure :	9.497 MPa
Peak Rate of Pressure Rise:	500.2 kPa/deg
Peak Heat Release Rate :	42.0 Joules/deg
Cumulative Heat Release :	1178.33 Joules
Apparent Combustion Efficiency :	72.8 %
Indicated Thermal Efficiency :	37.0 %
Brake Thermal Efficiency :	33.5 %
Ignition Delay :	6.3 degrees
Centroid Phasing :	198.2 degrees
Centroid Magnitude :	10.69 J/degree
Sensitivity :	29.8 degrees
Premixed/Diffusion Ratio :	.21235

871105.095546 AL-15299-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	75.408	.050	24.115	.028
Wet Bulb Temperature, F	64.746	.036	18.192	.020
P11-Baro (Vent), "Hg ABS	29.193	.001	98.859	.002
P3 C3 Fuel Pressure,psig	73.280	.183	505.25	1.263
P4 C3 Oil Pressure, psig	47.940	.012	330.54	.086
P5 C3 Airbox Pres., psig	2.784	.013	19.196	.090
P10 C3 Exh Comm, inH20g	13.293	.100	3.308	.025
P11 C3 Intake Vac,inH20v	12.215	.114	3.040	.028
P12 C3 Blowby, inH20g	-.006	.003	-.002	.001
C3 Speed, RPM	2200.4	1.536	2200.4	1.536
C3 Fuel Flow, lb/hr	69.487	.084	31.519	.038
C3 Smoke, %	4.797	.186	4.797	.186
Cell 3 Load, lb-ft	401.84	.966	544.82	1.310
K1 C3 Exhaust 1, F	734.69	.650	390.38	.361
K2 C3 Exhaust 2, F	802.15	.608	427.86	.338
K3 C3 Exhaust 3, F	929.11	.682	498.39	.379
K4 C3 Exhaust 4, F	740.20	7.366	393.45	4.092
K5 C3 Exhaust 5, F	939.63	.529	504.24	.294
K6 C3 Exhaust 6, F	940.37	.283	504.65	.157
K7-C3 Exhaust Comm, F	392.13	.402	200.07	.224
J1 C3 Water In, F	155.46	.099	68.589	.055
J2 C3 Water Out, F	169.07	.077	76.151	.043
J3 C3 Oil Sump, F	238.84	.100	114.91	.055
J4 C3 Fuel In, F	89.082	.037	31.712	.021
J5 C3 Inlet Air, F	101.40	.120	38.558	.067
J6 C3 Airbox, F	169.75	.090	76.527	.050
Horsepower	168.36	.445	125.53	.332
Corrected Horsepower	175.74	.465	131.03	.347
BSFC, lb/hp-hr	.413	.001	.251	.001
Corrected BSFC	.395	.001	.241	.001
Relative Humidity	56.417	.066	56.417	.066
Reference Pressure, inHg	33.963		115.01	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1350

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.96 in-Hg
Speed :	2200 RPM
Load :	401.8 lb-ft
Fuel Flow :	69.5 lb/hr
Brake Power :	168.31 bhp
BSFC :	.413 lb/bhp-hr
Indicated Power :	22.14 kW/cyl
Peak Pressure :	9.706 MPa
Peak Rate of Pressure Rise:	516.6 kPa/deg
Peak Heat Release Rate :	46.8 Joules/deg
Cumulative Heat Release :	1212.51 Joules
Apparent Combustion Efficiency :	71.0 %
Indicated Thermal Efficiency :	35.4 %
Brake Thermal Efficiency :	33.4 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	197.4 degrees
Centroid Magnitude :	12.32 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.24192

871105.100847 AL-15299-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	75.724	.043	24.291	.024
Wet Bulb Temperature, F	64.849	.002	18.250	.001
P11-Baro (Vent), "Hg ABS	29.193	.000	98.859	.001
P3 C3 Fuel Pressure,psig	70.696	.180	487.43	1.240
P4 C3 Oil Pressure, psig	43.556	.012	300.31	.086
P5 C3 Airbox Pres., psig	1.898	.005	13.085	.037
P10 C3 Exh Comm, inH20g	8.171	.185	2.033	.046
P11 C3 Intake Vac,inH20v	8.112	.078	2.019	.019
P12 C3 Blowby, inH20g	-.015	.002	-.004	.000
C3 Speed, RPM	1801.3	1.297	1801.3	1.297
C3 Fuel Flow, lb/hr	61.289	.074	27.800	.034
C3 Smoke, %	20.105	.521	20.105	.521
Cell 3 Load, lb-ft	402.87	.856	546.21	1.160
K1 C3 Exhaust 1, F	673.66	.394	356.48	.219
K2 C3 Exhaust 2, F	777.27	.571	414.04	.317
K3 C3 Exhaust 3, F	868.76	.363	464.87	.202
K4 C3 Exhaust 4, F	713.95	4.652	378.86	2.585
K5 C3 Exhaust 5, F	919.15	.760	492.86	.422
K6 C3 Exhaust 6, F	928.13	.564	497.85	.313
K7-C3 Exhaust Comm, F	363.77	.517	184.31	.287
J1 C3 Water In, F	154.82	.077	68.235	.043
J2 C3 Water Out, F	169.11	.055	76.173	.030
J3 C3 Oil Sump, F	233.77	.193	112.09	.107
J4 C3 Fuel In, F	87.639	.027	30.911	.015
J5 C3 Inlet Air, F	100.27	.067	37.930	.037
J6 C3 Airbox, F	155.61	.139	68.671	.077
Horsepower	138.17	.351	103.02	.262
Corrected Horsepower	144.09	.367	107.43	.273
BSFC, lb/hp-hr	.444	.001	.270	.001
Corrected BSFC	.425	.001	.259	.001
Relative Humidity	55.814	.127	55.814	.127
Reference Pressure, inHg	32.460		109.92	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1352

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.46 in-Hg
Speed :	1801 RPM
Load :	402.9 lb-ft
Fuel Flow :	61.3 lb/hr
Brake Power :	138.16 bhp
BSFC :	.444 lb/bhp-hr
Indicated Power :	17.76 kW/cyl
Peak Pressure :	9.830 MPa
Peak Rate of Pressure Rise:	597.7 kPa/deg
Peak Heat Release Rate :	60.6 Joules/deg
Cumulative Heat Release :	1185.55 Joules
Apparent Combustion Efficiency :	64.5 %
Indicated Thermal Efficiency :	32.2 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	6.0 degrees
Centroid Phasing :	196.4 degrees
Centroid Magnitude :	12.36 J/degree
Sensitivity :	28.4 degrees
Premixed/Diffusion Ratio :	.21264

871105.102334 AL-15299-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	76.264	.024	24.591	.013
Wet Bulb Temperature, F	65.170	.016	18.428	.009
P11-Baro (Vent), "Hg ABS	29.195	.000	98.866	.001
P3 C3 Fuel Pressure,psig	69.119	.080	476.56	.554
P4 C3 Oil Pressure, psig	32.991	.012	227.47	.082
P5 C3 Airbox Pres., psig	1.325	.007	9.135	.051
P10 C3 Exh Comm, inH2Og	3.907	.106	.972	.026
P11 C3 Intake Vac,inH2Ov	4.795	.045	1.193	.011
P12 C3 Blowby, inH2Og	-.015	.002	-.004	.001
C3 Speed, RPM	1400.5	1.532	1400.5	1.532
C3 Fuel Flow, lb/hr	52.271	.042	23.710	.019
C3 Smoke, %	48.739	.977	48.739	.977
Cell 3 Load, lb-ft	379.41	1.592	514.40	2.158
K1 C3 Exhaust 1, F	623.47	.424	328.59	.236
K2 C3 Exhaust 2, F	698.49	.426	370.27	.237
K3 C3 Exhaust 3, F	792.30	.520	422.39	.289
K4 C3 Exhaust 4, F	637.46	3.869	336.37	2.150
K5 C3 Exhaust 5, F	823.99	.864	439.99	.480
K6 C3 Exhaust 6, F	781.11	.379	416.17	.210
K7-C3 Exhaust Comm, F	340.00	.416	171.11	.231
J1 C3 Water In, F	154.99	.064	68.330	.036
J2 C3 Water Out, F	170.37	.025	76.874	.014
J3 C3 Oil Sump, F	233.70	.088	112.06	.049
J4 C3 Fuel In, F	86.548	.086	30.304	.048
J5 C3 Inlet Air, F	101.58	.114	38.656	.063
J6 C3 Airbox, F	153.32	.194	67.399	.108
Horsepower	101.17	.465	75.432	.346
Corrected Horsepower	105.63	.485	78.756	.362
BSFC, lb/hp-hr	.517	.003	.314	.002
Corrected BSFC	.495	.003	.301	.002
Relative Humidity	55.317	.072	55.317	.072
Reference Pressure, inHg	31.540		106.81	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1354

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.54 in-Hg
Speed :	1401 RPM
Load :	379.4 lb-ft
Fuel Flow :	52.3 lb/hr
Brake Power :	101.21 bhp
BSFC :	.517 lb/bhp-hr
Indicated Power :	13.81 kW/cyl
Peak Pressure :	10.18 MPa
Peak Rate of Pressure Rise:	677.8 kPa/deg
Peak Heat Release Rate :	73.6 Joules/deg
Cumulative Heat Release :	1198.95 Joules
Apparent Combustion Efficiency :	59.4 %
Indicated Thermal Efficiency :	29.3 %
Brake Thermal Efficiency :	26.7 %
Ignition Delay :	5.2 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	13.74 J/degree
Sensitivity :	27.6 degrees
Premixed/Diffusion Ratio :	.18805

DETROIT DIESEL 6V–53N LOG SHEET

TEST NO. 4 FUEL TF89N145B7 DATE 11-5-87 PAGE 22

Operator	Greg						
Time	11:15	11:30	11:40	11:55	12:10	12:20	12:35
Test Hour	20 min	15 min	10 min	15 min	15 min	10 min	15 min
Speed, RPM	2800	2499	2499	2200	2199	1799	1799
Load, lb–ft	381.1	409.3	391.3	426.4	229.3	413.1	279.2
Fuel Flow, lb/hr	97.2	91.3	62.8	84.2	44.3	73.3	41.6
Exh. Opacity, %	6.0	7.0	0	13.0	0	42.5	.5
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	800	800	600	750	500	700	500
Exhaust Cyl. L2	820	850	620	830	300	800	540
Exhaust Cyl. L3	920	960	700	955	360	880	600
Exhaust Cyl. R1	810	800	610	700	500	550	505
Exhaust Cyl. R2	940	960	700	960	550	900	610
Exhaust Cyl. R3	950	960	700	970	550	900	600
Exhaust Common	450	440	340	400	220	355	280
Water In	153	155	157	153	158	153	159
Water Out	167	169	168	167	168	168	169
Oil Sump	246	244	232	241	221	236	221
Fuel	93	93	92	92	91	89	90
Inlet Air	100	99	100	101	100	102	101
Airbox	193	189	167	181	155	159	148
Wet Bulb	66.9	66.9	67.5	67.2	68.1	68.5	69.0
Dry Bulb	80.5	81.0	81.5	82.0	83.0	84.0	85.0
PRESSURES, PSIG							
Oil Gallery	52.0	49.5	52.5	47.0	51.5	42.5	45.0
Air After Blower	5.0	4.0	3.8	3.0	2.8	2.1	1.8
Fuel Transfer	71.5	69.8	70.2	67.1	69.0	65.0	67.1
LOW PRESSURES							
Intake Vac., in.water	19.0	15.5	16.0	12.7	13.1	8.6	8.9
Exh. Comm., in.Water	27.5	24.0	20.0	19.0	14.5	14.0	11.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.19	29.19	29.18	29.18	29.17	29.17	29.17

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 4 FUEL ____ DATE 11-5-87 PAGE 23

TF#9N14587

Operator	Greg						
Time	12:45	1:00	1:15	1:30			
Test Hour	10min	15min	15min	15min			
Speed, RPM	1799	1798	1399	1400			
Load, lb-ft	150.9	101.6	377.3	100.7			
Fuel Flow, lb/hr	26.1	21.2	61.3	15.9			
Exh. Opacity, %	0	0	75.0	0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	400	360	610	350			
Exhaust Cyl. L2	400	350	670	310			
Exhaust Cyl. L3	440	390	760	355			
Exhaust Cyl. R1	360	300	650	260			
Exhaust Cyl. R2	380	305	770	260			
Exhaust Cyl. R3	380	310	730	290			
Exhaust Common	210	195	300	180			
Water In	159	160	152	161			
Water Out	168	167	167	168			
Oil Sump	212	206	232	202			
Fuel	89	89	88	87			
Inlet Air	100	100	100	100			
Airbox	142	139	152	137			
Wet Bulb	68.5	68.4	68.5	69.0			
Dry Bulb	84.5	85.0	83.0	86.1			
PRESSURES, PSIG							
Oil Gallery	47.0	48.0	33.0	39.0			
Air After Blower	1.7	1.7	1.3	1.3			
Fuel Transfer	68.0	68.5	64.2	66.5			
LOW PRESSURES							
Intake Vac., in.water	8.9	8.9	5.2	5.3			
Exh. Comm., in.Water	9.0	8.5	9.0	5.5			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	29.16	29.16	29.15	29.14			

871105.111737 AL-16090-F	AL-12920-L	DD6V53N		4
Dry Bulb Temperature, F	77.898	.048	25.499	.027
Wet Bulb Temperature, F	66.028	.023	18.904	.013
P11-Baro (Vent), "Hg ABS	29.194	.000	98.861	.001
P3 C3 Fuel Pressure,psig	71.445	.139	492.60	.957
P4 C3 Oil Pressure, psig	52.100	.024	359.22	.169
P5 C3 Airbox Pres., psig	5.017	.011	34.591	.075
P10 C3 Exh Comm, inH20g	23.436	.188	5.832	.047
P11 C3 Intake Vac,inH20v	18.907	.053	4.705	.013
P12 C3 Blowby, inH20g	.030	.004	.007	.001
C3 Speed, RPM	2801.6	1.202	2801.6	1.202
C3 Fuel Flow, lb/hr	97.867	.372	44.392	.169
C3 Smoke, %	5.833	.189	5.833	.189
Cell 3 Load, lb-ft	380.06	.530	515.29	.718
K1 C3 Exhaust 1, F	799.85	.542	426.58	.301
K2 C3 Exhaust 2, F	850.63	.454	454.80	.252
K3 C3 Exhaust 3, F	956.72	.533	513.73	.296
K4 C3 Exhaust 4, F	848.35	4.562	453.53	2.535
K5 C3 Exhaust 5, F	970.10	.803	521.17	.446
K6 C3 Exhaust 6, F	980.72	.782	527.07	.435
K7-C3 Exhaust Comm, F	466.28	1.247	241.27	.693
J1 C3 Water In, F	153.76	.053	67.646	.030
J2 C3 Water Out, F	167.41	.062	75.226	.034
J3 C3 Oil Sump, F	245.25	.423	118.47	.235
J4 C3 Fuel In, F	93.443	.032	34.135	.018
J5 C3 Inlet Air, F	99.843	.073	37.690	.041
J6 C3 Airbox, F	193.26	.141	89.591	.079
Horsepower	202.74	.300	151.16	.223
Corrected Horsepower	211.44	.312	157.64	.233
BSFC, lb/hp-hr	.483	.002	.294	.001
Corrected BSFC	.463	.002	.282	.001
Relative Humidity	53.485	.094	53.485	.094
Reference Pressure, inHg	38.018		128.74	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1356

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.02 in-Hg
Speed :	2802 RPM
Load :	380.1 lb-ft
Fuel Flow :	97.9 lb/hr
Brake Power :	202.79 bhp
BSFC :	.483 lb/bhp-hr
Indicated Power :	28.43 kW/cyl
Peak Pressure :	9.643 MPa
Peak Rate of Pressure Rise:	459.9 kPa/deg
Peak Heat Release Rate :	39.1 Joules/deg
Cumulative Heat Release :	1209.06 Joules
Apparent Combustion Efficiency :	64.6 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	28.8 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	198.8 degrees
Centroid Magnitude :	10.80 J/degree
Sensitivity :	29.9 degrees
Premixed/Diffusion Ratio :	.23214

871105.112823 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	78.083	.065	25.602	.036
Wet Bulb Temperature, F	66.120	.022	18.956	.012
P11-Baro (Vent), "Hg ABS	29.188	.000	98.841	.001
P3 C3 Fuel Pressure,psig	69.027	.245	475.92	1.693
P4 C3 Oil Pressure, psig	49.990	.015	344.67	.101
P5 C3 Airbox Pres., psig	3.948	.018	27.220	.122
P10 C3 Exh Comm, inH20g	18.959	.193	4.718	.048
P11 C3 Intake Vac,inH20v	15.352	.138	3.820	.034
P12 C3 Blowby, inH20g	.012	.003	.003	.001
C3 Speed, RPM	2498.8	1.682	2498.8	1.682
C3 Fuel Flow, lb/hr	91.645	.237	41.569	.108
C3 Smoke, %	6.897	.122	6.897	.122
Cell 3 Load, lb-ft	408.42	.846	553.74	1.147
K1 C3 Exhaust 1, F	833.67	.327	445.37	.182
K2 C3 Exhaust 2, F	876.11	.137	468.95	.076
K3 C3 Exhaust 3, F	991.19	.462	532.89	.257
K4 C3 Exhaust 4, F	829.39	4.180	442.99	2.322
K5 C3 Exhaust 5, F	994.48	.485	534.71	.270
K6 C3 Exhaust 6, F	996.16	.865	535.64	.481
K7-C3 Exhaust Comm, F	442.40	1.128	228.00	.626
J1 C3 Water In, F	155.47	.135	68.594	.075
J2 C3 Water Out, F	169.11	.115	76.174	.064
J3 C3 Oil Sump, F	244.39	.191	118.00	.106
J4 C3 Fuel In, F	92.764	.078	33.758	.044
J5 C3 Inlet Air, F	100.26	.162	37.924	.090
J6 C3 Airbox, F	189.11	.175	87.285	.097
Horsepower	194.32	.423	144.88	.315
Corrected Horsepower	202.79	.442	151.19	.329
BSFC, lb/hp-hr	.472	.001	.287	.001
Corrected BSFC	.452	.001	.275	.001
Relative Humidity	53.272	.163	53.272	.163
Reference Pressure, inHg	36.097		122.24	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1358

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.10 in-Hg
Speed :	2499 RPM
Load :	408.4 lb-ft
Fuel Flow :	91.7 lb/hr
Brake Power :	194.32 bhp
BSFC :	.472 lb/bhp-hr
Indicated Power :	26.69 kW/cyl
Peak Pressure :	9.825 MPa
Peak Rate of Pressure Rise:	478.1 kPa/deg
Peak Heat Release Rate :	39.8 Joules/deg
Cumulative Heat Release :	1254.61 Joules
Apparent Combustion Efficiency :	63.8 %
Indicated Thermal Efficiency :	32.6 %
Brake Thermal Efficiency :	29.5 %
Ignition Delay :	6.2 degrees
Centroid Phasing :	199.0 degrees
Centroid Magnitude :	11.48 J/degree
Sensitivity :	30.9 degrees
Premixed/Diffusion Ratio :	.19959

871105.114018 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	78.693	.057	25.941	.032
Wet Bulb Temperature, F	66.524	.002	19.180	.001
P11-Baro (Vent), "Hg ABS	29.181	.001	98.818	.002
P3 C3 Fuel Pressure,psig	69.821	.087	481.40	.599
P4 C3 Oil Pressure, psig	52.677	.019	363.19	.128
P5 C3 Airbox Pres., psig	3.686	.017	25.417	.115
P10 C3 Exh Comm, inH20g	14.997	.095	3.732	.024
P11 C3 Intake Vac,inH20v	15.769	.108	3.924	.027
P12 C3 Blowby, inH20g	.012	.003	.003	.001
C3 Speed, RPM	2499.1	1.023	2499.1	1.023
C3 Fuel Flow, lb/hr	63.305	.249	28.715	.113
C3 Smoke, %	-.393	.093	-.393	.093
Cell 3 Load, lb-ft	290.02	1.430	393.22	1.939
K1 C3 Exhaust 1, F	594.04	.499	312.24	.277
K2 C3 Exhaust 2, F	635.80	.265	335.44	.147
K3 C3 Exhaust 3, F	719.49	.441	381.94	.245
K4 C3 Exhaust 4, F	632.04	1.564	333.35	.869
K5 C3 Exhaust 5, F	709.83	.628	376.57	.349
K6 C3 Exhaust 6, F	721.88	.566	383.27	.314
K7-C3 Exhaust Comm, F	354.81	1.435	179.34	.797
J1 C3 Water In, F	157.02	.075	69.457	.042
J2 C3 Water Out, F	168.13	.094	75.626	.052
J3 C3 Oil Sump, F	232.16	.239	111.20	.133
J4 C3 Fuel In, F	92.510	.033	33.617	.018
J5 C3 Inlet Air, F	100.62	.084	38.124	.047
J6 C3 Airbox, F	167.27	.201	75.149	.112
Horsepower	138.00	.705	102.89	.525
Corrected Horsepower	144.13	.736	107.46	.549
BSFC, lb/hp-hr	.459	.003	.279	.002
Corrected BSFC	.439	.003	.267	.002
Relative Humidity	52.907	.158	52.907	.158
Reference Pressure, inHg	35.527		120.31	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1360

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.53 in-Hg
Speed :	2499 RPM
Load :	290.0 lb-ft
Fuel Flow :	63.3 lb/hr
Brake Power :	137.99 bhp
BSFC :	.459 lb/bhp-hr
Indicated Power :	19.24 kW/cyl
Peak Pressure :	8.626 MPa
Peak Rate of Pressure Rise:	537.0 kPa/deg
Peak Heat Release Rate :	49.9 Joules/deg
Cumulative Heat Release :	900.854 Joules
Apparent Combustion Efficiency :	66.4 %
Indicated Thermal Efficiency :	34.1 %
Brake Thermal Efficiency :	30.4 %
Ignition Delay :	8.6 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	10.24 J/degree
Sensitivity :	26.1 degrees
Premixed/Diffusion Ratio :	.32947

871105.115242 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	79.165	.056	26.203	.031
Wet Bulb Temperature, F	66.813	.019	19.341	.011
P11-Baro (Vent), "Hg ABS	29.178	.001	98.808	.002
P3 C3 Fuel Pressure,psig	66.711	.133	459.96	.918
P4 C3 Oil Pressure, psig	47.376	.014	326.65	.100
P5 C3 Airbox Pres., psig	2.844	.010	19.611	.069
P10 C3 Exh Comm, inH2Og	14.199	.135	3.533	.034
P11 C3 Intake Vac,inH2Ov	12.462	.082	3.101	.020
P12 C3 Blowby, inH2Og	.003	.003	.001	.001
C3 Speed, RPM	2200.3	2.044	2200.3	2.044
C3 Fuel Flow, lb/hr	84.637	.085	38.391	.038
C3 Smoke, %	12.174	.278	12.174	.278
Cell 3 Load, lb-ft	425.89	.777	577.43	1.054
K1 C3 Exhaust 1, F	777.20	.435	414.00	.241
K2 C3 Exhaust 2, F	860.48	.689	460.26	.383
K3 C3 Exhaust 3, F	992.96	.380	533.87	.211
K4 C3 Exhaust 4, F	706.74	25.116	374.86	13.954
K5 C3 Exhaust 5, F	1000.5	.375	538.07	.208
K6 C3 Exhaust 6, F	1007.3	.769	541.83	.427
K7-C3 Exhaust Comm, F	415.49	.555	213.05	.308
J1 C3 Water In, F	154.22	1.021	67.898	.567
J2 C3 Water Out, F	168.21	.065	75.671	.036
J3 C3 Oil Sump, F	241.87	.184	116.60	.102
J4 C3 Fuel In, F	92.124	.041	33.402	.023
J5 C3 Inlet Air, F	101.36	.074	38.535	.041
J6 C3 Airbox, F	178.26	.579	81.254	.322
Horsepower	178.42	.463	133.03	.345
Corrected Horsepower	186.52	.484	139.06	.361
BSFC, lb/hp-hr	.474	.001	.289	.001
Corrected BSFC	.454	.001	.276	.001
Relative Humidity	52.550	.109	52.550	.109
Reference Pressure, inHg	34.053		115.32	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1362

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.05 in-Hg
Speed :	2200 RPM
Load :	425.9 lb-ft
Fuel Flow :	84.6 lb/hr
Brake Power :	178.40 bhp
BSFC :	.474 lb/bhp-hr
Indicated Power :	23.06 kW/cyl
Peak Pressure :	10.03 MPa
Peak Rate of Pressure Rise:	524.1 kPa/deg
Peak Heat Release Rate :	47.2 Joules/deg
Cumulative Heat Release :	1265.20 Joules
Apparent Combustion Efficiency :	61.4 %
Indicated Thermal Efficiency :	30.5 %
Brake Thermal Efficiency :	29.4 %
Ignition Delay :	6.3 degrees
Centroid Phasing :	197.8 degrees
Centroid Magnitude :	12.27 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.21578

871105.120812 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	79.894	.094	26.608	.052
Wet Bulb Temperature, F	66.735	.050	19.297	.028
P11-Baro (Vent), "Hg ABS	29.173	.001	98.790	.002
P3 C3 Fuel Pressure,psig	68.285	.110	470.81	.760
P4 C3 Oil Pressure, psig	51.571	.025	355.57	.175
P5 C3 Airbox Pres., psig	2.611	.016	18.000	.112
P10 C3 Exh Comm, inH2Og	9.601	.191	2.389	.048
P11 C3 Intake Vac,inH2Ov	12.904	.129	3.211	.032
P12 C3 Blowby, inH2Og	.004	.004	.001	.001
C3 Speed, RPM	2199.7	.692	2199.7	.692
C3 Fuel Flow, lb/hr	44.855	.100	20.346	.045
C3 Smoke, %	-.602	.101	-.602	.101
Cell 3 Load, lb-ft	230.22	.944	312.13	1.280
K1 C3 Exhaust 1, F	504.87	.198	262.71	.110
K2 C3 Exhaust 2, F	522.15	.419	272.30	.233
K3 C3 Exhaust 3, F	581.88	.223	305.49	.124
K4 C3 Exhaust 4, F	514.42	2.104	268.01	1.169
K5 C3 Exhaust 5, F	575.86	.208	302.15	.116
K6 C3 Exhaust 6, F	576.81	.401	302.67	.223
K7-C3 Exhaust Comm, F	281.88	1.150	138.82	.639
J1 C3 Water In, F	158.58	.099	70.321	.055
J2 C3 Water Out, F	168.21	.084	75.672	.047
J3 C3 Oil Sump, F	222.15	.130	105.64	.072
J4 C3 Fuel In, F	91.148	.044	32.860	.024
J5 C3 Inlet Air, F	100.57	.077	38.096	.043
J6 C3 Airbox, F	155.33	.064	68.516	.035
Horsepower	96.422	.397	71.890	.296
Corrected Horsepower	100.70	.414	75.082	.309
BSFC, lb/hp-hr	.465	.002	.283	.001
Corrected BSFC	.445	.002	.271	.001
Relative Humidity	50.285	.126	50.285	.126
Reference Pressure, inHg	33.539		113.58	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1364

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.54 in-Hg
Speed :	2200 RPM
Load :	230.2 lb-ft
Fuel Flow :	44.9 lb/hr
Brake Power :	96.43 bhp
BSFC :	.466 lb/bhp-hr
Indicated Power :	13.75 kW/cyl
Peak Pressure :	8.040 MPa
Peak Rate of Pressure Rise:	612.4 kPa/deg
Peak Heat Release Rate :	63.9 Joules/deg
Cumulative Heat Release :	724.407 Joules
Apparent Combustion Efficiency :	66.3 %
Indicated Thermal Efficiency :	34.3 %
Brake Thermal Efficiency :	29.9 %
Ignition Delay :	9.9 degrees
Centroid Phasing :	195.2 degrees
Centroid Magnitude :	11.95 J/degree
Sensitivity :	23.3 degrees
Premixed/Diffusion Ratio :	.42346

871105.122152 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	79.877	.104	26.598	.058
Wet Bulb Temperature, F	66.854	.038	19.363	.021
P11-Baro (Vent), "Hg ABS	29.172	.001	98.786	.002
P3 C3 Fuel Pressure,psig	64.533	.079	444.94	.543
P4 C3 Oil Pressure, psig	43.182	.010	297.73	.071
P5 C3 Airbox Pres., psig	1.937	.006	13.352	.040
P10 C3 Exh Comm, inH2Og	8.690	.043	2.162	.011
P11 C3 Intake Vac,inH2Ov	8.521	.041	2.120	.010
P12 C3 Blowby, inH2Og	-.003	.008	-.001	.002
C3 Speed, RPM	1800.2	.964	1800.2	.964
C3 Fuel Flow, lb/hr	73.654	.133	33.409	.060
C3 Smoke, %	41.801	.690	41.801	.690
Cell 3 Load, lb-ft	412.28	.587	558.97	.795
K1 C3 Exhaust 1, F	708.36	.374	375.75	.208
K2 C3 Exhaust 2, F	815.26	.418	435.15	.232
K3 C3 Exhaust 3, F	906.02	.413	485.57	.229
K4 C3 Exhaust 4, F	545.95	54.172	285.53	30.096
K5 C3 Exhaust 5, F	938.96	1.595	503.87	.886
K6 C3 Exhaust 6, F	929.91	.366	498.84	.203
K7-C3 Exhaust Comm, F	362.72	.697	183.73	.387
J1 C3 Water In, F	153.69	.104	67.603	.058
J2 C3 Water Out, F	168.41	.095	75.784	.053
J3 C3 Oil Sump, F	235.98	.111	113.32	.062
J4 C3 Fuel In, F	89.880	.054	32.156	.030
J5 C3 Inlet Air, F	101.68	.052	38.714	.029
J6 C3 Airbox, F	161.35	.195	71.863	.108
Horsepower	141.31	.250	105.36	.187
Corrected Horsepower	147.76	.262	110.17	.195
BSFC, lb/hp-hr	.521	.001	.317	.001
Corrected BSFC	.498	.001	.303	.001
Relative Humidity	50.720	.201	50.720	.201
Reference Pressure, inHg	32.488		110.02	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1366

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.49 in-Hg
Speed :	1800 RPM
Load :	412.3 lb-ft
Fuel Flow :	73.7 lb/hr
Brake Power :	141.31 bhp
BSFC :	.522 lb/bhp-hr
Indicated Power :	18.08 kW/cyl
Peak Pressure :	10.14 MPa
Peak Rate of Pressure Rise:	662.3 kPa/deg
Peak Heat Release Rate :	70.5 Joules/deg
Cumulative Heat Release :	1221.46 Joules
Apparent Combustion Efficiency :	55.7 %
Indicated Thermal Efficiency :	27.5 %
Brake Thermal Efficiency :	26.7 %
Ignition Delay :	5.9 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	13.15 J/degree
Sensitivity :	28.7 degrees
Premixed/Diffusion Ratio :	.20576

971105.123500 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	80.535	.069	26.964	.038
Wet Bulb Temperature, F	67.023	.023	19.457	.013
P11-Baro (Vent), "Hg ABS	29.165	.000	98.765	.001
P3 C3 Fuel Pressure,psig	66.594	.083	459.15	.575
P4 C3 Oil Pressure, psig	45.724	.011	315.26	.077
P5 C3 Airbox Pres., psig	1.680	.007	11.586	.045
P10 C3 Exh Comm, inH20g	6.349	.158	1.580	.039
P11 C3 Intake Vac,inH20v	8.920	.053	2.220	.013
P12 C3 Blowby, inH20g	-.003	.009	-.001	.002
C3 Speed, RPM	1799.8	.622	1799.8	.622
C3 Fuel Flow, lb/hr	41.954	.061	19.030	.028
C3 Smoke, %	.264	.040	.264	.040
Cell 3 Load, lb-ft	278.95	.546	378.21	.740
K1 C3 Exhaust 1, F	506.19	.450	263.44	.250
K2 C3 Exhaust 2, F	547.20	.765	286.22	.425
K3 C3 Exhaust 3, F	607.71	.656	319.84	.364
K4 C3 Exhaust 4, F	526.17	.361	274.54	.200
K5 C3 Exhaust 5, F	639.31	.419	337.39	.233
K6 C3 Exhaust 6, F	620.16	.495	326.75	.275
K7-C3 Exhaust Comm, F	293.70	1.398	145.39	.777
J1 C3 Water In, F	158.50	.131	70.276	.073
J2 C3 Water Out, F	168.97	.149	76.093	.083
J3 C3 Oil Sump, F	222.16	.109	105.64	.061
J4 C3 Fuel In, F	89.103	.112	31.724	.062
J5 C3 Inlet Air, F	101.67	.118	38.708	.066
J6 C3 Airbox, F	148.78	.226	64.876	.126
Horsepower	95.594	.212	71.273	.158
Corrected Horsepower	99.974	.222	74.537	.166
BSFC, lb/hp-hr	.439	.001	.267	.001
Corrected BSFC	.420	.001	.255	.001
Relative Humidity	49.507	.133	49.507	.133
Reference Pressure, inHg	31.931		108.13	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1368

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.93 in-Hg
Speed :	1800 RPM
Load :	279.0 lb-ft
Fuel Flow :	42.0 lb/hr
Brake Power :	95.62 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	12.17 kW/cyl
Peak Pressure :	8.329 MPa
Peak Rate of Pressure Rise:	639.0 kPa/deg
Peak Heat Release Rate :	67.1 Joules/deg
Cumulative Heat Release :	775.025 Joules
Apparent Combustion Efficiency :	62.0 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	8.8 degrees
Centroid Phasing :	193.3 degrees
Centroid Magnitude :	12.44 J/degree
Sensitivity :	22.5 degrees
Premixed/Diffusion Ratio :	.39098

871105.124600 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	81.400	.081	27.445	.045
Wet Bulb Temperature, F	67.310	.022	19.617	.012
P11-Baro (Vent), "Hg ABS	29.158	.001	98.740	.002
P3 C3 Fuel Pressure,psig	67.705	.123	466.81	.850
P4 C3 Oil Pressure, psig	47.603	.015	328.21	.105
P5 C3 Airbox Pres., psig	1.672	.004	11.529	.028
P10 C3 Exh Comm, inH2Og	4.539	.075	1.129	.019
P11 C3 Intake Vac,inH2Ov	9.061	.098	2.255	.024
P12 C3 Blowby, inH2Og	-.001	.005	-.000	.001
C3 Speed, RPM	1799.8	1.293	1799.8	1.293
C3 Fuel Flow, lb/hr	26.627	.069	12.078	.031
C3 Smoke, %	-.869	.080	-.869	.080
Cell 3 Load, lb-ft	150.10	2.145	203.51	2.908
K1 C3 Exhaust 1, F	398.92	.211	203.84	.117
K2 C3 Exhaust 2, F	406.12	.181	207.85	.100
K3 C3 Exhaust 3, F	447.39	.167	230.77	.093
K4 C3 Exhaust 4, F	372.75	.191	189.31	.106
K5 C3 Exhaust 5, F	395.89	.217	202.16	.121
K6 C3 Exhaust 6, F	396.88	.516	202.71	.286
K7-C3 Exhaust Comm, F	228.77	.899	109.31	.500
J1 C3 Water In, F	160.97	.021	71.648	.012
J2 C3 Water Out, F	169.12	.033	76.180	.019
J3 C3 Oil Sump, F	212.65	.130	100.36	.072
J4 C3 Fuel In, F	89.741	.039	32.078	.022
J5 C3 Inlet Air, F	101.09	.072	38.381	.040
J6 C3 Airbox, F	144.06	.107	62.255	.059
Horsepower	51.438	.766	38.351	.571
Corrected Horsepower	53.781	.801	40.098	.597
BSFC, lb/hp-hr	.518	.008	.315	.005
Corrected BSFC	.495	.008	.301	.005
Relative Humidity	48.166	.165	48.166	.165
Reference Pressure, inHg	31.896		108.01	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1370

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.90 in-Hg
Speed :	1800 RPM
Load :	150.1 lb-ft
Fuel Flow :	26.6 lb/hr
Brake Power :	51.44 bhp
BSFC :	.517 lb/bhp-hr
Indicated Power :	8.21 kW/cyl
Peak Pressure :	7.306 MPa
Peak Rate of Pressure Rise:	716.5 kPa/deg
Peak Heat Release Rate :	80.3 Joules/deg
Cumulative Heat Release :	522.246 Joules
Apparent Combustion Efficiency :	66.0 %
Indicated Thermal Efficiency :	34.6 %
Brake Thermal Efficiency :	26.9 %
Ignition Delay :	10.5 degrees
Centroid Phasing :	192.6 degrees
Centroid Magnitude :	15.10 J/degree
Sensitivity :	20.1 degrees
Premixed/Diffusion Ratio :	.52525

871105.125958 AL-16090-F AL-12920-L DD6V53N				4
Dry Bulb Temperature, F	81.019	.055	27.233	.031
Wet Bulb Temperature, F	66.998	.002	19.443	.001
P11-Baro (Vent), "Hg ABS	29.155	.000	98.731	.001
P3 C3 Fuel Pressure,psig	67.834	.140	467.70	.964
P4 C3 Oil Pressure, psig	48.527	.041	334.58	.283
P5 C3 Airbox Pres., psig	1.705	.010	11.755	.066
P10 C3 Exh Comm, inH20g	3.979	.099	.990	.025
P11 C3 Intake Vac,inH20v	9.023	.102	2.245	.025
P12 C3 Blowby, inH20g	-.001	.009	-.000	.002
C3 Speed, RPM	1800.4	4.322	1800.4	4.322
C3 Fuel Flow, lb/hr	21.471	.408	9.739	.185
C3 Smoke, %	-.369	.036	-.369	.036
Cell 3 Load, lb-ft	101.19	2.212	137.20	2.999
K1 C3 Exhaust 1, F	363.13	.209	183.96	.116
K2 C3 Exhaust 2, F	359.26	.255	181.81	.142
K3 C3 Exhaust 3, F	392.37	.288	200.21	.160
K4 C3 Exhaust 4, F	314.87	.133	157.15	.074
K5 C3 Exhaust 5, F	316.89	.188	158.27	.105
K6 C3 Exhaust 6, F	324.71	.767	162.62	.426
K7-C3 Exhaust Comm, F	188.84	.484	87.132	.269
J1 C3 Water In, F	163.03	1.375	72.796	.764
J2 C3 Water Out, F	170.73	.790	77.074	.439
J3 C3 Oil Sump, F	207.10	.113	97.277	.063
J4 C3 Fuel In, F	89.047	.054	31.693	.030
J5 C3 Inlet Air, F	100.29	.154	37.940	.085
J6 C3 Airbox, F	139.54	.065	59.745	.036
Horsepower	34.690	.833	25.864	.621
Corrected Horsepower	36.239	.871	27.019	.649
BSFC, lb/hp-hr	.619	.016	.377	.010
Corrected BSFC	.593	.015	.361	.009
Relative Humidity	48.165	.146	48.165	.146
Reference Pressure, inHg	31.963		108.24	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1372

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.96 in-Hg
Speed :	1800 RPM
Load :	101.2 lb-ft
Fuel Flow :	21.5 lb/hr
Brake Power :	34.68 bhp
BSFC :	.620 lb/bhp-hr
Indicated Power :	6.81 kW/cyl
Peak Pressure :	7.012 MPa
Peak Rate of Pressure Rise:	713.8 kPa/deg
Peak Heat Release Rate :	80.4 Joules/deg
Cumulative Heat Release :	432.786 Joules
Apparent Combustion Efficiency :	67.7 %
Indicated Thermal Efficiency :	35.5 %
Brake Thermal Efficiency :	22.5 %
Ignition Delay :	11.0 degrees
Centroid Phasing :	192.4 degrees
Centroid Magnitude :	15.89 J/degree
Sensitivity :	19.4 degrees
Premixed/Diffusion Ratio :	.56337

971105.131223 AL-16090-F	AL-12920-L	DD6V53N		4
Dry Bulb Temperature, F	82.156	.146	27.864	.081
Wet Bulb Temperature, F	67.746	.034	19.859	.019
P11-Baro (Vent), "Hg ABS	29.148	.001	98.706	.002
P3 C3 Fuel Pressure,psig	63.628	.071	438.70	.488
P4 C3 Oil Pressure, psig	33.456	.040	230.67	.276
P5 C3 Airbox Pres., psig	1.328	.006	9.154	.040
P10 C3 Exh Comm, inH20g	4.245	.114	1.056	.028
P11 C3 Intake Vac,inH20v	5.560	.049	1.384	.012
P12 C3 Blowby, inH20g	.007	.018	.002	.004
C3 Speed, RPM	1402.4	1.230	1402.4	1.230
C3 Fuel Flow, lb/hr	62.129	.380	28.181	.172
C3 Smoke, %	75.416	.945	75.416	.945
Cell 3 Load, lb-ft	376.61	1.339	510.61	1.815
K1 C3 Exhaust 1, F	625.39	.753	329.66	.418
K2 C3 Exhaust 2, F	690.38	.739	365.77	.411
K3 C3 Exhaust 3, F	793.10	.939	422.83	.522
K4 C3 Exhaust 4, F	674.17	1.268	356.76	.704
K5 C3 Exhaust 5, F	802.64	.884	428.13	.491
K6 C3 Exhaust 6, F	753.19	1.265	400.66	.703
K7-C3 Exhaust Comm, F	306.17	1.861	152.32	1.034
J1 C3 Water In, F	152.96	1.675	67.199	.930
J2 C3 Water Out, F	167.96	.109	75.533	.061
J3 C3 Oil Sump, F	231.13	.133	110.63	.074
J4 C3 Fuel In, F	88.607	.041	31.448	.023
J5 C3 Inlet Air, F	101.81	.316	38.782	.176
J6 C3 Airbox, F	152.07	.202	66.707	.112
Horsepower	100.57	.379	74.980	.283
Corrected Horsepower	105.28	.397	78.491	.296
BSFC, lb/hp-hr	.618	.005	.376	.003
Corrected BSFC	.590	.005	.359	.003
Relative Humidity	47.608	.274	47.608	.274
Reference Pressure, inHg	31.442		106.48	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1374

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.44 in-Hg
Speed :	1402 RPM
Load :	376.6 lb-ft
Fuel Flow :	62.1 lb/hr
Brake Power :	100.53 bhp
BSFC :	.618 lb/bhp-hr
Indicated Power :	12.93 kW/cyl
Peak Pressure :	10.07 MPa
Peak Rate of Pressure Rise:	745.7 kPa/deg
Peak Heat Release Rate :	84.9 Joules/deg
Cumulative Heat Release :	1135.55 Joules
Apparent Combustion Efficiency :	47.9 %
Indicated Thermal Efficiency :	23.3 %
Brake Thermal Efficiency :	22.5 %
Ignition Delay :	5.3 degrees
Centroid Phasing :	194.4 degrees
Centroid Magnitude :	14.88 J/degree
Sensitivity :	27.1 degrees
Premixed/Diffusion Ratio :	.19531

871105.133037 AL-16090-F	AL-12920-L	DD6V53N		4
Dry Bulb Temperature, F	82.583	.298	28.102	.166
Wet Bulb Temperature, F	68.162	.110	20.090	.061
P11-Baro (Vent), "Hg ABS	29.142	.000	98.687	.002
P3 C3 Fuel Pressure,psig	66.040	.085	455.33	.585
P4 C3 Oil Pressure, psig	39.270	.023	270.76	.157
P5 C3 Airbox Pres., psig	1.268	.005	8.741	.036
P10 C3 Exh Comm, inH20g	1.155	.032	.287	.008
P11 C3 Intake Vac,inH20v	5.791	.033	1.441	.008
P12 C3 Blowby, inH20g	.001	.001	.000	.000
C3 Speed, RPM	1401.9	1.459	1401.9	1.459
C3 Fuel Flow, lb/hr	16.327	.058	7.406	.026
C3 Smoke, %	-1.578	.044	-1.578	.044
Cell 3 Load, lb-ft	98.738	.565	133.87	.765
K1 C3 Exhaust 1, F	345.45	2.529	174.14	1.405
K2 C3 Exhaust 2, F	325.57	.131	163.09	.073
K3 C3 Exhaust 3, F	367.19	.167	186.22	.093
K4 C3 Exhaust 4, F	277.27	2.329	136.26	1.294
K5 C3 Exhaust 5, F	278.84	.073	137.13	.041
K6 C3 Exhaust 6, F	294.50	.382	145.83	.212
K7-C3 Exhaust Comm, F	186.71	.674	85.951	.374
J1 C3 Water In, F	161.27	.166	71.815	.092
J2 C3 Water Out, F	168.55	.203	75.862	.113
J3 C3 Oil Sump, F	202.34	.072	94.632	.040
J4 C3 Fuel In, F	87.796	.583	30.998	.324
J5 C3 Inlet Air, F	100.34	.092	37.965	.051
J6 C3 Airbox, F	137.53	.197	58.626	.110
Horsepower	26.356	.172	19.650	.128
Corrected Horsepower	27.569	.179	20.554	.134
BSFC, lb/hp-hr	.620	.005	.377	.003
Corrected BSFC	.592	.005	.360	.003
Relative Humidity	47.822	.419	47.822	.419
Reference Pressure, inHg	31.297		105.98	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1376

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.30 in-Hg
Speed :	1402 RPM
Load :	98.7 lb-ft
Fuel Flow :	16.3 lb/hr
Brake Power :	26.35 bhp
BSFC :	.619 lb/bhp-hr
Indicated Power :	5.08 kW/cyl
Peak Pressure :	6.964 MPa
Peak Rate of Pressure Rise:	776.8 kPa/deg
Peak Heat Release Rate :	88.4 Joules/deg
Cumulative Heat Release :	422.847 Joules
Apparent Combustion Efficiency :	67.9 %
Indicated Thermal Efficiency :	34.9 %
Brake Thermal Efficiency :	22.5 %
Ignition Delay :	10.2 degrees
Centroid Phasing :	191.1 degrees
Centroid Magnitude :	18.41 J/degree
Sensitivity :	18.9 degrees
Premixed/Diffusion Ratio :	.53779

APPENDIX F5
DDC 6V-53N DATA SHEETS
FUEL BLEND TF01

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: DDA 6V-53N Engine Tester: G. Phillips
Test Fuel: TF9IN91587 Date: 1-14-98

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressures
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF9IN91587 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressures
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF9IN91587 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF01N01587 Date: 1-14-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	145	DN1377	DN1378
2500	146	DN1379	DN1380
2200	147	DN1381	DN1382
1800	148	DN1383	DN1384
1400	149	DN1385	DN1386

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF01N01587

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	150	DN1387	DN1388
2500	Full-Rack	151	DN1389	DN1390
2500	145	152	DN1391	DN1392
2200	Full-Rack	153	DN1393	DN1394
2200	100	154	DN1395	DN1396
1800	Full-Rack	155	DN1397	DN1398
1800	100	156	DN1399	DN1400
1800	54	157	DN1401	DN1402
1800	20	158	DN1403	DN1404
1400	Full-Rack	159	DN1405	DN1406
1400	28	160	DN1407	DN1408

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TFBINØ1587 Date: 1-18-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	161	DN1409	DN1410
2500	162	DN1411	DN1412
2200	163	DN1413	DN1414
1800	164	DN1415	DN1416
1400	165	DN1417	DN1418

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TFBINØ1587

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	166	DN1419	DN1420
2500	Full-Rack	167	DN1421	DN1422
2500	145	168	DN1423	DN1424
2200	Full-Rack	169	DN1425	DN1426
2200	100	170	DN1427	DN1428
1800	Full-Rack	171	DN1429	DN1430
1800	100	172	DN1431	DN1432
1800	54	173	DN1433	DN1434
1800	20	174	DN1435	DN1436
1400	Full-Rack	175	DN1437	DN1438
1400	28	176	DN1439	DN1440

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 5 FUEL BFD2V13286 DATE 1-14-88 PAGE 24

Operator Craig							
Time	9:30	10:25	10:50	11:10	11:25		
Test Hour	45min	55min	25min	20min	15min		
Speed, RPM	2800	2499	2199	1800	1401		
Load, lb-ft	348.7	379.3	405.1	408.0	383.7		
Fuel Flow, lb/hr	79.5	74.9	69.5	60.5	51.9		
Exh. Opacity, %	2.0	5.0	5.0	22.0	48.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	730	730	700	650	610		
Exhaust Cyl. L2	760	760	760	730	680		
Exhaust Cyl. L3	850	860	880	830	760		
Exhaust Cyl. R1	755	750	740	700	650		
Exhaust Cyl. R2	850	855	890	890	820		
Exhaust Cyl. R3	860	860	900	900	760		
Exhaust Common	400	380	360	350	320		
Water In	153	153	152	152	150		
Water Out	167	167	167	167	167		
Oil Sump	238	236	235	230	228		
Fuel	82	89	90	88	87		
Inlet Air	98	100	100	97	98		
Airbox	196	186	177	157	152		
Wet Bulb	56.0	52.0	52.1	53.0	54.5		
Dry Bulb	80.0	68.5	67.0	67.0	71.2		
PRESSURES, PSIG							
Oil Gallery	52.0	50.0	46.5	42.0	32.0		
Air After Blower	5.0	4.0	3.0	2.0	1.3		
Fuel Transfer	76.0	75.0	73.0	71.0	69.0		
LOW PRESSURES							
Intake Vac., in.water	18.2	16.0	12.7	8.4	5.0		
Exh. Comm., in.Water	20.0	22.5	18.3	13.5	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.44	29.44	29.43	29.43	29.41		

880114.093344 AL-15299-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	79.559	.311	26.422	.173
Wet Bulb Temperature, F	53.771	.078	12.095	.043
P11-Baro (Vent), "Hg ABS	29.445	.000	99.711	.001
P3 C3 Fuel Pressure,psig	76.576	.519	527.97	3.576
P4 C3 Oil Pressure, psig	52.624	.014	362.83	.094
P5 C3 Airbox Pres., psig	5.086	.015	35.067	.101
P10 C3 Exh Comm, inH2Og	27.476	.143	4.846	.030
P11 C3 Intake Vac,inH2Ov	18.629	.148	3.889	.032
P12 C3 Blowby, inH2Og	.021	.002	.005	.000
C3 Speed, RPM	2803.2	2.214	2803.2	2.214
C3 Fuel Flow, lb/hr	80.601	.193	36.560	.087
C3 Smoke, %	2.361	.103	2.361	.103
Cell 3 Load, lb-ft	347.77	.850	471.51	1.153
K1 C3 Exhaust 1, F	744.16	.575	395.64	.319
K2 C3 Exhaust 2, F	800.56	.391	426.98	.217
K3 C3 Exhaust 3, F	882.50	.703	472.50	.390
K4 C3 Exhaust 4, F	801.09	.551	427.27	.306
K5 C3 Exhaust 5, F	894.30	.576	479.05	.320
K6 C3 Exhaust 6, F	908.17	.635	486.76	.353
K7-C3 Exhaust Comm, F	422.88	.847	217.15	.471
J1 C3 Water In, F	156.36	.091	69.091	.051
J2 C3 Water Out, F	170.26	.057	76.808	.031
J3 C3 Oil Sump, F	242.26	.413	116.81	.229
J4 C3 Fuel In, F	93.166	.528	33.981	.293
J5 C3 Inlet Air, F	103.89	.327	39.939	.181
J6 C3 Airbox, F	199.98	.079	93.324	.044
Horsepower	185.62	.518	138.39	.386
Corrected Horsepower	190.09	.531	141.73	.396
BSFC, lb/hp-hr	.434	.001	.264	.001
Corrected BSFC	.424	.001	.258	.001
Relative Humidity	13.280	.278	13.280	.278
Reference Pressure, inHg	38.651		130.89	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1378

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.65 in-Hg
Speed :	2803 RPM
Load :	347.8 lb-ft
Fuel Flow :	80.6 lb/hr
Brake Power :	185.62 bhp
BSFC :	.434 lb/bhp-hr
Indicated Power :	26.48 kW/cyl
Peak Pressure :	9.421 MPa
Peak Rate of Pressure Rise:	456.3 kPa/deg
Peak Heat Release Rate :	37.2 Joules/deg
Cumulative Heat Release :	1111.09 Joules
Apparent Combustion Efficiency :	71.5 %
Indicated Thermal Efficiency :	36.5 %
Brake Thermal Efficiency :	31.8 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	197.9 degrees
Centroid Magnitude :	10.50 J/degree
Sensitivity :	28.8 degrees
Premixed/Diffusion Ratio :	.24686

880114.102442 AL-15299-F AL-12920-L 6V53N 5

Dry Bulb Temperature, F	66.921	.238	19.401	.132
Wet Bulb Temperature, F	48.181	.100	8.990	.056
P11-Baro (Vent), "Hg ABS	29.424	.000	99.642	.001
P3 C3 Fuel Pressure,psig	74.827	.453	515.91	3.126
P4 C3 Oil Pressure, psig	50.501	.011	348.20	.074
P5 C3 Airbox Pres., psig	4.023	.021	27.739	.145
P10 C3 Exh Comm, inH2Og	22.506	.215	5.600	.053
P11 C3 Intake Vac,inH2Ov	15.995	.151	3.980	.038
P12 C3 Blowby, inH2Og	-.012	.003	-.003	.001
C3 Speed, RPM	2502.1	2.735	2502.1	2.735
C3 Fuel Flow, lb/hr	75.016	.283	34.027	.128
C3 Smoke, %	3.622	.136	3.622	.136
Cell 3 Load, lb-ft	379.09	.497	513.98	.674
K1 C3 Exhaust 1, F	743.40	.446	395.22	.248
K2 C3 Exhaust 2, F	794.17	.244	423.43	.135
K3 C3 Exhaust 3, F	899.69	.788	482.05	.438
K4 C3 Exhaust 4, F	785.97	.331	418.87	.184
K5 C3 Exhaust 5, F	893.14	.426	478.41	.237
K6 C3 Exhaust 6, F	905.14	.437	485.08	.243
K7-C3 Exhaust Comm, F	405.82	.769	207.68	.427
J1 C3 Water In, F	155.62	.087	68.678	.048
J2 C3 Water Out, F	169.51	.053	76.396	.030
J3 C3 Oil Sump, F	239.67	.197	115.37	.109
J4 C3 Fuel In, F	93.377	.117	34.099	.065
J5 C3 Inlet Air, F	103.54	.159	39.745	.088
J6 C3 Airbox, F	190.19	.104	87.885	.058
Horsepower	180.61	.298	134.66	.223
Corrected Horsepower	185.03	.306	137.95	.228
BSFC, lb/hp-hr	.415	.002	.253	.001
Corrected BSFC	.405	.002	.247	.001
Relative Humidity	20.290	.257	20.290	.257
Reference Pressure, inHg	36.439		123.40	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1380

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.44 in-Hg
Speed :	2502 RPM
Load :	379.1 lb-ft
Fuel Flow :	75.0 lb/hr
Brake Power :	180.60 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	24.53 kW/cyl
Peak Pressure :	9.532 MPa
Peak Rate of Pressure Rise:	500.8 kPa/deg
Peak Heat Release Rate :	42.5 Joules/deg
Cumulative Heat Release :	1163.89 Joules
Apparent Combustion Efficiency :	71.9 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	33.2 %
Ignition Delay :	6.4 degrees
Centroid Phasing :	198.2 degrees
Centroid Magnitude :	10.46 J/degree
Sensitivity :	29.8 degrees
Premixed/Diffusion Ratio :	.21384

880114.105656 AL-15299-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	66.117	.158	18.954	.088
Wet Bulb Temperature, F	47.623	.025	8.680	.014
P11-Baro (Vent), "Hg ABS	29.426	.000	99.648	.001
P3 C3 Fuel Pressure,psig	73.041	.399	503.60	2.752
P4 C3 Oil Pressure, psig	47.133	.015	324.97	.106
P5 C3 Airbox Pres., psig	2.917	.011	20.113	.073
P10 C3 Exh Comm, inH2Og	17.873	.193	4.447	.048
P11 C3 Intake Vac,inH2Ov	12.661	.082	3.151	.020
P12 C3 Blowby, inH2Og	-.057	.002	-.014	.001
C3 Speed, RPM	2200.2	2.021	2200.2	2.021
C3 Fuel Flow, lb/hr	69.789	.334	31.656	.151
C3 Smoke, %	5.699	.171	5.699	.171
Cell 3 Load, lb-ft	399.62	.572	541.81	.775
K1 C3 Exhaust 1, F	722.22	.317	383.45	.176
K2 C3 Exhaust 2, F	801.53	.219	427.52	.122
K3 C3 Exhaust 3, F	914.81	.534	490.45	.297
K4 C3 Exhaust 4, F	770.93	.386	410.51	.214
K5 C3 Exhaust 5, F	922.17	.652	494.54	.362
K6 C3 Exhaust 6, F	933.12	.735	500.62	.409
K7-C3 Exhaust Comm, F	378.13	.355	192.29	.197
J1 C3 Water In, F	155.71	.075	68.728	.042
J2 C3 Water Out, F	170.32	.035	76.844	.019
J3 C3 Oil Sump, F	239.45	.151	115.25	.084
J4 C3 Fuel In, F	92.839	.037	33.799	.021
J5 C3 Inlet Air, F	103.78	.101	39.878	.056
J6 C3 Airbox, F	180.08	.160	82.264	.089
Horsepower	167.41	.291	124.82	.217
Corrected Horsepower	171.51	.298	127.87	.222
BSFC, lb/hp-hr	.417	.002	.254	.001
Corrected BSFC	.407	.002	.248	.001
Relative Humidity	20.199	.331	20.199	.331
Reference Pressure, inHg	34.434		116.61	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1382

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.43 in-Hg
Speed :	2200 RPM
Load :	399.6 lb-ft
Fuel Flow :	69.8 lb/hr
Brake Power :	167.39 bhp
BSFC :	.417 lb/bhp-hr
Indicated Power :	21.66 kW/cyl
Peak Pressure :	9.647 MPa
Peak Rate of Pressure Rise:	498.5 kPa/deg
Peak Heat Release Rate :	43.6 Joules/deg
Cumulative Heat Release :	1194.42 Joules
Apparent Combustion Efficiency :	69.7 %
Indicated Thermal Efficiency :	34.5 %
Brake Thermal Efficiency :	33.1 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	198.4 degrees
Centroid Magnitude :	11.34 J/degree
Sensitivity :	29.8 degrees
Premixed/Diffusion Ratio :	.22040

880114.111403 AL-15299-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	68.564	.459	20.313	.255
Wet Bulb Temperature, F	48.987	.106	9.437	.059
P11-Baro (Vent), "Hg ABS	29.423	.001	99.639	.002
P3 C3 Fuel Pressure,psig	71.126	.152	490.40	1.050
P4 C3 Oil Pressure, psig	42.858	.012	295.50	.085
P5 C3 Airbox Pres., psig	2.005	.016	13.821	.110
P10 C3 Exh Comm, inH2Og	12.655	.155	3.149	.039
P11 C3 Intake Vac,inH2Ov	8.764	.064	2.181	.016
P12 C3 Blowby, inH2Og	-.049	.003	-.012	.001
C3 Speed, RPM	1800.7	2.323	1800.7	2.323
C3 Fuel Flow, lb/hr	61.405	.222	27.853	.101
C3 Smoke, %	20.919	.554	20.919	.554
Cell 3 Load, lb-ft	407.52	.698	552.52	.946
K1 C3 Exhaust 1, F	660.58	.309	349.21	.172
K2 C3 Exhaust 2, F	777.84	.380	414.36	.211
K3 C3 Exhaust 3, F	861.59	.451	460.88	.250
K4 C3 Exhaust 4, F	741.82	.382	394.34	.212
K5 C3 Exhaust 5, F	919.76	.643	493.20	.357
K6 C3 Exhaust 6, F	932.80	.448	500.44	.249
K7-C3 Exhaust Comm, F	358.17	.566	181.20	.314
J1 C3 Water In, F	154.85	.062	68.251	.034
J2 C3 Water Out, F	169.88	.086	76.598	.048
J3 C3 Oil Sump, F	234.09	.168	112.27	.093
J4 C3 Fuel In, F	91.136	.043	32.853	.024
J5 C3 Inlet Air, F	100.51	.131	38.061	.073
J6 C3 Airbox, F	160.19	.069	71.216	.039
Horsepower	139.72	.325	104.17	.242
Corrected Horsepower	142.77	.332	106.44	.248
BSFC, lb/hp-hr	.439	.002	.267	.001
Corrected BSFC	.430	.002	.262	.001
Relative Humidity	19.351	.869	19.351	.869
Reference Pressure, inHg	32.860		111.28	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1384

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.86 in-Hg
Speed :	1801 RPM
Load :	407.5 lb-ft
Fuel Flow :	61.4 lb/hr
Brake Power :	139.74 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	17.53 kW/cyl
Peak Pressure :	9.779 MPa
Peak Rate of Pressure Rise:	562.2 kPa/deg
Peak Heat Release Rate :	54.8 Joules/deg
Cumulative Heat Release :	1178.79 Joules
Apparent Combustion Efficiency :	64.0 %
Indicated Thermal Efficiency :	31.7 %
Brake Thermal Efficiency :	31.4 %
Ignition Delay :	5.9 degrees
Centroid Phasing :	197.1 degrees
Centroid Magnitude :	11.64 J/degree
Sensitivity :	29.3 degrees
Premixed/Diffusion Ratio :	.19986

980114.112738 AL-15299-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	68.602	.310	20.335	.172
Wet Bulb Temperature, F	48.927	.040	9.404	.022
P11-Baro (Vent), "Hg ABS	29.410	.000	99.593	.001
P3 C3 Fuel Pressure,psig	69.140	.090	476.70	.622
P4 C3 Oil Pressure, psig	32.239	.015	222.28	.102
P5 C3 Airbox Pres., psig	1.429	.012	9.855	.082
P10 C3 Exh Comm, inH2Og	8.634	.095	2.149	.024
P11 C3 Intake Vac,inH2Ov	5.573	.038	1.387	.009
P12 C3 Blowby, inH2Og	-.047	.003	-.012	.001
C3 Speed, RPM	1403.9	1.343	1403.9	1.343
C3 Fuel Flow, lb/hr	52.517	.223	23.821	.101
C3 Smoke, %	48.170	.831	48.170	.831
Cell 3 Load, lb-ft	382.44	1.416	518.51	1.920
K1 C3 Exhaust 1, F	622.06	.424	327.81	.236
K2 C3 Exhaust 2, F	707.35	.354	375.20	.197
K3 C3 Exhaust 3, F	792.63	.628	422.57	.349
K4 C3 Exhaust 4, F	688.08	.817	364.49	.454
K5 C3 Exhaust 5, F	850.23	1.043	454.57	.579
K6 C3 Exhaust 6, F	797.20	.458	425.11	.255
K7-C3 Exhaust Comm, F	340.25	.764	171.25	.424
J1 C3 Water In, F	152.56	.110	66.978	.061
J2 C3 Water Out, F	169.00	.075	76.109	.041
J3 C3 Oil Sump, F	232.92	.109	111.62	.061
J4 C3 Fuel In, F	90.176	.054	32.320	.030
J5 C3 Inlet Air, F	102.03	.189	38.908	.105
J6 C3 Airbox, F	157.07	.080	69.485	.044
Horsepower	102.23	.375	76.220	.280
Corrected Horsepower	104.64	.384	78.016	.286
BSFC, lb/hp-hr	.514	.002	.313	.001
Corrected BSFC	.502	.002	.305	.001
Relative Humidity	19.071	.636	19.071	.636
Reference Pressure, inHg	31.910		108.06	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1386

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.91 in-Hg
Speed :	1404 RPM
Load :	382.4 lb-ft
Fuel Flow :	52.5 lb/hr
Brake Power :	102.23 bhp
BSFC :	.514 lb/bhp-hr
Indicated Power :	13.52 kW/cyl
Peak Pressure :	10.11 MPa
Peak Rate of Pressure Rise:	613.3 kPa/deg
Peak Heat Release Rate :	64.6 Joules/deg
Cumulative Heat Release :	1176.99 Joules
Apparent Combustion Efficiency :	58.3 %
Indicated Thermal Efficiency :	28.6 %
Brake Thermal Efficiency :	26.9 %
Ignition Delay :	5.0 degrees
Centroid Phasing :	195.3 degrees
Centroid Magnitude :	12.74 J/degree
Sensitivity :	28.3 degrees
Premixed/Diffusion Ratio :	.17696

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 5 FUEL TF01N01587 DATE 1-14-88 PAGE 25

Operator Gray							
Time	12:50	1:05	1:20	1:40	2:05	2:25	2:40
Test Hour	20 min	15 min	15 min	20 min	25 min	20 min	15 min
Speed, RPM	2800	2500	2499	2199	2199	1800	1800
Load, lb-ft	365.3	400.6	300.0	416.8	231.7	410.4	283.4
Fuel Flow, lb/hr	87.1	83.3	61.4	75.9	42.5	66.5	40.4
Exh. Opacity, %	3.0	3.5	0	8.5	0	3.0	1.0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	780	600	740	500	670	500
Exhaust Cyl. L2	800	830	630	800	505	780	530
Exhaust Cyl. L3	880	910	700	920	560	860	600
Exhaust Cyl. R1	800	800	630	760	500	730	510
Exhaust Cyl. R2	890	905	700	930	550	900	620
Exhaust Cyl. R3	900	910	705	940	550	900	600
Exhaust Common	410	410	340	460	270	505	490
Water In	152	152	153	151	154	153	154
Water Out	167	167	167	167	167	168	167
Oil Sump	238	238	226	236	218	231	218
Fuel	90	86	86	88	88	87	86
Inlet Air	97	97	98	99	97	100	102
Airbox	200	194	175	184	159	162	149
Wet Bulb	56.0	54.9	54.9	57.9	57.2	54.4	53.7
Dry Bulb	73.2	70.0	69.0	76.0	75.1	67.0	62.5
PRESSURES, PSIG							
Oil Gallery	51.5	49.5	51.5	46.5	50.5	42.0	44.5
Air After Blower	3.0	4.0	3.9	2.95	2.8	2.0	1.9
Fuel Transfer	77.0	74.0	74.0	73.0	74.3	70.5	71.0
LOW PRESSURES							
Intake Vac., in.water		15.5	15.5	12.5	12.9	8.4	8.7
Exh. Comm., in.Water	27.0	23.5	20.0	18.5	15.0	13.0	9.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.37	29.36	29.35	29.34	29.33	29.31	29.31

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 5 FUEL TFOINO1587 DATE 1-14-98 PAGE 26

Operator Grey							
Time	3:00	3:20	3:35	3:50			
Test Hour	20 min	20 min	15 min	15 min			
Speed, RPM	1799	1800	1399	1400			
Load, lb-ft	155.9	94.3	379.3	102.1			
Fuel Flow, lb/hr	25.5	19.0	56.7	15.5			
Exh. Opacity, %	0	0	20.0	0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	350	620	340			
Exhaust Cyl. L2	390	340	690	310			
Exhaust Cyl. L3	430	360	790	350			
Exhaust Cyl. R1	360	300	650	260			
Exhaust Cyl. R2	400	300	790	370			
Exhaust Cyl. R3	400	300	745	290			
Exhaust Common	350	300	320	300			
Water In	158	160	153	156			
Water Out	167	168	169	167			
Oil Sump	208	206	228	202			
Fuel	86	86	86	86			
Inlet Air	98	97	98	97			
Airbox	140	141	156	140			
Wet Bulb	53.5	56.0	53.5	55.8			
Dry Bulb	68.0	69.0	69.0	69.8			
PRESSURES, PSIG							
Oil Gallery	46.5	46.0	31.5	37.0			
Air After Blower	2.9	1.8	1.5	1.3			
Fuel Transfer	72.0	72.0	68.0	70.0			
LOW PRESSURES							
Intake Vac., in.water	8.8	8.6	5.0	5.1			
Exh. Comm., in.Water	9.0	8.0	9.0	5.8			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	29.3	29.3	29.3	29.3			

880114.125414 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	70.476	.336	21.375	.187
Wet Bulb Temperature, F	50.565	.091	10.314	.051
P11-Baro (Vent), "Hg ABS	29.370	.000	99.458	.001
P3 C3 Fuel Pressure,psig	76.937	.357	530.46	2.461
P4 C3 Oil Pressure, psig	52.183	.039	359.79	.268
P5 C3 Airbox Pres., psig	5.125	.011	35.335	.073
P10 C3 Exh Comm, inH2Og	27.453	.219	6.831	.055
P11 C3 Intake Vac,inH2Ov	19.927	.138	4.959	.034
P12 C3 Blowby, inH2Og	.016	.006	.004	.001
C3 Speed, RPM	2799.6	1.808	2799.6	1.808
C3 Fuel Flow, lb/hr	87.757	.075	39.806	.034
C3 Smoke, %	2.604	.144	2.604	.144
Cell 3 Load, lb-ft	365.79	.961	495.95	1.302
K1 C3 Exhaust 1, F	765.14	.467	407.30	.260
K2 C3 Exhaust 2, F	825.05	.441	440.58	.245
K3 C3 Exhaust 3, F	908.85	.333	487.14	.185
K4 C3 Exhaust 4, F	828.80	1.095	442.67	.608
K5 C3 Exhaust 5, F	922.27	.369	494.60	.205
K6 C3 Exhaust 6, F	940.61	.442	504.79	.246
K7-C3 Exhaust Comm, F	434.81	1.422	223.78	.790
J1 C3 Water In, F	154.54	.071	68.076	.039
J2 C3 Water Out, F	168.14	.059	75.635	.033
J3 C3 Oil Sump, F	240.30	.385	115.72	.214
J4 C3 Fuel In, F	91.490	.242	33.050	.135
J5 C3 Inlet Air, F	98.036	.417	36.687	.232
J6 C3 Airbox, F	199.69	.372	93.158	.207
Horsepower	194.99	.605	145.38	.451
Corrected Horsepower	199.28	.618	148.58	.461
BSFC, lb/hp-hr	.450	.001	.274	.001
Corrected BSFC	.440	.001	.268	.001
Relative Humidity	20.473	.444	20.473	.444
Reference Pressure, inHg	38.339		129.83	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1388

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.34 in-Hg
Speed :	2800 RPM
Load :	365.8 lb-ft
Fuel Flow :	87.8 lb/hr
Brake Power :	195.02 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	27.30 kW/cyl
Peak Pressure :	9.605 MPa
Peak Rate of Pressure Rise:	495.4 kPa/deg
Peak Heat Release Rate :	40.4 Joules/deg
Cumulative Heat Release :	1154.76 Joules
Apparent Combustion Efficiency :	68.7 %
Indicated Thermal Efficiency :	34.8 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	198.4 degrees
Centroid Magnitude :	10.89 J/degree
Sensitivity :	29.1 degrees
Premixed/Diffusion Ratio :	.24795

S80114.131008 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	71.151	.372	21.751	.207
Wet Bulb Temperature, F	51.505	.121	10.836	.067
P11-Baro (Vent), "Hg ABS	29.356	.000	99.410	.001
P3 C3 Fuel Pressure,psig	74.621	.376	514.49	2.589
P4 C3 Oil Pressure, psig	49.851	.016	343.71	.112
P5 C3 Airbox Pres., psig	4.042	.020	27.867	.134
P10 C3 Exh Comm, inH2Og	23.151	.128	5.761	.032
P11 C3 Intake Vac,inH2Ov	16.947	.066	4.217	.017
P12 C3 Blowby, inH2Og	.063	.002	.016	.000
C3 Speed, RPM	2498.7	1.442	2498.7	1.442
C3 Fuel Flow, lb/hr	83.999	.045	38.101	.020
C3 Smoke, %	3.532	.114	3.532	.114
Cell 3 Load, lb-ft	399.54	.823	541.70	1.116
K1 C3 Exhaust 1, F	791.91	.668	422.17	.367
K2 C3 Exhaust 2, F	852.60	.450	455.89	.250
K3 C3 Exhaust 3, F	951.83	.534	511.02	.297
K4 C3 Exhaust 4, F	826.44	.511	441.35	.284
K5 C3 Exhaust 5, F	946.04	.909	507.80	.505
K6 C3 Exhaust 6, F	956.09	.937	513.38	.520
K7-C3 Exhaust Comm, F	434.52	.801	223.62	.445
J1 C3 Water In, F	154.46	.078	68.034	.043
J2 C3 Water Out, F	168.80	.115	76.002	.064
J3 C3 Oil Sump, F	242.17	.228	116.76	.126
J4 C3 Fuel In, F	87.876	.050	31.042	.028
J5 C3 Inlet Air, F	100.44	.320	38.021	.178
J6 C3 Airbox, F	197.21	.091	91.783	.051
Horsepower	190.09	.465	141.73	.347
Corrected Horsepower	194.89	.477	145.30	.355
BSFC, lb/hp-hr	.442	.001	.269	.001
Corrected BSFC	.431	.001	.262	.001
Relative Humidity	22.087	.495	22.087	.495
Reference Pressure, inHg	36.339		123.06	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1390

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.34 in-Hg
Speed :	2499 RPM
Load :	399.5 lb-ft
Fuel Flow :	84.0 lb/hr
Brake Power :	190.09 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	25.24 kW/cyl
Peak Pressure :	9.699 MPa
Peak Rate of Pressure Rise:	545.9 kPa/deg
Peak Heat Release Rate :	48.4 Joules/deg
Cumulative Heat Release :	1220.05 Joules
Apparent Combustion Efficiency :	67.7 %
Indicated Thermal Efficiency :	33.6 %
Brake Thermal Efficiency :	31.5 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	199.0 degrees
Centroid Magnitude :	10.99 J/degree
Sensitivity :	30.1 degrees
Premixed/Diffusion Ratio :	.22828

880114.132621 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	71.337	.407	21.854	.226
Wet Bulb Temperature, F	51.664	.138	10.924	.077
P11-Baro (Vent), "Hg ABS	29.351	.000	99.392	.002
P3 C3 Fuel Pressure,psig	74.609	.292	514.41	2.016
P4 C3 Oil Pressure, psig	52.288	.038	360.52	.261
P5 C3 Airbox Pres., psig	3.863	.021	26.635	.143
P10 C3 Exh Comm, inH2Og	20.190	.165	5.024	.041
P11 C3 Intake Vac,inH2Ov	17.096	.082	4.254	.020
P12 C3 Blowby, inH2Og	.052	.004	.013	.001
C3 Speed, RPM	2500.5	2.944	2500.5	2.944
C3 Fuel Flow, lb/hr	62.285	.075	28.252	.034
C3 Smoke, %	.000	.097	.000	.097
Cell 3 Load, lb-ft	300.94	.929	408.02	1.259
K1 C3 Exhaust 1, F	610.23	.530	321.24	.294
K2 C3 Exhaust 2, F	652.44	.400	344.69	.222
K3 C3 Exhaust 3, F	735.79	.486	390.99	.270
K4 C3 Exhaust 4, F	657.51	.293	347.51	.163
K5 C3 Exhaust 5, F	733.56	.540	389.76	.300
K6 C3 Exhaust 6, F	740.69	.567	393.71	.315
K7-C3 Exhaust Comm, F	347.85	.537	175.47	.298
J1 C3 Water In, F	155.29	.173	68.494	.096
J2 C3 Water Out, F	167.45	.154	75.253	.086
J3 C3 Oil Sump, F	229.95	.146	109.97	.081
J4 C3 Fuel In, F	88.884	.063	31.602	.035
J5 C3 Inlet Air, F	102.22	.096	39.014	.053
J6 C3 Airbox, F	178.47	.069	81.372	.038
Horsepower	143.28	.502	106.82	.374
Corrected Horsepower	147.17	.516	109.72	.384
BSFC, lb/hp-hr	.435	.002	.264	.001
Corrected BSFC	.423	.001	.257	.001
Relative Humidity	22.203	.507	22.203	.507
Reference Pressure, inHg	35.958		121.77	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1392

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.96 in-Hg
Speed :	2501 RPM
Load :	300.9 lb-ft
Fuel Flow :	62.3 lb/hr
Brake Power :	143.29 bhp
BSFC :	.435 lb/bhp-hr
Indicated Power :	19.76 kW/cyl
Peak Pressure :	8.746 MPa
Peak Rate of Pressure Rise:	575.7 kPa/deg
Peak Heat Release Rate :	55.1 Joules/deg
Cumulative Heat Release :	931.504 Joules
Apparent Combustion Efficiency :	69.7 %
Indicated Thermal Efficiency :	35.5 %
Brake Thermal Efficiency :	32.0 %
Ignition Delay :	8.7 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	10.47 J/degree
Sensitivity :	26.8 degrees
Premixed/Diffusion Ratio :	.32440

880114.140009 AL-16089-F AL-12920-L 6V53 5

Dry Bulb Temperature, F	71.193	.343	21.774	.191
Wet Bulb Temperature, F	51.700	.170	10.944	.094
P11-Baro (Vent), "Hg ABS	29.329	.000	99.319	.001
P3 C3 Fuel Pressure,psig	73.405	.257	506.11	1.774
P4 C3 Oil Pressure, psig	47.151	.020	325.09	.136
P5 C3 Airbox Pres., psig	2.898	.015	19.980	.100
P10 C3 Exh Comm, inH2Og	18.515	.209	4.607	.052
P11 C3 Intake Vac,inH2Ov	13.945	.070	3.470	.017
P12 C3 Blowby, inH2Og	.011	.004	.003	.001
C3 Speed, RPM	2200.1	2.797	2200.1	2.797
C3 Fuel Flow, lb/hr	76.524	.069	34.711	.031
C3 Smoke, %	11.088	.128	11.088	.128
Cell 3 Load, lb-ft	415.84	1.224	563.81	1.659
K1 C3 Exhaust 1, F	766.64	.307	408.13	.171
K2 C3 Exhaust 2, F	838.97	.374	448.32	.208
K3 C3 Exhaust 3, F	956.86	.587	513.81	.326
K4 C3 Exhaust 4, F	801.69	.566	427.61	.314
K5 C3 Exhaust 5, F	965.21	.405	518.45	.225
K6 C3 Exhaust 6, F	977.25	.673	525.14	.374
K7-C3 Exhaust Comm, F	417.55	.386	214.20	.214
J1 C3 Water In, F	152.89	.095	67.161	.053
J2 C3 Water Out, F	167.56	.062	75.313	.034
J3 C3 Oil Sump, F	238.96	.316	114.98	.176
J4 C3 Fuel In, F	91.447	.037	33.026	.021
J5 C3 Inlet Air, F	103.37	.045	39.653	.025
J6 C3 Airbox, F	188.35	.031	86.862	.017
Horsepower	174.20	.595	129.88	.443
Corrected Horsepower	179.26	.612	133.65	.456
BSFC, lb/hp-hr	.439	.002	.267	.001
Corrected BSFC	.427	.002	.260	.001
Relative Humidity	22.651	.407	22.651	.407
Reference Pressure, inHg	34.203		115.82	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1394

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.20 in-Hg
Speed :	2200 RPM
Load :	415.8 lb-ft
Fuel Flow :	76.5 lb/hr
Brake Power :	174.17 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	22.43 kW/cyl
Peak Pressure :	9.856 MPa
Peak Rate of Pressure Rise:	569.3 kPa/deg
Peak Heat Release Rate :	53.6 Joules/deg
Cumulative Heat Release :	1230.60 Joules
Apparent Combustion Efficiency :	66.0 %
Indicated Thermal Efficiency :	32.8 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	197.8 degrees
Centroid Magnitude :	12.15 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.23768

880114.141133 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	71.179	.220	21.766	.122
Wet Bulb Temperature, F	51.945	.049	11.081	.027
P11-Baro (Vent), "Hg ABS	29.327	.001	99.311	.002
P3 C3 Fuel Pressure,psig	74.569	.311	514.13	2.146
P4 C3 Oil Pressure, psig	50.989	.027	351.55	.184
P5 C3 Airbox Pres., psig	2.713	.013	18.707	.088
P10 C3 Exh Comm, inH2Og	14.293	.202	3.557	.050
P11 C3 Intake Vac,inH2Ov	14.296	.057	3.557	.014
P12 C3 Blowby, inH2Og	.001	.003	.000	.001
C3 Speed, RPM	2200.7	2.061	2200.7	2.061
C3 Fuel Flow, lb/hr	43.235	.046	19.611	.021
C3 Smoke, %	-.562	.035	-.562	.035
Cell 3 Load, lb-ft	231.38	.999	313.70	1.355
K1 C3 Exhaust 1, F	522.04	.421	272.24	.234
K2 C3 Exhaust 2, F	531.54	.260	277.52	.145
K3 C3 Exhaust 3, F	589.79	.299	309.88	.166
K4 C3 Exhaust 4, F	520.14	.252	271.19	.140
K5 C3 Exhaust 5, F	575.67	.495	302.04	.275
K6 C3 Exhaust 6, F	577.60	.544	303.11	.302
K7-C3 Exhaust Comm, F	289.86	1.214	143.25	.675
J1 C3 Water In, F	156.81	.091	69.337	.050
J2 C3 Water Out, F	167.40	.097	75.222	.054
J3 C3 Oil Sump, F	220.21	.179	104.56	.099
J4 C3 Fuel In, F	90.687	.017	32.604	.009
J5 C3 Inlet Air, F	101.53	.057	38.629	.032
J6 C3 Airbox, F	163.32	.213	72.955	.118
Horsepower	96.954	.444	72.287	.331
Corrected Horsepower	99.637	.456	74.286	.340
BSFC, lb/hp-hr	.446	.002	.271	.001
Corrected BSFC	.434	.002	.264	.001
Relative Humidity	23.482	.454	23.482	.454
Reference Pressure, inHg	33.799		114.46	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1396

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.80 in-Hg
Speed :	2201 RPM
Load :	231.3 lb-ft
Fuel Flow :	43.2 lb/hr
Brake Power :	96.93 bhp
BSFC :	.446 lb/bhp-hr
Indicated Power :	13.69 kW/cyl
Peak Pressure :	8.077 MPa
Peak Rate of Pressure Rise:	675.1 kPa/deg
Peak Heat Release Rate :	72.7 Joules/deg
Cumulative Heat Release :	719.391 Joules
Apparent Combustion Efficiency :	68.3 %
Indicated Thermal Efficiency :	35.4 %
Brake Thermal Efficiency :	31.2 %
Ignition Delay :	10.2 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	12.95 J/degree
Sensitivity :	22.8 degrees
Premixed/Diffusion Ratio :	.44853

980114.143546 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	70.101	.244	21.167	.135
Wet Bulb Temperature, F	51.497	.054	10.832	.030
P11-Baro (Vent), "Hg ABS	29.311	.000	99.260	.001
P3 C3 Fuel Pressure,psig	70.641	.186	487.05	1.283
P4 C3 Oil Pressure, psig	42.440	.039	292.61	.271
P5 C3 Airbox Pres., psig	1.974	.009	13.608	.064
P10 C3 Exh Comm, inH2Og	14.496	.020	7.372	.005
P11 C3 Intake Vac,inH2Ov	10.308	.064	2.565	.016
P12 C3 Blowby, inH2Og	.032	.003	.008	.001
C3 Speed, RPM	1801.3	2.236	1801.3	2.236
C3 Fuel Flow, lb/hr	67.112	.106	30.441	.048
C3 Smoke, %	40.455	.704	40.455	.704
Cell 3 Load, lb-ft	410.82	1.203	556.99	1.630
K1 C3 Exhaust 1, F	687.86	.485	364.37	.270
K2 C3 Exhaust 2, F	808.69	.566	431.49	.315
K3 C3 Exhaust 3, F	895.51	.485	479.73	.270
K4 C3 Exhaust 4, F	762.35	.556	405.75	.309
K5 C3 Exhaust 5, F	943.27	1.851	506.26	1.028
K6 C3 Exhaust 6, F	945.31	.415	507.40	.231
K7-C3 Exhaust Comm, F	617.58	18.619	325.32	10.344
J1 C3 Water In, F	156.12	.129	68.953	.072
J2 C3 Water Out, F	171.24	.279	77.356	.155
J3 C3 Oil Sump, F	234.59	.208	112.55	.115
J4 C3 Fuel In, F	90.691	.774	32.606	.430
J5 C3 Inlet Air, F	104.14	.343	40.079	.191
J6 C3 Airbox, F	165.39	.051	74.106	.028
Horsepower	140.90	.466	105.05	.347
Corrected Horsepower	145.22	.480	108.27	.358
BSFC, lb/hp-hr	.476	.001	.290	.001
Corrected BSFC	.462	.001	.281	.001
Relative Humidity	24.442	.467	24.442	.467
Reference Pressure, inHg	32.572		110.30	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1398

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.57 in-Hg
Speed :	1801 RPM
Load :	410.8 lb-ft
Fuel Flow :	67.1 lb/hr
Brake Power :	140.87 bhp
BSFC :	.476 lb/bhp-hr
Indicated Power :	17.78 kW/cyl
Peak Pressure :	9.945 MPa
Peak Rate of Pressure Rise:	674.3 kPa/deg
Peak Heat Release Rate :	70.9 Joules/deg
Cumulative Heat Release :	1212.95 Joules
Apparent Combustion Efficiency :	60.7 %
Indicated Thermal Efficiency :	29.6 %
Brake Thermal Efficiency :	29.2 %
Ignition Delay :	6.2 degrees
Centroid Phasing :	197.4 degrees
Centroid Magnitude :	12.73 J/degree
Sensitivity :	29.2 degrees
Premixed/Diffusion Ratio :	.21364

880114.144706 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	70.585	.207	21.436	.115
Wet Bulb Temperature, F	51.849	.035	11.027	.020
P11-Baro (Vent), "Hg ABS	29.305	.000	99.238	.001
P3 C3 Fuel Pressure,psig	71.350	.209	491.94	1.442
P4 C3 Oil Pressure, psig	45.044	.018	310.57	.123
P5 C3 Airbox Pres., psig	1.740	.007	11.999	.047
P10 C3 Exh Comm, inH2Og	9.496	.026	5.427	.006
P11 C3 Intake Vac,inH2Ov	10.640	.048	2.648	.012
P12 C3 Blowby, inH2Og	.032	.003	.008	.001
C3 Speed, RPM	1802.9	1.893	1802.9	1.893
C3 Fuel Flow, lb/hr	41.040	.094	18.616	.042
C3 Smoke, %	1.090	.066	1.090	.066
Cell 3 Load, lb-ft	282.70	.529	383.29	.717
K1 C3 Exhaust 1, F	505.91	.298	263.28	.166
K2 C3 Exhaust 2, F	551.63	.555	288.68	.308
K3 C3 Exhaust 3, F	612.14	.450	322.30	.250
K4 C3 Exhaust 4, F	534.67	.292	279.26	.162
K5 C3 Exhaust 5, F	653.27	.701	345.15	.390
K6 C3 Exhaust 6, F	634.00	.508	334.44	.282
K7-C3 Exhaust Comm, F	508.63	.635	264.80	.353
J1 C3 Water In, F	157.25	.077	69.586	.043
J2 C3 Water Out, F	168.85	.050	76.028	.028
J3 C3 Oil Sump, F	222.26	.347	105.70	.193
J4 C3 Fuel In, F	89.588	.017	31.993	.009
J5 C3 Inlet Air, F	105.21	.132	40.672	.073
J6 C3 Airbox, F	153.02	.163	67.234	.091
Horsepower	97.046	.202	72.355	.151
Corrected Horsepower	100.15	.209	74.667	.156
BSFC, lb/hp-hr	.423	.001	.257	.001
Corrected BSFC	.410	.001	.249	.001
Relative Humidity	24.513	.381	24.513	.381
Reference Pressure, inHg	32.066		108.59	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1400

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.07 in-Hg
Speed :	1803 RPM
Load :	282.7 lb-ft
Fuel Flow :	41.0 lb/hr
Brake Power :	97.05 bhp
BSFC :	.422 lb/bhp-hr
Indicated Power :	12.28 kW/cyl
Peak Pressure :	8.310 MPa
Peak Rate of Pressure Rise:	657.7 kPa/deg
Peak Heat Release Rate :	69.9 Joules/deg
Cumulative Heat Release :	802.409 Joules
Apparent Combustion Efficiency :	65.8 %
Indicated Thermal Efficiency :	33.5 %
Brake Thermal Efficiency :	32.9 %
Ignition Delay :	8.9 degrees
Centroid Phasing :	194.5 degrees
Centroid Magnitude :	12.38 J/degree
Sensitivity :	23.6 degrees
Premixed/Diffusion Ratio :	.37768

980114.150820 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	71.194	.332	21.775	.184
Wet Bulb Temperature, F	52.203	.107	11.224	.059
P11-Baro (Vent), "Hg ABS	29.298	.000	99.213	.001
P3 C3 Fuel Pressure,psig	71.848	.273	495.37	1.881
P4 C3 Oil Pressure, psig	47.215	.014	325.54	.099
P5 C3 Airbox Pres., psig	1.738	.005	11.982	.034
P10 C3 Exh Comm, inH2Og	9.717	.023	5.398	.006
P11 C3 Intake Vac,inH2Ov	10.628	.044	2.645	.011
P12 C3 Blowby, inH2Og	.007	.008	.002	.002
C3 Speed, RPM	1802.0	1.717	1802.0	1.717
C3 Fuel Flow, lb/hr	26.269	.038	11.915	.017
C3 Smoke, %	.504	.032	.504	.032
Cell 3 Load, lb-ft	155.48	1.054	210.81	1.429
K1 C3 Exhaust 1, F	400.88	.535	204.93	.297
K2 C3 Exhaust 2, F	401.80	.596	205.44	.331
K3 C3 Exhaust 3, F	446.03	.995	230.02	.553
K4 C3 Exhaust 4, F	385.40	.589	196.34	.327
K5 C3 Exhaust 5, F	408.25	.537	209.03	.298
K6 C3 Exhaust 6, F	407.55	.443	208.64	.246
K7-C3 Exhaust Comm, F	357.22	.499	180.68	.277
J1 C3 Water In, F	160.51	.078	71.397	.044
J2 C3 Water Out, F	169.54	.097	76.410	.054
J3 C3 Oil Sump, F	211.59	.099	99.770	.055
J4 C3 Fuel In, F	88.443	.044	31.357	.024
J5 C3 Inlet Air, F	99.604	.486	37.558	.270
J6 C3 Airbox, F	142.50	.221	61.391	.123
Horsepower	53.348	.400	39.775	.298
Corrected Horsepower	54.797	.411	40.855	.306
BSFC, lb/hp-hr	.492	.004	.300	.002
Corrected BSFC	.479	.004	.292	.002
Relative Humidity	24.320	.501	24.320	.501
Reference Pressure, inHg	32.054		108.55	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1402

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.05 in-Hg
Speed :	1802 RPM
Load :	155.5 lb-ft
Fuel Flow :	26.3 lb/hr
Brake Power :	53.35 bhp
BSFC :	.493 lb/bhp-hr
Indicated Power :	8.26 kW/cyl
Peak Pressure :	7.349 MPa
Peak Rate of Pressure Rise:	768.9 kPa/deg
Peak Heat Release Rate :	87.6 Joules/deg
Cumulative Heat Release :	538.438 Joules
Apparent Combustion Efficiency :	68.8 %
Indicated Thermal Efficiency :	35.1 %
Brake Thermal Efficiency :	28.2 %
Ignition Delay :	10.9 degrees
Centroid Phasing :	193.9 degrees
Centroid Magnitude :	16.24 J/degree
Sensitivity :	21.0 degrees
Premixed/Diffusion Ratio :	.51726

880114.152748 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	71.819	.438	22.121	.244
Wet Bulb Temperature, F	52.634	.098	11.463	.054
P11-Baro (Vent), "Hg ABS	29.300	.000	99.222	.001
P3 C3 Fuel Pressure,psig	72.259	.374	498.21	2.580
P4 C3 Oil Pressure, psig	47.337	.008	326.38	.057
P5 C3 Airbox Pres., psig	1.782	.005	12.287	.038
P10 C3 Exh Comm, inH2Og	8.282	.119	2.061	.030
P11 C3 Intake Vac,inH2Ov	10.443	.046	2.599	.012
P12 C3 Blowby, inH2Og	-.004	.010	-.001	.003
C3 Speed, RPM	1802.4	1.981	1802.4	1.981
C3 Fuel Flow, lb/hr	19.794	.076	8.978	.035
C3 Smoke, %	.512	.033	.512	.033
Cell 3 Load, lb-ft	94.621	.708	128.29	.960
K1 C3 Exhaust 1, F	355.97	.302	179.99	.168
K2 C3 Exhaust 2, F	354.42	.527	179.12	.293
K3 C3 Exhaust 3, F	387.67	.293	197.60	.163
K4 C3 Exhaust 4, F	315.70	.321	157.61	.178
K5 C3 Exhaust 5, F	315.88	.453	157.71	.252
K6 C3 Exhaust 6, F	323.18	.469	161.77	.260
K7-C3 Exhaust Comm, F	210.60	1.403	99.220	.780
J1 C3 Water In, F	164.31	.119	73.505	.066
J2 C3 Water Out, F	172.62	.160	78.122	.089
J3 C3 Oil Sump, F	209.76	.054	98.757	.030
J4 C3 Fuel In, F	87.893	.026	31.051	.014
J5 C3 Inlet Air, F	101.13	.300	38.408	.167
J6 C3 Airbox, F	146.28	.125	63.488	.070
Horsepower	32.472	.265	24.210	.198
Corrected Horsepower	33.401	.273	24.903	.203
BSFC, lb/hp-hr	.610	.005	.371	.003
Corrected BSFC	.593	.005	.361	.003
Relative Humidity	24.339	.847	24.339	.847
Reference Pressure, inHg	32.161		108.91	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1404

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.16 in-Hg
Speed :	1802 RPM
Load :	94.6 lb-ft
Fuel Flow :	19.8 lb/hr
Brake Power :	32.46 bhp
BSFC :	.610 lb/bhp-hr
Indicated Power :	6.39 kW/cyl
Peak Pressure :	6.960 MPa
Peak Rate of Pressure Rise:	744.1 kPa/deg
Peak Heat Release Rate :	85.2 Joules/deg
Cumulative Heat Release :	423.638 Joules
Apparent Combustion Efficiency :	71.9 %
Indicated Thermal Efficiency :	36.1 %
Brake Thermal Efficiency :	22.8 %
Ignition Delay :	11.5 degrees
Centroid Phasing :	194.6 degrees
Centroid Magnitude :	17.08 J/degree
Sensitivity :	21.1 degrees
Premixed/Diffusion Ratio :	.54337

880114.154337 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	72.530	.634	22.517	.352
Wet Bulb Temperature, F	53.154	.153	11.752	.085
P11-Baro (Vent), "Hg ABS	29.300	.001	99.221	.005
P3 C3 Fuel Pressure,psig	68.228	.084	470.42	.577
P4 C3 Oil Pressure, psig	32.080	.026	221.18	.176
P5 C3 Airbox Pres., psig	1.381	.011	9.518	.077
P10 C3 Exh Comm, inH2Og	8.500	.147	2.115	.036
P11 C3 Intake Vac,inH2Ov	6.830	.051	1.700	.013
P12 C3 Blowby, inH2Og	-.016	.012	-.004	.003
C3 Speed, RPM	1402.5	1.835	1402.5	1.835
C3 Fuel Flow, lb/hr	57.505	.839	26.084	.381
C3 Smoke, %	71.770	.948	71.770	.948
Cell 3 Load, lb-ft	378.13	1.501	512.68	2.035
K1 C3 Exhaust 1, F	633.87	3.887	334.37	2.159
K2 C3 Exhaust 2, F	713.13	.497	378.41	.276
K3 C3 Exhaust 3, F	809.23	5.485	431.79	3.047
K4 C3 Exhaust 4, F	665.11	.398	351.73	.221
K5 C3 Exhaust 5, F	820.44	1.785	438.02	.991
K6 C3 Exhaust 6, F	774.67	.843	412.59	.468
K7-C3 Exhaust Comm, F	335.40	2.642	168.55	1.468
J1 C3 Water In, F	152.48	.219	66.933	.122
J2 C3 Water Out, F	169.26	.218	76.254	.121
J3 C3 Oil Sump, F	232.28	.183	111.26	.102
J4 C3 Fuel In, F	88.240	.117	31.244	.065
J5 C3 Inlet Air, F	102.25	.293	39.030	.163
J6 C3 Airbox, F	158.69	.049	70.384	.027
Horsepower	100.97	.397	75.283	.296
Corrected Horsepower	103.99	.409	77.530	.305
BSFC, lb/hp-hr	.570	.009	.346	.006
Corrected BSFC	.553	.009	.336	.005
Relative Humidity	24.460	1.144	24.460	1.144
Reference Pressure, inHg	31.608		107.04	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1406

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.61 in-Hg
Speed :	1403 RPM
Load :	378.1 lb-ft
Fuel Flow :	57.5 lb/hr
Brake Power :	101.00 bhp
BSFC :	.569 lb/bhp-hr
Indicated Power :	13.57 kW/cyl
Peak Pressure :	10.32 MPa
Peak Rate of Pressure Rise:	752.1 kPa/deg
Peak Heat Release Rate :	85.1 Joules/deg
Cumulative Heat Release :	1189.96 Joules
Apparent Combustion Efficiency :	54.1 %
Indicated Thermal Efficiency :	26.4 %
Brake Thermal Efficiency :	24.4 %
Ignition Delay :	5.4 degrees
Centroid Phasing :	195.1 degrees
Centroid Magnitude :	14.73 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.19602

880114.155316 AL-16089-F AL-12920-L 6V53				5
Dry Bulb Temperature, F	72.668	.459	22.593	.255
Wet Bulb Temperature, F	53.269	.099	11.816	.055
P11-Baro (Vent), "Hg ABS	29.303	.000	99.232	.001
P3 C3 Fuel Pressure,psig	70.109	.099	483.39	.681
P4 C3 Oil Pressure, psig	37.290	.062	257.11	.427
P5 C3 Airbox Pres., psig	1.310	.006	9.029	.038
P10 C3 Exh Comm, inH2Og	5.387	.055	1.341	.014
P11 C3 Intake Vac,inH2Ov	6.924	.030	1.723	.008
P12 C3 Blowby, inH2Og	-.015	.009	-.004	.002
C3 Speed, RPM	1402.5	1.178	1402.5	1.178
C3 Fuel Flow, lb/hr	16.177	.075	7.338	.034
C3 Smoke, %	-.417	.077	-.417	.077
Cell 3 Load, lb-ft	101.88	.906	138.13	1.228
K1 C3 Exhaust 1, F	346.16	1.276	174.53	.709
K2 C3 Exhaust 2, F	335.81	1.387	168.78	.771
K3 C3 Exhaust 3, F	373.54	.727	189.74	.404
K4 C3 Exhaust 4, F	288.31	.285	142.39	.158
K5 C3 Exhaust 5, F	291.19	.338	144.00	.188
K6 C3 Exhaust 6, F	304.53	.089	151.41	.050
K7-C3 Exhaust Comm, F	231.60	3.713	110.89	2.063
J1 C3 Water In, F	160.10	1.694	71.169	.941
J2 C3 Water Out, F	167.74	1.181	75.412	.656
J3 C3 Oil Sump, F	206.51	.288	96.951	.160
J4 C3 Fuel In, F	92.563	12.330	33.646	6.850
J5 C3 Inlet Air, F	100.72	.380	38.175	.211
J6 C3 Airbox, F	147.57	.362	64.204	.201
Horsepower	27.206	.237	20.284	.177
Corrected Horsepower	27.978	.244	20.860	.182
BSFC, lb/hp-hr	.595	.003	.362	.002
Corrected BSFC	.578	.003	.352	.002
Relative Humidity	24.517	.836	24.517	.836
Reference Pressure, inHg	31.460		106.54	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1408

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.46 in-Hg
Speed :	1403 RPM
Load :	101.9 lb-ft
Fuel Flow :	16.2 lb/hr
Brake Power :	27.22 bhp
BSFC :	.595 lb/bhp-hr
Indicated Power :	4.97 kW/cyl
Peak Pressure :	6.941 MPa
Peak Rate of Pressure Rise:	837.1 kPa/deg
Peak Heat Release Rate :	97.4 Joules/deg
Cumulative Heat Release :	413.733 Joules
Apparent Combustion Efficiency :	66.8 %
Indicated Thermal Efficiency :	34.3 %
Brake Thermal Efficiency :	23.4 %
Ignition Delay :	10.5 degrees
Centroid Phasing :	190.7 degrees
Centroid Magnitude :	20.51 J/degree
Sensitivity :	18.2 degrees
Premixed/Diffusion Ratio :	.57689

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 5 FUEL BF02V132 86 DATE 6-18-88 PAGE 27

Operator Greg							
Time	9:10	9:25	9:45	10:00	10:15		
Test Hour	30 min	15 min	20 min	15 min	15 min		
Speed, RPM	2801	2499	2199	1800	1401		
Load, lb-ft	351.3	380.1	401.1	401.9	372.3		
Fuel Flow, lb/hr	79.2	74.5	69.3	61.3	51.8		
Exh. Opacity, %	2.5	3.0	5.0	20.5	52.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	740	750	710	655	610		
Exhaust Cyl. L2	770	800	750	760	690		
Exhaust Cyl. L3	855	890	900	830	760		
Exhaust Cyl. R1	780	760	740	710	650		
Exhaust Cyl. R2	870	870	900	890	800		
Exhaust Cyl. R3	880	890	900	900	750		
Exhaust Common	440	400	350	340	300		
Water In	153	154	154	154	155		
Water Out	167	168	168	169	170		
Oil Sump	238	237	236	233	233		
Fuel	93	93	93	93	91		
Inlet Air	97	100	97	99	98		
Airbox	199	193	184	163	159		
Wet Bulb	63.0	62.6	62.5	62.4	63.5		
Dry Bulb	72.0	71.8	72.2	71.6	72.0		
PRESSURES, PSIG							
Oil Gallery	52.5	50.3	47.5	42.5	32.5		
Air After Blower	5.0	4.0	2.95	2.0	1.4		
Fuel Transfer	76.0	74.5	73.0	71.0	69.0		
LOW PRESSURES							
Intake Vac., in.water		15.0	12.4	8.3	4.9		
Exh. Comm., in.Water	27.0	22.0	18.0	13.0	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	28.79	28.79	28.8	28.79	28.78		

980118.091436 AL-15299-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	76.493	.004	24.719	.002
Wet Bulb Temperature, F	69.698	.031	20.943	.017
P11-Baro (Vent), "Hg ABS	28.786	.000	97.481	.002
P3 C3 Fuel Pressure,psig	76.320	.271	526.21	1.870
P4 C3 Oil Pressure, psig	52.967	.018	365.19	.124
P5 C3 Airbox Pres., psig	4.704	.006	32.435	.044
P10 C3 Exh Comm, inH2Og	26.500	.296	6.594	.074
P11 C3 Intake Vac,inH2Ov	19.670	.109	4.885	.027
P12 C3 Blowby, inH2Og	.018	.002	.004	.001
C3 Speed, RPM	2802.5	2.963	2802.5	2.963
C3 Fuel Flow, lb/hr	79.878	.233	36.232	.106
C3 Smoke, %	2.090	.117	2.090	.117
Cell 3 Load, lb-ft	351.75	.609	476.91	.826
K1 C3 Exhaust 1, F	748.57	.491	398.09	.273
K2 C3 Exhaust 2, F	808.03	.329	431.13	.183
K3 C3 Exhaust 3, F	893.47	.176	478.59	.098
K4 C3 Exhaust 4, F	814.81	.485	434.90	.270
K5 C3 Exhaust 5, F	909.31	.448	487.39	.249
K6 C3 Exhaust 6, F	922.94	.440	494.97	.245
K7-C3 Exhaust Comm, F	449.19	.942	231.77	.524
J1 C3 Water In, F	154.16	.080	67.866	.044
J2 C3 Water Out, F	167.50	.053	75.275	.029
J3 C3 Oil Sump, F	240.32	.208	115.73	.115
J4 C3 Fuel In, F	93.986	.033	34.437	.018
J5 C3 Inlet Air, F	97.554	.203	36.419	.113
J6 C3 Airbox, F	200.85	.123	93.805	.068
Horsepower	187.70	.387	139.94	.289
Corrected Horsepower	199.18	.411	148.50	.307
BSFC, lb/hp-hr	.426	.001	.259	.001
Corrected BSFC	.401	.001	.244	.001
Relative Humidity	71.584	.132	71.584	.132
Reference Pressure, inHg	36.329		123.02	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1410

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.33 in-Hg
Speed :	2803 RPM
Load :	351.8 lb-ft
Fuel Flow :	79.9 lb/hr
Brake Power :	187.76 bhp
BSFC :	.426 lb/bhp-hr
Indicated Power :	26.81 kW/cyl
Peak Pressure :	9.390 MPa
Peak Rate of Pressure Rise:	473.6 kPa/deg
Peak Heat Release Rate :	39.0 Joules/deg
Cumulative Heat Release :	1121.63 Joules
Apparent Combustion Efficiency :	72.8 %
Indicated Thermal Efficiency :	37.3 %
Brake Thermal Efficiency :	32.4 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	197.7 degrees
Centroid Magnitude :	10.70 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.25238

980118.093220 AL-15299-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	75.816	.063	24.342	.035
Wet Bulb Temperature, F	66.749	.204	19.305	.113
P11-Baro (Vent), "Hg ABS	28.792	.000	97.502	.001
P3 C3 Fuel Pressure,psig	74.730	.417	515.25	2.874
P4 C3 Oil Pressure, psig	51.008	.025	351.69	.171
P5 C3 Airbox Pres., psig	3.659	.025	25.225	.171
P10 C3 Exh Comm, inH20g	22.088	.214	5.496	.053
P11 C3 Intake Vac,inH20v	14.961	.063	3.723	.016
P12 C3 Blowby, inH20g	.007	.003	.002	.001
C3 Speed, RPM	2501.1	2.652	2501.1	2.652
C3 Fuel Flow, lb/hr	75.186	.175	34.104	.079
C3 Smoke, %	2.495	.127	2.495	.127
Cell 3 Load, lb-ft	380.19	.635	515.47	.861
K1 C3 Exhaust 1, F	764.34	.591	406.85	.328
K2 C3 Exhaust 2, F	818.59	.657	436.99	.365
K3 C3 Exhaust 3, F	919.78	.383	493.21	.213
K4 C3 Exhaust 4, F	797.27	.394	425.15	.219
K5 C3 Exhaust 5, F	907.84	.506	486.58	.281
K6 C3 Exhaust 6, F	921.47	.265	494.15	.147
K7-C3 Exhaust Comm, F	413.65	2.179	212.03	1.211
J1 C3 Water In, F	154.60	.082	68.109	.045
J2 C3 Water Out, F	167.91	.049	75.503	.027
J3 C3 Oil Sump, F	237.86	.241	114.37	.134
J4 C3 Fuel In, F	92.545	.025	33.636	.014
J5 C3 Inlet Air, F	100.08	.209	37.824	.116
J6 C3 Airbox, F	192.70	.230	89.276	.128
Horsepower	181.06	.427	134.99	.318
Corrected Horsepower	191.88	.452	143.06	.337
BSFC, lb/hp-hr	.415	.001	.253	.001
Corrected BSFC	.392	.001	.239	.001
Relative Humidity	62.668	.577	62.668	.577
Reference Pressure, inHg	35.137		118.99	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1412

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.44 in-Hg
Speed :	2501 RPM
Load :	380.2 lb-ft
Fuel Flow :	75.2 lb/hr
Brake Power :	181.05 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	24.44 kW/cyl
Peak Pressure :	9.439 MPa
Peak Rate of Pressure Rise:	514.7 kPa/deg
Peak Heat Release Rate :	44.7 Joules/deg
Cumulative Heat Release :	1177.23 Joules
Apparent Combustion Efficiency :	72.5 %
Indicated Thermal Efficiency :	36.1 %
Brake Thermal Efficiency :	33.2 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	199.0 degrees
Centroid Magnitude :	10.36 J/degree
Sensitivity :	30.5 degrees
Premixed/Diffusion Ratio :	.21535

880118.095024 AL-15299-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	75.991	.020	24.439	.011
Wet Bulb Temperature, F	66.904	.215	19.391	.120
P11-Baro (Vent), "Hg ABS	28.796	.001	97.513	.003
P3 C3 Fuel Pressure,psig	72.904	.142	502.66	.981
P4 C3 Oil Pressure, psig	47.961	.009	330.68	.061
P5 C3 Airbox Pres., psig	2.583	.010	17.806	.068
P10 C3 Exh Comm, inH2Og	17.774	.145	4.423	.036
P11 C3 Intake Vac,inH2Ov	12.011	.048	2.989	.012
P12 C3 Blowby, inH2Og	-.003	.003	-.001	.001
C3 Speed, RPM	2200.5	2.543	2200.5	2.543
C3 Fuel Flow, lb/hr	69.624	.183	31.581	.083
C3 Smoke, %	4.699	.110	4.699	.110
Cell 3 Load, lb-ft	400.15	.914	542.53	1.239
K1 C3 Exhaust 1, F	733.28	.363	389.60	.202
K2 C3 Exhaust 2, F	815.93	.477	435.51	.265
K3 C3 Exhaust 3, F	929.50	.506	498.61	.281
K4 C3 Exhaust 4, F	777.56	.336	414.20	.187
K5 C3 Exhaust 5, F	934.48	.660	501.38	.367
K6 C3 Exhaust 6, F	941.26	.528	505.14	.293
K7-C3 Exhaust Comm, F	358.45	.292	181.36	.162
J1 C3 Water In, F	154.46	.063	68.031	.035
J2 C3 Water Out, F	168.34	.043	75.744	.024
J3 C3 Oil Sump, F	237.53	.246	114.18	.137
J4 C3 Fuel In, F	93.087	.030	33.937	.017
J5 C3 Inlet Air, F	98.386	.289	36.881	.160
J6 C3 Airbox, F	184.25	.056	84.583	.031
Horsepower	167.65	.379	125.00	.282
Corrected Horsepower	177.40	.401	132.26	.299
BSFC, lb/hp-hr	.415	.002	.253	.001
Corrected BSFC	.392	.002	.239	.001
Relative Humidity	62.672	.844	62.672	.844
Reference Pressure, inHg	33.170		112.33	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1414

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.17 in-Hg
Speed :	2201 RPM
Load :	400.2 lb-ft
Fuel Flow :	69.6 lb/hr
Brake Power :	167.72 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	21.93 kW/cyl
Peak Pressure :	9.642 MPa
Peak Rate of Pressure Rise:	520.7 kPa/deg
Peak Heat Release Rate :	46.9 Joules/deg
Cumulative Heat Release :	1206.21 Joules
Apparent Combustion Efficiency :	70.6 %
Indicated Thermal Efficiency :	35.0 %
Brake Thermal Efficiency :	33.3 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	198.2 degrees
Centroid Magnitude :	11.77 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.23311

880118.101152 AL-15299-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	74.704	.097	23.725	.054
Wet Bulb Temperature, F	65.372	.067	18.540	.037
P11-Baro (Vent), "Hg ABS	28.783	.000	97.471	.001
P3 C3 Fuel Pressure,psig	70.510	.372	486.15	2.567
P4 C3 Oil Pressure, psig	43.199	.005	297.85	.034
P5 C3 Airbox Pres., psig	1.688	.010	11.635	.069
P10 C3 Exh Comm, inH2Og	12.505	.149	3.112	.037
P11 C3 Intake Vac,inH2Ov	8.112	.049	2.019	.012
P12 C3 Blowby, inH2Og	-.012	.003	-.003	.001
C3 Speed, RPM	1801.8	2.274	1801.8	2.274
C3 Fuel Flow, lb/hr	61.385	.247	27.844	.112
C3 Smoke, %	21.631	.220	21.631	.220
Cell 3 Load, lb-ft	401.86	.466	544.84	.632
K1 C3 Exhaust 1, F	675.02	.214	357.24	.119
K2 C3 Exhaust 2, F	794.27	.487	423.48	.270
K3 C3 Exhaust 3, F	873.40	.369	467.45	.205
K4 C3 Exhaust 4, F	746.34	.657	396.86	.365
K5 C3 Exhaust 5, F	920.16	.965	493.42	.536
K6 C3 Exhaust 6, F	931.67	.308	499.82	.171
K7-C3 Exhaust Comm, F	343.62	.482	173.12	.268
J1 C3 Water In, F	154.63	.071	68.126	.039
J2 C3 Water Out, F	169.28	.043	76.267	.024
J3 C3 Oil Sump, F	233.46	.328	111.92	.182
J4 C3 Fuel In, F	92.773	.020	33.763	.011
J5 C3 Inlet Air, F	99.082	.122	37.268	.068
J6 C3 Airbox, F	162.70	.077	72.609	.043
Horsepower	137.87	.309	102.79	.230
Corrected Horsepower	145.85	.327	108.74	.244
BSFC, lb/hp-hr	.445	.002	.271	.001
Corrected BSFC	.421	.002	.256	.001
Relative Humidity	61.159	.294	61.159	.294
Reference Pressure, inHg	31.622		107.09	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1416

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.62 in-Hg
Speed :	1802 RPM
Load :	401.9 lb-ft
Fuel Flow :	61.4 lb/hr
Brake Power :	137.89 bhp
BSFC :	.445 lb/bhp-hr
Indicated Power :	17.13 kW/cyl
Peak Pressure :	9.638 MPa
Peak Rate of Pressure Rise:	592.0 kPa/deg
Peak Heat Release Rate :	59.0 Joules/deg
Cumulative Heat Release :	1157.50 Joules
Apparent Combustion Efficiency :	62.9 %
Indicated Thermal Efficiency :	31.0 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	6.1 degrees
Centroid Phasing :	197.2 degrees
Centroid Magnitude :	11.89 J/degree
Sensitivity :	29.1 degrees
Premixed/Diffusion Ratio :	.21043

880118.102221 AL-15299-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	74.595	.004	23.664	.002
Wet Bulb Temperature, F	65.641	.123	18.689	.068
P11-Baro (Vent), "Hg ABS	28.780	.000	97.460	.001
P3 C3 Fuel Pressure,psig	68.483	.067	472.17	.461
P4 C3 Oil Pressure, psig	32.700	.025	225.46	.173
P5 C3 Airbox Pres., psig	1.109	.010	7.649	.072
P10 C3 Exh Comm, inH2Og	8.235	.170	2.049	.042
P11 C3 Intake Vac,inH2Ov	4.909	.053	1.222	.013
P12 C3 Blowby, inH2Og	-.013	.002	-.003	.001
C3 Speed, RPM	1404.4	1.386	1404.4	1.386
C3 Fuel Flow, lb/hr	52.627	.216	23.871	.098
C3 Smoke, %	51.677	1.075	51.677	1.075
Cell 3 Load, lb-ft	373.84	1.781	506.85	2.414
K1 C3 Exhaust 1, F	619.79	.184	326.55	.102
K2 C3 Exhaust 2, F	708.04	.381	375.58	.212
K3 C3 Exhaust 3, F	791.94	.548	422.19	.304
K4 C3 Exhaust 4, F	667.90	.293	353.28	.163
K5 C3 Exhaust 5, F	821.74	.609	438.75	.338
K6 C3 Exhaust 6, F	775.49	.377	413.05	.209
K7-C3 Exhaust Comm, F	312.60	.668	155.89	.371
J1 C3 Water In, F	154.04	.035	67.799	.020
J2 C3 Water Out, F	169.90	.052	76.609	.029
J3 C3 Oil Sump, F	232.77	.175	111.54	.097
J4 C3 Fuel In, F	91.063	.017	32.813	.009
J5 C3 Inlet Air, F	98.733	.095	37.074	.053
J6 C3 Airbox, F	159.50	.023	70.832	.013
Horsepower	99.969	.513	74.534	.383
Corrected Horsepower	105.77	.543	78.859	.405
BSFC, lb/hp-hr	.526	.003	.320	.002
Corrected BSFC	.498	.003	.303	.002
Relative Humidity	62.539	.477	62.539	.477
Reference Pressure, inHg	30.678		103.89	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1418

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	30.68 in-Hg
Speed :	1404 RPM
Load :	373.8 lb-ft
Fuel Flow :	52.6 lb/hr
Brake Power :	99.93 bhp
BSFC :	.526 lb/bhp-hr
Indicated Power :	13.20 kW/cyl
Peak Pressure :	9.987 MPa
Peak Rate of Pressure Rise:	650.1 kPa/deg
Peak Heat Release Rate :	69.7 Joules/deg
Cumulative Heat Release :	1158.75 Joules
Apparent Combustion Efficiency :	57.2 %
Indicated Thermal Efficiency :	27.9 %
Brake Thermal Efficiency :	26.2 %
Ignition Delay :	5.1 degrees
Centroid Phasing :	196.1 degrees
Centroid Magnitude :	12.91 J/degree
Sensitivity :	29.0 degrees
Premixed/Diffusion Ratio :	.17728

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 5 FUEL TF PING 1387 DATE 1-19-88 PAGE 28

Operator	CRSG						
Time	9:00	9:10	9:30	9:45	9:55	11:35 [redacted]	11:45
Test Hour	30 MIN	10 MIN	20 MIN	15 MIN	10 MIN	[redacted]	10 MIN
Speed, RPM	2801	2600	2500	2200	2201	1798	1798
Load, lb-ft	368.2	348.3	286.8	415.4	225.1	410.4	272.4
Fuel Flow, lb/hr	86.9	82.6	57.7	75.7	41.0	66.3	38.2
Exh. Opacity, %	6.0	4.5	0	2.0	0	32.0	1.0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	770	800	590	745	500	690	500
Exhaust Cyl. L2	810	840	610	805	500	790	530
Exhaust Cyl. L3	900	945	690	940	550	870	590
Exhaust Cyl. R1	810	900	610	760	495	730	500
Exhaust Cyl. R2	910	920	680	940	545	900	610
Exhaust Cyl. R3	930	940	700	950	550	900	600
Exhaust Common	655	655	500	645	400	610	400
Water In	155	154	156	154	156	153	156
Water Out	169	168	168	169	167	168	168
Oil Sump	243	240	228	240	221	233	219
Fuel	92	89	89	89	88	87	90
Inlet Air	102	103	101	102	100	102	101
Airbox	207	199	175	188	164	164	150
Wet Bulb	58.9	58.5	58.5	60.0	60.2	59.8	57.8
Dry Bulb	71.5	71.0	73.0	75.0	74.0	75.0	71.5
PRESSURES, PSIG							
Oil Gallery	51.5	49.5	52.5	46.5	51.0	42.5	45.0
Air After Blower	5.0	4.0	3.8	3.0	2.8	2.0	1.9
Fuel Transfer	76.0	73.5	74.0	73.0	74.0	70.5	71.0
LOW PRESSURES							
Intake Vac., in.water	19.0	15.5	16.0	17.4	12.7	9.4	8.6
Exh. Comm., in.Water	27.0	23.0	19.5	18.3	14.5	13.5	11.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	28.74	28.75	28.76	28.76	28.76	28.77	28.78

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 5 FUEL TF01M15187 DATE 1-19-88 PAGE 24

Operator	GRG						
Time	11:55	12:05	12:20	12:30			
Test Hour	10 MIN	10 MIN	15 MIN	10 MIN			
Speed, RPM	1799	1798	1399	1398			
Load, lb-ft	149.5	89.3	378.4	94.4			
Fuel Flow, lb/hr	24.2	18.1	55.2	14.9			
Exh. Opacity, %	0	0	60.0	0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	350	610	340			
Exhaust Cyl. L2	380	340	670	310			
Exhaust Cyl. L3	420	360	780	350			
Exhaust Cyl. R1	360	300	650	270			
Exhaust Cyl. R2	390	300	740	280			
Exhaust Cyl. R3	380	300	750	300			
Exhaust Common	300	250	540	260			
Water In	160	162	153	158			
Water Out	169	169	169	167			
Oil Sump	210	206	231	204			
Fuel	91	92	89	89			
Inlet Air	98	100	101	101			
Airbox	146	144	156	145			
Wet Bulb	57.5	56.9	57.0	55.0			
Dry Bulb	76.0	76.5	76.5	75.5			
PRESSURES, PSIG							
Oil Gallery	46.5	47.5	32.5	37.0			
Air After Blower	1.8	1.8	1.3	1.4			
Fuel Transfer	71.5	72.0	68.0	70.0			
LOW PRESSURES							
Intake Vac., in.water	9.7	8.6	5.1	5.2			
Exh. Comm., in.Water	9.0	8.0	8.0	5.5			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	28.77	28.77	28.76	28.75			

980119.090316 AL-16089-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	76.397	.038	24.665	.021
Wet Bulb Temperature, F	65.686	.190	18.714	.106
P11-Baro (Vent), "Hg ABS	28.744	.000	97.339	.001
P3 C3 Fuel Pressure,psig	76.099	.279	524.69	1.921
P4 C3 Oil Pressure, psig	52.172	.017	359.71	.116
P5 C3 Airbox Pres., psig	4.724	.011	32.569	.074
P10 C3 Exh Comm, inH2Og	26.746	.193	6.655	.048
P11 C3 Intake Vac,inH2Ov	19.137	.079	4.762	.020
P12 C3 Blowby, inH2Og	.022	.002	.005	.001
C3 Speed, RPM	2799.9	1.461	2799.9	1.461
C3 Fuel Flow, lb/hr	87.994	.200	39.913	.091
C3 Smoke, %	6.192	.217	6.192	.217
Cell 3 Load, lb-ft	368.58	.933	499.72	1.265
K1 C3 Exhaust 1, F	791.47	1.113	421.93	.618
K2 C3 Exhaust 2, F	844.77	.407	451.54	.226
K3 C3 Exhaust 3, F	940.06	.793	504.48	.440
K4 C3 Exhaust 4, F	853.89	.925	456.60	.514
K5 C3 Exhaust 5, F	951.11	.933	510.62	.518
K6 C3 Exhaust 6, F	970.45	.885	521.36	.492
K7-C3 Exhaust Comm, F	693.89	3.209	367.71	1.783
J1 C3 Water In, F	154.61	.078	68.119	.044
J2 C3 Water Out, F	168.73	.045	75.960	.025
J3 C3 Oil Sump, F	243.42	.449	117.46	.249
J4 C3 Fuel In, F	91.751	.103	33.195	.057
J5 C3 Inlet Air, F	101.88	1.014	38.824	.563
J6 C3 Airbox, F	206.93	.188	97.185	.104
Horsepower	196.49	.512	146.50	.382
Corrected Horsepower	208.61	.544	155.54	.406
BSFC, lb/hp-hr	.448	.002	.272	.001
Corrected BSFC	.422	.002	.257	.001
Relative Humidity	56.958	.617	56.958	.617
Reference Pressure, inHg	36.954		125.14	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1420

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.95 in-Hg
Speed :	2800 RPM
Load :	368.6 lb-ft
Fuel Flow :	88.0 lb/hr
Brake Power :	196.51 bhp
BSFC :	.448 lb/bhp-hr
Indicated Power :	28.13 kW/cyl
Peak Pressure :	9.431 MPa
Peak Rate of Pressure Rise:	498.7 kPa/deg
Peak Heat Release Rate :	41.7 Joules/deg
Cumulative Heat Release :	1199.48 Joules
Apparent Combustion Efficiency :	71.1 %
Indicated Thermal Efficiency :	35.8 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	199.8 degrees
Centroid Magnitude :	11.11 J/degree
Sensitivity :	30.1 degrees
Premixed/Diffusion Ratio :	.25253

880119.091648 AL-16089-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	76.185	.096	24.547	.053
Wet Bulb Temperature, F	63.608	.357	17.560	.199
P11-Baro (Vent), "Hg ABS	28.747	.001	97.348	.003
P3 C3 Fuel Pressure,psig	73.832	.391	509.05	2.696
P4 C3 Oil Pressure, psig	50.245	.011	346.43	.076
P5 C3 Airbox Pres., psig	3.685	.018	25.409	.124
P10 C3 Exh Comm, inH2Og	22.402	.198	5.574	.049
P11 C3 Intake Vac,inH2Ov	15.621	.063	3.887	.016
P12 C3 Blowby, inH2Og	.011	.002	.003	.001
C3 Speed, RPM	2501.4	3.556	2501.4	3.556
C3 Fuel Flow, lb/hr	83.323	.187	37.795	.085
C3 Smoke, %	4.682	.170	4.682	.170
Cell 3 Load, lb-ft	398.53	.482	540.33	.654
K1 C3 Exhaust 1, F	811.14	.799	432.85	.444
K2 C3 Exhaust 2, F	873.12	.371	467.29	.206
K3 C3 Exhaust 3, F	981.00	.357	527.22	.198
K4 C3 Exhaust 4, F	842.46	.854	450.25	.474
K5 C3 Exhaust 5, F	969.19	.733	520.66	.407
K6 C3 Exhaust 6, F	980.24	.356	526.80	.198
K7-C3 Exhaust Comm, F	696.29	3.259	369.05	1.811
J1 C3 Water In, F	154.28	.104	67.931	.058
J2 C3 Water Out, F	168.48	.148	75.824	.082
J3 C3 Oil Sump, F	240.21	.388	115.67	.215
J4 C3 Fuel In, F	88.542	.057	31.412	.032
J5 C3 Inlet Air, F	103.26	.199	39.589	.111
J6 C3 Airbox, F	197.83	.147	92.130	.082
Horsepower	189.81	.392	141.52	.292
Corrected Horsepower	201.29	.416	150.07	.310
BSFC, lb/hp-hr	.439	.001	.267	.001
Corrected BSFC	.414	.001	.252	.001
Relative Humidity	50.283	.969	50.283	.969
Reference Pressure, inHg	35.101		118.87	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1422

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.10 in-Hg
Speed :	2501 RPM
Load :	398.5 lb-ft
Fuel Flow :	83.3 lb/hr
Brake Power :	189.77 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	25.49 kW/cyl
Peak Pressure :	9.564 MPa
Peak Rate of Pressure Rise:	525.1 kPa/deg
Peak Heat Release Rate :	46.4 Joules/deg
Cumulative Heat Release :	1237.58 Joules
Apparent Combustion Efficiency :	69.3 %
Indicated Thermal Efficiency :	34.2 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	199.8 degrees
Centroid Magnitude :	11.03 J/degree
Sensitivity :	30.7 degrees
Premixed/Diffusion Ratio :	.23028

880119.093434 AL-16089-F AL-12920-L 6V53N 5

Dry Bulb Temperature, F	75.956	.062	24.420	.035
Wet Bulb Temperature, F	63.267	.045	17.371	.025
P11-Baro (Vent), "Hg ABS	28.756	.000	97.378	.001
P3 C3 Fuel Pressure,psig	74.049	.136	510.55	.937
P4 C3 Oil Pressure, psig	52.913	.020	364.82	.141
P5 C3 Airbox Pres., psig	3.488	.012	24.049	.083
P10 C3 Exh Comm, inH2Og	18.788	.195	4.675	.048
P11 C3 Intake Vac,inH2Ov	15.834	.073	3.940	.018
P12 C3 Blowby, inH2Og	.008	.002	.002	.001
C3 Speed, RPM	2501.4	3.290	2501.4	3.290
C3 Fuel Flow, lb/hr	58.849	.123	26.694	.056
C3 Smoke, %	-.253	.103	-.253	.103
Cell 3 Load, lb-ft	286.06	1.465	387.84	1.986
K1 C3 Exhaust 1, F	599.86	.910	315.48	.506
K2 C3 Exhaust 2, F	639.07	.348	337.26	.193
K3 C3 Exhaust 3, F	717.49	.655	380.83	.364
K4 C3 Exhaust 4, F	642.57	.697	339.21	.387
K5 C3 Exhaust 5, F	713.90	.563	378.83	.313
K6 C3 Exhaust 6, F	722.17	.719	383.43	.400
K7-C3 Exhaust Comm, F	524.23	.746	273.46	.414
J1 C3 Water In, F	157.02	.221	69.458	.123
J2 C3 Water Out, F	168.40	.141	75.778	.079
J3 C3 Oil Sump, F	228.72	.249	109.29	.138
J4 C3 Fuel In, F	88.224	.033	31.235	.018
J5 C3 Inlet Air, F	100.91	.319	38.286	.177
J6 C3 Airbox, F	175.27	.074	79.594	.041
Horsepower	136.24	.803	101.58	.598
Corrected Horsepower	144.09	.849	107.43	.633
BSFC, lb/hp-hr	.432	.002	.263	.001
Corrected BSFC	.408	.002	.248	.001
Relative Humidity	49.750	.237	49.750	.237
Reference Pressure, inHg	34.693		117.48	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1424

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.69 in-Hg
Speed :	2501 RPM
Load :	286.1 lb-ft
Fuel Flow :	58.8 lb/hr
Brake Power :	136.24 bhp
BSFC :	.432 lb/bhp-hr
Indicated Power :	19.25 kW/cyl
Peak Pressure :	8.478 MPa
Peak Rate of Pressure Rise:	566.5 kPa/deg
Peak Heat Release Rate :	55.3 Joules/deg
Cumulative Heat Release :	906.436 Joules
Apparent Combustion Efficiency :	71.9 %
Indicated Thermal Efficiency :	36.6 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	9.3 degrees
Centroid Phasing :	197.8 degrees
Centroid Magnitude :	10.69 J/degree
Sensitivity :	26.5 degrees
Premixed/Diffusion Ratio :	.35187

880119.095054 AL-16089-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	75.774	.023	24.319	.013
Wet Bulb Temperature, F	63.895	.133	17.720	.074
P11-Baro (Vent), "Hg ABS	28.759	.001	97.390	.002
P3 C3 Fuel Pressure,psig	72.964	.318	503.07	2.193
P4 C3 Oil Pressure, psig	47.243	.008	325.73	.055
P5 C3 Airbox Pres., psig	2.595	.013	17.891	.088
P10 C3 Exh Comm, inH2Og	18.044	.148	4.490	.037
P11 C3 Intake Vac,inH2Ov	12.645	.062	3.147	.015
P12 C3 Blowby, inH2Og	.001	.002	.000	.001
C3 Speed, RPM	2201.1	2.665	2201.1	2.665
C3 Fuel Flow, lb/hr	76.492	.200	34.696	.091
C3 Smoke, %	8.170	.159	8.170	.159
Cell 3 Load, lb-ft	414.28	.625	561.69	.847
K1 C3 Exhaust 1, F	763.45	.184	406.36	.102
K2 C3 Exhaust 2, F	847.03	.346	452.79	.192
K3 C3 Exhaust 3, F	972.39	.513	522.44	.285
K4 C3 Exhaust 4, F	809.74	.506	432.08	.281
K5 C3 Exhaust 5, F	976.40	.560	524.67	.311
K6 C3 Exhaust 6, F	988.28	.348	531.27	.193
K7-C3 Exhaust Comm, F	673.37	2.847	356.32	1.582
J1 C3 Water In, F	154.18	.071	67.878	.040
J2 C3 Water Out, F	168.60	.055	75.887	.030
J3 C3 Oil Sump, F	239.78	.201	115.43	.112
J4 C3 Fuel In, F	88.386	.024	31.325	.014
J5 C3 Inlet Air, F	102.03	.340	38.908	.189
J6 C3 Airbox, F	187.75	.069	86.526	.038
Horsepower	173.63	.237	129.45	.176
Corrected Horsepower	183.93	.251	137.13	.187
BSFC, lb/hp-hr	.441	.001	.268	.001
Corrected BSFC	.416	.001	.253	.001
Relative Humidity	52.465	.479	52.465	.479
Reference Pressure, inHg	33.112		112.13	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1426

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.11 in-Hg
Speed :	2201 RPM
Load :	414.3 lb-ft
Fuel Flow :	76.5 lb/hr
Brake Power :	173.62 bhp
BSFC :	.441 lb/bhp-hr
Indicated Power :	22.96 kW/cyl
Peak Pressure :	9.728 MPa
Peak Rate of Pressure Rise:	582.9 kPa/deg
Peak Heat Release Rate :	55.9 Joules/deg
Cumulative Heat Release :	1254.18 Joules
Apparent Combustion Efficiency :	67.3 %
Indicated Thermal Efficiency :	33.6 %
Brake Thermal Efficiency :	31.6 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	197.8 degrees
Centroid Magnitude :	11.98 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.23839

880119.100348 AL-16089-F AL-12920-L 6V53N 5

Dry Bulb Temperature, F	75.862	.029	24.368	.016
Wet Bulb Temperature, F	63.170	.295	17.317	.164
P11-Baro (Vent), "Hg ABS	28.769	.000	97.424	.001
P3 C3 Fuel Pressure,psig	74.232	.361	511.81	2.487
P4 C3 Oil Pressure, psig	51.321	.026	353.85	.183
P5 C3 Airbox Pres., psig	2.415	.010	16.651	.071
P10 C3 Exh Comm, inH2Og	13.582	.151	3.380	.038
P11 C3 Intake Vac,inH2Ov	12.847	.051	3.197	.013
P12 C3 Blowby, inH2Og	.010	.004	.002	.001
C3 Speed, RPM	2202.2	2.838	2202.2	2.838
C3 Fuel Flow, lb/hr	41.585	.197	18.863	.089
C3 Smoke, %	-.642	.039	-.642	.039
Cell 3 Load, lb-ft	223.94	.701	303.62	.951
K1 C3 Exhaust 1, F	506.21	.381	263.45	.212
K2 C3 Exhaust 2, F	523.38	.497	272.99	.276
K3 C3 Exhaust 3, F	581.36	.269	305.20	.150
K4 C3 Exhaust 4, F	514.47	.290	268.04	.161
K5 C3 Exhaust 5, F	568.52	.260	298.07	.145
K6 C3 Exhaust 6, F	572.85	.461	300.47	.256
K7-C3 Exhaust Comm, F	425.56	1.736	218.65	.964
J1 C3 Water In, F	156.69	.061	69.270	.034
J2 C3 Water Out, F	166.87	.046	74.929	.026
J3 C3 Oil Sump, F	221.16	.244	105.09	.135
J4 C3 Fuel In, F	88.076	.068	31.154	.038
J5 C3 Inlet Air, F	100.06	.181	37.812	.100
J6 C3 Airbox, F	164.86	.222	73.811	.123
Horsepower	93.902	.353	70.011	.263
Corrected Horsepower	99.181	.373	73.946	.278
BSFC, lb/hp-hr	.443	.003	.269	.002
Corrected BSFC	.419	.003	.255	.002
Relative Humidity	49.680	1.001	49.680	1.001
Reference Pressure, inHg	32.746		110.89	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1428

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.10 in-Hg
Speed :	2202 RPM
Load :	223.9 lb-ft
Fuel Flow :	41.6 lb/hr
Brake Power :	93.87 bhp
BSFC :	.443 lb/bhp-hr
Indicated Power :	13.73 kW/cyl
Peak Pressure :	7.954 MPa
Peak Rate of Pressure Rise:	693.6 kPa/deg
Peak Heat Release Rate :	76.0 Joules/deg
Cumulative Heat Release :	718.156 Joules
Apparent Combustion Efficiency :	70.9 %
Indicated Thermal Efficiency :	36.9 %
Brake Thermal Efficiency :	31.4 %
Ignition Delay :	10.6 degrees
Centroid Phasing :	194.2 degrees
Centroid Magnitude :	13.91 J/degree
Sensitivity :	21.7 degrees
Premixed/Diffusion Ratio :	.48752

880119.113541 AL-16089-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	76.151	.122	24.528	.068
Wet Bulb Temperature, F	61.198	.449	16.221	.250
P11-Baro (Vent), "Hg ABS	28.775	.001	97.442	.002
P3 C3 Fuel Pressure,psig	69.978	.158	482.48	1.089
P4 C3 Oil Pressure, psig	43.045	.030	296.78	.209
P5 C3 Airbox Pres., psig	1.723	.011	11.882	.079
P10 C3 Exh Comm, inH2Og	12.480	.216	3.106	.054
P11 C3 Intake Vac,inH2Ov	8.438	.052	2.100	.013
P12 C3 Blowby, inH2Og	.053	.039	.013	.010
C3 Speed, RPM	1799.5	2.329	1799.5	2.329
C3 Fuel Flow, lb/hr	67.390	.216	30.567	.098
C3 Smoke, %	32.618	.236	32.618	.236
Cell 3 Load, lb-ft	409.89	.728	555.73	.987
K1 C3 Exhaust 1, F	706.87	.726	374.93	.403
K2 C3 Exhaust 2, F	822.13	.639	438.96	.355
K3 C3 Exhaust 3, F	914.06	.901	490.03	.500
K4 C3 Exhaust 4, F	767.52	.606	408.62	.337
K5 C3 Exhaust 5, F	944.01	.552	506.67	.306
K6 C3 Exhaust 6, F	942.94	.371	506.08	.206
K7-C3 Exhaust Comm, F	641.68	1.495	338.71	.830
J1 C3 Water In, F	153.23	.070	67.349	.039
J2 C3 Water Out, F	168.45	.063	75.808	.035
J3 C3 Oil Sump, F	232.85	.172	111.58	.095
J4 C3 Fuel In, F	87.906	.194	31.059	.108
J5 C3 Inlet Air, F	105.93	.546	41.072	.303
J6 C3 Airbox, F	160.45	.345	71.359	.192
Horsepower	140.44	.275	104.71	.205
Corrected Horsepower	148.75	.292	110.90	.217
BSFC, lb/hp-hr	.480	.002	.292	.001
Corrected BSFC	.453	.002	.276	.001
Relative Humidity	42.238	1.170	42.238	1.170
Reference Pressure, inHg	31.663		107.22	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1430

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.66 in-Hg
Speed :	1800 RPM
Load :	409.9 lb-ft
Fuel Flow :	67.4 lb/hr
Brake Power :	140.48 bhp
BSFC :	.480 lb/bhp-hr
Indicated Power :	18.10 kW/cyl
Peak Pressure :	9.877 MPa
Peak Rate of Pressure Rise:	722.7 kPa/deg
Peak Heat Release Rate :	78.3 Joules/deg
Cumulative Heat Release :	1220.73 Joules
Apparent Combustion Efficiency :	60.8 %
Indicated Thermal Efficiency :	30.0 %
Brake Thermal Efficiency :	29.0 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	196.7 degrees
Centroid Magnitude :	13.68 J/degree
Sensitivity :	28.1 degrees
Premixed/Diffusion Ratio :	.23692

880119.114422 AL-16089-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	76.225	.063	24.570	.035
Wet Bulb Temperature, F	60.740	.055	15.967	.030
P11-Baro (Vent), "Hg ABS	28.778	.001	97.453	.002
P3 C3 Fuel Pressure,psig	70.898	.136	488.82	.939
P4 C3 Oil Pressure, psig	45.454	.014	313.39	.093
P5 C3 Airbox Pres., psig	1.473	.006	10.158	.043
P10 C3 Exh Comm, inH2Og	10.161	.151	2.529	.037
P11 C3 Intake Vac,inH2Ov	8.811	.056	2.193	.014
P12 C3 Blowby, inH2Og	.047	.014	.012	.003
C3 Speed, RPM	1800.2	2.126	1800.2	2.126
C3 Fuel Flow, lb/hr	38.930	.075	17.659	.034
C3 Smoke, %	.424	.053	.424	.053
Cell 3 Load, lb-ft	274.50	1.346	372.17	1.825
K1 C3 Exhaust 1, F	502.85	.354	261.58	.196
K2 C3 Exhaust 2, F	541.76	.457	283.20	.254
K3 C3 Exhaust 3, F	603.10	.541	317.28	.300
K4 C3 Exhaust 4, F	525.30	.333	274.06	.185
K5 C3 Exhaust 5, F	638.78	.859	337.10	.477
K6 C3 Exhaust 6, F	619.86	.765	326.59	.425
K7-C3 Exhaust Comm, F	431.27	1.270	221.82	.706
J1 C3 Water In, F	157.18	.078	69.543	.043
J2 C3 Water Out, F	168.21	.031	75.672	.017
J3 C3 Oil Sump, F	220.18	.158	104.55	.088
J4 C3 Fuel In, F	90.548	.025	32.527	.014
J5 C3 Inlet Air, F	102.54	.325	39.186	.180
J6 C3 Airbox, F	151.72	.166	66.513	.092
Horsepower	94.092	.447	70.153	.333
Corrected Horsepower	99.298	.472	74.034	.352
BSFC, lb/hp-hr	.414	.002	.252	.001
Corrected BSFC	.392	.002	.239	.001
Relative Humidity	40.550	.306	40.550	.306
Reference Pressure, inHg	31.130		105.42	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1432

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.13 in-Hg
Speed :	1800 RPM
Load :	274.5 lb-ft
Fuel Flow :	38.9 lb/hr
Brake Power :	94.08 bhp
BSFC :	.413 lb/bhp-hr
Indicated Power :	12.22 kW/cyl
Peak Pressure :	8.140 MPa
Peak Rate of Pressure Rise:	676.7 kPa/deg
Peak Heat Release Rate :	73.3 Joules/deg
Cumulative Heat Release :	786.583 Joules
Apparent Combustion Efficiency :	67.9 %
Indicated Thermal Efficiency :	35.1 %
Brake Thermal Efficiency :	33.6 %
Ignition Delay :	9.4 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	12.98 J/degree
Sensitivity :	22.6 degrees
Premixed/Diffusion Ratio :	.41753

880119.115556 AL-16089-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	75.932	.076	24.406	.042
Wet Bulb Temperature, F	61.900	.191	16.611	.106
P11-Baro (Vent), "Hg ABS	28.772	.001	97.433	.002
P3 C3 Fuel Pressure,psig	71.502	.173	492.99	1.194
P4 C3 Oil Pressure, psig	47.139	.009	325.01	.061
P5 C3 Airbox Pres., psig	1.468	.004	10.125	.030
P10 C3 Exh Comm, inH2Og	8.531	.105	2.123	.026
P11 C3 Intake Vac,inH2Ov	8.987	.038	2.236	.009
P12 C3 Blowby, inH2Og	.030	.014	.007	.003
C3 Speed, RPM	1799.3	2.385	1799.3	2.385
C3 Fuel Flow, lb/hr	25.000	.081	11.340	.037
C3 Smoke, %	.499	.035	.499	.035
Cell 3 Load, lb-ft	149.82	.434	203.13	.588
K1 C3 Exhaust 1, F	395.10	.171	201.72	.095
K2 C3 Exhaust 2, F	400.26	.164	204.59	.091
K3 C3 Exhaust 3, F	441.46	.186	227.48	.103
K4 C3 Exhaust 4, F	379.71	.167	193.17	.093
K5 C3 Exhaust 5, F	403.05	.259	206.14	.144
K6 C3 Exhaust 6, F	401.94	.264	205.52	.146
K7-C3 Exhaust Comm, F	313.90	.986	156.61	.548
J1 C3 Water In, F	160.59	.064	71.439	.035
J2 C3 Water Out, F	169.53	.038	76.403	.021
J3 C3 Oil Sump, F	211.06	.144	99.478	.080
J4 C3 Fuel In, F	91.344	.047	32.969	.026
J5 C3 Inlet Air, F	99.044	.141	37.247	.079
J6 C3 Airbox, F	146.05	.147	63.361	.082
Horsepower	51.329	.166	38.270	.124
Corrected Horsepower	54.085	.175	40.324	.131
BSFC, lb/hp-hr	.487	.003	.296	.002
Corrected BSFC	.462	.003	.281	.002
Relative Humidity	45.151	.459	45.151	.459
Reference Pressure, inHg	31.101		105.32	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N

FILE : DN1434

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.10 in-Hg
Speed :	1799 RPM
Load :	149.8 lb-ft
Fuel Flow :	25.0 lb/hr
Brake Power :	51.31 bhp
BSFC :	.487 lb/bhp-hr
Indicated Power :	8.22 kW/cyl
Peak Pressure :	7.233 MPa
Peak Rate of Pressure Rise:	772.9 kPa/deg
Peak Heat Release Rate :	89.0 Joules/deg
Cumulative Heat Release :	527.517 Joules
Apparent Combustion Efficiency :	70.8 %
Indicated Thermal Efficiency :	36.8 %
Brake Thermal Efficiency :	28.5 %
Ignition Delay :	11.3 degrees
Centroid Phasing :	193.2 degrees
Centroid Magnitude :	17.10 J/degree
Sensitivity :	20.0 degrees
Premixed/Diffusion Ratio :	.56380

380119.120619 AL-16089-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	76.029	.105	24.461	.059
Wet Bulb Temperature, F	58.545	.217	14.747	.121
P11-Baro (Vent), "Hg ABS	28.766	.001	97.411	.003
P3 C3 Fuel Pressure,psig	71.452	.216	492.64	1.491
P4 C3 Oil Pressure, psig	47.951	.009	330.61	.061
P5 C3 Airbox Pres., psig	1.511	.004	10.418	.030
P10 C3 Exh Comm, inH2Og	7.814	.089	1.944	.022
P11 C3 Intake Vac,inH2Ov	8.860	.059	2.205	.015
P12 C3 Blowby, inH2Og	.012	.026	.003	.006
C3 Speed, RPM	1800.5	2.282	1800.5	2.282
C3 Fuel Flow, lb/hr	18.873	.070	8.561	.032
C3 Smoke, %	.741	.022	.741	.022
Cell 3 Load, lb-ft	89.350	.678	121.14	.919
K1 C3 Exhaust 1, F	353.98	.538	178.88	.299
K2 C3 Exhaust 2, F	347.89	.504	175.50	.280
K3 C3 Exhaust 3, F	379.27	.782	192.93	.434
K4 C3 Exhaust 4, F	308.08	.369	153.38	.205
K5 C3 Exhaust 5, F	309.00	.380	153.89	.211
K6 C3 Exhaust 6, F	317.74	.448	158.74	.249
K7-C3 Exhaust Comm, F	270.18	.853	132.32	.474
J1 C3 Water In, F	162.01	.045	72.226	.025
J2 C3 Water Out, F	169.91	.029	76.619	.016
J3 C3 Oil Sump, F	206.76	.081	97.090	.045
J4 C3 Fuel In, F	91.779	.015	33.210	.008
J5 C3 Inlet Air, F	100.35	.094	37.973	.052
J6 C3 Airbox, F	144.79	.054	62.662	.030
Horsepower	30.631	.255	22.838	.190
Corrected Horsepower	32.207	.268	24.013	.200
BSFC, lb/hp-hr	.616	.005	.375	.003
Corrected BSFC	.586	.005	.357	.003
Relative Humidity	34.033	.481	34.033	.481
Reference Pressure, inHg	31.190		105.62	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1436

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.19 in-Hg
Speed :	1801 RPM
Load :	89.4 lb-ft
Fuel Flow :	18.9 lb/hr
Brake Power :	30.66 bhp
BSFC :	.617 lb/bhp-hr
Indicated Power :	6.42 kW/cyl
Peak Pressure :	6.876 MPa
Peak Rate of Pressure Rise:	744.9 kPa/deg
Peak Heat Release Rate :	86.3 Joules/deg
Cumulative Heat Release :	410.627 Joules
Apparent Combustion Efficiency :	72.9 %
Indicated Thermal Efficiency :	38.0 %
Brake Thermal Efficiency :	22.5 %
Ignition Delay :	11.9 degrees
Centroid Phasing :	192.7 degrees
Centroid Magnitude :	18.66 J/degree
Sensitivity :	18.9 degrees
Premixed/Diffusion Ratio :	.62745

880119.122008 AL-16089-F AL-12920-L 6V53N				5
Dry Bulb Temperature, F	75.081	.073	23.934	.041
Wet Bulb Temperature, F	59.110	.092	15.061	.051
P11-Baro (Vent), "Hg ABS	28.757	.001	97.382	.002
P3 C3 Fuel Pressure,psig	67.665	.131	466.54	.901
P4 C3 Oil Pressure, psig	32.965	.049	227.28	.340
P5 C3 Airbox Pres., psig	1.124	.010	7.750	.070
P10 C3 Exh Comm, inH2Og	8.137	.108	2.025	.027
P11 C3 Intake Vac,inH2Ov	5.470	.039	1.361	.010
P12 C3 Blowby, inH2Og	.002	.009	.000	.002
C3 Speed, RPM	1400.5	1.257	1400.5	1.257
C3 Fuel Flow, lb/hr	56.126	.113	25.458	.051
C3 Smoke, %	59.526	1.386	59.526	1.386
Cell 3 Load, lb-ft	378.16	1.121	512.71	1.520
K1 C3 Exhaust 1, F	623.16	.252	328.42	.140
K2 C3 Exhaust 2, F	698.59	.564	370.33	.313
K3 C3 Exhaust 3, F	806.90	.525	430.50	.291
K4 C3 Exhaust 4, F	671.72	.840	355.40	.467
K5 C3 Exhaust 5, F	811.85	.746	433.25	.414
K6 C3 Exhaust 6, F	774.40	.371	412.45	.206
K7-C3 Exhaust Comm, F	543.76	1.653	284.31	.918
J1 C3 Water In, F	153.67	.058	67.593	.032
J2 C3 Water Out, F	169.58	.057	76.434	.031
J3 C3 Oil Sump, F	230.20	.279	110.11	.155
J4 C3 Fuel In, F	89.200	.015	31.778	.008
J5 C3 Inlet Air, F	102.29	.237	39.050	.132
J6 C3 Airbox, F	154.37	.305	67.982	.170
Horsepower	100.84	.251	75.183	.187
Corrected Horsepower	106.34	.265	79.285	.198
BSFC, lb/hp-hr	.557	.002	.339	.001
Corrected BSFC	.528	.002	.321	.001
Relative Humidity	38.121	.420	38.121	.420
Reference Pressure, inHg	30.643		103.77	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1438

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	30.64 in-Hg
Speed :	1401 RPM
Load :	378.2 lb-ft
Fuel Flow :	56.1 lb/hr
Brake Power :	100.89 bhp
BSFC :	.556 lb/bhp-hr
Indicated Power :	13.74 kW/cyl
Peak Pressure :	10.12 MPa
Peak Rate of Pressure Rise:	775.2 kPa/deg
Peak Heat Release Rate :	88.3 Joules/deg
Cumulative Heat Release :	1195.33 Joules
Apparent Combustion Efficiency :	55.7 %
Indicated Thermal Efficiency :	27.4 %
Brake Thermal Efficiency :	25.0 %
Ignition Delay :	5.8 degrees
Centroid Phasing :	195.4 degrees
Centroid Magnitude :	14.97 J/degree
Sensitivity :	27.6 degrees
Premixed/Diffusion Ratio :	.21110

880119.123103 AL-16089-F	AL-12920-L	6V53N			5
Dry Bulb Temperature, F	74.324	.031	23.513	.017
Wet Bulb Temperature, F	58.126	.039	14.514	.022
P11-Baro (Vent), "Hg ABS	28.749	.001	97.354	.002
P3 C3 Fuel Pressure,psig	69.368	.123	478.28	.851
P4 C3 Oil Pressure, psig	37.392	.119	257.81	.819
P5 C3 Airbox Pres., psig	1.061	.005	7.312	.033
P10 C3 Exh Comm, inH2Og	5.162	.066	1.285	.016
P11 C3 Intake Vac,inH2Ov	5.704	.031	1.419	.008
P12 C3 Blowby, inH2Og	.023	.015	.006	.004
C3 Speed, RPM	1401.5	1.192	1401.5	1.192
C3 Fuel Flow, lb/hr	15.559	.040	7.057	.018
C3 Smoke, %	-.047	.060	-.047	.060
Cell 3 Load, lb-ft	99.652	.477	135.11	.647
K1 C3 Exhaust 1, F	345.77	.223	174.32	.124
K2 C3 Exhaust 2, F	333.45	1.122	167.47	.623
K3 C3 Exhaust 3, F	372.62	.425	189.23	.236
K4 C3 Exhaust 4, F	282.61	.385	139.23	.214
K5 C3 Exhaust 5, F	287.58	.477	141.99	.265
K6 C3 Exhaust 6, F	303.18	.667	150.66	.370
K7-C3 Exhaust Comm, F	296.14	3.724	146.74	2.069
J1 C3 Water In, F	157.68	.188	69.822	.105
J2 C3 Water Out, F	166.90	.423	74.947	.235
J3 C3 Oil Sump, F	206.94	.487	97.191	.271
J4 C3 Fuel In, F	88.631	.011	31.462	.006
J5 C3 Inlet Air, F	102.22	4.995	39.009	2.775
J6 C3 Airbox, F	147.34	.292	64.078	.162
Horsepower	26.592	.140	19.826	.104
Corrected Horsepower	28.030	.147	20.898	.110
BSFC, lb/hp-hr	.585	.003	.356	.002
Corrected BSFC	.555	.003	.338	.002
Relative Humidity	36.786	.173	36.786	.173
Reference Pressure, inHg	30.488		103.25	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1440

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	30.49 in-Hg
Speed :	1402 RPM
Load :	99.7 lb-ft
Fuel Flow :	15.6 lb/hr
Brake Power :	26.61 bhp
BSFC :	.586 lb/bhp-hr
Indicated Power :	5.13 kW/cyl
Peak Pressure :	6.844 MPa
Peak Rate of Pressure Rise:	841.6 kPa/deg
Peak Heat Release Rate :	98.6 Joules/deg
Cumulative Heat Release :	414.367 Joules
Apparent Combustion Efficiency :	69.4 %
Indicated Thermal Efficiency :	36.8 %
Brake Thermal Efficiency :	23.7 %
Ignition Delay :	10.8 degrees
Centroid Phasing :	190.0 degrees
Centroid Magnitude :	20.89 J/degree
Sensitivity :	17.2 degrees
Premixed/Diffusion Ratio :	.62738

APPENDIX F6
DDC 6V-53N DATA SHEETS
FUEL BLEND TF02

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: DDA 6V-53N Engine Tester: G. Phillips
Test Fuel: TF02N21487 Date: 1-22-88

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressure:
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF02N21487 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressure.
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF02N21487 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF02N2L87 Date: 1-22-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	177	DN1441	DN1442
2500	178	DN1443	DN1444
2200	179	DN1445	DN1446
1800	180	DN1447	DN1448
1400	181	DN1449	DN1450

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF02N2L87

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	182	DN1451	DN1452
2500	Full-Rack	183	DN1453	DN1454
2500	145	184	DN1455	DN1456
2200	Full-Rack	185	DN1457	DN1458
2200	100	186	DN1459	DN1460
1800	Full-Rack	187	DN1461	DN1462
1800	100	188	DN1463	DN1464
1800	54	189	DN1465	DN1466
1800	20	190	DN1467	DN1468
1400	Full-Rack	191	DN1469	DN1470
1400	28	192	DN1471	DN1472

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF02N21487 Date: 1-25-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	193	DN1473	DN1474
2500	194	DN1475	DN1476
2200	195	DN1477	DN1478
1800	196	DN1479	DN1480
1400	197	DN1481	DN1482

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF02N21487

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	198	DN1483	DN1484
2500	Full-Rack	199	DN1485	DN1486
2500	145	200	DN1487	DN1488
2200	Full-Rack	201	DN1489	DN1490
2200	100	202	DN1491	DN1492
1800	Full-Rack	203	DN1493	DN1494
1800	100	204	DN1495	DN1496
1800	54	205	DN1497	DN1498
1800	20	206	DN1499	DN1500
1400	Full-Rack	207	DN1501	DN1502
1400	28	209	DN1503	DN1504

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 6 FUEL ~~FFO2N37L87~~ BFO 2D/3L86 DATE ~~1-22-88~~ PAGE 30

Operator Eric							
Time	9:20	9:40	9:55	10:15	10:30		
Test Hour	40 min	20 min	15 min	20 min	15 min		
Speed, RPM	2801	2300	2199	1800	1399		
Load, lb-ft	334	388.5	408.9	411.1	384.3		
Fuel Flow, lb/hr	80.3	76.0	70.6	62.3	53.0		
Exh. Opacity, %	2.0	3.5	5.5	17.5	43.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	750	710	660	610		
Exhaust Cyl. L2	780	790	780	750	690		
Exhaust Cyl. L3	860	870	900	850	770		
Exhaust Cyl. R1	780	760	740	710	650		
Exhaust Cyl. R2	870	870	900	890	800		
Exhaust Cyl. R3	890	890	900	900	750		
Exhaust Common	640	640	610	600	350		
Water In	154	154	153	155	155		
Water Out	167	169	169	170	170		
Oil Sump	242	241	240	236	237		
Fuel	90	93	91	91	90		
Inlet Air	100	100	99	99	102		
Airbox	204	193	184	162	160		
Wet Bulb	52.5	53.0	53.0	55.5	54.2		
Dry Bulb	78.0	71.5	72.9	75.0	72.5		
PRESSURES, PSIG							
Oil Gallery	52.5	50.0	47.0	42.5	32.0		
Air After Blower	5.0	4.0	3.0	2.0	1.5		
Fuel Transfer	76.0	74.0	73.0	70.5	68.5		
LOW PRESSURES							
Intake Vac., in.water	18.5	16.0	12.8	8.6	5.1		
Exh. Comm., in.Water	27.0	23.0	18.5	13.5	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.33	29.34	29.34	29.34	29.34		

880122.091723 AL-15299-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	78.647	.293	25.915	.163
Wet Bulb Temperature, F	53.300	.078	11.833	.043
P11-Baro (Vent), "Hg ABS	29.335	.000	99.338	.001
P3 C3 Fuel Pressure,psig	76.204	.526	525.41	3.625
P4 C3 Oil Pressure, psig	52.984	.015	365.31	.106
P5 C3 Airbox Pres., psig	5.051	.012	34.824	.084
P10 C3 Exh Comm, inH2Og	26.611	.155	6.622	.039
P11 C3 Intake Vac,inH2Ov	18.901	.176	4.450	.044
P12 C3 Blowby, inH2Og	.029	.009	.007	.002
C3 Speed, RPM	2801.2	3.041	2801.2	3.041
C3 Fuel Flow, lb/hr	81.231	.226	36.846	.103
C3 Smoke, %	2.338	.086	2.338	.086
Cell 3 Load, lb-ft	356.92	.671	483.92	.910
K1 C3 Exhaust 1, F	760.98	.701	404.99	.389
K2 C3 Exhaust 2, F	815.21	.641	435.12	.356
K3 C3 Exhaust 3, F	905.11	.576	485.06	.320
K4 C3 Exhaust 4, F	814.91	.976	434.95	.542
K5 C3 Exhaust 5, F	909.23	.450	487.35	.250
K6 C3 Exhaust 6, F	928.05	1.052	497.81	.585
K7-C3 Exhaust Comm, F	662.80	3.824	350.45	2.124
J1 C3 Water In, F	153.18	.050	67.322	.028
J2 C3 Water Out, F	167.00	.029	75.001	.016
J3 C3 Oil Sump, F	241.61	.525	116.45	.292
J4 C3 Fuel In, F	90.871	.715	32.706	.397
J5 C3 Inlet Air, F	99.957	.412	37.754	.229
J6 C3 Airbox, F	203.22	.109	95.122	.061
Horsepower	190.37	.539	141.93	.402
Corrected Horsepower	194.99	.552	145.38	.412
BSFC, lb/hp-hr	.427	.002	.260	.001
Corrected BSFC	.417	.002	.253	.001
Relative Humidity	13.560	.273	13.560	.273
Reference Pressure, inHg	38.007		128.71	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1442

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.01 in-Hg
Speed :	2801 RPM
Load :	356.9 lb-ft
Fuel Flow :	81.2 lb/hr
Brake Power :	190.34 bhp
BSFC :	.427 lb/bhp-hr
Indicated Power :	27.38 kW/cyl
Peak Pressure :	9.545 MPa
Peak Rate of Pressure Rise:	460.6 kPa/deg
Peak Heat Release Rate :	39.0 Joules/deg
Cumulative Heat Release :	1162.60 Joules
Apparent Combustion Efficiency :	74.2 %
Indicated Thermal Efficiency :	37.4 %
Brake Thermal Efficiency :	32.4 %
Ignition Delay :	7.0 degrees
Centroid Phasing :	199.0 degrees
Centroid Magnitude :	10.95 J/degree
Sensitivity :	30.0 degrees
Premixed/Diffusion Ratio :	.23304

880122.093929 AL-15299-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	76.175	.290	24.542	.161
Wet Bulb Temperature, F	51.954	.069	11.086	.038
P11-Baro (Vent), "Hg ABS	29.337	.000	99.348	.002
P3 C3 Fuel Pressure,psig	74.935	.535	516.66	3.687
P4 C3 Oil Pressure, psig	50.763	.007	350.00	.048
P5 C3 Airbox Pres., psig	4.026	.019	27.756	.132
P10 C3 Exh Comm, inH2Og	22.082	.172	5.495	.043
P11 C3 Intake Vac,inH2Ov	16.226	.122	3.535	.030
P12 C3 Blowby, inH2Og	.011	.001	.003	.000
C3 Speed, RPM	2501.1	3.102	2501.1	3.102
C3 Fuel Flow, lb/hr	77.183	.162	35.010	.074
C3 Smoke, %	3.125	.118	3.125	.118
Cell 3 Load, lb-ft	387.91	.601	525.93	.815
K1 C3 Exhaust 1, F	783.59	.293	417.55	.163
K2 C3 Exhaust 2, F	821.88	.440	438.82	.244
K3 C3 Exhaust 3, F	926.03	.397	496.69	.221
K4 C3 Exhaust 4, F	800.61	.759	427.00	.422
K5 C3 Exhaust 5, F	912.36	1.061	489.09	.589
K6 C3 Exhaust 6, F	926.74	1.134	497.08	.630
K7-C3 Exhaust Comm, F	654.71	1.468	345.95	.816
J1 C3 Water In, F	154.50	.055	68.058	.031
J2 C3 Water Out, F	168.56	.039	75.866	.022
J3 C3 Oil Sump, F	241.14	.118	116.19	.065
J4 C3 Fuel In, F	91.466	.164	33.037	.091
J5 C3 Inlet Air, F	100.13	.563	37.848	.313
J6 C3 Airbox, F	192.47	.085	89.150	.047
Horsepower	184.73	.360	137.73	.269
Corrected Horsepower	189.18	.369	141.05	.275
BSFC, lb/hp-hr	.418	.001	.254	.001
Corrected BSFC	.408	.001	.248	.001
Relative Humidity	13.912	.455	13.912	.455
Reference Pressure, inHg	36.193		122.56	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1444

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.19 in-Hg
Speed :	2501 RPM
Load :	387.9 lb-ft
Fuel Flow :	77.2 lb/hr
Brake Power :	184.72 bhp
BSFC :	.418 lb/bhp-hr
Indicated Power :	24.82 kW/cyl
Peak Pressure :	9.679 MPa
Peak Rate of Pressure Rise:	494.1 kPa/deg
Peak Heat Release Rate :	41.4 Joules/deg
Cumulative Heat Release :	1183.47 Joules
Apparent Combustion Efficiency :	71.0 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	33.0 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	198.0 degrees
Centroid Magnitude :	11.14 J/degree
Sensitivity :	29.3 degrees
Premixed/Diffusion Ratio :	.22929

880122.095749 AL-15299-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	74.337	.708	23.521	.393
Wet Bulb Temperature, F	51.189	.190	10.661	.105
P11-Baro (Vent), "Hg ABS	29.339	.000	99.353	.001
P3 C3 Fuel Pressure,psig	72.997	.201	503.29	1.388
P4 C3 Oil Pressure, psig	47.643	.008	328.48	.053
P5 C3 Airbox Pres., psig	2.914	.016	20.093	.109
P10 C3 Exh Comm, inH2Og	17.807	.148	4.431	.037
P11 C3 Intake Vac,inH2Ov	13.031	.141	2.740	.035
P12 C3 Blowby, inH2Og	-.005	.003	-.001	.001
C3 Speed, RPM	2199.2	2.879	2199.2	2.879
C3 Fuel Flow, lb/hr	71.273	.182	32.329	.082
C3 Smoke, %	4.998	.067	4.998	.067
Cell 3 Load, lb-ft	407.62	.571	552.66	.774
K1 C3 Exhaust 1, F	737.09	.330	391.72	.183
K2 C3 Exhaust 2, F	813.93	.474	434.41	.263
K3 C3 Exhaust 3, F	936.13	.304	502.29	.169
K4 C3 Exhaust 4, F	781.89	.589	416.61	.327
K5 C3 Exhaust 5, F	940.39	.789	504.66	.438
K6 C3 Exhaust 6, F	949.50	.612	509.72	.340
K7-C3 Exhaust Comm, F	651.15	2.691	343.97	1.495
J1 C3 Water In, F	154.85	.046	68.249	.025
J2 C3 Water Out, F	169.31	.032	76.282	.018
J3 C3 Oil Sump, F	239.58	.196	115.32	.109
J4 C3 Fuel In, F	91.329	.032	32.961	.018
J5 C3 Inlet Air, F	99.363	.219	37.424	.122
J6 C3 Airbox, F	182.83	.032	83.795	.018
Horsepower	170.69	.372	127.26	.277
Corrected Horsepower	174.68	.381	130.24	.284
BSFC, lb/hp-hr	.418	.002	.254	.001
Corrected BSFC	.408	.002	.248	.001
Relative Humidity	14.909	1.001	14.909	1.001
Reference Pressure, inHg	34.167		115.70	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1446

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.17 in-Hg
Speed :	2199 RPM
Load :	407.6 lb-ft
Fuel Flow :	71.3 lb/hr
Brake Power :	170.66 bhp
BSFC :	.418 lb/bhp-hr
Indicated Power :	22.48 kW/cyl
Peak Pressure :	9.817 MPa
Peak Rate of Pressure Rise:	525.8 kPa/deg
Peak Heat Release Rate :	47.0 Joules/deg
Cumulative Heat Release :	1215.79 Joules
Apparent Combustion Efficiency :	69.4 %
Indicated Thermal Efficiency :	35.0 %
Brake Thermal Efficiency :	33.0 %
Ignition Delay :	6.4 degrees
Centroid Phasing :	196.5 degrees
Centroid Magnitude :	11.65 J/degree
Sensitivity :	28.1 degrees
Premixed/Diffusion Ratio :	.22760

880122.101353 AL-15299-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	74.750	.607	23.750	.337
Wet Bulb Temperature, F	51.023	.117	10.568	.065
P11-Baro (Vent), "Hg ABS	29.341	.001	99.359	.002
P3 C3 Fuel Pressure,psig	70.773	.174	487.96	1.197
P4 C3 Oil Pressure, psig	43.173	.010	297.67	.069
P5 C3 Airbox Pres., psig	2.007	.006	13.834	.042
P10 C3 Exh Comm, inH2Og	12.402	.167	3.086	.041
P11 C3 Intake Vac,inH2Ov	8.868	.071	1.704	.018
P12 C3 Blowby, inH2Og	-.019	.002	-.005	.000
C3 Speed, RPM	1801.9	2.694	1801.9	2.694
C3 Fuel Flow, lb/hr	63.101	.197	28.622	.090
C3 Smoke, %	17.205	.203	17.205	.203
Cell 3 Load, lb-ft	412.65	1.053	559.48	1.428
K1 C3 Exhaust 1, F	694.39	.317	367.99	.176
K2 C3 Exhaust 2, F	793.51	.312	423.06	.173
K3 C3 Exhaust 3, F	880.09	.441	471.16	.245
K4 C3 Exhaust 4, F	751.78	.714	399.88	.397
K5 C3 Exhaust 5, F	929.77	.973	498.76	.541
K6 C3 Exhaust 6, F	941.67	.657	505.37	.365
K7-C3 Exhaust Comm, F	620.43	.807	326.90	.449
J1 C3 Water In, F	154.31	.116	67.949	.064
J2 C3 Water Out, F	169.28	.087	76.268	.048
J3 C3 Oil Sump, F	235.51	.161	113.06	.089
J4 C3 Fuel In, F	90.847	.017	32.693	.009
J5 C3 Inlet Air, F	98.680	.497	37.044	.276
J6 C3 Airbox, F	162.05	.165	72.249	.092
Horsepower	141.58	.506	105.56	.377
Corrected Horsepower	144.75	.517	107.92	.385
BSFC, lb/hp-hr	.446	.002	.271	.001
Corrected BSFC	.436	.002	.265	.001
Relative Humidity	13.708	.758	13.708	.758
Reference Pressure, inHg	32.627		110.49	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1448

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.63 in-Hg
Speed :	1802 RPM
Load :	412.7 lb-ft
Fuel Flow :	63.1 lb/hr
Brake Power :	141.60 bhp
BSFC :	.446 lb/bhp-hr
Indicated Power :	18.12 kW/cyl
Peak Pressure :	9.961 MPa
Peak Rate of Pressure Rise:	577.9 kPa/deg
Peak Heat Release Rate :	57.8 Joules/deg
Cumulative Heat Release :	1215.74 Joules
Apparent Combustion Efficiency :	64.3 %
Indicated Thermal Efficiency :	31.9 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	6.1 degrees
Centroid Phasing :	196.2 degrees
Centroid Magnitude :	12.53 J/degree
Sensitivity :	28.1 degrees
Premixed/Diffusion Ratio :	.21549

880122.103025 AL-15299-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	78.151	.538	25.639	.299
Wet Bulb Temperature, F	52.792	.152	11.551	.084
P11-Baro (Vent), "Hg ABS	29.340	.001	99.355	.002
P3 C3 Fuel Pressure,psig	68.734	.133	473.91	.915
P4 C3 Oil Pressure, psig	32.316	.006	222.81	.045
P5 C3 Airbox Pres., psig	1.406	.008	9.695	.057
P10 C3 Exh Comm, inH2Og	8.052	.105	2.004	.026
P11 C3 Intake Vac,inH2Ov	5.481	.058	.862	.014
P12 C3 Blowby, inH2Og	-.016	.002	-.004	.000
C3 Speed, RPM	1400.4	1.625	1400.4	1.625
C3 Fuel Flow, lb/hr	53.347	.711	24.198	.322
C3 Smoke, %	44.088	2.222	44.088	2.222
Cell 3 Load, lb-ft	384.58	1.957	521.41	2.653
K1 C3 Exhaust 1, F	628.56	.539	331.42	.300
K2 C3 Exhaust 2, F	711.71	.535	377.62	.297
K3 C3 Exhaust 3, F	800.80	.530	427.11	.295
K4 C3 Exhaust 4, F	691.39	.805	366.33	.447
K5 C3 Exhaust 5, F	840.52	1.406	449.18	.781
K6 C3 Exhaust 6, F	793.01	.614	422.78	.341
K7-C3 Exhaust Comm, F	571.57	.211	299.76	.117
J1 C3 Water In, F	154.43	.064	68.014	.035
J2 C3 Water Out, F	170.62	.071	77.011	.039
J3 C3 Oil Sump, F	237.13	.125	113.96	.069
J4 C3 Fuel In, F	89.381	.027	31.878	.015
J5 C3 Inlet Air, F	101.64	.883	38.688	.498
J6 C3 Airbox, F	158.17	.110	70.094	.061
Horsepower	102.54	.572	76.455	.426
Corrected Horsepower	105.15	.586	78.396	.437
BSFC, lb/hp-hr	.520	.007	.317	.005
Corrected BSFC	.507	.007	.309	.004
Relative Humidity	13.003	.558	13.003	.558
Reference Pressure, inHg	31.652		107.19	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1450

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.65 in-Hg
Speed :	1400 RPM
Load :	384.6 lb-ft
Fuel Flow :	53.3 lb/hr
Brake Power :	102.52 bhp
BSFC :	.520 lb/bhp-hr
Indicated Power :	13.61 kW/cyl
Peak Pressure :	10.18 MPa
Peak Rate of Pressure Rise:	621.0 kPa/deg
Peak Heat Release Rate :	65.0 Joules/deg
Cumulative Heat Release :	1192.13 Joules
Apparent Combustion Efficiency :	58.0 %
Indicated Thermal Efficiency :	28.4 %
Brake Thermal Efficiency :	26.5 %
Ignition Delay :	5.1 degrees
Centroid Phasing :	195.1 degrees
Centroid Magnitude :	13.28 J/degree
Sensitivity :	28.0 degrees
Premixed/Diffusion Ratio :	.18139

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 6 FUEL TF02N21287 DATE 1-22-88 PAGE 31

Operator Greg							
Time	11:20	11:30	11:45	12:00	12:10	12:25	12:45
Test Hour	30 min	10 min	15 min	15 min	10 min	15 min	20 min
Speed, RPM	2799	2499	2500	2199	2199	1800	1800
Load, lb-ft	372.2	406.5	289.2	427.8	226.1	421.4	276.3
Fuel Flow, lb/hr	84.5	84.8	54.8	78.7	41.6	67.8	39.5
Exh. Opacity, %	6.0	5.0	2.0	7.0	2.0	23.0	5.5
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	760	790	590	750	500	690	500
Exhaust Cyl. L2	810	830	610	820	500	780	510
Exhaust Cyl. L3	900	930	690	950	550	860	565
Exhaust Cyl. R1	800	800	600	780	490	720	500
Exhaust Cyl. R2	900	910	680	950	550	900	610
Exhaust Cyl. R3	910	930	690	950	545	900	600
Exhaust Common	660	660	500	640	400	620	400
Water In	154	154	158	154	159	153	158
Water Out	168	169	170	168	170	168	170
Oil Sump	245	243	231	241	223	236	222
Fuel	93	92	92	92	92	91	91
Inlet Air	98	100	98	101	98	97	102
Airbox	203	200	179	193	164	166	153
Wet Bulb	52.8	53.1	54.0	53.6	53.8	53.5	53.9
Dry Bulb	72.0	73.0	75.0	73.1	74.0	73.0	74.2
PRESSURES, PSIG							
Oil Gallery	51.5	44.5	52.0	46.5	50.5	42.5	44.5
Air After Blower	5.0	4.0	3.9	3.1	2.5	2.0	1.8
Fuel Transfer	76.5	74.0	75.0	73.5	75.0	71.0	71.5
LOW PRESSURES							
Intake Vac., in.water	18.0	16.0	16.0	12.8	13.1	8.6	8.9
Exh. Comm., in.Water	27.0	24.0	20.0	19.0	15.0	14.0	11.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.34	29.34	29.34	29.34	29.33	29.33	29.32

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 6 FUEL TF02N2L87 DATE 1-22-88 PAGE 32

Operator GRG							
Time	12:55	1:05	1:20	1:35			
Test Hour	10 MIN	10 MIN	15 MIN	15 MIN			
Speed, RPM	1799	1799	1398	1399			
Load, lb-ft	149.1	89.8	373.8	98.6			
Fuel Flow, lb/hr	24.9	19.1	56.8	15.5			
Exh. Opacity, %	2.0	4.0	58.0	6.0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	350	620	340			
Exhaust Cyl. L2	380	335	680	300			
Exhaust Cyl. L3	410	355	780	350			
Exhaust Cyl. R1	350	295	640	260			
Exhaust Cyl. R2	380	295	780	260			
Exhaust Cyl. R3	380	300	740	280			
Exhaust Common	300	250	540	250			
Water In	162	162	152	161			
Water Out	171	170	169	169			
Oil Sump	214	209	236	205			
Fuel	92	91	91	90			
Inlet Air	102	102	102	99			
Airbox	149	145	157	144			
Wet Bulb	53.2	53.6	54.0	53.5			
Dry Bulb	73.5	75.0	75.6	74.0			
PRESSURES, PSIG							
Oil Gallery	46.5	47.0	32.0	37.5			
Air After Blower	1.8	1.8	1.5	1.3			
Fuel Transfer	70.5	70.5	68.5	70.0			
LOW PRESSURES							
Intake Vac., in.water	9.0	8.9	5.2	5.4			
Exh. Comm., in.Water	9.5	9.0	9.0	6.0			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	29.32	29.31	29.30	29.3			

880122.111647 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	73.512	.515	23.062	.286
Wet Bulb Temperature, F	49.944	.198	9.969	.110
P11-Baro (Vent), "Hg ABS	29.341	.000	99.359	.001
P3 C3 Fuel Pressure,psig	77.136	.474	531.84	3.267
P4 C3 Oil Pressure, psig	52.008	.018	358.58	.127
P5 C3 Airbox Pres., psig	5.114	.011	35.260	.078
P10 C3 Exh Comm, inH20g	27.220	.290	6.774	.072
P11 C3 Intake Vac,inH20v	18.695	.193	4.399	.048
P12 C3 Blowby, inH20g	.026	.003	.006	.001
C3 Speed, RPM	2799.0	2.343	2799.0	2.343
C3 Fuel Flow, lb/hr	90.447	.098	41.026	.044
C3 Smoke, %	5.847	.237	5.847	.237
Cell 3 Load, lb-ft	371.76	.851	504.04	1.154
K1 C3 Exhaust 1, F	799.34	1.144	426.30	.635
K2 C3 Exhaust 2, F	840.02	.712	448.90	.396
K3 C3 Exhaust 3, F	930.57	.992	499.21	.551
K4 C3 Exhaust 4, F	843.46	1.092	450.81	.607
K5 C3 Exhaust 5, F	938.63	1.237	503.68	.687
K6 C3 Exhaust 6, F	957.03	1.406	513.90	.781
K7-C3 Exhaust Comm, F	682.73	.962	361.52	.534
J1 C3 Water In, F	154.82	.062	68.232	.034
J2 C3 Water Out, F	168.69	.103	75.941	.057
J3 C3 Oil Sump, F	244.82	.331	118.24	.184
J4 C3 Fuel In, F	93.034	.068	33.908	.038
J5 C3 Inlet Air, F	98.939	.725	37.189	.403
J6 C3 Airbox, F	208.46	.243	98.031	.135
Horsepower	198.13	.465	147.72	.347
Corrected Horsepower	202.52	.475	150.99	.354
BSFC, lb/hp-hr	.457	.001	.278	.001
Corrected BSFC	.447	.001	.272	.001
Relative Humidity	12.735	.601	12.735	.601
Reference Pressure, inHg	38.157		129.21	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6Y-53N FILE : DN1452

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.16 in-Hg
Speed :	2799 RPM
Load :	371.8 lb-ft
Fuel Flow :	90.4 lb/hr
Brake Power :	198.15 bhp
BSFC :	.456 lb/bhp-hr
Indicated Power :	29.86 kW/cyl
Peak Pressure :	9.696 MPa
Peak Rate of Pressure Rise:	589.7 kPa/deg
Peak Heat Release Rate :	55.5 Joules/deg
Cumulative Heat Release :	1253.60 Joules
Apparent Combustion Efficiency :	73.4 %
Indicated Thermal Efficiency :	37.5 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	8.7 degrees
Centroid Phasing :	198.1 degrees
Centroid Magnitude :	13.20 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.31556

880122.113140 AL-16088-F AL-12920-L 6V53N 6

Dry Bulb Temperature, F	79.242	.152	26.246	.085
Wet Bulb Temperature, F	52.761	.025	11.534	.014
P11-Baro (Vent), "Hg ABS	29.339	.000	99.353	.002
P3 C3 Fuel Pressure,psig	74.544	.559	513.96	3.854
P4 C3 Oil Pressure, psig	49.900	.010	344.05	.068
P5 C3 Airbox Pres., psig	4.068	.014	28.046	.095
P10 C3 Exh Comm, inH2Og	22.956	.267	5.712	.066
P11 C3 Intake Vac,inH2Ov	16.053	.074	3.492	.018
P12 C3 Blowby, inH2Og	.002	.002	.000	.001
C3 Speed, RPM	2501.0	3.062	2501.0	3.062
C3 Fuel Flow, lb/hr	85.616	.079	38.835	.036
C3 Smoke, %	4.825	.147	4.825	.147
Cell 3 Load, lb-ft	405.49	.506	549.77	.686
K1 C3 Exhaust 1, F	803.71	.572	428.73	.318
K2 C3 Exhaust 2, F	864.41	.379	462.45	.211
K3 C3 Exhaust 3, F	966.95	.812	519.42	.451
K4 C3 Exhaust 4, F	835.16	.450	446.20	.250
K5 C3 Exhaust 5, F	958.63	.665	514.79	.369
K6 C3 Exhaust 6, F	967.98	.537	519.99	.298
K7-C3 Exhaust Comm, F	700.24	.340	371.24	.189
J1 C3 Water In, F	154.71	.055	68.175	.031
J2 C3 Water Out, F	168.91	.082	76.060	.046
J3 C3 Oil Sump, F	244.36	.151	117.98	.084
J4 C3 Fuel In, F	92.210	.018	33.450	.010
J5 C3 Inlet Air, F	99.753	.325	37.641	.181
J6 C3 Airbox, F	200.56	.077	93.643	.043
Horsepower	193.10	.335	143.97	.249
Corrected Horsepower	197.59	.342	147.31	.255
BSFC, lb/hp-hr	.443	.001	.270	.001
Corrected BSFC	.433	.001	.264	.001
Relative Humidity	11.282	.231	11.282	.231
Reference Pressure, inHg	36.293		122.90	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1454

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.29 in-Hg
Speed :	2501 RPM
Load :	405.5 lb-ft
Fuel Flow :	85.6 lb/hr
Brake Power :	193.10 bhp
BSFC :	.443 lb/bhp-hr
Indicated Power :	25.90 kW/cyl
Peak Pressure :	9.815 MPa
Peak Rate of Pressure Rise:	657.0 kPa/deg
Peak Heat Release Rate :	64.5 Joules/deg
Cumulative Heat Release :	1239.41 Joules
Apparent Combustion Efficiency :	68.5 %
Indicated Thermal Efficiency :	34.3 %
Brake Thermal Efficiency :	31.8 %
Ignition Delay :	7.7 degrees
Centroid Phasing :	198.2 degrees
Centroid Magnitude :	12.61 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.27083

980122.114344 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	81.029	.115	27.238	.064
Wet Bulb Temperature, F	53.537	.030	11.965	.017
P11-Baro (Vent), "Hg ABS	29.339	.000	99.354	.002
P3 C3 Fuel Pressure,psig	75.095	.184	517.76	1.268
P4 C3 Oil Pressure, psig	52.348	.020	360.92	.141
P5 C3 Airbox Pres., psig	3.848	.019	26.530	.132
P10 C3 Exh Comm, inH2Og	19.017	.210	4.732	.052
P11 C3 Intake Vac,inH2Ov	16.463	.134	3.594	.033
P12 C3 Blowby, inH2Og	.001	.003	.000	.001
C3 Speed, RPM	2500.8	3.608	2500.8	3.608
C3 Fuel Flow, lb/hr	60.627	.129	27.500	.059
C3 Smoke, %	1.940	.138	1.940	.138
Cell 3 Load, lb-ft	288.98	1.371	391.80	1.859
K1 C3 Exhaust 1, F	601.64	.662	316.47	.368
K2 C3 Exhaust 2, F	639.72	.567	337.62	.315
K3 C3 Exhaust 3, F	716.96	.541	380.53	.301
K4 C3 Exhaust 4, F	635.26	.750	335.14	.417
K5 C3 Exhaust 5, F	710.15	.690	376.75	.383
K6 C3 Exhaust 6, F	720.09	.704	382.27	.391
K7-C3 Exhaust Comm, F	527.61	.926	275.34	.515
J1 C3 Water In, F	157.76	.122	69.869	.068
J2 C3 Water Out, F	169.38	.191	76.322	.106
J3 C3 Oil Sump, F	230.57	.294	110.32	.163
J4 C3 Fuel In, F	91.957	.017	33.309	.009
J5 C3 Inlet Air, F	99.152	.440	37.307	.244
J6 C3 Airbox, F	180.34	.172	82.410	.096
Horsepower	137.60	.636	102.59	.474
Corrected Horsepower	140.73	.650	104.92	.485
BSFC, lb/hp-hr	.441	.003	.268	.002
Corrected BSFC	.431	.002	.262	.002
Relative Humidity	10.687	.211	10.687	.211
Reference Pressure, inHg	35.815		121.28	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1456

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.82 in-Hg
Speed :	2501 RPM
Load :	290.0 lb-ft
Fuel Flow :	60.6 lb/hr
Brake Power :	138.10 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	19.45 kW/cyl
Peak Pressure :	8.766 MPa
Peak Rate of Pressure Rise:	726.9 kPa/deg
Peak Heat Release Rate :	78.0 Joules/deg
Cumulative Heat Release :	906.848 Joules
Apparent Combustion Efficiency :	70.8 %
Indicated Thermal Efficiency :	36.4 %
Brake Thermal Efficiency :	32.1 %
Ignition Delay :	10.2 degrees
Centroid Phasing :	196.3 degrees
Centroid Magnitude :	13.51 J/degree
Sensitivity :	24.2 degrees
Premixed/Diffusion Ratio :	.42020

980122.115702 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	81.294	.302	27.386	.168
Wet Bulb Temperature, F	53.700	.095	12.056	.053
P11-Baro (Vent), "Hg ABS	29.336	.001	99.342	.002
P3 C3 Fuel Pressure,psig	73.784	.283	508.73	1.952
P4 C3 Oil Pressure, psig	46.963	.009	323.80	.061
P5 C3 Airbox Pres., psig	2.966	.019	20.451	.129
P10 C3 Exh Comm, inH2Og	18.421	.288	4.584	.072
P11 C3 Intake Vac,inH2Ov	12.100	.084	2.757	.021
P12 C3 Blowby, inH2Og	-.000	.003	-.000	.001
C3 Speed, RPM	2200.4	3.396	2200.4	3.396
C3 Fuel Flow, lb/hr	79.659	.075	36.133	.034
C3 Smoke, %	8.761	.284	8.761	.284
Cell 3 Load, lb-ft	427.37	.414	579.43	.561
K1 C3 Exhaust 1, F	787.81	.403	419.89	.224
K2 C3 Exhaust 2, F	855.86	.318	457.70	.177
K3 C3 Exhaust 3, F	981.83	.538	527.68	.299
K4 C3 Exhaust 4, F	815.28	1.012	435.15	.562
K5 C3 Exhaust 5, F	982.32	.659	527.95	.366
K6 C3 Exhaust 6, F	997.62	.531	536.46	.295
K7-C3 Exhaust Comm, F	662.73	3.008	350.41	1.671
J1 C3 Water In, F	153.65	.039	67.584	.022
J2 C3 Water Out, F	168.49	.085	75.829	.047
J3 C3 Oil Sump, F	241.69	.119	116.50	.066
J4 C3 Fuel In, F	91.689	.033	33.161	.018
J5 C3 Inlet Air, F	98.476	.196	36.931	.109
J6 C3 Airbox, F	192.02	.142	88.901	.079
Horsepower	179.05	.325	133.50	.243
Corrected Horsepower	183.04	.333	136.47	.248
BSFC, lb/hp-hr	.445	.001	.271	.001
Corrected BSFC	.435	.001	.265	.001
Relative Humidity	10.722	.224	10.722	.224
Reference Pressure, inHg	34.265		116.03	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DH1458

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.27 in-Hg
Speed :	2200 RPM
Load :	427.4 lb-ft
Fuel Flow :	79.7 lb/hr
Brake Power :	179.03 bhp
BSFC :	.445 lb/bhp-hr
Indicated Power :	23.58 kW/cyl
Peak Pressure :	10.11 MPa
Peak Rate of Pressure Rise:	737.9 kPa/deg
Peak Heat Release Rate :	77.1 Joules/deg
Cumulative Heat Release :	1287.48 Joules
Apparent Combustion Efficiency :	67.2 %
Indicated Thermal Efficiency :	33.6 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	197.0 degrees
Centroid Magnitude :	14.04 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.27686

980122.121135 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	75.554	.259	24.197	.144
Wet Bulb Temperature, F	51.092	.036	10.607	.020
P11-Baro (Vent), "Hg ABS	29.332	.000	99.329	.001
P3 C3 Fuel Pressure,psig	75.163	.332	518.23	2.292
P4 C3 Oil Pressure, psig	50.795	.016	350.22	.111
P5 C3 Airbox Pres., psig	2.738	.011	18.880	.078
P10 C3 Exh Comm, inH2Og	13.817	.099	3.438	.025
P11 C3 Intake Vac,inH2Ov	13.437	.087	2.841	.022
P12 C3 Blowby, inH2Og	-.004	.003	-.001	.001
C3 Speed, RPM	2200.8	2.971	2200.8	2.971
C3 Fuel Flow, lb/hr	42.420	.067	19.241	.030
C3 Smoke, %	1.988	.106	1.988	.106
Cell 3 Load, lb-ft	224.69	1.370	304.64	1.857
K1 C3 Exhaust 1, F	503.94	.822	262.19	.457
K2 C3 Exhaust 2, F	521.27	.300	271.82	.167
K3 C3 Exhaust 3, F	576.77	.729	302.65	.405
K4 C3 Exhaust 4, F	510.23	.656	265.68	.365
K5 C3 Exhaust 5, F	565.65	.860	296.47	.478
K6 C3 Exhaust 6, F	565.71	.857	296.50	.476
K7-C3 Exhaust Comm, F	420.77	.876	215.99	.487
J1 C3 Water In, F	159.31	.101	70.730	.056
J2 C3 Water Out, F	169.65	.132	76.473	.073
J3 C3 Oil Sump, F	223.15	.113	106.19	.063
J4 C3 Fuel In, F	91.241	.066	32.912	.037
J5 C3 Inlet Air, F	98.480	.380	36.934	.211
J6 C3 Airbox, F	166.06	.237	74.476	.132
Horsepower	94.154	.592	70.199	.442
Corrected Horsepower	96.251	.605	71.762	.451
BSFC, lb/hp-hr	.451	.003	.274	.002
Corrected BSFC	.441	.003	.268	.002
Relative Humidity	12.556	.361	12.556	.361
Reference Pressure, inHg	33.772		114.36	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1460

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.77 in-Hg
Speed :	2201 RPM
Load :	224.7 lb-ft
Fuel Flow :	42.4 lb/hr
Brake Power :	94.17 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	13.85 kW/cyl
Peak Pressure :	8.199 MPa
Peak Rate of Pressure Rise:	882.8 kPa/deg
Peak Heat Release Rate :	103.2 Joules/deg
Cumulative Heat Release :	735.513 Joules
Apparent Combustion Efficiency :	72.2 %
Indicated Thermal Efficiency :	37.1 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	11.7 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	19.29 J/degree
Sensitivity :	21.0 degrees
Premixed/Diffusion Ratio :	.55507

880122.122630 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	76.272	.429	24.595	.239
Wet Bulb Temperature, F	51.435	.114	10.797	.063
P11-Baro (Vent), "Hg ABS	29.330	.000	99.322	.001
P3 C3 Fuel Pressure,psig	71.043	.150	489.82	1.037
P4 C3 Oil Pressure, psig	42.837	.013	295.35	.088
P5 C3 Airbox Pres., psig	2.047	.012	14.114	.080
P10 C3 Exh Comm, inH2Og	12.693	.138	3.158	.034
P11 C3 Intake Vac,inH2Ov	8.000	.078	1.737	.019
P12 C3 Blowby, inH2Og	-.008	.002	-.002	.000
C3 Speed, RPM	1800.6	1.830	1800.6	1.830
C3 Fuel Flow, lb/hr	68.744	.176	31.182	.080
C3 Smoke, %	22.583	.286	22.583	.286
Cell 3 Load, lb-ft	420.74	.851	570.44	1.154
K1 C3 Exhaust 1, F	700.25	.359	371.25	.200
K2 C3 Exhaust 2, F	813.20	.357	434.00	.199
K3 C3 Exhaust 3, F	902.48	.472	483.60	.262
K4 C3 Exhaust 4, F	760.00	.538	404.44	.299
K5 C3 Exhaust 5, F	943.79	.733	506.55	.407
K6 C3 Exhaust 6, F	944.76	.627	507.09	.348
K7-C3 Exhaust Comm, F	646.40	.838	341.33	.465
J1 C3 Water In, F	153.00	.021	67.225	.012
J2 C3 Water Out, F	168.29	.065	75.718	.036
J3 C3 Oil Sump, F	236.56	.144	113.64	.080
J4 C3 Fuel In, F	90.180	.018	32.322	.010
J5 C3 Inlet Air, F	96.729	.507	35.961	.281
J6 C3 Airbox, F	165.30	.098	74.058	.054
Horsepower	144.25	.294	107.55	.219
Corrected Horsepower	147.25	.300	109.78	.224
BSFC, lb/hp-hr	.477	.001	.290	.001
Corrected BSFC	.467	.001	.284	.001
Relative Humidity	12.342	.663	12.342	.663
Reference Pressure, inHg	32.689		110.70	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1462

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.69 in-Hg
Speed :	1801 RPM
Load :	420.7 lb-ft
Fuel Flow :	68.7 lb/hr
Brake Power :	144.27 bhp
BSFC :	.476 lb/bhp-hr
Indicated Power :	18.38 kW/cyl
Peak Pressure :	10.18 MPa
Peak Rate of Pressure Rise:	907.9 kPa/deg
Peak Heat Release Rate :	104.9 Joules/deg
Cumulative Heat Release :	1230.99 Joules
Apparent Combustion Efficiency :	61.0 %
Indicated Thermal Efficiency :	30.4 %
Brake Thermal Efficiency :	29.6 %
Ignition Delay :	7.5 degrees
Centroid Phasing :	196.2 degrees
Centroid Magnitude :	16.39 J/degree
Sensitivity :	26.7 degrees
Premixed/Diffusion Ratio :	.28009

880122.124246 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	74.379	.414	23.544	.230
Wet Bulb Temperature, F	50.356	.077	10.198	.043
P11-Baro (Vent), "Hg ABS	29.320	.001	99.289	.002
P3 C3 Fuel Pressure,psig	71.866	.171	495.50	1.181
P4 C3 Oil Pressure, psig	45.148	.011	311.29	.077
P5 C3 Airbox Pres., psig	1.752	.010	12.078	.066
P10 C3 Exh Comm, inH2Og	9.977	.160	2.483	.040
P11 C3 Intake Vac,inH2Ov	8.380	.062	1.832	.015
P12 C3 Blowby, inH2Og	-.016	.003	-.004	.001
C3 Speed, RPM	1801.0	2.249	1801.0	2.249
C3 Fuel Flow, lb/hr	40.145	.060	18.210	.027
C3 Smoke, %	5.245	1.085	5.245	1.085
Cell 3 Load, lb-ft	275.93	.502	374.10	.680
K1 C3 Exhaust 1, F	503.38	.078	261.88	.043
K2 C3 Exhaust 2, F	537.72	.282	280.96	.157
K3 C3 Exhaust 3, F	598.49	.303	314.71	.168
K4 C3 Exhaust 4, F	527.24	.344	275.14	.191
K5 C3 Exhaust 5, F	640.91	.426	338.29	.237
K6 C3 Exhaust 6, F	621.08	.691	327.27	.384
K7-C3 Exhaust Comm, F	427.33	.593	219.63	.329
J1 C3 Water In, F	158.48	.049	70.265	.027
J2 C3 Water Out, F	169.87	.051	76.593	.028
J3 C3 Oil Sump, F	223.56	.099	106.42	.055
J4 C3 Fuel In, F	91.130	.042	32.850	.024
J5 C3 Inlet Air, F	104.66	.214	40.366	.119
J6 C3 Airbox, F	153.88	.051	67.710	.028
Horsepower	94.618	.210	70.545	.157
Corrected Horsepower	97.281	.216	72.530	.161
BSFC, lb/hp-hr	.424	.001	.258	.000
Corrected BSFC	.413	.001	.251	.000
Relative Humidity	12.459	.553	12.459	.553
Reference Pressure, inHg	32.050		108.53	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1464

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.05 in-Hg
Speed :	1801 RPM
Load :	275.9 lb-ft
Fuel Flow :	40.1 lb/hr
Brake Power :	94.61 bhp
BSFC :	.424 lb/bhp-hr
Indicated Power :	12.21 kW/cyl
Peak Pressure :	8.337 MPa
Peak Rate of Pressure Rise:	853.3 kPa/deg
Peak Heat Release Rate :	97.9 Joules/deg
Cumulative Heat Release :	790.215 Joules
Apparent Combustion Efficiency :	67.1 %
Indicated Thermal Efficiency :	34.6 %
Brake Thermal Efficiency :	33.3 %
Ignition Delay :	10.3 degrees
Centroid Phasing :	193.8 degrees
Centroid Magnitude :	17.15 J/degree
Sensitivity :	21.4 degrees
Premixed/Diffusion Ratio :	.48268

880122.125317 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	75.513	.272	24.174	.151
Wet Bulb Temperature, F	50.552	.132	10.307	.073
P11-Baro (Vent), "Hg ABS	29.320	.000	99.289	.001
P3 C3 Fuel Pressure,psig	71.580	.704	493.53	4.857
P4 C3 Oil Pressure, psig	46.874	.007	323.18	.046
P5 C3 Airbox Pres., psig	1.759	.008	12.127	.054
P10 C3 Exh Comm, inH2Og	8.406	.085	2.092	.021
P11 C3 Intake Vac,inH2Ov	9.426	.049	1.843	.012
P12 C3 Blowby, inH2Og	-.020	.003	-.005	.001
C3 Speed, RPM	1800.9	1.363	1800.9	1.363
C3 Fuel Flow, lb/hr	25.845	.130	11.723	.059
C3 Smoke, %	1.836	.148	1.836	.148
Cell 3 Load, lb-ft	148.91	.521	201.89	.706
K1 C3 Exhaust 1, F	397.18	.226	202.88	.126
K2 C3 Exhaust 2, F	400.50	.559	204.72	.311
K3 C3 Exhaust 3, F	438.01	.357	225.56	.199
K4 C3 Exhaust 4, F	378.32	.403	192.40	.224
K5 C3 Exhaust 5, F	399.72	.376	204.29	.209
K6 C3 Exhaust 6, F	401.26	.285	205.14	.158
K7-C3 Exhaust Comm, F	321.75	1.126	160.97	.626
J1 C3 Water In, F	160.77	.245	71.538	.136
J2 C3 Water Out, F	169.68	.260	76.489	.145
J3 C3 Oil Sump, F	210.56	12.934	99.198	7.185
J4 C3 Fuel In, F	91.126	.017	32.848	.009
J5 C3 Inlet Air, F	102.29	.223	39.048	.124
J6 C3 Airbox, F	149.73	.151	65.406	.084
Horsepower	51.060	.189	38.069	.141
Corrected Horsepower	52.374	.194	39.048	.145
BSFC, lb/hp-hr	.506	.003	.308	.002
Corrected BSFC	.493	.003	.300	.002
Relative Humidity	11.148	.486	11.148	.486
Reference Pressure, inHg	32.061		108.57	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1466

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.06 in-Hg
Speed :	1801 RPM
Load :	148.9 lb-ft
Fuel Flow :	25.8 lb/hr
Brake Power :	51.06 bhp
BSFC :	.505 lb/bhp-hr
Indicated Power :	8.08 kW/cyl
Peak Pressure :	7.532 MPa
Peak Rate of Pressure Rise:	932.9 kPa/deg
Peak Heat Release Rate :	111.9 Joules/deg
Cumulative Heat Release :	514.472 Joules
Apparent Combustion Efficiency :	67.9 %
Indicated Thermal Efficiency :	35.5 %
Brake Thermal Efficiency :	27.9 %
Ignition Delay :	12.2 degrees
Centroid Phasing :	192.3 degrees
Centroid Magnitude :	25.21 J/degree
Sensitivity :	18.0 degrees
Premixed/Diffusion Ratio :	.67966

980122.130413 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	73.874	.834	23.263	.463
Wet Bulb Temperature, F	50.196	.197	10.109	.110
P11-Baro (Vent), "Hg ABS	29.315	.001	99.271	.002
P3 C3 Fuel Pressure,psig	71.844	.783	495.35	5.401
P4 C3 Oil Pressure, psig	47.579	.011	328.05	.076
P5 C3 Airbox Pres., psig	1.797	.006	12.389	.042
P10 C3 Exh Comm, inH2Og	7.591	.081	1.889	.020
P11 C3 Intake Vac,inH2Ov	9.436	.060	1.846	.015
P12 C3 Blowby, inH2Og	-.025	.004	-.006	.001
C3 Speed, RPM	1800.8	1.381	1800.8	1.381
C3 Fuel Flow, lb/hr	19.646	.128	8.911	.058
C3 Smoke, %	4.317	.486	4.317	.486
Cell 3 Load, lb-ft	89.852	.603	121.82	.818
K1 C3 Exhaust 1, F	356.97	.161	180.54	.090
K2 C3 Exhaust 2, F	348.97	.379	176.09	.211
K3 C3 Exhaust 3, F	382.90	.203	194.95	.113
K4 C3 Exhaust 4, F	307.46	.396	153.03	.220
K5 C3 Exhaust 5, F	307.03	.450	152.79	.250
K6 C3 Exhaust 6, F	317.88	.410	158.82	.228
K7-C3 Exhaust Comm, F	270.55	.792	132.53	.440
J1 C3 Water In, F	162.92	.312	72.736	.174
J2 C3 Water Out, F	171.60	.293	77.554	.163
J3 C3 Oil Sump, F	210.30	.100	99.058	.056
J4 C3 Fuel In, F	91.092	.037	32.829	.021
J5 C3 Inlet Air, F	102.94	.241	39.409	.134
J6 C3 Airbox, F	146.01	.053	63.339	.029
Horsepower	30.808	.213	22.970	.159
Corrected Horsepower	31.634	.219	23.585	.163
BSFC, lb/hp-hr	.638	.005	.388	.003
Corrected BSFC	.621	.005	.378	.003
Relative Humidity	12.881	.975	12.881	.975
Reference Pressure, inHg	32.132		108.81	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1468

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.13 in-Hg
Speed :	1801 RPM
Load :	89.9 lb-ft
Fuel Flow :	19.6 lb/hr
Brake Power :	30.83 bhp
BSFC :	.636 lb/bhp-hr
Indicated Power :	6.45 kW/cyl
Peak Pressure :	7.130 MPa
Peak Rate of Pressure Rise:	889.0 kPa/deg
Peak Heat Release Rate :	107.5 Joules/deg
Cumulative Heat Release :	410.698 Joules
Apparent Combustion Efficiency :	71.4 %
Indicated Thermal Efficiency :	37.3 %
Brake Thermal Efficiency :	22.2 %
Ignition Delay :	12.8 degrees
Centroid Phasing :	191.8 degrees
Centroid Magnitude :	26.46 J/degree
Sensitivity :	17.0 degrees
Premixed/Diffusion Ratio :	.75578

880122.131950 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	76.685	.851	24.825	.473
Wet Bulb Temperature, F	51.442	.169	10.801	.094
P11-Baro (Vent), "Hg ABS	29.305	.000	99.236	.001
P3 C3 Fuel Pressure,psig	68.759	.123	474.08	.851
P4 C3 Oil Pressure, psig	32.486	.037	223.98	.252
P5 C3 Airbox Pres., psig	1.412	.011	9.738	.073
P10 C3 Exh Comm, inH2Og	7.980	.161	1.986	.040
P11 C3 Intake Vac,inH2Ov	5.939	.041	.976	.010
P12 C3 Blowby, inH2Og	-.016	.002	-.004	.001
C3 Speed, RPM	1401.8	.929	1401.8	.929
C3 Fuel Flow, lb/hr	57.722	.125	26.182	.057
C3 Smoke, %	57.274	1.558	57.274	1.558
Cell 3 Load, lb-ft	372.83	1.413	505.49	1.916
K1 C3 Exhaust 1, F	633.43	.702	334.13	.390
K2 C3 Exhaust 2, F	708.81	.578	376.01	.321
K3 C3 Exhaust 3, F	809.36	.912	431.87	.506
K4 C3 Exhaust 4, F	669.18	.454	353.99	.252
K5 C3 Exhaust 5, F	812.78	.911	433.77	.506
K6 C3 Exhaust 6, F	765.75	.369	407.64	.205
K7-C3 Exhaust Comm, F	554.07	1.064	290.04	.591
J1 C3 Water In, F	152.80	.040	67.111	.022
J2 C3 Water Out, F	169.51	.042	76.393	.023
J3 C3 Oil Sump, F	236.82	.193	113.79	.107
J4 C3 Fuel In, F	90.562	.062	32.535	.034
J5 C3 Inlet Air, F	101.34	.501	38.520	.278
J6 C3 Airbox, F	156.98	.289	69.433	.161
Horsepower	99.511	.371	74.193	.277
Corrected Horsepower	102.07	.381	76.102	.284
BSFC, lb/hp-hr	.580	.002	.353	.001
Corrected BSFC	.566	.002	.344	.001
Relative Humidity	11.748	.904	11.748	.904
Reference Pressure, inHg	31.596		107.00	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1470

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.60 in-Hg
Speed :	1402 RPM
Load :	372.8 lb-ft
Fuel Flow :	57.7 lb/hr
Brake Power :	99.52 bhp
BSFC :	.580 lb/bhp-hr
Indicated Power :	13.49 kW/cyl
Peak Pressure :	10.25 MPa
Peak Rate of Pressure Rise:	1055. kPa/deg
Peak Heat Release Rate :	128.5 Joules/deg
Cumulative Heat Release :	1181.07 Joules
Apparent Combustion Efficiency :	54.3 %
Indicated Thermal Efficiency :	26.5 %
Brake Thermal Efficiency :	24.3 %
Ignition Delay :	7.0 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	20.14 J/degree
Sensitivity :	25.7 degrees
Premixed/Diffusion Ratio :	.27244

880122.133344 AL-16088-F	AL-12920-L 6V53N			6
Dry Bulb Temperature, F	73.962	.427	23.312	.237
Wet Bulb Temperature, F	50.558	.196	10.310	.109
P11-Baro (Vent), "Hg ABS	29.298	.001	99.214	.004
P3 C3 Fuel Pressure,psig	70.364	.064	485.14	.442
P4 C3 Oil Pressure, psig	38.070	.014	262.48	.100
P5 C3 Airbox Pres., psig	1.338	.005	9.227	.035
P10 C3 Exh Comm, inH20g	4.868	.061	1.211	.015
P11 C3 Intake Vac,inH20v	5.161	.047	1.031	.012
P12 C3 Blowby, inH20g	-.026	.007	-.006	.002
C3 Speed, RPM	1400.6	1.672	1400.6	1.672
C3 Fuel Flow, lb/hr	15.997	.063	7.256	.029
C3 Smoke, %	5.874	.981	5.874	.981
Cell 3 Load, lb-ft	97.853	1.107	132.67	1.501
K1 C3 Exhaust 1, F	348.47	.294	175.82	.163
K2 C3 Exhaust 2, F	322.35	.342	161.30	.190
K3 C3 Exhaust 3, F	365.74	.326	185.41	.181
K4 C3 Exhaust 4, F	278.86	.510	137.14	.283
K5 C3 Exhaust 5, F	282.97	.471	139.43	.261
K6 C3 Exhaust 6, F	297.00	.775	147.22	.430
K7-C3 Exhaust Comm, F	263.63	1.712	128.68	.951
J1 C3 Water In, F	159.44	.465	70.800	.258
J2 C3 Water Out, F	167.76	.417	75.423	.232
J3 C3 Oil Sump, F	205.89	.182	96.604	.101
J4 C3 Fuel In, F	89.957	.037	32.198	.021
J5 C3 Inlet Air, F	100.37	.290	37.982	.161
J6 C3 Airbox, F	146.06	.299	63.366	.166
Horsepower	26.095	.305	19.456	.228
Corrected Horsepower	26.757	.313	19.949	.233
BSFC, lb/hp-hr	.613	.006	.373	.004
Corrected BSFC	.598	.006	.364	.004
Relative Humidity	13.772	.462	13.772	.462
Reference Pressure, inHg	31.423		106.41	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1472

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.42 in-Hg
Speed :	1401 RPM
Load :	97.9 lb-ft
Fuel Flow :	16.0 lb/hr
Brake Power :	26.12 bhp
BSFC :	.613 lb/bhp-hr
Indicated Power :	4.92 kW/cyl
Peak Pressure :	7.167 MPa
Peak Rate of Pressure Rise:	1005. kPa/deg
Peak Heat Release Rate :	121.6 Joules/deg
Cumulative Heat Release :	399.719 Joules
Apparent Combustion Efficiency :	66.2 %
Indicated Thermal Efficiency :	34.9 %
Brake Thermal Efficiency :	23.0 %
Ignition Delay :	11.8 degrees
Centroid Phasing :	188.9 degrees
Centroid Magnitude :	31.22 J/degree
Sensitivity :	15.1 degrees
Premixed/Diffusion Ratio :	.78149

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 6 FUEL BF02V132 86 DATE 1-25-88 PAGE 33

Operator Lopez							
Time	9:20	9:33	9:53	10:20	10:35		
Test Hour	30 min	15 min	20 min	25 min	15 min		
Speed, RPM	2800	2501	2199	1801	1400		
Load, lb-ft	353.7	384.1	407.2	408.3	386.3		
Fuel Flow, lb/hr	79.8	75.6	67.6	61.5	52.4		
Exh. Opacity, %	6.0	3.0	5.0	23.0	48.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	730	740	700	660	610		
Exhaust Cyl. L2	760	770	760	750	680		
Exhaust Cyl. L3	850	870	840	830	760		
Exhaust Cyl. R1	735	750	740	700	655		
Exhaust Cyl. R2	850	850	840	840	820		
Exhaust Cyl. R3	860	860	900	900	770		
Exhaust Common	700	700	700	700	610		
Water In	154	154	154	154	157		
Water Out	167	168	168	169	167		
Oil Sump	241	239	238	234	233		
Fuel	93	89	88	88	87		
Inlet Air	97	101	99	102	99		
Airbox	196	190	181	162	154		
Wet Bulb	53.0	54.1	53.5	51.0	51.5		
Dry Bulb	71.0	71.1	74.0	72.2	71.2		
PRESSURES, PSIG							
Oil Gallery	52.0	50.0	46.5	42.0	32.0		
Air After Blower	5.0	4.0	3.0	2.1	1.5		
Fuel Transfer	76.0	74.5	72.0	70.5	68.5		
LOW PRESSURES							
Intake Vac., in.water	19.0	16.0	13.0	8.8	5.3		
Exh. Comm., in.Water	17.5	23.0	19.0	14.0	9.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.54	29.55	29.55	29.53	29.55		

880125.091800 AL-15299-F AL-12920-L 6V53N 6

Dry Bulb Temperature, F	73.957	.338	23.309	.188
Wet Bulb Temperature, F	50.155	.075	10.086	.042
P11-Baro (Vent), "Hg ABS	29.542	.000	100.04	.002
P3 C3 Fuel Pressure,psig	76.570	.620	527.93	4.275
P4 C3 Oil Pressure, psig	52.553	.009	362.34	.063
P5 C3 Airbox Pres., psig	5.209	.010	35.915	.072
P10 C3 Exh Comm, inH2Og	28.471	.135	7.085	.034
P11 C3 Intake Vac,inH2Ov	19.537	.172	4.862	.043
P12 C3 Blowby, inH2Og	.015	.008	.004	.002
C3 Speed, RPM	2800.9	2.638	2800.9	2.638
C3 Fuel Flow, lb/hr	80.555	.231	36.539	.105
C3 Smoke, %	5.711	.335	5.711	.335
Cell 3 Load, lb-ft	352.81	1.181	478.35	1.601
K1 C3 Exhaust 1, F	759.57	.612	404.21	.340
K2 C3 Exhaust 2, F	799.15	.766	426.20	.426
K3 C3 Exhaust 3, F	884.23	.655	473.46	.364
K4 C3 Exhaust 4, F	799.58	.880	426.43	.489
K5 C3 Exhaust 5, F	891.69	.331	477.60	.184
K6 C3 Exhaust 6, F	907.44	.486	486.35	.270
K7-C3 Exhaust Comm, F	714.97	.468	379.43	.260
J1 C3 Water In, F	155.67	.069	68.708	.038
J2 C3 Water Out, F	169.27	.066	76.260	.036
J3 C3 Oil Sump, F	242.48	.261	116.93	.145
J4 C3 Fuel In, F	94.233	.166	34.574	.092
J5 C3 Inlet Air, F	96.347	.451	35.748	.251
J6 C3 Airbox, F	196.65	.119	91.472	.066
Horsepower	188.16	.629	140.29	.469
Corrected Horsepower	190.57	.637	142.08	.475
BSFC, lb/hp-hr	.428	.001	.260	.001
Corrected BSFC	.423	.001	.257	.001
Relative Humidity	12.367	.501	12.367	.501
Reference Pressure, inHg	38.710		131.09	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1474

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.71 in-Hg
Speed :	2801 RPM
Load :	352.8 lb-ft
Fuel Flow :	80.6 lb/hr
Brake Power :	188.16 bhp
BSFC :	.428 lb/bhp-hr
Indicated Power :	27.10 kW/cyl
Peak Pressure :	9.609 MPa
Peak Rate of Pressure Rise:	467.5 kPa/deg
Peak Heat Release Rate :	38.8 Joules/deg
Cumulative Heat Release :	1150.26 Joules
Apparent Combustion Efficiency :	74.0 %
Indicated Thermal Efficiency :	37.3 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	11.00 J/degree
Sensitivity :	29.8 degrees
Premixed/Diffusion Ratio :	.23952

880125.093336 AL-15299-F AL-12920-L 6V53N 6

Dry Bulb Temperature, F	75.256	.312	24.031	.174
Wet Bulb Temperature, F	50.629	.105	10.349	.059
P11-Baro (Vent), "Hg ABS	29.548	.000	100.06	.001
P3 C3 Fuel Pressure,psig	75.120	.304	517.94	2.095
P4 C3 Oil Pressure, psig	50.531	.010	348.40	.069
P5 C3 Airbox Pres., psig	4.111	.025	28.347	.171
P10 C3 Exh Comm, inH2Og	23.808	.240	5.924	.060
P11 C3 Intake Vac,inH2Ov	15.677	.105	3.901	.026
P12 C3 Blowby, inH2Og	-.001	.007	-.000	.002
C3 Speed, RPM	2502.9	3.204	2502.9	3.204
C3 Fuel Flow, lb/hr	76.432	.192	34.669	.087
C3 Smoke, %	2.877	.142	2.877	.142
Cell 3 Load, lb-ft	384.69	.427	521.56	.579
K1 C3 Exhaust 1, F	756.35	.339	402.42	.188
K2 C3 Exhaust 2, F	805.34	.353	429.63	.196
K3 C3 Exhaust 3, F	915.87	.641	491.04	.356
K4 C3 Exhaust 4, F	794.34	.451	423.52	.251
K5 C3 Exhaust 5, F	901.64	.466	483.13	.259
K6 C3 Exhaust 6, F	916.32	.737	491.29	.409
K7-C3 Exhaust Comm, F	737.57	.208	391.98	.116
J1 C3 Water In, F	155.84	.053	68.799	.029
J2 C3 Water Out, F	169.53	.053	76.406	.029
J3 C3 Oil Sump, F	240.30	.268	115.72	.149
J4 C3 Fuel In, F	90.251	.037	32.362	.020
J5 C3 Inlet Air, F	103.34	.301	39.631	.167
J6 C3 Airbox, F	190.94	.173	88.302	.096
Horsepower	183.33	.204	136.68	.152
Corrected Horsepower	186.78	.208	139.26	.155
BSFC, lb/hp-hr	.417	.001	.254	.001
Corrected BSFC	.409	.001	.249	.001
Relative Humidity	11.538	.429	11.538	.429
Reference Pressure, inHg	36.765		124.50	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1476

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.77 in-Hg
Speed :	2503 RPM
Load :	384.7 lb-ft
Fuel Flow :	76.4 lb/hr
Brake Power :	183.34 bhp
BSFC :	.417 lb/bhp-hr
Indicated Power :	24.69 kW/cyl
Peak Pressure :	9.686 MPa
Peak Rate of Pressure Rise:	495.3 kPa/deg
Peak Heat Release Rate :	41.2 Joules/deg
Cumulative Heat Release :	1183.22 Joules
Apparent Combustion Efficiency :	71.7 %
Indicated Thermal Efficiency :	35.9 %
Brake Thermal Efficiency :	33.1 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	198.1 degrees
Centroid Magnitude :	10.98 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.22700

980125.095507 AL-15299-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	75.818	.344	24.343	.191
Wet Bulb Temperature, F	50.700	.152	10.389	.085
P11-Baro (Vent), "Hg ABS	29.551	.000	100.07	.002
P3 C3 Fuel Pressure,psig	72.736	.318	501.49	2.192
P4 C3 Oil Pressure, psig	47.372	.013	326.62	.090
P5 C3 Airbox Pres., psig	3.014	.017	20.780	.117
P10 C3 Exh Comm, inH2Og	19.717	.183	4.906	.046
P11 C3 Intake Vac,inH2Ov	12.516	.124	3.114	.031
P12 C3 Blowby, inH2Og	-.012	.009	-.003	.002
C3 Speed, RPM	2199.3	1.731	2199.3	1.731
C3 Fuel Flow, lb/hr	70.469	.181	31.964	.082
C3 Smoke, %	5.003	.154	5.003	.154
Cell 3 Load, lb-ft	405.82	.833	550.22	1.130
K1 C3 Exhaust 1, F	725.90	.333	385.50	.185
K2 C3 Exhaust 2, F	802.95	.629	428.31	.350
K3 C3 Exhaust 3, F	924.99	.748	496.11	.415
K4 C3 Exhaust 4, F	771.66	.437	410.92	.243
K5 C3 Exhaust 5, F	927.52	.327	497.51	.182
K6 C3 Exhaust 6, F	936.30	.321	502.39	.178
K7-C3 Exhaust Comm, F	744.09	.329	395.60	.183
J1 C3 Water In, F	155.34	.061	68.520	.034
J2 C3 Water Out, F	169.67	.032	76.484	.018
J3 C3 Oil Sump, F	239.45	.191	115.25	.106
J4 C3 Fuel In, F	89.238	.064	31.799	.036
J5 C3 Inlet Air, F	99.373	.259	37.429	.144
J6 C3 Airbox, F	182.11	.071	83.396	.039
Horsepower	169.94	.373	126.70	.278
Corrected Horsepower	172.48	.379	128.60	.282
BSFC, lb/hp-hr	.415	.001	.252	.001
Corrected BSFC	.409	.001	.249	.001
Relative Humidity	10.833	.535	10.833	.535
Reference Pressure, inHg	34.767		117.73	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1478

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.66 in-Hg
Speed :	2199 RPM
Load :	405.8 lb-ft
Fuel Flow :	70.5 lb/hr
Brake Power :	169.91 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	22.49 kW/cyl
Peak Pressure :	9.858 MPa
Peak Rate of Pressure Rise:	520.2 kPa/deg
Peak Heat Release Rate :	46.3 Joules/deg
Cumulative Heat Release :	1219.69 Joules
Apparent Combustion Efficiency :	70.4 %
Indicated Thermal Efficiency :	35.4 %
Brake Thermal Efficiency :	33.3 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	196.4 degrees
Centroid Magnitude :	11.85 J/degree
Sensitivity :	27.8 degrees
Premixed/Diffusion Ratio :	.23586

880125.101638 AL-15299-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	78.073	.935	25.596	.519
Wet Bulb Temperature, F	51.413	.301	10.785	.167
P11-Baro (Vent), "Hg ABS	29.551	.001	100.07	.002
P3 C3 Fuel Pressure,psig	70.843	.120	488.44	.828
P4 C3 Oil Pressure, psig	42.652	.009	294.07	.064
P5 C3 Airbox Pres., psig	2.082	.014	14.357	.096
P10 C3 Exh Comm, inH2Og	14.237	.149	3.543	.037
P11 C3 Intake Vac,inH2Ov	8.346	.059	2.077	.015
P12 C3 Blowby, inH2Og	-.025	.019	-.006	.005
C3 Speed, RPM	1803.4	2.204	1803.4	2.204
C3 Fuel Flow, lb/hr	62.376	.219	28.293	.100
C3 Smoke, %	23.196	.193	23.196	.193
Cell 3 Load, lb-ft	407.10	.596	551.94	.809
K1 C3 Exhaust 1, F	675.77	.629	357.65	.350
K2 C3 Exhaust 2, F	789.52	.440	420.84	.244
K3 C3 Exhaust 3, F	881.97	.585	472.21	.325
K4 C3 Exhaust 4, F	743.24	.806	395.13	.448
K5 C3 Exhaust 5, F	930.65	1.301	499.25	.723
K6 C3 Exhaust 6, F	948.37	.932	509.09	.518
K7-C3 Exhaust Comm, F	727.05	.249	386.14	.138
J1 C3 Water In, F	155.87	.095	68.816	.053
J2 C3 Water Out, F	170.91	.036	77.171	.020
J3 C3 Oil Sump, F	236.06	.113	113.37	.063
J4 C3 Fuel In, F	88.561	.059	31.423	.033
J5 C3 Inlet Air, F	105.97	.663	41.092	.369
J6 C3 Airbox, F	163.14	.172	72.856	.095
Horsepower	139.78	.244	104.22	.182
Corrected Horsepower	142.68	.249	106.38	.185
BSFC, lb/hp-hr	.446	.002	.271	.001
Corrected BSFC	.437	.002	.266	.001
Relative Humidity	9.351	1.274	9.351	1.274
Reference Pressure, inHg	33.176		112.35	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1480

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.18 in-Hg
Speed :	1803 RPM
Load :	407.1 lb-ft
Fuel Flow :	62.4 lb/hr
Brake Power :	139.76 bhp
BSFC :	.446 lb/bhp-hr
Indicated Power :	17.96 kW/cyl
Peak Pressure :	9.924 MPa
Peak Rate of Pressure Rise:	565.4 kPa/deg
Peak Heat Release Rate :	55.7 Joules/deg
Cumulative Heat Release :	1205.39 Joules
Apparent Combustion Efficiency :	64.5 %
Indicated Thermal Efficiency :	32.0 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	6.0 degrees
Centroid Phasing :	196.2 degrees
Centroid Magnitude :	12.36 J/degree
Sensitivity :	28.2 degrees
Premixed/Diffusion Ratio :	.21357

880125.103205 AL-15299-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	73.604	.389	23.114	.216
Wet Bulb Temperature, F	49.673	.056	9.819	.031
P11-Baro (Vent), "Hg ABS	29.549	.000	100.06	.001
P3 C3 Fuel Pressure,psig	68.814	.092	474.45	.632
P4 C3 Oil Pressure, psig	32.250	.008	222.35	.057
P5 C3 Airbox Pres., psig	1.513	.014	10.429	.098
P10 C3 Exh Comm, inH2Og	9.782	.153	2.434	.038
P11 C3 Intake Vac,inH2Ov	4.985	.041	1.240	.010
P12 C3 Blowby, inH2Og	-.024	.013	-.006	.003
C3 Speed, RPM	1401.4	2.432	1401.4	2.432
C3 Fuel Flow, lb/hr	52.988	.187	24.035	.085
C3 Smoke, %	46.762	1.482	46.762	1.482
Cell 3 Load, lb-ft	387.01	1.366	524.71	1.852
K1 C3 Exhaust 1, F	624.12	.415	328.96	.231
K2 C3 Exhaust 2, F	704.88	.594	373.82	.330
K3 C3 Exhaust 3, F	802.04	.492	427.80	.273
K4 C3 Exhaust 4, F	687.47	.327	364.15	.182
K5 C3 Exhaust 5, F	848.14	.610	453.41	.339
K6 C3 Exhaust 6, F	801.33	1.448	427.41	.804
K7-C3 Exhaust Comm, F	645.10	.176	340.61	.098
J1 C3 Water In, F	153.80	.066	67.668	.037
J2 C3 Water Out, F	170.10	.040	76.721	.022
J3 C3 Oil Sump, F	236.03	.137	113.35	.076
J4 C3 Fuel In, F	87.822	.022	31.012	.012
J5 C3 Inlet Air, F	100.43	.739	38.019	.410
J6 C3 Airbox, F	158.58	.041	70.321	.023
Horsepower	103.27	.383	76.995	.285
Corrected Horsepower	104.92	.389	78.226	.290
BSFC, lb/hp-hr	.513	.002	.312	.001
Corrected BSFC	.505	.002	.307	.001
Relative Humidity	11.574	.640	11.574	.640
Reference Pressure, inHg	32.262		109.25	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1482

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.26 in-Hg
Speed :	1401 RPM
Load :	387.0 lb-ft
Fuel Flow :	53.0 lb/hr
Brake Power :	103.23 bhp
BSFC :	.513 lb/bhp-hr
Indicated Power :	13.83 kW/cyl
Peak Pressure :	10.31 MPa
Peak Rate of Pressure Rise:	631.1 kPa/deg
Peak Heat Release Rate :	66.0 Joules/deg
Cumulative Heat Release :	1210.41 Joules
Apparent Combustion Efficiency :	59.2 %
Indicated Thermal Efficiency :	29.0 %
Brake Thermal Efficiency :	26.9 %
Ignition Delay :	5.3 degrees
Centroid Phasing :	195.2 degrees
Centroid Magnitude :	13.53 J/degree
Sensitivity :	27.9 degrees
Premixed/Diffusion Ratio :	.18887

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 6 FUEL TF02N21L87 DATE 1-25-88 PAGE 34

Operator GRS							
Time	11:10	11:30	11:45	12:00	12:15	12:30	12:45
Test Hour	35min	20min	15min	15min	15min	15min	15min
Speed, RPM	2800	2500	2500	1999	~~2498~~	1800	1798
Load, lb-ft	370.4	407.2	387.4	424.1	255.8	421.2	277.5
Fuel Flow, lb/hr	856	84.4	59.0	72.4	41.7	68.5	39.8
Exh. Opacity, %	3.0	4.5	0	6.5	0	28.0	1.0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	800	590	750	500	690	500
Exhaust Cyl. L2	500	820	605	810	500	780	510
Exhaust Cyl. L3	570	920	690	940	550	960	565
Exhaust Cyl. R1	800	800	600	760	490	730	500
Exhaust Cyl. R2	895	910	670	930	545	900	600
Exhaust Cyl. R3	900	920	690	940	550	900	600
Exhaust Common	730	740	550	740	445	700	455
Water In	153	151	154	150	155	150	153
Water Out	167	167	167	167	167	167	163
Oil Sump	242	246	227	236	218	232	217
Fuel	91	87	87	87	87	87	87
Inlet Air	97	97	98	97	97	97	98
Airbox	201	196	173	185	160	160	143
Wet Bulb	49.5	49.2	50.6	52.8	53.3	52.0	52.1
Dry Bulb	68.0	68.3	70.5	71.4	73.0	69.0	68.5
PRESSURES, PSIG							
Oil Gallery	51.5	49.5	51.5	46.5	50.0	42.0	44.5
Air After Blower	3.1	4.1	4.0	3.0	2.9	2.1	1.8
Fuel Transfer	76.5	74.0	74.0	73.0	76.0	70.5	71.0
LOW PRESSURES							
Intake Vac., in.water	19.0	16.0	16.0	12.9	13.2	8.8	9.1
Exh. Comm., in.Water	27.5	24.0	20.0	19.5	15.0	14.0	12.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.53	29.52	29.51	29.50	29.48	29.47	29.46

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 6 FUEL TF02N0287 DATE 1-25-88 PAGE 35

Operator Greg							
Time	12:55	1:05	1:20	1:35			
Test Hour	10 min	10 min	15 min	15 min			
Speed, RPM	1798	1799	1400	1400			
Load, lb-ft	149.0	84.9	386.2	97.5			
Fuel Flow, lb/hr	25.1	18.8	57.8	15.3			
Exh. Opacity, %	0	1.0	58.0	1.0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	350	610	340			
Exhaust Cyl. L2	380	335	690	300			
Exhaust Cyl. L3	410	360	790	350			
Exhaust Cyl. R1	350	290	650	260			
Exhaust Cyl. R2	370	290	800	265			
Exhaust Cyl. R3	380	300	750	280			
Exhaust Common	340	295	605	260			
Water In	157	159	150	160			
Water Out	167	168	167	168			
Oil Sump	203	204	230	201			
Fuel	87	90	87	88			
Inlet Air	97	97	99	97			
Airbox	143	140	152	138			
Wet Bulb	51.6	54.2	51.2	51.5			
Dry Bulb	69.0	68.6	68.9	68.0			
PRESSURES, PSIG							
Oil Gallery	46.5	47.0	32.0	38.5			
Air After Blower	2.0	1.9	1.5	1.4			
Fuel Transfer	70.5	71.5	69.8	70.5			
LOW PRESSURES							
Intake Vac., in.water	9.1	9.1	5.4	5.5			
Exh. Comm., in.Water	10.0	9.0	9.5	6.0			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	29.44	29.43	29.43	29.41			

880125.111127 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	71.796	.189	22.109	.105
Wet Bulb Temperature, F	48.617	.032	9.232	.018
P11-Baro (Vent), "Hg ABS	29.529	.001	99.997	.002
P3 C3 Fuel Pressure,psig	76.581	.373	528.01	2.575
P4 C3 Oil Pressure, psig	51.989	.060	358.45	.417
P5 C3 Airbox Pres., psig	5.254	.010	36.225	.072
P10 C3 Exh Comm, inH20g	29.140	.218	7.251	.054
P11 C3 Intake Vac,inH20v	19.711	.141	4.905	.035
P12 C3 Blowby, inH20g	.039	.017	.010	.004
C3 Speed, RPM	2801.2	2.748	2801.2	2.748
C3 Fuel Flow, lb/hr	89.566	.252	40.627	.115
C3 Smoke, %	2.931	.169	2.931	.169
Cell 3 Load, lb-ft	368.73	.928	499.93	1.258
K1 C3 Exhaust 1, F	775.44	.609	413.02	.338
K2 C3 Exhaust 2, F	830.60	.542	443.67	.301
K3 C3 Exhaust 3, F	920.63	.317	493.68	.176
K4 C3 Exhaust 4, F	830.67	1.061	443.70	.590
K5 C3 Exhaust 5, F	925.91	.571	496.61	.317
K6 C3 Exhaust 6, F	944.66	.592	507.04	.329
K7-C3 Exhaust Comm, F	758.98	1.123	403.88	.624
J1 C3 Water In, F	156.12	.124	68.958	.069
J2 C3 Water Out, F	169.92	.131	76.624	.073
J3 C3 Oil Sump, F	243.94	.303	117.74	.168
J4 C3 Fuel In, F	92.368	.409	33.538	.227
J5 C3 Inlet Air, F	98.533	.361	36.963	.200
J6 C3 Airbox, F	202.84	.542	94.909	.301
Horsepower	196.67	.678	146.63	.506
Corrected Horsepower	199.57	.688	148.79	.513
BSFC, lb/hp-hr	.455	.002	.277	.001
Corrected BSFC	.449	.002	.273	.001
Relative Humidity	11.622	.324	11.622	.324
Reference Pressure, inHg	38.776		131.31	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1484

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.78 in-Hg
Speed :	2801 RPM
Load :	368.7 lb-ft
Fuel Flow :	89.6 lb/hr
Brake Power :	196.64 bhp
BSFC :	.456 lb/bhp-hr
Indicated Power :	29.62 kW/cyl
Peak Pressure :	9.720 MPa
Peak Rate of Pressure Rise:	554.9 kPa/deg
Peak Heat Release Rate :	50.1 Joules/deg
Cumulative Heat Release :	1246.14 Joules
Apparent Combustion Efficiency :	73.7 %
Indicated Thermal Efficiency :	37.5 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	8.4 degrees
Centroid Phasing :	198.4 degrees
Centroid Magnitude :	12.84 J/degree
Sensitivity :	28.0 degrees
Premixed/Diffusion Ratio :	.30120

880125.113125 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	71.694	.153	22.052	.085
Wet Bulb Temperature, F	48.461	.038	9.145	.021
P11-Baro (Vent), "Hg ABS	29.515	.001	99.949	.002
P3 C3 Fuel Pressure,psig	74.531	.376	513.87	2.592
P4 C3 Oil Pressure, psig	49.815	.009	343.46	.062
P5 C3 Airbox Pres., psig	4.166	.019	28.722	.131
P10 C3 Exh Comm, inH2Og	24.757	.251	6.161	.063
P11 C3 Intake Vac,inH2Ov	16.105	.094	4.008	.023
P12 C3 Blowby, inH2Og	.020	.013	.005	.003
C3 Speed, RPM	2499.9	2.922	2499.9	2.922
C3 Fuel Flow, lb/hr	85.100	.127	38.601	.058
C3 Smoke, %	4.494	.092	4.494	.092
Cell 3 Load, lb-ft	405.87	.660	550.29	.895
K1 C3 Exhaust 1, F	819.91	.679	437.73	.377
K2 C3 Exhaust 2, F	859.48	.499	459.71	.277
K3 C3 Exhaust 3, F	964.05	.394	517.81	.219
K4 C3 Exhaust 4, F	834.51	.385	445.84	.214
K5 C3 Exhaust 5, F	955.05	.919	512.80	.511
K6 C3 Exhaust 6, F	967.23	.509	519.57	.283
K7-C3 Exhaust Comm, F	754.16	.359	401.20	.199
J1 C3 Water In, F	155.01	.073	68.339	.041
J2 C3 Water Out, F	168.97	.031	76.096	.017
J3 C3 Oil Sump, F	242.21	.295	116.78	.164
J4 C3 Fuel In, F	90.614	.075	32.564	.042
J5 C3 Inlet Air, F	101.27	.144	38.485	.080
J6 C3 Airbox, F	198.49	.168	92.495	.093
Horsepower	193.20	.383	144.04	.286
Corrected Horsepower	196.61	.390	146.58	.291
BSFC, lb/hp-hr	.440	.001	.268	.001
Corrected BSFC	.433	.001	.263	.001
Relative Humidity	11.346	.256	11.346	.256
Reference Pressure, inHg	36.812		124.66	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1486

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.81 in-Hg
Speed :	2500 RPM
Load :	405.9 lb-ft
Fuel Flow :	85.1 lb/hr
Brake Power :	193.21 bhp
BSFC :	.440 lb/bhp-hr
Indicated Power :	26.04 kW/cyl
Peak Pressure :	9.911 MPa
Peak Rate of Pressure Rise:	648.8 kPa/deg
Peak Heat Release Rate :	64.3 Joules/deg
Cumulative Heat Release :	1249.54 Joules
Apparent Combustion Efficiency :	69.4 %
Indicated Thermal Efficiency :	34.7 %
Brake Thermal Efficiency :	32.0 %
Ignition Delay :	7.7 degrees
Centroid Phasing :	198.1 degrees
Centroid Magnitude :	12.74 J/degree
Sensitivity :	28.4 degrees
Premixed/Diffusion Ratio :	.27185

980125.114831 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	73.327	.313	22.959	.174
Wet Bulb Temperature, F	49.068	.035	9.482	.019
P11-Baro (Vent), "Hg ABS	29.507	.000	99.920	.002
P3 C3 Fuel Pressure,psig	74.854	.246	516.10	1.693
P4 C3 Oil Pressure, psig	52.170	.016	359.70	.110
P5 C3 Airbox Pres., psig	3.947	.013	27.211	.092
P10 C3 Exh Comm, inH2Og	20.718	.205	5.155	.051
P11 C3 Intake Vac,inH2Ov	16.491	.092	4.104	.023
P12 C3 Blowby, inH2Og	.006	.009	.002	.002
C3 Speed, RPM	2499.9	3.317	2499.9	3.317
C3 Fuel Flow, lb/hr	59.981	.086	27.207	.039
C3 Smoke, %	-.242	.098	-.242	.098
Cell 3 Load, lb-ft	287.04	.963	389.17	1.305
K1 C3 Exhaust 1, F	595.37	.468	312.98	.260
K2 C3 Exhaust 2, F	633.61	.542	334.23	.301
K3 C3 Exhaust 3, F	712.76	.681	378.20	.378
K4 C3 Exhaust 4, F	634.74	.752	334.85	.418
K5 C3 Exhaust 5, F	705.84	.973	374.36	.540
K6 C3 Exhaust 6, F	716.57	1.238	380.32	.688
K7-C3 Exhaust Comm, F	572.69	.310	300.38	.172
J1 C3 Water In, F	158.03	.045	70.017	.025
J2 C3 Water Out, F	169.69	.042	76.493	.023
J3 C3 Oil Sump, F	230.20	.273	110.11	.151
J4 C3 Fuel In, F	89.967	.092	32.204	.051
J5 C3 Inlet Air, F	101.83	.971	38.792	.539
J6 C3 Airbox, F	176.62	.269	80.345	.150
Horsepower	136.63	.399	101.87	.298
Corrected Horsepower	139.13	.407	103.73	.303
BSFC, lb/hp-hr	.439	.001	.267	.001
Corrected BSFC	.431	.001	.262	.001
Relative Humidity	10.340	.486	10.340	.486
Reference Pressure, inHg	36.329		123.02	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1488

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.33 in-Hg
Speed :	2500 RPM
Load :	287.0 lb-ft
Fuel Flow :	60.0 lb/hr
Brake Power :	136.61 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	19.13 kW/cyl
Peak Pressure :	8.753 MPa
Peak Rate of Pressure Rise:	720.7 kPa/deg
Peak Heat Release Rate :	77.0 Joules/deg
Cumulative Heat Release :	898.795 Joules
Apparent Combustion Efficiency :	70.8 %
Indicated Thermal Efficiency :	36.2 %
Brake Thermal Efficiency :	32.1 %
Ignition Delay :	10.1 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	13.30 J/degree
Sensitivity :	24.5 degrees
Premixed/Diffusion Ratio :	.41225

880125.120200 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	74.407	.273	23.560	.152
Wet Bulb Temperature, F	49.522	.067	9.735	.037
P11-Baro (Vent), "Hg ABS	29.496	.000	99.883	.001
P3 C3 Fuel Pressure,psig	73.374	.196	505.90	1.351
P4 C3 Oil Pressure, psig	47.017	.008	324.17	.053
P5 C3 Airbox Pres., psig	3.015	.017	20.788	.118
P10 C3 Exh Comm, inH2Og	20.205	.170	5.028	.042
P11 C3 Intake Vac,inH2Ov	13.214	.090	3.288	.022
P12 C3 Blowby, inH2Og	-.007	.007	-.002	.002
C3 Speed, RPM	2200.9	3.727	2200.9	3.727
C3 Fuel Flow, lb/hr	78.087	.187	35.420	.085
C3 Smoke, %	6.383	.156	6.383	.156
Cell 3 Load, lb-ft	422.98	1.143	573.48	1.550
K1 C3 Exhaust 1, F	764.01	.347	406.67	.193
K2 C3 Exhaust 2, F	845.54	.327	451.97	.182
K3 C3 Exhaust 3, F	970.67	1.068	521.48	.593
K4 C3 Exhaust 4, F	804.77	.704	429.32	.391
K5 C3 Exhaust 5, F	969.34	.370	520.75	.205
K6 C3 Exhaust 6, F	982.86	.615	528.26	.342
K7-C3 Exhaust Comm, F	772.62	.129	411.46	.072
J1 C3 Water In, F	153.30	.064	67.387	.035
J2 C3 Water Out, F	167.99	.019	75.552	.011
J3 C3 Oil Sump, F	240.90	.372	116.06	.207
J4 C3 Fuel In, F	89.868	.100	32.149	.056
J5 C3 Inlet Air, F	101.93	.157	38.848	.087
J6 C3 Airbox, F	188.12	.075	86.733	.042
Horsepower	177.25	.681	132.15	.508
Corrected Horsepower	180.58	.694	134.63	.517
BSFC, lb/hp-hr	.441	.002	.268	.002
Corrected BSFC	.432	.002	.263	.001
Relative Humidity	9.873	.325	9.873	.325
Reference Pressure, inHg	34.662		117.38	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1490

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.66 in-Hg
Speed :	2201 RPM
Load :	423.0 lb-ft
Fuel Flow :	78.1 lb/hr
Brake Power :	177.27 bhp
BSFC :	.441 lb/bhp-hr
Indicated Power :	23.32 kW/cyl
Peak Pressure :	10.08 MPa
Peak Rate of Pressure Rise:	732.6 kPa/deg
Peak Heat Release Rate :	76.4 Joules/deg
Cumulative Heat Release :	1272.37 Joules
Apparent Combustion Efficiency :	67.8 %
Indicated Thermal Efficiency :	33.9 %
Brake Thermal Efficiency :	32.0 %
Ignition Delay :	7.7 degrees
Centroid Phasing :	197.1 degrees
Centroid Magnitude :	14.02 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.28012

880125.121635 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	73.851	.419	23.250	.233
Wet Bulb Temperature, F	49.674	.196	9.819	.109
P11-Baro (Vent), "Hg ABS	29.481	.001	99.834	.005
P3 C3 Fuel Pressure,psig	74.691	.288	514.97	1.985
P4 C3 Oil Pressure, psig	50.553	.011	348.55	.078
P5 C3 Airbox Pres., psig	2.798	.017	19.294	.118
P10 C3 Exh Comm, inH2Og	15.339	.182	3.817	.045
P11 C3 Intake Vac,inH2Ov	13.728	.065	3.416	.016
P12 C3 Blowby, inH2Og	-.033	.007	-.008	.002
C3 Speed, RPM	2198.9	2.604	2198.9	2.604
C3 Fuel Flow, lb/hr	42.443	.139	19.252	.063
C3 Smoke, %	.090	.043	.090	.043
Cell 3 Load, lb-ft	226.17	1.087	306.64	1.474
K1 C3 Exhaust 1, F	505.61	.510	263.12	.283
K2 C3 Exhaust 2, F	521.44	.331	271.91	.184
K3 C3 Exhaust 3, F	580.86	.468	304.92	.260
K4 C3 Exhaust 4, F	511.73	.781	266.52	.434
K5 C3 Exhaust 5, F	562.95	.536	294.97	.298
K6 C3 Exhaust 6, F	567.73	.359	297.63	.199
K7-C3 Exhaust Comm, F	464.65	.455	240.36	.253
J1 C3 Water In, F	159.07	.038	70.596	.021
J2 C3 Water Out, F	169.47	.033	76.370	.019
J3 C3 Oil Sump, F	223.20	.209	106.22	.116
J4 C3 Fuel In, F	89.780	.020	32.100	.011
J5 C3 Inlet Air, F	101.03	.280	38.351	.155
J6 C3 Airbox, F	165.20	.104	74.001	.058
Horsepower	94.690	.448	70.599	.334
Corrected Horsepower	96.471	.456	71.926	.340
BSFC, lb/hp-hr	.448	.003	.273	.002
Corrected BSFC	.440	.003	.268	.002
Relative Humidity	11.235	.793	11.235	.793
Reference Pressure, inHg	34.169		115.71	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1492

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.17 in-Hg
Speed :	2199 RPM
Load :	226.2 lb-ft
Fuel Flow :	42.4 lb/hr
Brake Power :	94.71 bhp
BSFC :	.448 lb/bhp-hr
Indicated Power :	13.86 kW/cyl
Peak Pressure :	8.242 MPa
Peak Rate of Pressure Rise:	899.8 kPa/deg
Peak Heat Release Rate :	105.2 Joules/deg
Cumulative Heat Release :	736.638 Joules
Apparent Combustion Efficiency :	72.3 %
Indicated Thermal Efficiency :	37.1 %
Brake Thermal Efficiency :	31.5 %
Ignition Delay :	11.6 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	19.28 J/degree
Sensitivity :	21.1 degrees
Premixed/Diffusion Ratio :	.54872

880125.123122 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	73.369	.202	22.983	.112
Wet Bulb Temperature, F	49.232	.032	9.573	.018
P11-Baro (Vent), "Hg ABS	29.465	.001	99.780	.003
P3 C3 Fuel Pressure,psig	70.631	.330	486.98	2.276
P4 C3 Oil Pressure, psig	42.626	.024	293.89	.163
P5 C3 Airbox Pres., psig	2.098	.011	14.465	.078
P10 C3 Exh Comm, inH2Og	14.423	.120	3.589	.030
P11 C3 Intake Vac,inH2Ov	9.486	.067	2.360	.017
P12 C3 Blowby, inH2Og	.003	.016	.001	.004
C3 Speed, RPM	1800.3	2.629	1800.3	2.629
C3 Fuel Flow, lb/hr	69.390	.146	31.475	.066
C3 Smoke, %	27.756	.442	27.756	.442
Cell 3 Load, lb-ft	419.81	.746	569.18	1.011
K1 C3 Exhaust 1, F	700.25	.414	371.25	.230
K2 C3 Exhaust 2, F	810.55	.410	432.53	.228
K3 C3 Exhaust 3, F	907.09	.592	486.16	.329
K4 C3 Exhaust 4, F	761.96	.577	405.53	.321
K5 C3 Exhaust 5, F	945.46	1.482	507.48	.823
K6 C3 Exhaust 6, F	947.79	.594	508.77	.330
K7-C3 Exhaust Comm, F	737.68	.486	392.05	.270
J1 C3 Water In, F	154.13	.093	67.852	.051
J2 C3 Water Out, F	169.42	.085	76.344	.047
J3 C3 Oil Sump, F	235.45	.373	113.03	.207
J4 C3 Fuel In, F	88.292	.054	31.274	.030
J5 C3 Inlet Air, F	99.661	.214	37.589	.119
J6 C3 Airbox, F	164.02	.081	73.346	.045
Horsepower	143.90	.290	107.29	.216
Corrected Horsepower	146.48	.295	109.21	.220
BSFC, lb/hp-hr	.482	.002	.293	.001
Corrected BSFC	.474	.002	.288	.001
Relative Humidity	10.782	.324	10.782	.324
Reference Pressure, inHg	33.039		111.88	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1494

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.03 in-Hg
Speed :	1800 RPM
Load :	419.8 lb-ft
Fuel Flow :	69.4 lb/hr
Brake Power :	143.88 bhp
BSFC :	.482 lb/bhp-hr
Indicated Power :	18.28 kW/cyl
Peak Pressure :	10.21 MPa
Peak Rate of Pressure Rise:	898.4 kPa/deg
Peak Heat Release Rate :	103.0 Joules/deg
Cumulative Heat Release :	1237.00 Joules
Apparent Combustion Efficiency :	60.7 %
Indicated Thermal Efficiency :	29.9 %
Brake Thermal Efficiency :	29.2 %
Ignition Delay :	7.4 degrees
Centroid Phasing :	196.7 degrees
Centroid Magnitude :	16.02 J/degree
Sensitivity :	27.3 degrees
Premixed/Diffusion Ratio :	.27080

880125.124421 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	72.000	.224	22.222	.124
Wet Bulb Temperature, F	48.388	.051	9.104	.028
P11-Baro (Vent), "Hg ABS	29.455	.001	99.746	.002
P3 C3 Fuel Pressure,psig	71.592	.423	493.61	2.916
P4 C3 Oil Pressure, psig	45.106	.007	310.99	.046
P5 C3 Airbox Pres., psig	1.835	.007	12.655	.050
P10 C3 Exh Comm, inH20g	11.836	.121	2.945	.030
P11 C3 Intake Vac,inH20v	9.981	.071	2.484	.018
P12 C3 Blowby, inH20g	-.004	.013	-.001	.003
C3 Speed, RPM	1800.0	2.963	1800.0	2.963
C3 Fuel Flow, lb/hr	40.569	.134	18.402	.061
C3 Smoke, %	1.188	.054	1.188	.054
Cell 3 Load, lb-ft	278.21	1.048	377.19	1.421
K1 C3 Exhaust 1, F	500.21	.507	260.12	.282
K2 C3 Exhaust 2, F	535.36	.553	279.64	.307
K3 C3 Exhaust 3, F	596.38	.520	313.55	.289
K4 C3 Exhaust 4, F	520.04	.440	271.13	.245
K5 C3 Exhaust 5, F	633.64	.241	334.24	.134
K6 C3 Exhaust 6, F	615.35	.397	324.08	.221
K7-C3 Exhaust Comm, F	487.25	.541	252.92	.300
J1 C3 Water In, F	159.00	.250	70.558	.139
J2 C3 Water Out, F	170.29	.152	76.826	.084
J3 C3 Oil Sump, F	221.28	.254	105.16	.141
J4 C3 Fuel In, F	87.812	.047	31.007	.026
J5 C3 Inlet Air, F	100.20	.773	37.888	.430
J6 C3 Airbox, F	151.32	.078	66.290	.043
Horsepower	95.348	.487	71.089	.363
Corrected Horsepower	97.121	.496	72.410	.370
BSFC, lb/hp-hr	.425	.002	.259	.001
Corrected BSFC	.418	.002	.254	.001
Relative Humidity	10.659	.389	10.659	.389
Reference Pressure, inHg	32.458		109.91	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1496

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.46 in-Hg
Speed :	1800 RPM
Load :	278.2 lb-ft
Fuel Flow :	40.6 lb/hr
Brake Power :	95.35 bhp
BSFC :	.426 lb/bhp-hr
Indicated Power :	12.30 kW/cyl
Peak Pressure :	8.436 MPa
Peak Rate of Pressure Rise:	863.0 kPa/deg
Peak Heat Release Rate :	99.0 Joules/deg
Cumulative Heat Release :	800.037 Joules
Apparent Combustion Efficiency :	67.1 %
Indicated Thermal Efficiency :	34.4 %
Brake Thermal Efficiency :	33.1 %
Ignition Delay :	10.4 degrees
Centroid Phasing :	193.6 degrees
Centroid Magnitude :	17.43 J/degree
Sensitivity :	21.2 degrees
Premixed/Diffusion Ratio :	.48851

980125.125643 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	74.775	2.235	23.764	1.242
Wet Bulb Temperature, F	49.098	.706	9.499	.392
P11-Baro (Vent), "Hg ABS	29.442	.001	99.702	.002
P3 C3 Fuel Pressure,psig	71.924	.468	495.90	3.227
P4 C3 Oil Pressure, psig	46.908	.008	323.42	.055
P5 C3 Airbox Pres., psig	1.828	.006	12.602	.042
P10 C3 Exh Comm, inH2Og	10.127	.121	2.520	.030
P11 C3 Intake Vac,inH2Ov	10.152	.061	2.526	.015
P12 C3 Blowby, inH2Og	-.019	.014	-.005	.003
C3 Speed, RPM	1800.2	1.982	1800.2	1.982
C3 Fuel Flow, lb/hr	25.955	.058	11.773	.026
C3 Smoke, %	1.015	.021	1.015	.021
Cell 3 Load, lb-ft	149.31	.555	202.44	.753
K1 C3 Exhaust 1, F	393.69	.126	200.94	.070
K2 C3 Exhaust 2, F	396.30	.263	202.39	.146
K3 C3 Exhaust 3, F	436.66	.165	224.81	.092
K4 C3 Exhaust 4, F	373.45	.164	189.70	.091
K5 C3 Exhaust 5, F	393.06	.202	200.59	.112
K6 C3 Exhaust 6, F	397.00	.362	202.78	.201
K7-C3 Exhaust Comm, F	350.90	.493	177.17	.274
J1 C3 Water In, F	159.88	.068	71.042	.038
J2 C3 Water Out, F	168.90	.096	76.056	.053
J3 C3 Oil Sump, F	211.91	.070	99.950	.039
J4 C3 Fuel In, F	87.868	.030	31.038	.017
J5 C3 Inlet Air, F	100.26	.455	37.921	.253
J6 C3 Airbox, F	146.61	.122	63.672	.068
Horsepower	51.180	.226	38.158	.168
Corrected Horsepower	52.133	.230	38.869	.171
BSFC, lb/hp-hr	.507	.002	.309	.001
Corrected BSFC	.498	.002	.303	.001
Relative Humidity	8.290	1.976	8.290	1.976
Reference Pressure, inHg	32.417		109.78	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1498

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.42 in-Hg
Speed :	1800 RPM
Load :	149.3 lb-ft
Fuel Flow :	26.0 lb/hr
Brake Power :	51.17 bhp
BSFC :	.508 lb/bhp-hr
Indicated Power :	8.15 kW/cyl
Peak Pressure :	7.560 MPa
Peak Rate of Pressure Rise:	961.9 kPa/deg
Peak Heat Release Rate :	115.7 Joules/deg
Cumulative Heat Release :	519.695 Joules
Apparent Combustion Efficiency :	68.1 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	27.8 %
Ignition Delay :	12.2 degrees
Centroid Phasing :	192.2 degrees
Centroid Magnitude :	25.47 J/degree
Sensitivity :	17.9 degrees
Premixed/Diffusion Ratio :	.68402

880125.130605 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	70.354	.117	21.308	.065
Wet Bulb Temperature, F	47.599	.033	8.666	.018
P11-Baro (Vent), "Hg ABS	29.433	.001	99.672	.002
P3 C3 Fuel Pressure,psig	72.089	.290	497.04	2.003
P4 C3 Oil Pressure, psig	47.560	.020	327.91	.137
P5 C3 Airbox Pres., psig	1.883	.007	12.982	.046
P10 C3 Exh Comm, inH2Og	9.363	.088	2.330	.022
P11 C3 Intake Vac,inH2Ov	10.224	.070	2.544	.017
P12 C3 Blowby, inH2Og	-.010	.008	-.003	.002
C3 Speed, RPM	1798.5	2.146	1798.5	2.146
C3 Fuel Flow, lb/hr	19.640	.051	8.909	.023
C3 Smoke, %	1.049	.015	1.049	.015
Cell 3 Load, lb-ft	89.672	1.066	121.58	1.445
K1 C3 Exhaust 1, F	354.65	.599	179.25	.333
K2 C3 Exhaust 2, F	348.94	.626	176.08	.348
K3 C3 Exhaust 3, F	382.58	.950	194.77	.528
K4 C3 Exhaust 4, F	303.23	.818	150.68	.454
K5 C3 Exhaust 5, F	303.87	.903	151.04	.502
K6 C3 Exhaust 6, F	313.79	.891	156.55	.495
K7-C3 Exhaust Comm, F	305.01	1.060	151.67	.589
J1 C3 Water In, F	162.14	.188	72.299	.105
J2 C3 Water Out, F	170.17	.141	76.760	.078
J3 C3 Oil Sump, F	208.47	.181	98.039	.101
J4 C3 Fuel In, F	92.825	.133	33.791	.074
J5 C3 Inlet Air, F	99.822	.373	37.679	.207
J6 C3 Airbox, F	144.91	.159	62.725	.089
Horsepower	30.708	.383	22.895	.286
Corrected Horsepower	31.291	.390	23.330	.291
BSFC, lb/hp-hr	.640	.009	.389	.006
Corrected BSFC	.628	.009	.382	.006
Relative Humidity	11.227	.194	11.227	.194
Reference Pressure, inHg	32.515		110.11	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1500

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.52 in-Hg
Speed :	1799 RPM
Load :	89.7 lb-ft
Fuel Flow :	19.6 lb/hr
Brake Power :	30.73 bhp
BSFC :	.638 lb/bhp-hr
Indicated Power :	6.50 kW/cyl
Peak Pressure :	7.180 MPa
Peak Rate of Pressure Rise:	888.9 kPa/deg
Peak Heat Release Rate :	107.3 Joules/deg
Cumulative Heat Release :	416.178 Joules
Apparent Combustion Efficiency :	72.3 %
Indicated Thermal Efficiency :	37.7 %
Brake Thermal Efficiency :	22.1 %
Ignition Delay :	12.7 degrees
Centroid Phasing :	191.8 degrees
Centroid Magnitude :	26.31 J/degree
Sensitivity :	17.1 degrees
Premixed/Diffusion Ratio :	.74421

980125.131818 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	69.905	.226	21.058	.126
Wet Bulb Temperature, F	47.176	.063	8.431	.035
P11-Baro (Vent), "Hg ABS	29.422	.001	99.633	.003
P3 C3 Fuel Pressure,psig	69.141	.075	476.71	.517
P4 C3 Oil Pressure, psig	32.589	.036	224.69	.246
P5 C3 Airbox Pres., psig	1.478	.014	10.188	.094
P10 C3 Exh Comm, inH2Og	9.970	.146	2.481	.036
P11 C3 Intake Vac,inH2Ov	6.727	.052	1.674	.013
P12 C3 Blowby, inH2Og	-.015	.014	-.004	.003
C3 Speed, RPM	1401.0	1.601	1401.0	1.601
C3 Fuel Flow, lb/hr	58.296	.317	26.442	.144
C3 Smoke, %	58.505	1.394	58.505	1.394
Cell 3 Load, lb-ft	387.90	1.374	525.92	1.863
K1 C3 Exhaust 1, F	629.98	.320	332.21	.178
K2 C3 Exhaust 2, F	710.53	.926	376.96	.514
K3 C3 Exhaust 3, F	813.76	.611	434.31	.339
K4 C3 Exhaust 4, F	685.64	.545	363.13	.303
K5 C3 Exhaust 5, F	822.97	1.111	439.43	.617
K6 C3 Exhaust 6, F	781.89	.894	416.61	.496
K7-C3 Exhaust Comm, F	630.13	1.025	332.29	.570
J1 C3 Water In, F	152.63	.081	67.014	.045
J2 C3 Water Out, F	169.15	.038	76.197	.021
J3 C3 Oil Sump, F	233.83	.168	112.13	.093
J4 C3 Fuel In, F	92.577	.149	33.654	.083
J5 C3 Inlet Air, F	101.50	.454	38.608	.252
J6 C3 Airbox, F	154.93	.233	68.297	.129
Horsepower	103.47	.328	77.148	.244
Corrected Horsepower	105.62	.335	78.748	.250
BSFC, lb/hp-hr	.563	.004	.343	.002
Corrected BSFC	.552	.004	.336	.002
Relative Humidity	10.750	.329	10.750	.329
Reference Pressure, inHg	31.935		108.15	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1502

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.94 in-Hg
Speed :	1401 RPM
Load :	387.9 lb-ft
Fuel Flow :	58.3 lb/hr
Brake Power :	103.47 bhp
BSFC :	.563 lb/bhp-hr
Indicated Power :	13.89 kW/cyl
Peak Pressure :	10.47 MPa
Peak Rate of Pressure Rise:	992.0 kPa/deg
Peak Heat Release Rate :	117.1 Joules/deg
Cumulative Heat Release :	1211.70 Joules
Apparent Combustion Efficiency :	55.1 %
Indicated Thermal Efficiency :	27.0 %
Brake Thermal Efficiency :	25.0 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	18.82 J/degree
Sensitivity :	26.2 degrees
Premixed/Diffusion Ratio :	.25511

880125.133334 AL-16088-F AL-12920-L 6V53N				6
Dry Bulb Temperature, F	69.367	.229	20.759	.127
Wet Bulb Temperature, F	46.909	.041	8.283	.023
P11-Baro (Vent), "Hg ABS	29.412	.000	99.602	.001
P3 C3 Fuel Pressure,psig	70.783	.154	488.03	1.062
P4 C3 Oil Pressure, psig	37.883	.005	261.19	.037
P5 C3 Airbox Pres., psig	1.410	.007	9.718	.046
P10 C3 Exh Comm, inH2Og	6.567	.120	1.634	.030
P11 C3 Intake Vac,inH2Ov	6.968	.053	1.734	.013
P12 C3 Blowby, inH2Og	-.017	.008	-.004	.002
C3 Speed, RPM	1402.2	1.613	1402.2	1.613
C3 Fuel Flow, lb/hr	16.066	.051	7.288	.023
C3 Smoke, %	.401	.063	.401	.063
Cell 3 Load, lb-ft	96.709	.628	131.12	.852
K1 C3 Exhaust 1, F	348.42	.146	175.79	.081
K2 C3 Exhaust 2, F	321.56	.143	160.87	.080
K3 C3 Exhaust 3, F	367.19	.200	186.22	.111
K4 C3 Exhaust 4, F	277.91	.154	136.62	.086
K5 C3 Exhaust 5, F	279.52	.125	137.51	.070
K6 C3 Exhaust 6, F	292.15	.154	144.53	.086
K7-C3 Exhaust Comm, F	275.90	.538	135.50	.299
J1 C3 Water In, F	161.53	.177	71.963	.098
J2 C3 Water Out, F	169.66	.177	76.479	.099
J3 C3 Oil Sump, F	204.63	.115	95.908	.064
J4 C3 Fuel In, F	90.815	.015	32.675	.008
J5 C3 Inlet Air, F	101.04	.132	38.354	.073
J6 C3 Airbox, F	141.93	.039	61.072	.022
Horsepower	25.820	.193	19.251	.144
Corrected Horsepower	26.353	.197	19.648	.147
BSFC, lb/hp-hr	.622	.005	.379	.003
Corrected BSFC	.610	.005	.371	.003
Relative Humidity	10.920	.354	10.920	.354
Reference Pressure, inHg	31.770		107.58	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1504

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.77 in-Hg
Speed :	1402 RPM
Load :	96.7 lb-ft
Fuel Flow :	16.1 lb/hr
Brake Power :	25.81 bhp
BSFC :	.624 lb/bhp-hr
Indicated Power :	5.03 kW/cyl
Peak Pressure :	7.194 MPa
Peak Rate of Pressure Rise:	1003. kPa/deg
Peak Heat Release Rate :	121.0 Joules/deg
Cumulative Heat Release :	407.820 Joules
Apparent Combustion Efficiency :	67.2 %
Indicated Thermal Efficiency :	35.5 %
Brake Thermal Efficiency :	22.6 %
Ignition Delay :	11.7 degrees
Centroid Phasing :	189.2 degrees
Centroid Magnitude :	30.22 J/degree
Sensitivity :	15.5 degrees
Premixed/Diffusion Ratio :	.75642

APPENDIX F7
DDC 6V-53N DATA SHEETS
FUEL BLEND TF08

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: DDA 6V-53N Engine Tester: G. Shultz
Test Fuel: TF08N90187 Date: 1-27-88

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressure
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF08N90187 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressure
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF08N90187 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF08N9087 Date: 1-28-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	211	DN1505	DN1506
2500	212	DN1507	DN1508
2200	213	DN1509	DN1510
1800	214	DN1511	DN1512
1400	215	DN1513	DN1514

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF08N9087

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	216	DN1515	DN1516
2500	Full-Rack	217	DN1517	DN1518
2500	145	218	DN1519	DN1520
2200	Full-Rack	219	DN1521	DN1522
2200	100	220	DN1523	DN1524
1800	Full-Rack	221	DN1525	DN1526
1800	100	222	DN1527	DN1528
1800	54	223	DN1529	DN1530
1800	20	224	DN1531	DN1532
1400	Full-Rack	225	DN1533	DN1534
1400	28	226	DN1535	DN1536

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF08N19087 Date: 1-28-98

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	227	DN1537	DN1538
2500	228	DN1539	DN1540
2200	229	DN1541	DN1542
1800	230	DN1543	DN1544
1400	231	DN1545	DN1546

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF08N19087

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	233	DN1547	DN1548
2500	Full-Rack	234	DN1549	DN1550
2500	145	235	DN1551	DN1552
2200	Full-Rack	236	DN1553	DN1554
2200	100	237	DN1555	DN1556
1800	Full-Rack	238	DN1557	DN1558
1800	100	239	DN1559	DN1560
1800	54	240	DN1561	DN1562
1800	20	241	DN1563	DN1564
1400	Full-Rack	242	DN1565	DN1566
1400	28	243	DN1567	DN1568

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 7 FUEL ~~FFO 8N19087~~ BFO 2U13L86 DATE 6-17-88 PAGE 36

Operator GRSG							
Time	9:15	9:30	9:45	10:00	10:10		
Test Hour	30 min	15 min	15 min	15 min	10 min		
Speed, RPM	2801	2494	2200	1800	1400		
Load, lb-ft	355.1	386.3	406.9	413.2	384.3		
Fuel Flow, lb/hr	74.6	75.6	69.5	61.9	52.8		
Exh. Opacity, %	7.0	3.5	4.5	20.0	52.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	740	750	700	650	610		
Exhaust Cyl. L2	760	770	760	750	680		
Exhaust Cyl. L3	850	880	890	845	760		
Exhaust Cyl. R1	755	750	730	700	650		
Exhaust Cyl. R2	850	860	870	880	800		
Exhaust Cyl. R3	870	870	900	900	760		
Exhaust Common	690	695	700	670	600		
Water In	155	155	153	154	153		
Water Out	170	170	169	169	171		
Oil Sump	242	237	237	235	235		
Fuel	89	88	88	88	87		
Inlet Air	100	104	102	102	101		
Airbox	200	193	183	164	158		
Wet Bulb	51.5	52.0	52.0	54.0	55.9		
Dry Bulb	65.8	66.3	66.0	70.0	73.0		
PRESSURES, PSIG							
Oil Gallery	51.5	49.5	76.5	42.0	31.5		
Air After Blower	5.0	4.0	3.0	2.0	1.3		
Fuel Transfer	76.5	74.0	72.0	70.0	68.3		
LOW PRESSURES							
Intake Vac., in.water	17.0	16.0	13.1	8.8	5.2		
Exh. Comm., in.Water	27.5	23.5	19.0	14.0	9.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.62	29.62	29.62	29.62	29.63		

880127.091754 AL-15299-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	63.764	.147	17.646	.082
Wet Bulb Temperature, F	46.067	.027	7.815	.015
P11-Baro (Vent), "Hg ABS	29.622	.000	100.31	.001
P3 C3 Fuel Pressure,psig	76.904	.529	530.24	3.650
P4 C3 Oil Pressure, psig	52.184	.014	359.80	.096
P5 C3 Airbox Pres., psig	5.247	.013	36.178	.093
P10 C3 Exh Comm, inH2Og	28.061	.168	6.983	.042
P11 C3 Intake Vac,inH2Ov	19.615	.169	4.881	.042
P12 C3 Blowby, inH2Og	.031	.003	.008	.001
C3 Speed, RPM	2801.2	2.616	2801.2	2.616
C3 Fuel Flow, lb/hr	80.831	.210	36.664	.095
C3 Smoke, %	5.814	.380	5.814	.380
Cell 3 Load, lb-ft	353.90	1.073	479.82	1.455
K1 C3 Exhaust 1, F	752.65	.754	400.36	.419
K2 C3 Exhaust 2, F	807.10	.751	430.61	.417
K3 C3 Exhaust 3, F	892.51	1.101	478.06	.612
K4 C3 Exhaust 4, F	800.76	.828	427.09	.460
K5 C3 Exhaust 5, F	895.73	.666	479.85	.370
K6 C3 Exhaust 6, F	913.92	.368	489.95	.204
K7-C3 Exhaust Comm, F	727.92	.550	386.62	.306
J1 C3 Water In, F	155.66	.051	68.703	.028
J2 C3 Water Out, F	169.23	.035	76.238	.020
J3 C3 Oil Sump, F	243.05	.285	117.25	.158
J4 C3 Fuel In, F	87.774	.018	30.985	.010
J5 C3 Inlet Air, F	99.891	.462	37.717	.257
J6 C3 Airbox, F	199.65	.116	93.142	.065
Horsepower	188.75	.594	140.73	.443
Corrected Horsepower	191.35	.602	142.66	.449
BSFC, lb/hp-hr	.428	.002	.261	.001
Corrected BSFC	.422	.002	.257	.001
Relative Humidity	20.021	.327	20.021	.327
Reference Pressure, inHg	38.863		131.60	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1506

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.86 in-Hg
Speed :	2801 RPM
Load :	353.9 lb-ft
Fuel Flow :	80.8 lb/hr
Brake Power :	188.74 bhp
BSFC :	.428 lb/bhp-hr
Indicated Power :	27.11 kW/cyl
Peak Pressure :	9.627 MPa
Peak Rate of Pressure Rise:	455.5 kPa/deg
Peak Heat Release Rate :	39.3 Joules/deg
Cumulative Heat Release :	1149.79 Joules
Apparent Combustion Efficiency :	73.8 %
Indicated Thermal Efficiency :	37.3 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	199.1 degrees
Centroid Magnitude :	10.93 J/degree
Sensitivity :	30.0 degrees
Premixed/Diffusion Ratio :	.23615

980127.093147 AL-15299-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	63.831	.110	17.684	.061
Wet Bulb Temperature, F	46.104	.023	7.835	.013
P11-Baro (Vent), "Hg ABS	29.625	.000	100.32	.002
P3 C3 Fuel Pressure,psig	74.761	.311	515.46	2.144
P4 C3 Oil Pressure, psig	50.187	.011	346.03	.074
P5 C3 Airbox Pres., psig	4.159	.027	28.677	.187
P10 C3 Exh Comm, inH20g	23.458	.192	5.837	.048
P11 C3 Intake Vac,inH20v	15.776	.117	3.926	.029
P12 C3 Blowby, inH20g	.002	.003	.000	.001
C3 Speed, RPM	2499.7	2.596	2499.7	2.596
C3 Fuel Flow, lb/hr	76.199	.314	34.563	.143
C3 Smoke, %	3.439	.113	3.439	.113
Cell 3 Load, lb-ft	385.64	.965	522.85	1.309
K1 C3 Exhaust 1, F	761.42	.369	405.24	.205
K2 C3 Exhaust 2, F	810.18	.468	432.32	.260
K3 C3 Exhaust 3, F	918.41	.435	492.45	.242
K4 C3 Exhaust 4, F	795.15	.361	423.97	.201
K5 C3 Exhaust 5, F	904.90	.246	484.95	.137
K6 C3 Exhaust 6, F	916.22	.467	491.23	.260
K7-C3 Exhaust Comm, F	729.91	.251	387.73	.139
J1 C3 Water In, F	155.46	.077	68.590	.043
J2 C3 Water Out, F	169.07	.076	76.150	.042
J3 C3 Oil Sump, F	236.75	9.351	113.75	5.195
J4 C3 Fuel In, F	87.372	.039	30.762	.022
J5 C3 Inlet Air, F	104.76	.242	40.421	.134
J6 C3 Airbox, F	192.88	.090	89.380	.050
Horsepower	183.54	.487	136.85	.363
Corrected Horsepower	186.86	.496	139.32	.369
BSFC, lb/hp-hr	.415	.002	.253	.001
Corrected BSFC	.408	.002	.248	.001
Relative Humidity	19.986	.228	19.986	.228
Reference Pressure, inHg	36.932		125.07	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1508

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.93 in-Hg
Speed :	2500 RPM
Load :	385.6 lb-ft
Fuel Flow :	76.2 lb/hr
Brake Power :	183.55 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	24.89 kW/cyl
Peak Pressure :	9.703 MPa
Peak Rate of Pressure Rise:	488.1 kPa/deg
Peak Heat Release Rate :	40.3 Joules/deg
Cumulative Heat Release :	1193.19 Joules
Apparent Combustion Efficiency :	72.4 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	33.2 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	197.8 degrees
Centroid Magnitude :	11.21 J/degree
Sensitivity :	29.1 degrees
Premixed/Diffusion Ratio :	.22866

980127.094610 AL-15299-F AL-12920-L 6V53N				?
Dry Bulb Temperature, F	63.303	.061	17.391	.034
Wet Bulb Temperature, F	45.895	.020	7.720	.011
P11-Baro (Vent), "Hg ABS	29.622	.000	100.31	.001
P3 C3 Fuel Pressure,psig	72.721	.210	501.40	1.447
P4 C3 Oil Pressure, psig	47.208	.007	325.49	.049
P5 C3 Airbox Pres., psig	3.058	.011	21.084	.075
P10 C3 Exh Comm, inH2Og	19.236	.167	4.787	.042
P11 C3 Intake Vac,inH2Ov	12.733	.116	3.168	.029
P12 C3 Blowby, inH2Og	-.012	.002	-.003	.001
C3 Speed, RPM	2203.2	2.588	2203.2	2.588
C3 Fuel Flow, lb/hr	70.740	.210	32.087	.095
C3 Smoke, %	4.588	.134	4.588	.134
Cell 3 Load, lb-ft	405.76	.635	550.13	.861
K1 C3 Exhaust 1, F	731.92	.587	388.84	.326
K2 C3 Exhaust 2, F	809.68	.287	432.04	.159
K3 C3 Exhaust 3, F	930.24	.590	499.02	.328
K4 C3 Exhaust 4, F	772.45	.607	411.36	.337
K5 C3 Exhaust 5, F	929.41	.569	498.56	.316
K6 C3 Exhaust 6, F	940.85	.676	504.91	.375
K7-C3 Exhaust Comm, F	737.09	.374	391.72	.208
J1 C3 Water In, F	154.64	.064	68.131	.036
J2 C3 Water Out, F	168.94	.025	76.080	.014
J3 C3 Oil Sump, F	239.26	.252	115.14	.140
J4 C3 Fuel In, F	87.505	.034	30.836	.019
J5 C3 Inlet Air, F	102.58	.327	39.213	.182
J6 C3 Airbox, F	183.14	.274	83.969	.152
Horsepower	170.21	.359	126.91	.268
Corrected Horsepower	172.98	.365	128.97	.272
BSFC, lb/hp-hr	.416	.002	.253	.001
Corrected BSFC	.409	.002	.249	.001
Relative Humidity	20.541	.137	20.541	.137
Reference Pressure, inHg	34.912		118.22	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1510

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.91 in-Hg
Speed :	2203 RPM
Load :	405.8 lb-ft
Fuel Flow :	70.7 lb/hr
Brake Power :	170.22 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	22.50 kW/cyl
Peak Pressure :	9.880 MPa
Peak Rate of Pressure Rise:	529.7 kPa/deg
Peak Heat Release Rate :	47.8 Joules/deg
Cumulative Heat Release :	1221.71 Joules
Apparent Combustion Efficiency :	70.5 %
Indicated Thermal Efficiency :	35.3 %
Brake Thermal Efficiency :	33.2 %
Ignition Delay :	6.5 degrees
Centroid Phasing :	196.7 degrees
Centroid Magnitude :	11.88 J/degree
Sensitivity :	28.2 degrees
Premixed/Diffusion Ratio :	.23031

880127,095739 AL-15299-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	63.631	.055	17.573	.030
Wet Bulb Temperature, F	45.840	.002	7.689	.001
P11-Baro (Vent), "Hg ABS	29.624	.000	100.32	.001
P3 C3 Fuel Pressure,psig	70.450	.085	485.73	.587
P4 C3 Oil Pressure, psig	42.596	.026	293.69	.181
P5 C3 Airbox Pres,, psig	2.149	.011	14.819	.078
P10 C3 Exh Comm, inH2Og	13.793	.151	3.432	.038
P11 C3 Intake Vac,inH2Ov	8.440	.068	2.100	.017
P12 C3 Blowby, inH2Og	-.026	.002	-.007	.000
C3 Speed, RPM	1800.1	2.242	1800.1	2.242
C3 Fuel Flow, lb/hr	62.369	.247	28.290	.112
C3 Smoke, %	19.220	.222	19.220	.222
Cell 3 Load, lb-ft	411.73	.826	558.23	1.120
K1 C3 Exhaust 1, F	676.51	.545	358.06	.303
K2 C3 Exhaust 2, F	790.03	.534	421.13	.297
K3 C3 Exhaust 3, F	880.97	.571	471.65	.317
K4 C3 Exhaust 4, F	743.62	.512	395.34	.284
K5 C3 Exhaust 5, F	922.22	1.059	494.57	.588
K6 C3 Exhaust 6, F	939.79	.702	504.33	.390
K7-C3 Exhaust Comm, F	713.47	.236	378.60	.131
J1 C3 Water In, F	153.44	.065	67.465	.036
J2 C3 Water Out, F	168.50	.095	75.834	.053
J3 C3 Oil Sump, F	235.36	.176	112.98	.098
J4 C3 Fuel In, F	86.909	.099	30.505	.055
J5 C3 Inlet Air, F	101.49	.276	38.605	.153
J6 C3 Airbox, F	163.91	.114	73.281	.064
Horsepower	141.12	.273	105.21	.204
Corrected Horsepower	143.24	.277	106.79	.207
BSFC, lb/hp-hr	.442	.002	.269	.001
Corrected BSFC	.435	.002	.265	.001
Relative Humidity	19.489	.137	19.489	.137
Reference Pressure, inHg	33.380		113.04	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1512

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.38 in-Hg
Speed :	1800 RPM
Load :	411.7 lb-ft
Fuel Flow :	62.4 lb/hr
Brake Power :	141.10 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	17.92 kW/cyl
Peak Pressure :	9.993 MPa
Peak Rate of Pressure Rise:	585.3 kPa/deg
Peak Heat Release Rate :	58.4 Joules/deg
Cumulative Heat Release :	1207.64 Joules
Apparent Combustion Efficiency :	64.5 %
Indicated Thermal Efficiency :	31.9 %
Brake Thermal Efficiency :	31.2 %
Ignition Delay :	6.0 degrees
Centroid Phasing :	196.5 degrees
Centroid Magnitude :	12.34 J/degree
Sensitivity :	28.4 degrees
Premixed/Diffusion Ratio :	.21281

880127.101141 AL-15299-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	64.838	.064	18.243	.035
Wet Bulb Temperature, F	46.483	.016	8.046	.009
P11-Baro (Vent), "Hg ABS	29.628	.000	100.33	.002
P3 C3 Fuel Pressure,psig	69.014	.165	475.84	1.137
P4 C3 Oil Pressure, psig	32.016	.009	220.74	.059
P5 C3 Airbox Pres., psig	1.557	.007	10.736	.050
P10 C3 Exh Comm, inH2Og	9.401	.097	2.339	.024
P11 C3 Intake Vac,inH2Ov	4.924	.058	1.225	.014
P12 C3 Blowby, inH2Og	-.030	.002	-.008	.000
C3 Speed, RPM	1401.2	.847	1401.2	.847
C3 Fuel Flow, lb/hr	53.196	.216	24.129	.098
C3 Smoke, %	50.783	.771	50.783	.771
Cell 3 Load, lb-ft	390.11	1.646	528.92	2.232
K1 C3 Exhaust 1, F	628.67	.321	331.48	.178
K2 C3 Exhaust 2, F	706.76	.281	374.87	.156
K3 C3 Exhaust 3, F	803.50	.790	428.61	.439
K4 C3 Exhaust 4, F	690.46	.552	365.81	.307
K5 C3 Exhaust 5, F	843.50	.473	450.83	.263
K6 C3 Exhaust 6, F	799.21	.709	426.23	.394
K7-C3 Exhaust Comm, F	638.01	.210	336.67	.117
J1 C3 Water In, F	154.68	.072	68.156	.040
J2 C3 Water Out, F	170.93	.071	77.183	.040
J3 C3 Oil Sump, F	234.77	.240	112.65	.133
J4 C3 Fuel In, F	86.565	.037	30.314	.020
J5 C3 Inlet Air, F	101.36	.140	38.533	.078
J6 C3 Airbox, F	158.40	.177	70.221	.098
Horsepower	104.08	.459	77.598	.342
Corrected Horsepower	105.62	.466	78.746	.348
BSFC, lb/hp-hr	.511	.002	.311	.001
Corrected BSFC	.504	.002	.306	.001
Relative Humidity	18.906	.111	18.906	.111
Reference Pressure, inHg	32.436		109.84	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1514

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.44 in-Hg
Speed :	1401 RPM
Load :	390.1 lb-ft
Fuel Flow :	53.2 lb/hr
Brake Power :	104.06 bhp
BSFC :	.511 lb/bhp-hr
Indicated Power :	13.60 kW/cyl
Peak Pressure :	10.21 MPa
Peak Rate of Pressure Rise:	645.4 kPa/deg
Peak Heat Release Rate :	68.4 Joules/deg
Cumulative Heat Release :	1198.27 Joules
Apparent Combustion Efficiency :	58.4 %
Indicated Thermal Efficiency :	28.4 %
Brake Thermal Efficiency :	27.0 %
Ignition Delay :	5.2 degrees
Centroid Phasing :	195.5 degrees
Centroid Magnitude :	13.35 J/degree
Sensitivity :	28.3 degrees
Premixed/Diffusion Ratio :	.18503

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 7 FUEL TF08N19087 DATE 1-27-88 PAGE 37

Operator Greg							
Time	11:05	11:15	11:30	11:40	11:55	12:10	12:20
Test Hour	20 min	10 min	15 min	10 min	15 min	15 min	10 min
Speed, RPM	2800	2499	2498	2200	2200	1800	1801
Load, lb-ft	377.5	413.3	290.7	430.0	325.7	416.9	279.3
Fuel Flow, lb/hr	96.1	91.7	63.4	84.3	44.0	74.0	41.7
Exh. Opacity, %	18.0	8.0	1.0	17.0	1.0	35.0	2.0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	760	800	580	750	490	700	500
Exhaust Cyl. L2	800	845	605	820	500	800	310
Exhaust Cyl. L3	900	950	680	950	550	890	380
Exhaust Cyl. R1	805	810	600	780	495	730	500
Exhaust Cyl. R2	900	940	670	950	545	910	605
Exhaust Cyl. R3	920	945	690	955	550	910	395
Exhaust Common	740	745	545	740	440	700	450
Water In	154	155	155	154	159	153	159
Water Out	169	170	170	169	169	168	170
Oil Sump	245	243	231	242	222	236	221
Fuel	94	94	93	93	91	90	90
Inlet Air	101	102	100	101	100	102	101
Airbox	208	202	180	191	164	166	154
Wet Bulb	55.2	54.2	55.6	55.0	55.2	54.2	56.8
Dry Bulb	73.5	70.6	72.5	71.6	71.2	70.0	74.5
PRESSURES, PSIG							
Oil Gallery	51.0	48.5	51.0	46.0	50.0	42.0	44.0
Air After Blower	5.1	4.1	3.9	3.1	2.9	2.0	1.9
Fuel Transfer	75.0	72.0	72.5	70.0	72.0	63.0	69.3
LOW PRESSURES							
Intake Vac., in.water	19.0	16.0	16.0	13.0	13.3	8.8	9.1
Exh. Comm., in.Water	27.5	24.0	20.5	19.5	15.0	14.0	12
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.64	29.63	29.63	29.62	29.62	29.61	29.60

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 7 FUEL TF08NV9U87 DATE 1-27-88 PAGE 38

Operator	Greg						
Time	12:30	12:40	1:00	1:10			
Test Hour	10 min	10 min	20 min	10 min			
Speed, RPM	1800	1800	1400	1400			
Load, lb-ft	148.7	91.3	386.5	97.5			
Fuel Flow, lb/hr	26.3	20.1	61.5	15.9			
Exh. Opacity, %	0	0	720	1.0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	350	620	340			
Exhaust Cyl. L2	390	340	690	310			
Exhaust Cyl. L3	410	360	790	350			
Exhaust Cyl. R1	350	295	655	260			
Exhaust Cyl. R2	360	290	790	255			
Exhaust Cyl. R3	360	300	750	280			
Exhaust Common	340	290	605	290			
Water In	161	162	154	160			
Water Out	191	170	171	168			
Oil Sump	212	206	235	205			
Fuel	90	90	89	89			
Inlet Air	100	100	102	101			
Airbox	148	146	160	148			
Wet Bulb	57.0	57.5	54.9	56.1			
Dry Bulb	74.5	75.0	70.9	72.0			
PRESSURES, PSIG							
Oil Gallery	46.0	47.5	31.5	37.0			
Air After Blower	1.9	1.9	1.2	1.5			
Fuel Transfer	70.0	70.5	[illegible] 66.0	68.0			
LOW PRESSURES							
Intake Vac., in.water	9.1	9.1	5.3	5.4			
Exh. Comm., in.Water	10.0	9.0	9.5	6.0			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	29.6	29.59	29.57	29.56			

880127.110248 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	65.320	.238	18.511	.132
Wet Bulb Temperature, F	46.712	.044	8.173	.024
P11-Baro (Vent), "Hg ABS	29.634	.001	100.35	.003
P3 C3 Fuel Pressure,psig	76.074	.275	524.51	1.893
P4 C3 Oil Pressure, psig	51.801	.047	357.16	.322
P5 C3 Airbox Pres., psig	5.318	.014	36.665	.095
P10 C3 Exh Comm, inH2Og	28.943	.276	7.202	.069
P11 C3 Intake Vac,inH2Ov	19.355	.071	4.816	.018
P12 C3 Blowby, inH2Og	.010	.001	.002	.000
C3 Speed, RPM	2800.7	2.396	2800.7	2.396
C3 Fuel Flow, lb/hr	96.972	.411	43.986	.187
C3 Smoke, %	12.027	1.012	12.027	1.012
Cell 3 Load, lb-ft	375.66	.475	509.33	.644
K1 C3 Exhaust 1, F	779.50	.783	415.28	.435
K2 C3 Exhaust 2, F	840.03	.649	448.91	.361
K3 C3 Exhaust 3, F	934.74	1.082	501.52	.601
K4 C3 Exhaust 4, F	843.71	.561	450.95	.311
K5 C3 Exhaust 5, F	942.25	1.211	505.69	.673
K6 C3 Exhaust 6, F	959.54	.650	515.30	.361
K7-C3 Exhaust Comm, F	757.63	.912	403.13	.507
J1 C3 Water In, F	154.57	.033	68.096	.018
J2 C3 Water Out, F	168.41	.036	75.783	.020
J3 C3 Oil Sump, F	243.37	.667	117.43	.371
J4 C3 Fuel In, F	93.263	.322	34.035	.179
J5 C3 Inlet Air, F	100.69	.267	38.158	.148
J6 C3 Airbox, F	205.25	.580	96.252	.322
Horsepower	200.32	.295	149.36	.220
Corrected Horsepower	203.13	.300	151.44	.223
BSFC, lb/hp-hr	.484	.002	.295	.001
Corrected BSFC	.477	.002	.290	.001
Relative Humidity	18.582	.440	18.582	.440
Reference Pressure, inHg	39.037		132.20	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1516

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	39.04 in-Hg
Speed :	2801 RPM
Load :	375.7 lb-ft
Fuel Flow :	97.0 lb/hr
Brake Power :	200.37 bhp
BSFC :	.484 lb/bhp-hr
Indicated Power :	28.30 kW/cyl
Peak Pressure :	9.769 MPa
Peak Rate of Pressure Rise:	485.2 kPa/deg
Peak Heat Release Rate :	39.5 Joules/deg
Cumulative Heat Release :	1203.01 Joules
Apparent Combustion Efficiency :	65.3 %
Indicated Thermal Efficiency :	32.9 %
Brake Thermal Efficiency :	28.9 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	199.5 degrees
Centroid Magnitude :	11.09 J/degree
Sensitivity :	30.4 degrees
Premixed/Diffusion Ratio :	.23531

980127.111815 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	65.748	.086	18.749	.048
Wet Bulb Temperature, F	47.135	.049	8.408	.027
P11-Baro (Vent), "Hg ABS	29.632	.001	100.35	.002
P3 C3 Fuel Pressure,psig	72.576	.409	500.39	2.822
P4 C3 Oil Pressure, psig	49.275	.020	339.74	.138
P5 C3 Airbox Pres., psig	4.242	.019	29.251	.130
P10 C3 Exh Comm, inH2Og	24.635	.205	6.130	.051
P11 C3 Intake Vac,inH2Ov	15.706	.136	3.908	.034
P12 C3 Blowby, inH2Og	-.003	.003	-.001	.001
C3 Speed, RPM	2501.5	2.822	2501.5	2.822
C3 Fuel Flow, lb/hr	92.121	.150	41.786	.068
C3 Smoke, %	7.311	.146	7.311	.146
Cell 3 Load, lb-ft	413.10	1.015	560.09	1.376
K1 C3 Exhaust 1, F	808.74	.953	431.52	.530
K2 C3 Exhaust 2, F	873.61	.643	467.56	.357
K3 C3 Exhaust 3, F	982.91	.484	528.29	.269
K4 C3 Exhaust 4, F	844.29	.495	451.27	.275
K5 C3 Exhaust 5, F	973.19	.443	522.89	.246
K6 C3 Exhaust 6, F	983.01	.596	528.34	.331
K7-C3 Exhaust Comm, F	779.32	.457	415.18	.254
J1 C3 Water In, F	155.24	.081	68.464	.045
J2 C3 Water Out, F	169.52	.062	76.399	.034
J3 C3 Oil Sump, F	241.98	.257	116.66	.143
J4 C3 Fuel In, F	92.751	.065	33.751	.036
J5 C3 Inlet Air, F	102.07	.401	38.926	.223
J6 C3 Airbox, F	202.02	.142	94.457	.079
Horsepower	196.76	.570	146.70	.425
Corrected Horsepower	199.80	.578	148.96	.431
BSFC, lb/hp-hr	.468	.001	.285	.001
Corrected BSFC	.461	.001	.281	.001
Relative Humidity	19.094	.121	19.094	.121
Reference Pressure, inHg	37.115		125.68	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1518

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.12 in-Hg
Speed :	2502 RPM
Load :	413.1 lb-ft
Fuel Flow :	92.1 lb/hr
Brake Power :	196.80 bhp
BSFC :	.468 lb/bhp-hr
Indicated Power :	26.05 kW/cyl
Peak Pressure :	9.893 MPa
Peak Rate of Pressure Rise:	532.6 kPa/deg
Peak Heat Release Rate :	46.9 Joules/deg
Cumulative Heat Release :	1268.46 Joules
Apparent Combustion Efficiency :	64.8 %
Indicated Thermal Efficiency :	31.9 %
Brake Thermal Efficiency :	29.9 %
Ignition Delay :	7.0 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	11.68 J/degree
Sensitivity :	29.9 degrees
Premixed/Diffusion Ratio :	.23549

880127.112915 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	66.008	.087	18.893	.049
Wet Bulb Temperature, F	47.200	.024	8.444	.013
P11-Baro (Vent), "Hg ABS	29.627	.000	100.33	.001
P3 C3 Fuel Pressure,psig	73.397	.177	506.05	1.218
P4 C3 Oil Pressure, psig	51.714	.037	356.55	.252
P5 C3 Airbox Pres., psig	4.010	.016	27.646	.111
P10 C3 Exh Comm, inH2Og	20.504	.130	5.102	.032
P11 C3 Intake Vac,inH2Ov	16.029	.097	3.989	.024
P12 C3 Blowby, inH2Og	-.011	.002	-.003	.001
C3 Speed, RPM	2499.7	2.878	2499.7	2.878
C3 Fuel Flow, lb/hr	64.103	.097	29.077	.044
C3 Smoke, %	1.103	.072	1.103	.072
Cell 3 Load, lb-ft	290.06	1.747	393.26	2.369
K1 C3 Exhaust 1, F	593.61	.648	312.01	.360
K2 C3 Exhaust 2, F	633.83	.591	334.35	.328
K3 C3 Exhaust 3, F	711.98	.336	377.76	.187
K4 C3 Exhaust 4, F	635.89	.582	335.49	.323
K5 C3 Exhaust 5, F	706.55	.532	374.75	.295
K6 C3 Exhaust 6, F	716.90	.249	380.50	.138
K7-C3 Exhaust Comm, F	567.57	1.215	297.54	.675
J1 C3 Water In, F	157.72	.070	69.842	.039
J2 C3 Water Out, F	169.11	.029	76.172	.016
J3 C3 Oil Sump, F	231.03	.110	110.57	.061
J4 C3 Fuel In, F	93.135	.102	33.964	.057
J5 C3 Inlet Air, F	100.60	.137	38.109	.076
J6 C3 Airbox, F	181.07	.325	82.819	.181
Horsepower	138.06	.852	102.93	.635
Corrected Horsepower	140.03	.864	104.40	.645
BSFC, lb/hp-hr	.464	.003	.282	.002
Corrected BSFC	.458	.003	.279	.002
Relative Humidity	18.722	.235	18.722	.235
Reference Pressure, inHg	36.612		123.98	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1520

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.61 in-Hg
Speed :	2500 RPM
Load :	290.1 lb-ft
Fuel Flow :	64.1 lb/hr
Brake Power :	138.09 bhp
BSFC :	.464 lb/bhp-hr
Indicated Power :	18.83 kW/cyl
Peak Pressure :	8.771 MPa
Peak Rate of Pressure Rise:	590.1 kPa/deg
Peak Heat Release Rate :	57.9 Joules/deg
Cumulative Heat Release :	899.206 Joules
Apparent Combustion Efficiency :	65.9 %
Indicated Thermal Efficiency :	33.1 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	9.4 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	11.19 J/degree
Sensitivity :	26.1 degrees
Premixed/Diffusion Ratio :	.35960

880127.114217 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	66.124	.073	18.958	.041
Wet Bulb Temperature, F	47.349	.024	8.527	.013
P11-Baro (Vent), "Hg ABS	29.621	.001	100.31	.002
P3 C3 Fuel Pressure,psig	70.512	.211	486.17	1.455
P4 C3 Oil Pressure, psig	46.684	.019	321.87	.132
P5 C3 Airbox Pres., psig	3.099	.017	21.365	.119
P10 C3 Exh Comm, inH2Og	19.994	.213	4.975	.053
P11 C3 Intake Vac,inH2Ov	12.772	.070	3.178	.017
P12 C3 Blowby, inH2Og	-.015	.002	-.004	.000
C3 Speed, RPM	2201.4	2.876	2201.4	2.876
C3 Fuel Flow, lb/hr	84.835	.161	38.481	.073
C3 Smoke, %	16.470	.878	16.470	.878
Cell 3 Load, lb-ft	428.49	1.075	580.95	1.458
K1 C3 Exhaust 1, F	768.08	.340	408.93	.189
K2 C3 Exhaust 2, F	856.13	.449	457.85	.250
K3 C3 Exhaust 3, F	981.68	.774	527.60	.430
K4 C3 Exhaust 4, F	811.46	.547	433.04	.304
K5 C3 Exhaust 5, F	983.49	.337	528.61	.187
K6 C3 Exhaust 6, F	996.60	.432	535.89	.240
K7-C3 Exhaust Comm, F	774.18	.189	412.32	.105
J1 C3 Water In, F	153.54	.155	67.521	.086
J2 C3 Water Out, F	170.78	8.107	77.098	4.504
J3 C3 Oil Sump, F	241.81	.250	116.56	.139
J4 C3 Fuel In, F	92.732	.033	33.740	.018
J5 C3 Inlet Air, F	101.24	.302	38.467	.168
J6 C3 Airbox, F	191.23	.225	88.462	.125
Horsepower	179.60	.615	133.91	.459
Corrected Horsepower	182.32	.625	135.93	.466
BSFC, lb/hp-hr	.472	.002	.287	.001
Corrected BSFC	.465	.002	.283	.001
Relative Humidity	18.992	.142	18.992	.142
Reference Pressure, inHg	34.990		118.49	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1522

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.99 in-Hg
Speed :	2201 RPM
Load :	428.5 lb-ft
Fuel Flow :	84.8 lb/hr
Brake Power :	179.58 bhp
BSFC :	.472 lb/bhp-hr
Indicated Power :	23.22 kW/cyl
Peak Pressure :	10.15 MPa
Peak Rate of Pressure Rise:	582.9 kPa/deg
Peak Heat Release Rate :	55.7 Joules/deg
Cumulative Heat Release :	1275.33 Joules
Apparent Combustion Efficiency :	62.2 %
Indicated Thermal Efficiency :	30.9 %
Brake Thermal Efficiency :	29.7 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	197.6 degrees
Centroid Magnitude :	12.39 J/degree
Sensitivity :	29.0 degrees
Premixed/Diffusion Ratio :	.22858

880127.115640 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	67.454	.114	19.697	.063
Wet Bulb Temperature, F	48.058	.027	8.921	.015
P11-Baro (Vent), "Hg ABS	29.615	.000	100.29	.001
P3 C3 Fuel Pressure,psig	72.397	.206	499.16	1.421
P4 C3 Oil Pressure, psig	50.526	.010	348.37	.068
P5 C3 Airbox Pres., psig	2.888	.012	19.912	.083
P10 C3 Exh Comm, inH2Og	15.171	.132	3.775	.033
P11 C3 Intake Vac,inH2Ov	13.197	.080	3.284	.020
P12 C3 Blowby, inH2Og	-.022	.002	-.006	.000
C3 Speed, RPM	2202.0	2.401	2202.0	2.401
C3 Fuel Flow, lb/hr	44.880	.104	20.357	.047
C3 Smoke, %	.569	.040	.569	.040
Cell 3 Load, lb-ft	226.01	.903	306.43	1.224
K1 C3 Exhaust 1, F	497.85	.162	258.80	.090
K2 C3 Exhaust 2, F	519.30	.387	270.72	.215
K3 C3 Exhaust 3, F	576.16	.308	302.31	.171
K4 C3 Exhaust 4, F	511.80	.368	266.56	.204
K5 C3 Exhaust 5, F	566.49	.818	296.94	.454
K6 C3 Exhaust 6, F	569.50	.758	298.61	.421
K7-C3 Exhaust Comm, F	456.79	.790	235.99	.439
J1 C3 Water In, F	158.50	.170	70.277	.094
J2 C3 Water Out, F	168.80	.065	76.002	.036
J3 C3 Oil Sump, F	222.93	.099	106.07	.055
J4 C3 Fuel In, F	90.945	.082	32.747	.046
J5 C3 Inlet Air, F	100.08	.494	37.819	.275
J6 C3 Airbox, F	164.98	.150	73.880	.083
Horsepower	94.759	.401	70.650	.299
Corrected Horsepower	96.121	.406	71.665	.303
BSFC, lb/hp-hr	.474	.002	.288	.001
Corrected BSFC	.467	.002	.284	.001
Relative Humidity	18.436	.212	18.436	.212
Reference Pressure, inHg	34.524		116.91	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1524

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.52 in-Hg
Speed :	2202 RPM
Load :	226.0 lb-ft
Fuel Flow :	44.9 lb/hr
Brake Power :	94.75 bhp
BSFC :	.474 lb/bhp-hr
Indicated Power :	13.63 kW/cyl
Peak Pressure :	8.177 MPa
Peak Rate of Pressure Rise:	694.0 kPa/deg
Peak Heat Release Rate :	75.1 Joules/deg
Cumulative Heat Release :	719.085 Joules
Apparent Combustion Efficiency :	66.3 %
Indicated Thermal Efficiency :	34.2 %
Brake Thermal Efficiency :	29.6 %
Ignition Delay :	10.4 degrees
Centroid Phasing :	194.8 degrees
Centroid Magnitude :	13.67 J/degree
Sensitivity :	22.4 degrees
Premixed/Diffusion Ratio :	.46410

880127.120931 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	67.334	.091	19.630	.051
Wet Bulb Temperature, F	48.212	.024	9.007	.013
P11-Baro (Vent), "Hg ABS	29.609	.000	100.27	.002
P3 C3 Fuel Pressure,psig	68.215	.158	470.33	1.087
P4 C3 Oil Pressure, psig	42.435	.013	292.58	.091
P5 C3 Airbox Pres., psig	2.191	.010	15.104	.072
P10 C3 Exh Comm, inH2Og	14.212	.091	3.536	.023
P11 C3 Intake Vac,inH2Ov	8.725	.074	2.171	.018
P12 C3 Blowby, inH2Og	-.020	.002	-.005	.000
C3 Speed, RPM	1802.0	1.556	1802.0	1.556
C3 Fuel Flow, lb/hr	74.492	.104	33.789	.047
C3 Smoke, %	34.090	.711	34.090	.711
Cell 3 Load, lb-ft	417.63	1.272	566.23	1.724
K1 C3 Exhaust 1, F	706.98	.576	374.99	.320
K2 C3 Exhaust 2, F	825.65	.489	440.92	.272
K3 C3 Exhaust 3, F	916.42	.422	491.34	.235
K4 C3 Exhaust 4, F	761.79	.277	405.44	.154
K5 C3 Exhaust 5, F	955.45	.426	513.03	.237
K6 C3 Exhaust 6, F	950.03	.684	510.02	.380
K7-C3 Exhaust Comm, F	737.44	.389	391.91	.216
J1 C3 Water In, F	152.79	.151	67.104	.084
J2 C3 Water Out, F	168.30	.074	75.720	.041
J3 C3 Oil Sump, F	235.51	.245	113.06	.136
J4 C3 Fuel In, F	90.201	.037	32.334	.021
J5 C3 Inlet Air, F	102.19	.130	38.993	.072
J6 C3 Airbox, F	165.90	.063	74.386	.035
Horsepower	143.29	.495	106.84	.369
Corrected Horsepower	145.68	.503	108.61	.375
BSFC, lb/hp-hr	.520	.002	.316	.001
Corrected BSFC	.511	.002	.311	.001
Relative Humidity	19.250	.189	19.250	.189
Reference Pressure, inHg	33.428		113.20	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1526

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.43 in-Hg
Speed :	1802 RPM
Load :	417.6 lb-ft
Fuel Flow :	74.5 lb/hr
Brake Power :	143.28 bhp
BSFC :	.520 lb/bhp-hr
Indicated Power :	17.86 kW/cyl
Peak Pressure :	10.10 MPa
Peak Rate of Pressure Rise:	756.5 kPa/deg
Peak Heat Release Rate :	82.2 Joules/deg
Cumulative Heat Release :	1216.78 Joules
Apparent Combustion Efficiency :	55.3 %
Indicated Thermal Efficiency :	27.0 %
Brake Thermal Efficiency :	27.0 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	196.7 degrees
Centroid Magnitude :	14.23 J/degree
Sensitivity :	28.1 degrees
Premixed/Diffusion Ratio :	.23358

880127.122131 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	67.640	.061	19.800	.034
Wet Bulb Temperature, F	48.428	.002	9.126	.001
P11-Baro (Vent), "Hg ABS	29.602	.000	100.24	.001
P3 C3 Fuel Pressure,psig	69.903	.150	481.96	1.032
P4 C3 Oil Pressure, psig	44.945	.009	309.88	.062
P5 C3 Airbox Pres., psig	1.914	.010	13.195	.071
P10 C3 Exh Comm, inH2Og	11.553	.102	2.875	.025
P11 C3 Intake Vac,inH2Ov	9.184	.080	2.285	.020
P12 C3 Blowby, inH2Og	-.031	.002	-.008	.001
C3 Speed, RPM	1802.0	1.828	1802.0	1.828
C3 Fuel Flow, lb/hr	42.199	.278	19.141	.126
C3 Smoke, %	1.618	.063	1.618	.063
Cell 3 Load, lb-ft	278.17	1.751	377.14	2.374
K1 C3 Exhaust 1, F	499.28	.687	259.60	.382
K2 C3 Exhaust 2, F	541.82	.488	283.24	.271
K3 C3 Exhaust 3, F	597.80	2.186	314.33	1.215
K4 C3 Exhaust 4, F	520.10	1.571	271.16	.873
K5 C3 Exhaust 5, F	629.82	2.961	332.12	1.645
K6 C3 Exhaust 6, F	611.71	2.552	322.06	1.418
K7-C3 Exhaust Comm, F	486.39	1.069	252.44	.594
J1 C3 Water In, F	158.86	.205	70.477	.114
J2 C3 Water Out, F	169.89	.194	76.607	.108
J3 C3 Oil Sump, F	221.28	.170	105.16	.095
J4 C3 Fuel In, F	89.574	.217	31.986	.120
J5 C3 Inlet Air, F	101.46	.561	38.590	.311
J6 C3 Airbox, F	155.34	.240	68.524	.133
Horsepower	95.440	.575	71.158	.428
Corrected Horsepower	96.997	.584	72.318	.435
BSFC, lb/hp-hr	.442	.004	.269	.002
Corrected BSFC	.435	.003	.265	.002
Relative Humidity	19.311	.136	19.311	.136
Reference Pressure, inHg	32.823		111.15	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1528

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.82 in-Hg
Speed :	1802 RPM
Load :	278.2 lb-ft
Fuel Flow :	42.2 lb/hr
Brake Power :	95.45 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	12.26 kW/cyl
Peak Pressure :	8.435 MPa
Peak Rate of Pressure Rise:	700.5 kPa/deg
Peak Heat Release Rate :	75.4 Joules/deg
Cumulative Heat Release :	803.235 Joules
Apparent Combustion Efficiency :	64.5 %
Indicated Thermal Efficiency :	32.8 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	9.2 degrees
Centroid Phasing :	193.9 degrees
Centroid Magnitude :	13.40 J/degree
Sensitivity :	22.7 degrees
Premixed/Diffusion Ratio :	.40720

880127.123317 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	68.348	.161	20.194	.090
Wet Bulb Temperature, F	48.799	.055	9.333	.030
P11-Baro (Vent), "Hg ABS	29.594	.000	100.21	.001
P3 C3 Fuel Pressure,psig	70.622	.138	486.92	.953
P4 C3 Oil Pressure, psig	46.626	.016	321.47	.109
P5 C3 Airbox Pres., psig	1.912	.007	13.182	.051
P10 C3 Exh Comm, inH2Og	9.792	.142	2.437	.035
P11 C3 Intake Vac,inH2Ov	9.342	.081	2.325	.020
P12 C3 Blowby, inH2Og	-.028	.002	-.007	.000
C3 Speed, RPM	1802.1	1.189	1802.1	1.189
C3 Fuel Flow, lb/hr	26.975	.047	12.236	.021
C3 Smoke, %	-.032	.029	-.032	.029
Cell 3 Load, lb-ft	148.55	.336	201.41	.455
K1 C3 Exhaust 1, F	394.68	.249	201.49	.138
K2 C3 Exhaust 2, F	401.97	.177	205.54	.098
K3 C3 Exhaust 3, F	440.12	.188	226.73	.105
K4 C3 Exhaust 4, F	372.79	.386	189.33	.215
K5 C3 Exhaust 5, F	389.88	.333	198.82	.185
K6 C3 Exhaust 6, F	394.25	.326	201.25	.181
K7-C3 Exhaust Comm, F	348.05	.842	175.59	.468
J1 C3 Water In, F	162.55	.672	72.530	.373
J2 C3 Water Out, F	172.01	.627	77.786	.348
J3 C3 Oil Sump, F	212.61	.113	100.34	.063
J4 C3 Fuel In, F	89.854	.024	32.141	.013
J5 C3 Inlet Air, F	100.63	.237	38.126	.131
J6 C3 Airbox, F	147.87	.084	64.373	.047
Horsepower	50.972	.135	38.004	.101
Corrected Horsepower	51.781	.137	38.607	.102
BSFC, lb/hp-hr	.529	.002	.322	.001
Corrected BSFC	.521	.002	.317	.001
Relative Humidity	19.005	.211	19.005	.211
Reference Pressure, inHg	32.799		111.07	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1530

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.80 in-Hg
Speed :	1802 RPM
Load :	148.6 lb-ft
Fuel Flow :	27.0 lb/hr
Brake Power :	50.99 bhp
BSFC :	.530 lb/bhp-hr
Indicated Power :	8.11 kW/cyl
Peak Pressure :	7.470 MPa
Peak Rate of Pressure Rise:	768.4 kPa/deg
Peak Heat Release Rate :	87.6 Joules/deg
Cumulative Heat Release :	527.530 Joules
Apparent Combustion Efficiency :	66.2 %
Indicated Thermal Efficiency :	33.9 %
Brake Thermal Efficiency :	26.5 %
Ignition Delay :	11.0 degrees
Centroid Phasing :	193.1 degrees
Centroid Magnitude :	17.45 J/degree
Sensitivity :	20.1 degrees
Premixed/Diffusion Ratio :	.55012

880127.124159 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	68.139	.295	20.077	.164
Wet Bulb Temperature, F	48.812	.106	9.340	.059
P11-Baro (Vent), "Hg ABS	29.584	.000	100.18	.001
P3 C3 Fuel Pressure,psig	70.795	.153	488.12	1.056
P4 C3 Oil Pressure, psig	47.788	.013	329.48	.092
P5 C3 Airbox Pres., psig	1.953	.006	13.468	.038
P10 C3 Exh Comm, inH2Og	9.096	.116	2.263	.029
P11 C3 Intake Vac,inH2Ov	9.427	.062	2.346	.015
P12 C3 Blowby, inH2Og	-.028	.003	-.007	.001
C3 Speed, RPM	1801.5	1.051	1801.5	1.051
C3 Fuel Flow, lb/hr	20.666	.059	9.374	.027
C3 Smoke, %	.181	.054	.181	.054
Cell 3 Load, lb-ft	91.103	.726	123.52	.984
K1 C3 Exhaust 1, F	355.40	.254	179.67	.141
K2 C3 Exhaust 2, F	353.11	.450	178.39	.250
K3 C3 Exhaust 3, F	385.05	.276	196.14	.153
K4 C3 Exhaust 4, F	303.50	.135	150.84	.075
K5 C3 Exhaust 5, F	301.23	.280	149.57	.156
K6 C3 Exhaust 6, F	312.00	.214	155.55	.119
K7-C3 Exhaust Comm, F	299.63	.969	148.68	.538
J1 C3 Water In, F	161.24	.181	71.800	.101
J2 C3 Water Out, F	169.24	.130	76.242	.072
J3 C3 Oil Sump, F	206.98	.086	97.212	.048
J4 C3 Fuel In, F	89.314	.036	31.841	.020
J5 C3 Inlet Air, F	99.779	.356	37.655	.198
J6 C3 Airbox, F	146.02	.171	63.347	.095
Horsepower	31.249	.256	23.298	.191
Corrected Horsepower	31.734	.259	23.660	.193
BSFC, lb/hp-hr	.661	.005	.402	.003
Corrected BSFC	.651	.005	.396	.003
Relative Humidity	19.528	.311	19.528	.311
Reference Pressure, inHg	32.868		111.30	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1532

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.87 in-Hg
Speed :	1802 RPM
Load :	91.1 lb-ft
Fuel Flow :	20.7 lb/hr
Brake Power :	31.26 bhp
BSFC :	.662 lb/bhp-hr
Indicated Power :	6.57 kW/cyl
Peak Pressure :	7.085 MPa
Peak Rate of Pressure Rise:	769.1 kPa/deg
Peak Heat Release Rate :	88.7 Joules/deg
Cumulative Heat Release :	428.101 Joules
Apparent Combustion Efficiency :	70.0 %
Indicated Thermal Efficiency :	35.8 %
Brake Thermal Efficiency :	21.2 %
Ignition Delay :	11.5 degrees
Centroid Phasing :	193.0 degrees
Centroid Magnitude :	18.45 J/degree
Sensitivity :	19.5 degrees
Premixed/Diffusion Ratio :	.59355

880127.125837 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	68.775	.190	20.430	.105
Wet Bulb Temperature, F	49.337	.058	9.632	.032
P11-Baro (Vent), "Hg ABS	29.573	.000	100.14	.002
P3 C3 Fuel Pressure,psig	66.001	.118	455.06	.814
P4 C3 Oil Pressure, psig	32.066	.017	221.09	.115
P5 C3 Airbox Pres., psig	1.566	.009	10.798	.065
P10 C3 Exh Comm, inH2Og	9.775	.112	2.432	.028
P11 C3 Intake Vac,inH2Ov	5.862	.053	1.459	.013
P12 C3 Blowby, inH2Og	-.020	.002	-.005	.000
C3 Speed, RPM	1400.4	1.061	1400.4	1.061
C3 Fuel Flow, lb/hr	62.089	.187	28.163	.085
C3 Smoke, %	72.711	1.021	72.711	1.021
Cell 3 Load, lb-ft	387.70	1.922	525.64	2.606
K1 C3 Exhaust 1, F	635.60	.290	335.33	.161
K2 C3 Exhaust 2, F	716.75	.679	380.42	.377
K3 C3 Exhaust 3, F	816.32	1.420	435.73	.789
K4 C3 Exhaust 4, F	691.44	2.601	366.36	1.445
K5 C3 Exhaust 5, F	818.97	.854	437.20	.474
K6 C3 Exhaust 6, F	779.57	1.751	415.32	.973
K7-C3 Exhaust Comm, F	635.99	.198	335.55	.110
J1 C3 Water In, F	154.18	.064	67.879	.036
J2 C3 Water Out, F	170.49	.038	76.941	.021
J3 C3 Oil Sump, F	234.72	.251	112.62	.139
J4 C3 Fuel In, F	88.755	.020	31.530	.011
J5 C3 Inlet Air, F	102.31	.447	39.061	.248
J6 C3 Airbox, F	159.83	.180	71.015	.100
Horsepower	103.38	.554	77.074	.413
Corrected Horsepower	105.28	.564	78.493	.421
BSFC, lb/hp-hr	.601	.003	.365	.002
Corrected BSFC	.590	.003	.359	.002
Relative Humidity	19.905	.371	19.905	.371
Reference Pressure, inHg	32.330		109.48	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1534

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.33 in-Hg
Speed :	1400 RPM
Load :	387.7 lb-ft
Fuel Flow :	62.1 lb/hr
Brake Power :	103.35 bhp
BSFC :	.601 lb/bhp-hr
Indicated Power :	13.91 kW/cyl
Peak Pressure :	10.57 MPa
Peak Rate of Pressure Rise:	767.9 kPa/deg
Peak Heat Release Rate :	87.3 Joules/deg
Cumulative Heat Release :	1214.70 Joules
Apparent Combustion Efficiency :	51.5 %
Indicated Thermal Efficiency :	25.3 %
Brake Thermal Efficiency :	23.3 %
Ignition Delay :	5.5 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	15.35 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.20250

980127.131028 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	67.316	.450	19.620	.250
Wet Bulb Temperature, F	48.907	.086	9.393	.048
P11-Baro (Vent), "Hg ABS	29.562	.000	100.11	.001
P3 C3 Fuel Pressure,psig	68.092	.134	469.48	.921
P4 C3 Oil Pressure, psig	37.546	.068	258.87	.468
P5 C3 Airbox Pres., psig	1.484	.005	10.229	.037
P10 C3 Exh Comm, inH2Og	6.296	.060	1.567	.015
P11 C3 Intake Vac,inH2Ov	6.134	.050	1.526	.012
P12 C3 Blowby, inH2Og	-.025	.003	-.006	.001
C3 Speed, RPM	1400.6	1.090	1400.6	1.090
C3 Fuel Flow, lb/hr	16.571	.056	7.516	.025
C3 Smoke, %	.753	.063	.753	.063
Cell 3 Load, lb-ft	96.679	.728	131.08	.986
K1 C3 Exhaust 1, F	344.52	.428	173.62	.238
K2 C3 Exhaust 2, F	332.88	1.142	167.16	.635
K3 C3 Exhaust 3, F	372.14	.379	188.97	.211
K4 C3 Exhaust 4, F	279.02	.183	137.23	.102
K5 C3 Exhaust 5, F	275.84	.310	135.47	.172
K6 C3 Exhaust 6, F	294.91	.261	146.06	.145
K7-C3 Exhaust Comm, F	313.33	3.480	156.30	1.934
J1 C3 Water In, F	158.45	.345	70.249	.192
J2 C3 Water Out, F	166.73	.349	74.849	.194
J3 C3 Oil Sump, F	206.17	.446	96.759	.248
J4 C3 Fuel In, F	88.640	.028	31.466	.016
J5 C3 Inlet Air, F	102.06	.303	38.922	.168
J6 C3 Airbox, F	149.31	.415	65.172	.231
Horsepower	25.782	.208	19.223	.155
Corrected Horsepower	26.266	.212	19.583	.158
BSFC, lb/hp-hr	.643	.006	.391	.004
Corrected BSFC	.631	.006	.384	.004
Relative Humidity	21.790	.801	21.790	.801
Reference Pressure, inHg	32.131		108.81	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1536

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.13 in-Hg
Speed :	1401 RPM
Load :	96.7 lb-ft
Fuel Flow :	16.6 lb/hr
Brake Power :	25.80 bhp
BSFC :	.644 lb/bhp-hr
Indicated Power :	4.98 kW/cyl
Peak Pressure :	7.042 MPa
Peak Rate of Pressure Rise:	853.8 kPa/deg
Peak Heat Release Rate :	99.4 Joules/deg
Cumulative Heat Release :	410.686 Joules
Apparent Combustion Efficiency :	65.1 %
Indicated Thermal Efficiency :	33.8 %
Brake Thermal Efficiency :	21.8 %
Ignition Delay :	10.7 degrees
Centroid Phasing :	189.8 degrees
Centroid Magnitude :	21.99 J/degree
Sensitivity :	17.1 degrees
Premixed/Diffusion Ratio :	.62391

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 7 FUEL ~~FEDERAL #87~~ BF#2D.374 DATE 4-28-88 PAGE 39

Operator	Gray						
Time	~~9:05~~	~~9:25~~	9:40	10:00	10:15		
Test Hour	40min	20min	15min	20min	15min		
Speed, RPM	1800	2500	2200	1800	1400		
Load, lb-ft	336.0	388.1	406.4	412.3	390.9		
Fuel Flow, lb/hr	80.2	74.9	69.7	65.8	51.8		
Exh. Opacity, %	5.0	2.0	4.0	17.0	46.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	740	745	700	660	610		
Exhaust Cyl. L2	770	780	760	750	680		
Exhaust Cyl. L3	850	870	890	850	760		
Exhaust Cyl. R1	760	750	730	750	655		
Exhaust Cyl. R2	855	860	895	890	820		
Exhaust Cyl. R3	875	870	900	900	770		
Exhaust Common	690	690	690	670	600		
Water In	155	156	156	154	154		
Water Out	169	170	170	168	169		
Oil Sump	241	239	239	234	232		
Fuel	84	90	90	89	89		
Inlet Air	99	101	102	101	101		
Airbox	199	192	182	163	159		
Wet Bulb	63.0	~~61.9~~	62.9	60.9	62.5		
Dry Bulb	72.3	75.0	77.0	71.7	75.0		
PRESSURES, PSIG							
Oil Gallery	51.5	50.0	46.7	42.0	32.0		
Air After Blower	5.0	4.0	3.0	20.5	1.5		
Fuel Transfer	76.5	74.5	72.5	2.0	68.5		
LOW PRESSURES							
Intake Vac., in.water	20.0	16.0	13.0	8.8	5.3		
Exh. Comm., in.Water	27.5	23.5	19.5	14.0	9.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.49	29.50	29.51	29.51	29.51		

880128.090634 AL-15299-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	58.871	.206	14.928	.114
Wet Bulb Temperature, F	49.316	.037	9.620	.021
P11-Baro (Vent), "Hg ABS	29.490	.000	99.864	.001
P3 C3 Fuel Pressure,psig	76.629	.520	528.34	3.584
P4 C3 Oil Pressure, psig	52.215	.016	360.01	.110
P5 C3 Airbox Pres., psig	5.178	.012	35.704	.080
P10 C3 Exh Comm, inH2Og	27.689	.186	6.890	.046
P11 C3 Intake Vac,inH2Ov	20.018	.121	4.981	.030
P12 C3 Blowby, inH2Og	.024	.002	.006	.000
C3 Speed, RPM	2800.9	2.835	2800.9	2.835
C3 Fuel Flow, lb/hr	80.707	.272	36.608	.123
C3 Smoke, %	3.261	1.976	3.261	1.976
Cell 3 Load, lb-ft	355.74	.859	482.32	1.164
K1 C3 Exhaust 1, F	756.30	.772	402.39	.429
K2 C3 Exhaust 2, F	806.71	.454	430.40	.252
K3 C3 Exhaust 3, F	893.19	.711	478.44	.395
K4 C3 Exhaust 4, F	801.91	1.123	427.73	.624
K5 C3 Exhaust 5, F	899.11	.922	481.73	.512
K6 C3 Exhaust 6, F	915.24	.503	490.69	.280
K7-C3 Exhaust Comm, F	722.97	.317	383.87	.176
J1 C3 Water In, F	155.21	.066	68.452	.037
J2 C3 Water Out, F	168.66	.028	75.921	.015
J3 C3 Oil Sump, F	241.38	.472	116.32	.262
J4 C3 Fuel In, F	88.631	.051	31.462	.028
J5 C3 Inlet Air, F	98.906	.532	37.170	.296
J6 C3 Airbox, F	198.60	.070	92.554	.039
Horsepower	189.72	.555	141.45	.414
Corrected Horsepower	193.88	.568	144.55	.423
BSFC, lb/hp-hr	.425	.002	.259	.001
Corrected BSFC	.416	.002	.253	.001
Relative Humidity	49.732	.742	49.732	.742
Reference Pressure, inHg	38.561		130.58	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1538

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.56 in-Hg
Speed :	2801 RPM
Load :	355.7 lb-ft
Fuel Flow :	80.7 lb/hr
Brake Power :	189.70 bhp
BSFC :	.425 lb/bhp-hr
Indicated Power :	28.19 kW/cyl
Peak Pressure :	9.563 MPa
Peak Rate of Pressure Rise:	462.4 kPa/deg
Peak Heat Release Rate :	40.5 Joules/deg
Cumulative Heat Release :	1183.82 Joules
Apparent Combustion Efficiency :	76.0 %
Indicated Thermal Efficiency :	38.8 %
Brake Thermal Efficiency :	32.4 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	198.1 degrees
Centroid Magnitude :	11.75 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.26730

880128.092805 AL-15299-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	61.281	.272	16.267	.151
Wet Bulb Temperature, F	50.594	.052	10.330	.029
P11-Baro (Vent), "Hg ABS	29.502	.000	99.905	.001
P3 C3 Fuel Pressure,psig	75.043	.348	517.40	2.396
P4 C3 Oil Pressure, psig	50.089	.018	345.35	.122
P5 C3 Airbox Pres., psig	4.116	.026	28.377	.182
P10 C3 Exh Comm, inH2Og	23.132	.295	5.756	.073
P11 C3 Intake Vac,inH2Ov	16.250	.093	4.044	.023
P12 C3 Blowby, inH2Og	.012	.002	.003	.000
C3 Speed, RPM	2500.9	2.737	2500.9	2.737
C3 Fuel Flow, lb/hr	75.700	.162	34.337	.074
C3 Smoke, %	1.798	.103	1.798	.103
Cell 3 Load, lb-ft	387.61	.624	525.53	.846
K1 C3 Exhaust 1, F	755.65	.550	402.03	.305
K2 C3 Exhaust 2, F	808.30	.389	431.28	.216
K3 C3 Exhaust 3, F	914.93	.313	490.52	.174
K4 C3 Exhaust 4, F	789.16	.253	420.65	.140
K5 C3 Exhaust 5, F	898.78	.403	481.55	.224
K6 C3 Exhaust 6, F	910.22	.465	487.90	.258
K7-C3 Exhaust Comm, F	721.07	.163	382.82	.090
J1 C3 Water In, F	156.64	.056	69.243	.031
J2 C3 Water Out, F	169.87	.022	76.593	.012
J3 C3 Oil Sump, F	239.11	.139	115.06	.077
J4 C3 Fuel In, F	88.911	.034	31.617	.019
J5 C3 Inlet Air, F	100.27	.077	37.930	.043
J6 C3 Airbox, F	191.09	.099	88.381	.055
Horsepower	184.57	.429	137.61	.320
Corrected Horsepower	188.81	.438	140.77	.327
BSFC, lb/hp-hr	.410	.001	.250	.001
Corrected BSFC	.401	.001	.244	.001
Relative Humidity	46.506	.862	46.506	.862
Reference Pressure, inHg	36.686		124.23	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1540

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.69 in-Hg
Speed :	2501 RPM
Load :	387.6 lb-ft
Fuel Flow :	75.7 lb/hr
Brake Power :	184.57 bhp
BSFC :	.410 lb/bhp-hr
Int'icated Power :	24.81 kW/cyl
Pe4k Pressure :	9.717 MPa
Peak Rate of Pressure Rise:	508.9 kPa/deg
Peak Heat Release Rate :	44.1 Joules/deg
Cumulative Heat Release :	1191.28 Joules
Apparent Combustion Efficiency :	72.8 %
Indicated Thermal Efficiency :	36.4 %
Brake Thermal Efficiency :	33.6 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	197.9 degrees
Centroid Magnitude :	11.40 J/degree
Sensitivity :	29.1 degrees
Premixed/Diffusion Ratio :	.23696

880128.094250 AL-15299-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	61.981	.116	16.656	.065
Wet Bulb Temperature, F	51.253	.062	10.696	.034
P11-Baro (Vent), "Hg ABS	29.506	.000	99.919	.001
P3 C3 Fuel Pressure,psig	72.987	.212	503.23	1.461
P4 C3 Oil Pressure, psig	47.046	.008	324.37	.058
P5 C3 Airbox Pres., psig	2.981	.007	20.556	.048
P10 C3 Exh Comm, inH2Og	18.750	.129	4.666	.032
P11 C3 Intake Vac,inH2Ov	13.084	.065	3.256	.016
P12 C3 Blowby, inH2Og	-.001	.001	-.000	.000
C3 Speed, RPM	2203.5	2.102	2203.5	2.102
C3 Fuel Flow, lb/hr	70.154	.196	31.821	.089
C3 Smoke, %	3.845	.105	3.845	.105
Cell 3 Load, lb-ft	405.65	.799	549.99	1.083
K1 C3 Exhaust 1, F	729.59	.381	387.55	.212
K2 C3 Exhaust 2, F	810.22	.289	432.35	.160
K3 C3 Exhaust 3, F	927.81	.500	497.67	.278
K4 C3 Exhaust 4, F	768.63	.438	409.24	.243
K5 C3 Exhaust 5, F	929.02	.597	498.35	.332
K6 C3 Exhaust 6, F	938.14	.504	503.41	.280
K7-C3 Exhaust Comm, F	726.20	.343	385.67	.191
J1 C3 Water In, F	156.05	.045	68.918	.025
J2 C3 Water Out, F	170.00	.031	76.669	.017
J3 C3 Oil Sump, F	239.18	.170	115.10	.095
J4 C3 Fuel In, F	89.269	.015	31.816	.008
J5 C3 Inlet Air, F	101.69	.410	38.718	.228
J6 C3 Airbox, F	182.32	.045	83.511	.025
Horsepower	170.19	.280	126.89	.209
Corrected Horsepower	174.35	.287	129.99	.214
BSFC, lb/hp-hr	.412	.001	.251	.001
Corrected BSFC	.402	.001	.245	.001
Relative Humidity	46.913	.274	46.913	.274
Reference Pressure, inHg	34.614		117.22	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1542

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.61 in-Hg
Speed :	2204 RPM
Load :	405.7 lb-ft
Fuel Flow :	70.2 lb/hr
Brake Power :	170.25 bhp
BSFC :	.412 lb/bhp-hr
Indicated Power :	22.49 kW/cyl
Peak Pressure :	9.825 MPa
Peak Rate of Pressure Rise:	523.3 kPa/deg
Peak Heat Release Rate :	47.2 Joules/deg
Cumulative Heat Release :	1215.52 Joules
Apparent Combustion Efficiency :	70.6 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	33.5 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	11.91 J/degree
Sensitivity :	28.0 degrees
Premixed/Diffusion Ratio :	.23520

880128.100349 AL-15299-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	63.704	.326	17.613	.181
Wet Bulb Temperature, F	52.563	.054	11.424	.030
P11-Baro (Vent), "Hg ABS	29.513	.000	99.941	.001
P3 C3 Fuel Pressure,psig	70.508	.091	486.14	.626
P4 C3 Oil Pressure, psig	42.722	.025	294.56	.172
P5 C3 Airbox Pres., psig	2.089	.011	14.405	.078
P10 C3 Exh Comm, inH2Og	13.445	.138	3.346	.034
P11 C3 Intake Vac,inH2Ov	8.861	.076	2.205	.019
P12 C3 Blowby, inH2Og	.000	.002	.000	.001
C3 Speed, RPM	1802.3	1.684	1802.3	1.684
C3 Fuel Flow, lb/hr	66.136	.957	29.999	.434
C3 Smoke, %	17.667	.216	17.667	.216
Cell 3 Load, lb-ft	410.80	.840	556.97	1.138
K1 C3 Exhaust 1, F	676.70	4.287	358.17	2.382
K2 C3 Exhaust 2, F	790.33	.699	421.29	.388
K3 C3 Exhaust 3, F	876.15	5.886	468.97	3.270
K4 C3 Exhaust 4, F	734.31	1.165	390.17	.647
K5 C3 Exhaust 5, F	923.25	1.103	495.14	.613
K6 C3 Exhaust 6, F	934.87	.691	501.60	.384
K7-C3 Exhaust Comm, F	704.48	.286	373.60	.159
J1 C3 Water In, F	153.33	.113	67.404	.063
J2 C3 Water Out, F	168.07	.160	75.596	.089
J3 C3 Oil Sump, F	233.72	.119	112.07	.066
J4 C3 Fuel In, F	88.720	.033	31.511	.018
J5 C3 Inlet Air, F	100.54	.344	38.078	.191
J6 C3 Airbox, F	162.57	.066	72.540	.036
Horsepower	140.97	.345	105.11	.257
Corrected Horsepower	144.30	.353	107.59	.263
BSFC, lb/hp-hr	.469	.007	.285	.004
Corrected BSFC	.458	.006	.279	.004
Relative Humidity	46.544	.994	46.544	.994
Reference Pressure, inHg	33.115		112.14	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1544

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.12 in-Hg
Speed :	1802 RPM
Load :	410.8 lb-ft
Fuel Flow :	66.1 lb/hr
Brake Power :	140.95 bhp
BSFC :	.469 lb/bhp-hr
Indicated Power :	17.94 kW/cyl
Peak Pressure :	9.976 MPa
Peak Rate of Pressure Rise:	591.3 kPa/deg
Peak Heat Release Rate :	59.4 Joules/deg
Cumulative Heat Release :	1204.29 Joules
Apparent Combustion Efficiency :	60.8 %
Indicated Thermal Efficiency :	30.1 %
Brake Thermal Efficiency :	29.4 %
Ignition Delay :	6.0 degrees
Centroid Phasing :	196.2 degrees
Centroid Magnitude :	12.38 J/degree
Sensitivity :	28.2 degrees
Premixed/Diffusion Ratio :	.21463

880128.101844 AL-15299-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	65.097	.352	18.387	.195
Wet Bulb Temperature, F	53.219	.071	11.788	.039
P11-Baro (Vent), "Hg ABS	29.514	.000	99.945	.001
P3 C3 Fuel Pressure,psig	68.631	.084	473.20	.578
P4 C3 Oil Pressure, psig	32.418	.005	223.51	.038
P5 C3 Airbox Pres., psig	1.505	.011	10.378	.077
P10 C3 Exh Comm, inH20g	9.125	.124	2.271	.031
P11 C3 Intake Vac,inH20v	5.345	.059	1.330	.015
P12 C3 Blowby, inH20g	-.004	.003	-.001	.001
C3 Speed, RPM	1401.5	1.372	1401.5	1.372
C3 Fuel Flow, lb/hr	52.456	.231	23.793	.105
C3 Smoke, %	45.778	1.705	45.778	1.705
Cell 3 Load, lb-ft	389.27	1.794	527.77	2.432
K1 C3 Exhaust 1, F	624.84	.396	329.36	.220
K2 C3 Exhaust 2, F	708.03	.178	375.57	.099
K3 C3 Exhaust 3, F	798.63	.354	425.91	.197
K4 C3 Exhaust 4, F	683.27	.538	361.82	.299
K5 C3 Exhaust 5, F	847.98	.772	453.32	.429
K6 C3 Exhaust 6, F	800.25	.817	426.80	.454
K7-C3 Exhaust Comm, F	632.69	.295	333.72	.164
J1 C3 Water In, F	153.43	.062	67.461	.034
J2 C3 Water Out, F	169.25	.043	76.247	.024
J3 C3 Oil Sump, F	232.07	.211	111.15	.117
J4 C3 Fuel In, F	87.685	.023	30.936	.013
J5 C3 Inlet Air, F	101.56	.121	38.643	.067
J6 C3 Airbox, F	159.26	.061	70.702	.034
Horsepower	103.88	.538	77.449	.401
Corrected Horsepower	106.43	.551	79.351	.411
BSFC, lb/hp-hr	.505	.004	.307	.002
Corrected BSFC	.493	.004	.300	.002
Relative Humidity	44.591	1.017	44.591	1.017
Reference Pressure, inHg	32.185		108.99	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1546

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.19 in-Hg
Speed :	1402 RPM
Load :	389.3 lb-ft
Fuel Flow :	52.5 lb/hr
Brake Power :	103.92 bhp
BSFC :	.505 lb/bhp-hr
Indicated Power :	13.77 kW/cyl
Peak Pressure :	10.30 MPa
Peak Rate of Pressure Rise:	649.0 kPa/deg
Peak Heat Release Rate :	68.5 Joules/deg
Cumulative Heat Release :	1202.47 Joules
Apparent Combustion Efficiency :	59.4 %
Indicated Thermal Efficiency :	29.1 %
Brake Thermal Efficiency :	27.3 %
Ignition Delay :	5.2 degrees
Centroid Phasing :	195.1 degrees
Centroid Magnitude :	13.49 J/degree
Sensitivity :	27.9 degrees
Premixed/Diffusion Ratio :	.18524

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 7 FUEL TF08N14087 DATE ~~1-28-88~~ PAGE 40

Operator Grey							
Time	11:40	12:00	12:10	12:23	12:35	12:50	1:05
Test Hour	30min	20min	10min	15min	10min	15min	15min
Speed, RPM	2800	2500	2501	2200	2201	1799	1799
Load, lb-ft	382.9	413.0	290.6	429.3	224.0	420.4	275.8
Fuel Flow, lb/hr	96.2	90.3	61.9	82.9	43.1	72.4	40.6
Exh. Opacity, %	8.5	6.0	0	9.5	0	29.0	0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	800	800	593	750	495	700	490
Exhaust Cyl. L2	830	850	610	830	500	800	505
Exhaust Cyl. L3	920	900	690	950	550	880	565
Exhaust Cyl. R1	830	810	605	770	500	730	495
Exhaust Cyl. R2	930	950	690	950	545	910	600
Exhaust Cyl. R3	945	930	690	933	550	910	580
Exhaust Common	750	750	545	740	430	700	430
Water In	156	155	159	154	158	155	159
Water Out	170	169	170	169	169	171	170
Oil Sump	247	243	231	242	222	237	221
Fuel	94	93	93	91	93	90	90
Inlet Air	103	102	101	102	101	103	100
Airbox	217	204	181	193	167	169	135
Wet Bulb	60.9	61.8	61.5	61.5	60.5	60.0	60.0
Dry Bulb	73.9	74.0	73.5	73.2	71.5	71.1	72.0
PRESSURES, PSIG							
Oil Gallery	50.5	49.0	51.3	46.0	50.3	41.5	44.3
Air After Blower 5.1	~~74.5~~	4.1	4.0	3.0	2.9	2.0	1.4
Fuel Transfer 74.5	~~57~~	71.5	72.5	69.5	71.2	67.5	69.2
LOW PRESSURES							
Intake Vac., in.water	20.0	17.0	16.0	13.0	13.4	8.9	9.1
Exh. Comm., in.Water	18.0	14.0	20.0	19.5	15.0	14.0	11.7
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.5	29.49	29.48	29.48	29.46	29.46	29.45

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 7 FUEL TF# 8211908 DATE 1-28-88 PAGE 41

Operator							
Time	1:20	1:30	1:50	2:00			
Test Hour	15min	10min	20min	10min			
Speed, RPM	1799	1798	1400	1400			
Load, lb-ft	148.2	87.5	384.6	99.4			
Fuel Flow, lb/hr	25.3	15.2	60.2	15.6			
Exh. Opacity, %	0	0	70.0	0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	350	620	340			
Exhaust Cyl. L2	380	340	690	310			
Exhaust Cyl. L3	410	360	790	330			
Exhaust Cyl. R1	350	290	650	260			
Exhaust Cyl. R2	370	280	790	260			
Exhaust Cyl. R3	370	295	750	280			
Exhaust Common	330	280	600	270			
Water In	161	162	133	160			
Water Out	170	170	169	169			
Oil Sump	212	206	234	203			
Fuel	91	92	91	93			
Inlet Air	100	99	100	98			
Airbox	148	146	161	145			
Wet Bulb	61.1	62.0	61.2	61.0			
Dry Bulb	74.0	73.1	74.0	73.5			
PRESSURES, PSIG							
Oil Gallery	47.0	47.5	32.0	37.5			
Air After Blower	2.0	2.0	1.5	1.4			
Fuel Transfer	70.0	70.5	66.0	68.0			
LOW PRESSURES							
Intake Vac., in.water	9.1	9.1	5.3	5.5			
Exh. Comm., in.Water	9.5	9.0	7.5	6.0			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	29.43	29.43	29.41	29.41			

880128.113942 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	65.007	.301	18.337	.167
Wet Bulb Temperature, F	53.339	.054	11.855	.030
P11-Baro (Vent), "Hg ABS	29.499	.001	99.896	.002
P3 C3 Fuel Pressure,psig	74.913	.332	516.51	2.287
P4 C3 Oil Pressure, psig	50.819	.010	350.38	.070
P5 C3 Airbox Pres., psig	5.250	.014	36.201	.097
P10 C3 Exh Comm, inH2Og	28.801	.222	7.167	.055
P11 C3 Intake Vac,inH2Ov	19.788	.157	4.924	.039
P12 C3 Blowby, inH2Og	.039	.008	.010	.002
C3 Speed, RPM	2800.5	2.272	2800.5	2.272
C3 Fuel Flow, lb/hr	96.946	.088	43.974	.040
C3 Smoke, %	8.232	.660	8.232	.660
Cell 3 Load, lb-ft	380.73	.532	516.20	.721
K1 C3 Exhaust 1, F	803.16	.667	428.42	.370
K2 C3 Exhaust 2, F	862.12	.503	461.18	.280
K3 C3 Exhaust 3, F	959.56	.659	515.31	.366
K4 C3 Exhaust 4, F	861.54	.398	460.85	.221
K5 C3 Exhaust 5, F	968.51	.804	520.29	.447
K6 C3 Exhaust 6, F	981.94	.465	527.74	.258
K7-C3 Exhaust Comm, F	784.66	.441	418.14	.245
J1 C3 Water In, F	156.46	.047	69.142	.026
J2 C3 Water Out, F	170.14	.024	76.746	.013
J3 C3 Oil Sump, F	246.92	.188	119.40	.105
J4 C3 Fuel In, F	93.975	.049	34.431	.027
J5 C3 Inlet Air, F	101.96	.280	38.867	.156
J6 C3 Airbox, F	217.03	.078	102.79	.044
Horsepower	203.02	.343	151.37	.256
Corrected Horsepower	208.21	.352	155.24	.263
BSFC, lb/hp-hr	.478	.001	.291	.000
Corrected BSFC	.466	.001	.283	.000
Relative Humidity	45.398	.851	45.398	.851
Reference Pressure, inHg	38.734		131.17	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1548

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.73 in-Hg
Speed :	2801 RPM
Load :	380.7 lb-ft
Fuel Flow :	96.9 lb/hr
Brake Power :	203.04 bhp
BSFC :	.477 lb/bhp-hr
Indicated Power :	30.23 kW/cyl
Peak Pressure :	9.819 MPa
Peak Rate of Pressure Rise:	505.7 kPa/deg
Peak Heat Release Rate :	43.0 Joules/deg
Cumulative Heat Release :	1294.28 Joules
Apparent Combustion Efficiency :	70.3 %
Indicated Thermal Efficiency :	35.2 %
Brake Thermal Efficiency :	29.4 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	199.3 degrees
Centroid Magnitude :	12.10 J/degree
Sensitivity :	29.8 degrees
Premixed/Diffusion Ratio :	.25385

880128.115759 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	64.776	.249	18.209	.138
Wet Bulb Temperature, F	53.353	.062	11.863	.035
P11-Baro (Vent), "Hg ABS	29.490	.000	99.863	.002
P3 C3 Fuel Pressure,psig	71.803	.289	495.07	1.990
P4 C3 Oil Pressure, psig	49.317	.014	340.03	.097
P5 C3 Airbox Pres., psig	4.178	.017	28.807	.120
P10 C3 Exh Comm, inH2Og	24.276	.152	6.041	.038
P11 C3 Intake Vac,inH2Ov	16.317	.131	4.060	.033
P12 C3 Blowby, inH2Og	.022	.006	.005	.001
C3 Speed, RPM	2502.2	3.455	2502.2	3.455
C3 Fuel Flow, lb/hr	91.081	.083	41.314	.038
C3 Smoke, %	6.241	.210	6.241	.210
Cell 3 Load, lb-ft	412.28	.869	558.97	1.179
K1 C3 Exhaust 1, F	833.09	.469	445.05	.260
K2 C3 Exhaust 2, F	887.31	.421	475.17	.234
K3 C3 Exhaust 3, F	991.48	.649	533.04	.361
K4 C3 Exhaust 4, F	852.07	.595	455.59	.331
K5 C3 Exhaust 5, F	986.22	.498	530.12	.276
K6 C3 Exhaust 6, F	993.44	.548	534.13	.304
K7-C3 Exhaust Comm, F	769.51	.279	409.73	.155
J1 C3 Water In, F	154.71	.050	68.174	.028
J2 C3 Water Out, F	168.57	.035	75.872	.019
J3 C3 Oil Sump, F	242.82	.239	117.12	.133
J4 C3 Fuel In, F	92.147	.017	33.415	.009
J5 C3 Inlet Air, F	102.38	.053	39.102	.030
J6 C3 Airbox, F	199.81	10.851	93.229	6.028
Horsepower	196.42	.496	146.45	.369
Corrected Horsepower	201.61	.509	150.32	.379
BSFC, lb/hp-hr	.464	.001	.282	.001
Corrected BSFC	.452	.001	.275	.001
Relative Humidity	46.236	.860	46.236	.860
Reference Pressure, inHg	36.796		124.61	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1550

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.80 in-Hg
Speed :	2502 RPM
Load :	412.3 lb-ft
Fuel Flow :	91.1 lb/hr
Brake Power :	196.42 bhp
BSFC :	.464 lb/bhp-hr
Indicated Power :	25.91 kW/cyl
Peak Pressure :	9.899 MPa
Peak Rate of Pressure Rise:	543.9 kPa/deg
Peak Heat Release Rate :	48.5 Joules/deg
Cumulative Heat Release :	1262.84 Joules
Apparent Combustion Efficiency :	65.2 %
Indicated Thermal Efficiency :	32.1 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	199.3 degrees
Centroid Magnitude :	11.53 J/degree
Sensitivity :	30.3 degrees
Premixed/Diffusion Ratio :	.23301

880128.121222 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	67.837	.228	19.909	.127
Wet Bulb Temperature, F	54.722	.111	12.623	.062
P11-Baro (Vent), "Hg ABS	29.481	.001	99.834	.002
P3 C3 Fuel Pressure,psig	72.834	.387	502.17	2.668
P4 C3 Oil Pressure, psig	51.898	.020	357.82	.138
P5 C3 Airbox Pres., psig	3.924	.023	27.058	.160
P10 C3 Exh Comm, inH2Og	19.948	.181	4.964	.045
P11 C3 Intake Vac,inH2Ov	16.775	.123	4.174	.031
P12 C3 Blowby, inH2Og	.013	.006	.003	.002
C3 Speed, RPM	2502.2	2.861	2502.2	2.861
C3 Fuel Flow, lb/hr	62.594	.102	28.392	.046
C3 Smoke, %	.221	.043	.221	.043
Cell 3 Load, lb-ft	291.15	1.304	394.75	1.768
K1 C3 Exhaust 1, F	609.44	.583	320.80	.324
K2 C3 Exhaust 2, F	637.17	.481	336.21	.267
K3 C3 Exhaust 3, F	716.68	.414	380.38	.230
K4 C3 Exhaust 4, F	636.19	.565	335.66	.314
K5 C3 Exhaust 5, F	711.66	1.542	377.59	.857
K6 C3 Exhaust 6, F	702.79	1.151	372.66	.639
K7-C3 Exhaust Comm, F	568.36	.407	297.98	.226
J1 C3 Water In, F	158.76	.078	70.423	.043
J2 C3 Water Out, F	169.88	.095	76.598	.053
J3 C3 Oil Sump, F	231.19	.095	110.66	.053
J4 C3 Fuel In, F	92.879	.024	33.822	.014
J5 C3 Inlet Air, F	100.45	.378	38.026	.210
J6 C3 Airbox, F	180.83	.066	82.682	.037
Horsepower	138.71	.679	103.42	.506
Corrected Horsepower	142.19	.696	106.01	.519
BSFC, lb/hp-hr	.451	.003	.275	.002
Corrected BSFC	.440	.002	.268	.002
Relative Humidity	41.943	.565	41.943	.565
Reference Pressure, inHg	36.237		122.71	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1552

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.24 in-Hg
Speed :	2502 RPM
Load :	291.2 lb-ft
Fuel Flow :	62.6 lb/hr
Brake Power :	138.72 bhp
BSFC :	.451 lb/bhp-hr
Indicated Power :	18.80 kW/cyl
Peak Pressure :	8.745 MPa
Peak Rate of Pressure Rise:	610.6 kPa/deg
Peak Heat Release Rate :	61.0 Joules/deg
Cumulative Heat Release :	892.422 Joules
Apparent Combustion Efficiency :	67.0 %
Indicated Thermal Efficiency :	33.9 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	9.5 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	11.43 J/degree
Sensitivity :	25.9 degrees
Premixed/Diffusion Ratio :	.36777

880128.122446 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	67.783	.743	19.879	.413
Wet Bulb Temperature, F	54.334	.216	12.408	.120
P11-Baro (Vent), "Hg ABS	29.474	.001	99.809	.002
P3 C3 Fuel Pressure,psig	69.468	.142	478.97	.976
P4 C3 Oil Pressure, psig	46.542	.013	320.89	.088
P5 C3 Airbox Pres., psig	3.025	.012	20.854	.084
P10 C3 Exh Comm, inH2Og	19.376	.185	4.822	.046
P11 C3 Intake Vac,inH2Ov	13.300	.119	3.310	.030
P12 C3 Blowby, inH2Og	-.002	.003	-.000	.001
C3 Speed, RPM	2201.5	1.933	2201.5	1.933
C3 Fuel Flow, lb/hr	83.539	.052	37.893	.023
C3 Smoke, %	9.434	.132	9.434	.132
Cell 3 Load, lb-ft	428.48	.659	580.94	.893
K1 C3 Exhaust 1, F	775.59	.483	413.10	.268
K2 C3 Exhaust 2, F	863.96	.379	462.20	.211
K3 C3 Exhaust 3, F	988.21	.476	531.23	.264
K4 C3 Exhaust 4, F	814.33	.748	434.63	.416
K5 C3 Exhaust 5, F	990.82	.692	532.68	.384
K6 C3 Exhaust 6, F	1003.7	.719	539.86	.399
K7-C3 Exhaust Comm, F	777.80	.294	414.33	.163
J1 C3 Water In, F	153.83	.057	67.685	.032
J2 C3 Water Out, F	168.18	.033	75.653	.019
J3 C3 Oil Sump, F	241.51	.159	116.39	.088
J4 C3 Fuel In, F	90.957	.017	32.754	.009
J5 C3 Inlet Air, F	101.97	.093	38.872	.052
J6 C3 Airbox, F	192.87	.049	89.375	.027
Horsepower	179.61	.309	133.91	.230
Corrected Horsepower	184.34	.317	137.44	.236
BSFC, lb/hp-hr	.465	.001	.283	.000
Corrected BSFC	.453	.001	.276	.000
Relative Humidity	40.633	1.415	40.633	1.415
Reference Pressure, inHg	34.654		117.35	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1554

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.65 in-Hg
Speed :	2202 RPM
Load :	428.5 lb-ft
Fuel Flow :	83.5 lb/hr
Brake Power :	179.66 bhp
BSFC :	.465 lb/bhp-hr
Indicated Power :	23.17 kW/cyl
Peak Pressure :	10.18 MPa
Peak Rate of Pressure Rise:	589.2 kPa/deg
Peak Heat Release Rate :	56.4 Joules/deg
Cumulative Heat Release :	1268.42 Joules
Apparent Combustion Efficiency :	62.9 %
Indicated Thermal Efficiency :	31.3 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	197.4 degrees
Centroid Magnitude :	12.33 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.22814

380128.123740 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	67.638	.140	19.799	.078
Wet Bulb Temperature, F	54.646	.064	12.581	.036
P11-Baro (Vent), "Hg ABS	29.463	.000	99.772	.001
P3 C3 Fuel Pressure,psig	71.755	.157	494.73	1.081
P4 C3 Oil Pressure, psig	50.665	.020	349.32	.137
P5 C3 Airbox Pres., psig	2.799	.011	19.298	.078
P10 C3 Exh Comm, inH2Og	14.510	.175	3.611	.044
P11 C3 Intake Vac,inH2Ov	13.806	.127	3.436	.031
P12 C3 Blowby, inH2Og	-.018	.002	-.004	.001
C3 Speed, RPM	2201.4	1.867	2201.4	1.867
C3 Fuel Flow, lb/hr	43.731	.048	19.836	.022
C3 Smoke, %	-.328	.043	-.328	.043
Cell 3 Load, lb-ft	223.89	1.237	303.55	1.678
K1 C3 Exhaust 1, F	498.19	.158	259.00	.088
K2 C3 Exhaust 2, F	518.15	.443	270.08	.246
K3 C3 Exhaust 3, F	575.40	.266	301.89	.148
K4 C3 Exhaust 4, F	514.62	.552	268.12	.306
K5 C3 Exhaust 5, F	566.22	.208	296.79	.116
K6 C3 Exhaust 6, F	567.14	.440	297.30	.244
K7-C3 Exhaust Comm, F	455.49	.947	235.27	.526
J1 C3 Water In, F	158.19	.035	70.104	.019
J2 C3 Water Out, F	168.12	.014	75.625	.008
J3 C3 Oil Sump, F	221.90	.174	105.50	.097
J4 C3 Fuel In, F	91.751	.034	33.195	.019
J5 C3 Inlet Air, F	100.62	.177	38.122	.098
J6 C3 Airbox, F	166.50	.149	74.725	.083
Horsepower	93.841	.545	69.966	.407
Corrected Horsepower	96.266	.559	71.773	.417
BSFC, lb/hp-hr	.466	.003	.284	.002
Corrected BSFC	.454	.003	.276	.002
Relative Humidity	42.265	.420	42.265	.420
Reference Pressure, inHg	34.146		115.63	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1556

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.15 in-Hg
Speed :	2201 RPM
Load :	223.9 lb-ft
Fuel Flow :	43.7 lb/hr
Brake Power :	93.83 bhp
BSFC :	.466 lb/bhp-hr
Indicated Power :	13.39 kW/cyl
Peak Pressure :	8.129 MPa
Peak Rate of Pressure Rise:	718.6 kPa/deg
Peak Heat Release Rate :	78.5 Joules/deg
Cumulative Heat Release :	708.169 Joules
Apparent Combustion Efficiency :	67.0 %
Indicated Thermal Efficiency :	34.6 %
Brake Thermal Efficiency :	30.1 %
Ignition Delay :	10.4 degrees
Centroid Phasing :	194.5 degrees
Centroid Magnitude :	13.99 J/degree
Sensitivity :	22.1 degrees
Premixed/Diffusion Ratio :	.46874

880128.125043 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	68.260	.699	20.144	.388
Wet Bulb Temperature, F	54.683	.111	12.602	.062
P11-Baro (Vent), "Hg ABS	29.456	.001	99.749	.002
P3 C3 Fuel Pressure,psig	67.852	.161	467.82	1.112
P4 C3 Oil Pressure, psig	42.215	.019	291.06	.133
P5 C3 Airbox Pres., psig	2.103	.007	14.501	.050
P10 C3 Exh Comm, inH2Og	13.516	.160	3.363	.040
P11 C3 Intake Vac,inH2Ov	9.455	.059	2.353	.015
P12 C3 Blowby, inH2Og	-.026	.004	-.006	.001
C3 Speed, RPM	1800.4	1.787	1800.4	1.787
C3 Fuel Flow, lb/hr	73.046	.039	33.133	.017
C3 Smoke, %	28.246	.361	28.246	.361
Cell 3 Load, lb-ft	419.85	.849	569.24	1.151
K1 C3 Exhaust 1, F	711.97	.325	377.76	.180
K2 C3 Exhaust 2, F	831.11	.726	443.95	.403
K3 C3 Exhaust 3, F	917.54	.713	491.96	.396
K4 C3 Exhaust 4, F	756.98	.413	402.77	.230
K5 C3 Exhaust 5, F	954.81	.792	512.67	.440
K6 C3 Exhaust 6, F	956.78	.366	513.77	.203
K7-C3 Exhaust Comm, F	735.59	.316	390.89	.176
J1 C3 Water In, F	155.05	.082	68.360	.045
J2 C3 Water Out, F	170.21	.036	76.783	.020
J3 C3 Oil Sump, F	236.28	.257	113.49	.143
J4 C3 Fuel In, F	89.167	.011	31.759	.006
J5 C3 Inlet Air, F	102.89	.070	39.382	.039
J6 C3 Airbox, F	168.00	.096	75.558	.053
Horsepower	143.93	.374	107.31	.279
Corrected Horsepower	147.95	.385	110.31	.287
BSFC, lb/hp-hr	.508	.001	.309	.001
Corrected BSFC	.494	.001	.300	.001
Relative Humidity	40.568	1.710	40.568	1.710
Reference Pressure, inHg	33.043		111.90	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1558

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.04 in-Hg
Speed :	1800 RPM
Load :	419.9 lb-ft
Fuel Flow :	73.0 lb/hr
Brake Power :	143.91 bhp
BSFC :	.507 lb/bhp-hr
Indicated Power :	18.20 kW/cyl
Peak Pressure :	10.26 MPa
Peak Rate of Pressure Rise:	733.7 kPa/deg
Peak Heat Release Rate :	79.7 Joules/deg
Cumulative Heat Release :	1235.59 Joules
Apparent Combustion Efficiency :	57.3 %
Indicated Thermal Efficiency :	28.1 %
Brake Thermal Efficiency :	27.6 %
Ignition Delay :	6.3 degrees
Centroid Phasing :	196.7 degrees
Centroid Magnitude :	13.74 J/degree
Sensitivity :	28.4 degrees
Premixed/Diffusion Ratio :	.21997

880128.130611 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	68.190	.150	20.106	.083
Wet Bulb Temperature, F	54.191	.019	12.328	.011
P11-Baro (Vent), "Hg ABS	29.443	.000	99.706	.002
P3 C3 Fuel Pressure,psig	69.422	.181	478.65	1.249
P4 C3 Oil Pressure, psig	45.165	.006	311.40	.044
P5 C3 Airbox Pres., psig	1.829	.008	12.613	.056
P10 C3 Exh Comm, inH2Og	10.710	.131	2.665	.033
P11 C3 Intake Vac,inH2Ov	9.995	.054	2.487	.014
P12 C3 Blowby, inH2Og	-.025	.003	-.006	.001
C3 Speed, RPM	1800.0	1.093	1800.0	1.093
C3 Fuel Flow, lb/hr	41.255	.073	18.713	.033
C3 Smoke, %	.181	.055	.181	.055
Cell 3 Load, lb-ft	275.82	.449	373.96	.609
K1 C3 Exhaust 1, F	505.57	.216	263.09	.120
K2 C3 Exhaust 2, F	535.81	.468	279.89	.260
K3 C3 Exhaust 3, F	596.24	.193	313.47	.107
K4 C3 Exhaust 4, F	514.61	.335	268.12	.186
K5 C3 Exhaust 5, F	628.16	.508	331.20	.282
K6 C3 Exhaust 6, F	607.12	.268	319.51	.149
K7-C3 Exhaust Comm, F	459.60	.381	237.56	.212
J1 C3 Water In, F	158.57	.066	70.317	.037
J2 C3 Water Out, F	169.36	.057	76.312	.032
J3 C3 Oil Sump, F	220.80	.140	104.89	.078
J4 C3 Fuel In, F	89.281	.033	31.823	.018
J5 C3 Inlet Air, F	100.30	.056	37.945	.031
J6 C3 Airbox, F	154.63	.108	68.130	.060
Horsepower	94.530	.158	70.480	.117
Corrected Horsepower	96.951	.162	72.284	.120
BSFC, lb/hp-hr	.436	.001	.266	.001
Corrected BSFC	.426	.001	.259	.001
Relative Humidity	38.884	.379	38.884	.379
Reference Pressure, inHg	32.433		109.83	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1560

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.43 in-Hg
Speed :	1800 RPM
Load :	275.8 lb-ft
Fuel Flow :	41.3 lb/hr
Brake Power :	94.52 bhp
BSFC :	.437 lb/bhp-hr
Indicated Power :	12.08 kW/cyl
Peak Pressure :	8.398 MPa
Peak Rate of Pressure Rise:	716.7 kPa/deg
Peak Heat Release Rate :	78.0 Joules/deg
Cumulative Heat Release :	791.612 Joules
Apparent Combustion Efficiency :	64.8 %
Indicated Thermal Efficiency :	33.0 %
Brake Thermal Efficiency :	32.1 %
Ignition Delay :	9.4 degrees
Centroid Phasing :	193.8 degrees
Centroid Magnitude :	13.76 J/degree
Sensitivity :	22.4 degrees
Premixed/Diffusion Ratio :	.41678

980128.132241 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	68.324	.210	20.180	.117
Wet Bulb Temperature, F	54.413	.032	12.452	.018
P11-Baro (Vent), "Hg ABS	29.429	.001	99.657	.002
P3 C3 Fuel Pressure,psig	70.273	.234	484.52	1.612
P4 C3 Oil Pressure, psig	47.088	.008	324.66	.058
P5 C3 Airbox Pres., psig	1.817	.006	12.530	.040
P10 C3 Exh Comm, inH2Og	8.965	.045	2.231	.011
P11 C3 Intake Vac,inH2Ov	10.212	.058	2.541	.014
P12 C3 Blowby, inH2Og	-.018	.004	-.005	.001
C3 Speed, RPM	1799.6	1.082	1799.6	1.082
C3 Fuel Flow, lb/hr	25.960	.053	11.775	.024
C3 Smoke, %	-.378	.030	-.378	.030
Cell 3 Load, lb-ft	147.64	.411	200.17	.558
K1 C3 Exhaust 1, F	397.06	.186	202.81	.103
K2 C3 Exhaust 2, F	396.88	.166	202.71	.092
K3 C3 Exhaust 3, F	436.93	.237	224.96	.132
K4 C3 Exhaust 4, F	369.19	.316	187.33	.175
K5 C3 Exhaust 5, F	390.39	.227	199.10	.126
K6 C3 Exhaust 6, F	391.72	.282	199.85	.157
K7-C3 Exhaust Comm, F	330.56	.090	165.87	.050
J1 C3 Water In, F	161.49	.191	71.939	.106
J2 C3 Water Out, F	169.93	.145	76.629	.080
J3 C3 Oil Sump, F	211.34	.087	99.633	.048
J4 C3 Fuel In, F	90.498	.029	32.499	.016
J5 C3 Inlet Air, F	99.461	.157	37.479	.087
J6 C3 Airbox, F	147.66	.088	64.256	.049
Horsepower	50.590	.134	37.719	.100
Corrected Horsepower	51.880	.137	38.680	.102
BSFC, lb/hp-hr	.513	.001	.312	.001
Corrected BSFC	.500	.001	.304	.001
Relative Humidity	39.348	.533	39.348	.533
Reference Pressure, inHg	32.378		109.64	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1562

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.38 in-Hg
Speed :	1800 RPM
Load :	147.6 lb-ft
Fuel Flow :	26.0 lb/hr
Brake Power :	50.59 bhp
BSFC :	.514 lb/bhp-hr
Indicated Power :	7.97 kW/cyl
Peak Pressure :	7.428 MPa
Peak Rate of Pressure Rise:	820.1 kPa/deg
Peak Heat Release Rate :	94.8 Joules/deg
Cumulative Heat Release :	518.403 Joules
Apparent Combustion Efficiency :	67.4 %
Indicated Thermal Efficiency :	34.6 %
Brake Thermal Efficiency :	27.3 %
Ignition Delay :	11.1 degrees
Centroid Phasing :	193.2 degrees
Centroid Magnitude :	18.62 J/degree
Sensitivity :	20.1 degrees
Premixed/Diffusion Ratio :	.55332

880128.133246 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	68.144	.044	20.080	.024
Wet Bulb Temperature, F	54.273	.003	12.374	.002
P11-Baro (Vent), "Hg ABS	29.425	.000	99.644	.002
P3 C3 Fuel Pressure,psig	70.561	.141	486.50	.976
P4 C3 Oil Pressure, psig	47.943	.014	330.55	.098
P5 C3 Airbox Pres., psig	1.873	.005	12.916	.034
P10 C3 Exh Comm, inH2Og	8.343	.102	2.076	.025
P11 C3 Intake Vac,inH2Ov	10.203	.070	2.539	.017
P12 C3 Blowby, inH2Og	-.025	.002	-.006	.001
C3 Speed, RPM	1799.7	1.874	1799.7	1.874
C3 Fuel Flow, lb/hr	19.757	.044	8.962	.020
C3 Smoke, %	-.077	.033	-.077	.033
Cell 3 Load, lb-ft	88.370	.716	119.81	.971
K1 C3 Exhaust 1, F	353.00	.102	178.33	.057
K2 C3 Exhaust 2, F	350.33	.382	176.85	.212
K3 C3 Exhaust 3, F	382.78	.405	194.88	.225
K4 C3 Exhaust 4, F	297.24	.115	147.36	.064
K5 C3 Exhaust 5, F	297.15	.183	147.31	.102
K6 C3 Exhaust 6, F	304.41	.268	151.34	.149
K7-C3 Exhaust Comm, F	294.13	.614	145.63	.341
J1 C3 Water In, F	160.82	.345	71.567	.191
J2 C3 Water Out, F	168.58	.287	75.876	.159
J3 C3 Oil Sump, F	206.86	.262	97.146	.146
J4 C3 Fuel In, F	91.201	.018	32.890	.010
J5 C3 Inlet Air, F	98.031	.178	36.684	.099
J6 C3 Airbox, F	145.70	.040	63.164	.022
Horsepower	30.282	.265	22.577	.197
Corrected Horsepower	31.016	.271	23.125	.202
BSFC, lb/hp-hr	.652	.006	.397	.004
Corrected BSFC	.637	.006	.388	.003
Relative Humidity	39.347	.131	39.347	.131
Reference Pressure, inHg	32.489		110.02	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1564

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.49 in-Hg
Speed :	1800 RPM
Load :	88.4 lb-ft
Fuel Flow :	19.8 lb/hr
Brake Power :	30.30 bhp
BSFC :	.654 lb/bhp-hr
Indicated Power :	6.43 kW/cyl
Peak Pressure :	7.096 MPa
Peak Rate of Pressure Rise:	804.4 kPa/deg
Peak Heat Release Rate :	93.9 Joules/deg
Cumulative Heat Release :	418.119 Joules
Apparent Combustion Efficiency :	71.4 %
Indicated Thermal Efficiency :	36.6 %
Brake Thermal Efficiency :	21.4 %
Ignition Delay :	11.6 degrees
Centroid Phasing :	192.9 degrees
Centroid Magnitude :	20.19 J/degree
Sensitivity :	19.3 degrees
Premixed/Diffusion Ratio :	.60253

980128.134858 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	69.449	.365	20.805	.203
Wet Bulb Temperature, F	54.858	.101	12.699	.056
P11-Baro (Vent), "Hg ABS	29.413	.000	99.602	.001
P3 C3 Fuel Pressure,psig	65.949	.280	454.70	1.930
P4 C3 Oil Pressure, psig	32.497	.015	224.06	.100
P5 C3 Airbox Pres., psig	1.474	.006	10.166	.043
P10 C3 Exh Comm, inH2Og	9.119	.105	2.269	.026
P11 C3 Intake Vac,inH2Ov	6.629	.052	1.650	.013
P12 C3 Blowby, inH2Og	-.012	.004	-.003	.001
C3 Speed, RPM	1402.0	.978	1402.0	.978
C3 Fuel Flow, lb/hr	60.857	.038	27.604	.017
C3 Smoke, %	70.168	.918	70.168	.918
Cell 3 Load, lb-ft	388.20	1.069	526.32	1.449
K1 C3 Exhaust 1, F	632.82	.261	333.79	.145
K2 C3 Exhaust 2, F	711.67	.307	377.59	.170
K3 C3 Exhaust 3, F	814.14	.599	434.52	.333
K4 C3 Exhaust 4, F	692.69	1.066	367.05	.592
K5 C3 Exhaust 5, F	819.06	.929	437.25	.516
K6 C3 Exhaust 6, F	774.33	.824	412.41	.458
K7-C3 Exhaust Comm, F	623.63	.835	328.68	.464
J1 C3 Water In, F	152.75	.076	67.086	.042
J2 C3 Water Out, F	168.89	.086	76.048	.048
J3 C3 Oil Sump, F	232.56	.062	111.42	.035
J4 C3 Fuel In, F	90.354	.049	32.419	.027
J5 C3 Inlet Air, F	100.06	.107	37.814	.059
J6 C3 Airbox, F	160.37	.045	71.315	.025
Horsepower	103.62	.290	77.260	.216
Corrected Horsepower	106.38	.298	79.315	.222
BSFC, lb/hp-hr	.587	.002	.357	.001
Corrected BSFC	.572	.002	.348	.001
Relative Humidity	37.809	.793	37.809	.793
Reference Pressure, inHg	31.927		108.12	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1566

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.93 in-Hg
Speed :	1402 RPM
Load :	388.2 lb-ft
Fuel Flow :	60.9 lb/hr
Brake Power :	103.63 bhp
BSFC :	.588 lb/bhp-hr
Indicated Power :	13.77 kW/cyl
Peak Pressure :	10.48 MPa
Peak Rate of Pressure Rise:	794.5 kPa/deg
Peak Heat Release Rate :	90.8 Joules/deg
Cumulative Heat Release :	1209.33 Joules
Apparent Combustion Efficiency :	52.3 %
Indicated Thermal Efficiency :	25.5 %
Brake Thermal Efficiency :	23.8 %
Ignition Delay :	5.6 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	15.60 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.20404

880128.140134 AL-16085-F AL-12920-L 6V53N				7
Dry Bulb Temperature, F	69.984	.210	21.102	.117
Wet Bulb Temperature, F	55.200	.090	12.889	.050
P11-Baro (Vent), "Hg ABS	29.407	.001	99.583	.002
P3 C3 Fuel Pressure,psig	68.062	.184	469.27	1.266
P4 C3 Oil Pressure, psig	38.061	.034	262.42	.235
P5 C3 Airbox Pres., psig	1.404	.007	9.679	.046
P10 C3 Exh Comm, inH2Og	5.546	.062	1.380	.016
P11 C3 Intake Vac,inH2Ov	6.878	.053	1.712	.013
P12 C3 Blowby, inH2Og	-.017	.004	-.004	.001
C3 Speed, RPM	1401.8	.899	1401.8	.899
C3 Fuel Flow, lb/hr	16.049	.037	7.280	.017
C3 Smoke, %	-.574	.064	-.574	.064
Cell 3 Load, lb-ft	97.548	1.342	132.26	1.819
K1 C3 Exhaust 1, F	347.34	.175	175.19	.097
K2 C3 Exhaust 2, F	327.50	.237	164.16	.132
K3 C3 Exhaust 3, F	368.02	.299	186.68	.166
K4 C3 Exhaust 4, F	275.72	.659	135.40	.366
K5 C3 Exhaust 5, F	275.49	.851	135.27	.473
K6 C3 Exhaust 6, F	289.54	.875	143.08	.486
K7-C3 Exhaust Comm, F	285.85	1.577	141.03	.876
J1 C3 Water In, F	159.77	.439	70.983	.244
J2 C3 Water Out, F	167.75	.102	75.416	.057
J3 C3 Oil Sump, F	203.52	.156	95.287	.087
J4 C3 Fuel In, F	93.228	.029	34.015	.016
J5 C3 Inlet Air, F	97.958	.054	36.643	.030
J6 C3 Airbox, F	146.03	.217	63.349	.121
Horsepower	26.037	.358	19.413	.267
Corrected Horsepower	26.688	.367	19.898	.273
BSFC, lb/hp-hr	.616	.007	.375	.004
Corrected BSFC	.601	.007	.366	.004
Relative Humidity	37.570	.372	37.570	.372
Reference Pressure, inHg	31.759		107.55	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1568

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.76 in-Hg
Speed :	1402 RPM
Load :	97.5 lb-ft
Fuel Flow :	16.0 lb/hr
Brake Power :	26.03 bhp
BSFC :	.615 lb/bhp-hr
Indicated Power :	5.04 kW/cyl
Peak Pressure :	7.081 MPa
Peak Rate of Pressure Rise:	898.7 kPa/deg
Peak Heat Release Rate :	105.9 Joules/deg
Cumulative Heat Release :	416.260 Joules
Apparent Combustion Efficiency :	68.5 %
Indicated Thermal Efficiency :	35.5 %
Brake Thermal Efficiency :	22.8 %
Ignition Delay :	10.8 degrees
Centroid Phasing :	189.8 degrees
Centroid Magnitude :	23.50 J/degree
Sensitivity :	17.0 degrees
Premixed/Diffusion Ratio :	.63606

APPENDIX F8
DDC 6V-53N DATA SHEETS
FUEL BLEND TF07

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: DDA 6V-53N Engine Tester: [signature]
Test Fuel: TF07N1107 Date: 2-1-88

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressures
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF07N1107 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressures
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF07N1107 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF07N11U87 Date: 2-1-93

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	244	DN1569	DN1570
2500	245	DN1571	DN1572
2200	246	DN1573	DN1574
1800	247	DN1575	DN1576
1400	248	DN1577	DN1578

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF07N11U87

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	249	DN1579	DN1580
2500	Full-Rack	250	DN1581	DN1582
2500	145	251	DN1583	DN1584
2200	Full-Rack	252	DN1585	DN1586
2200	100	253	DN1587	DN1588
1800	Full-Rack	254	DN1589	DN1590
1800	100	255	DN1591	DN1592
1800	54	256	DN1593	DN1594
1800	20	257	DN1595	DN1596
1400	Full-Rack	258	DN1597	DN1598
1400	28	259	DN1599	DN1600

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF07N11U87 Date: 2-1-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	260	QN1601	QN1602
2500	261	QN1603	QN1604
2200	262	QN1605	QN1606
1800	263	QN1607	QN1608
1400	264	QN1609	QN1610

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF07N11U87

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	265	QN1611	QN1612
2500	Full-Rack	266	QN1613	QN1614
2500	145	267	QN1615	QN1616
2200	Full-Rack	268	QN1617	QN1618
2200	100	269	QN1619	QN1620
1800	Full-Rack	270	QN1621	QN1622
1800	100	271	QN1623	QN1624
1800	54	272	QN1625	QN1626
1800	20	273	QN1627	QN1628
1400	Full-Rack	274	QN1629	QN1630
1400	28	275	QN1631	QN1632

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 8 FUEL DF#2V132-86 DATE 2-1-88 PAGE 42

Operator	Greg						
Time	9:10	10:15	10:30	10:40	10:55		
Test Hour	30 min	1 hr 15 min	15 min	10 min	15 min		
Speed, RPM	2800	2501	2199	1800	1399		
Load, lb-ft	352.3	382.9	403.1	406.1	374.6		
Fuel Flow, lb/hr	79.7	74.0	68.7	61.0	51.2		
Exh. Opacity, %	5.5	2.0	2.0	17.0	34.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	750	710	670	610		
Exhaust Cyl. L2	800	790	790	760	680		
Exhaust Cyl. L3	860	870	900	850	760		
Exhaust Cyl. R1	790	750	740	700	645		
Exhaust Cyl. R2	870	860	900	900	800		
Exhaust Cyl. R3	900	880	900	900	750		
Exhaust Common	700	695	695	670	600		
Water In	155	156	155	155	154		
Water Out	169	169	168	169	170		
Oil Sump	244	238	238	235	235		
Fuel	94	92	92	90	88		
Inlet Air	102	100	101	102	102		
Airbox	207	190	186	169	163		
Wet Bulb	66.5	67.5	68.0	69.0	69.1		
Dry Bulb	71.2	71.8	73.0	74.5	74.4		
PRESSURES, PSIG							
Oil Gallery	51.5	51.0	47.0	42.0	32.0		
Air After Blower	5.0	4.0	3.0	2.0	1.4		
Fuel Transfer	76.0	74.5	73.0	70.3	64.0		
LOW PRESSURES							
Intake Vac., in.water	19.0	16.0	13.8	8.6	5.2		
Exh. Comm., in.Water	22.0	22.0	18.0	13.5	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.01	29.01	29.01	29.02	29.02		

880201.091111 AL-15299-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	69.966	.047	21.092	.026
Wet Bulb Temperature, F	64.951	.019	18.306	.011
P11-Baro (Vent), "Hg ABS	29.006	.000	98.226	.002
P3 C3 Fuel Pressure,psig	76.268	.499	525.85	3.439
P4 C3 Oil Pressure, psig	52.235	.017	360.15	.115
P5 C3 Airbox Pres., psig	4.821	.013	33.237	.088
P10 C3 Exh Comm, inH20g	26.912	.149	6.697	.037
P11 C3 Intake Vac,inH20v	18.979	.083	4.723	.021
P12 C3 Blowby, inH20g	.013	.002	.003	.001
C3 Speed, RPM	2799.8	2.258	2799.8	2.258
C3 Fuel Flow, lb/hr	79.998	.240	36.286	.109
C3 Smoke, %	5.496	.162	5.496	.162
Cell 3 Load, lb-ft	353.16	.598	478.81	.811
K1 C3 Exhaust 1, F	778.42	.549	414.68	.305
K2 C3 Exhaust 2, F	820.85	.562	438.25	.312
K3 C3 Exhaust 3, F	908.27	.611	486.82	.339
K4 C3 Exhaust 4, F	817.23	.528	436.24	.293
K5 C3 Exhaust 5, F	915.63	.648	490.91	.360
K6 C3 Exhaust 6, F	933.72	.650	500.96	.361
K7-C3 Exhaust Comm, F	720.34	.398	382.41	.221
J1 C3 Water In, F	156.13	.059	68.963	.033
J2 C3 Water Out, F	169.27	.045	76.263	.025
J3 C3 Oil Sump, F	244.01	.318	117.78	.177
J4 C3 Fuel In, F	94.063	.047	34.479	.026
J5 C3 Inlet Air, F	101.82	.150	38.789	.084
J6 C3 Airbox, F	207.64	.268	97.578	.149
Horsepower	188.26	.351	140.36	.262
Corrected Horsepower	198.34	.370	147.88	.276
BSFC, lb/hp-hr	.425	.002	.259	.001
Corrected BSFC	.403	.002	.245	.001
Relative Humidity	76.761	.199	76.761	.199
Reference Pressure, inHg	37.425		126.74	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1570

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.43 in-Hg
Speed :	2800 RPM
Load :	353.2 lb-ft
Fuel Flow :	80.0 lb/hr
Brake Power :	188.30 bhp
BSFC :	.425 lb/bhp-hr
Indicated Power :	27.80 kW/cyl
Peak Pressure :	9.312 MPa
Peak Rate of Pressure Rise:	482.7 kPa/deg
Peak Heat Release Rate :	40.8 Joules/deg
Cumulative Heat Release :	1176.69 Joules
Apparent Combustion Efficiency :	76.2 %
Indicated Thermal Efficiency :	38.6 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	7.8 degrees
Centroid Phasing :	198.5 degrees
Centroid Magnitude :	11.49 J/degree
Sensitivity :	28.7 degrees
Premixed/Diffusion Ratio :	.26979

880201.101607 AL-15299-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	70.303	.074	21.279	.041
Wet Bulb Temperature, F	65.207	.023	18.448	.013
P11-Baro (Vent), "Hg ABS	29.014	.000	98.251	.001
P3 C3 Fuel Pressure,psig	74.791	.444	515.66	3.063
P4 C3 Oil Pressure, psig	51.411	.098	354.47	.677
P5 C3 Airbox Pres., psig	3.827	.015	26.383	.105
P10 C3 Exh Comm, inH2Og	22.436	.142	5.583	.035
P11 C3 Intake Vac,inH2Ov	15.447	.132	3.844	.033
P12 C3 Blowby, inH2Og	.003	.003	.001	.001
C3 Speed, RPM	2502.9	2.319	2502.9	2.319
C3 Fuel Flow, lb/hr	74.518	.148	33.801	.067
C3 Smoke, %	1.809	.104	1.809	.104
Cell 3 Load, lb-ft	382.12	.392	518.08	.532
K1 C3 Exhaust 1, F	757.63	.859	403.13	.477
K2 C3 Exhaust 2, F	805.81	.549	429.90	.305
K3 C3 Exhaust 3, F	918.73	.535	492.63	.297
K4 C3 Exhaust 4, F	789.12	.621	420.62	.345
K5 C3 Exhaust 5, F	901.16	.616	482.86	.342
K6 C3 Exhaust 6, F	913.33	.605	489.63	.336
K7-C3 Exhaust Comm, F	711.87	1.331	377.71	.740
J1 C3 Water In, F	156.12	.056	68.958	.031
J2 C3 Water Out, F	168.99	.041	76.105	.023
J3 C3 Oil Sump, F	236.55	.502	113.64	.279
J4 C3 Fuel In, F	92.193	.018	33.441	.010
J5 C3 Inlet Air, F	99.216	.131	37.342	.073
J6 C3 Airbox, F	188.21	.614	86.785	.341
Horsepower	182.11	.231	135.77	.172
Corrected Horsepower	191.39	.243	142.69	.181
BSFC, lb/hp-hr	.409	.001	.249	.000
Corrected BSFC	.389	.001	.237	.000
Relative Humidity	76.509	.251	76.509	.251
Reference Pressure, inHg	35.668		120.79	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1572

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.67 in-Hg
Speed :	2503 RPM
Load :	382.1 lb-ft
Fuel Flow :	74.5 lb/hr
Brake Power :	182.10 bhp
BSFC :	.409 lb/bhp-hr
Indicated Power :	24.03 kW/cyl
Peak Pressure :	9.448 MPa
Peak Rate of Pressure Rise:	515.3 kPa/deg
Peak Heat Release Rate :	45.0 Joules/deg
Cumulative Heat Release :	1154.49 Joules
Apparent Combustion Efficiency :	71.8 %
Indicated Thermal Efficiency :	35.8 %
Brake Thermal Efficiency :	33.7 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	198.3 degrees
Centroid Magnitude :	10.97 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.23530

880201.102939 AL-15299-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	69.850	.104	21.028	.058
Wet Bulb Temperature, F	65.093	.027	18.385	.015
P11-Baro (Vent), "Hg ABS	29.014	.001	98.251	.002
P3 C3 Fuel Pressure,psig	72.772	.216	501.75	1.491
P4 C3 Oil Pressure, psig	47.546	.015	327.82	.105
P5 C3 Airbox Pres., psig	2.705	.009	18.653	.065
P10 C3 Exh Comm, inH2Og	18.129	.194	4.511	.048
P11 C3 Intake Vac,inH2Ov	12.228	.070	3.043	.017
P12 C3 Blowby, inH2Og	-.013	.002	-.003	.001
C3 Speed, RPM	2201.0	2.190	2201.0	2.190
C3 Fuel Flow, lb/hr	68.089	1.031	30.885	.468
C3 Smoke, %	2.043	.088	2.043	.088
Cell 3 Load, lb-ft	402.12	.937	545.19	1.270
K1 C3 Exhaust 1, F	736.23	.289	391.24	.161
K2 C3 Exhaust 2, F	815.12	.526	435.06	.292
K3 C3 Exhaust 3, F	935.00	.590	501.66	.328
K4 C3 Exhaust 4, F	770.18	.455	410.10	.253
K5 C3 Exhaust 5, F	936.84	.437	502.69	.243
K6 C3 Exhaust 6, F	945.98	.381	507.77	.211
K7-C3 Exhaust Comm, F	732.71	.219	389.28	.122
J1 C3 Water In, F	154.03	.060	67.793	.033
J2 C3 Water Out, F	167.63	.066	75.348	.036
J3 C3 Oil Sump, F	239.12	.219	115.07	.122
J4 C3 Fuel In, F	91.460	.025	33.033	.014
J5 C3 Inlet Air, F	101.41	.157	38.560	.087
J6 C3 Airbox, F	186.61	.080	85.897	.044
Horsepower	168.52	.327	125.64	.244
Corrected Horsepower	177.46	.345	132.31	.257
BSFC, lb/hp-hr	.404	.006	.246	.004
Corrected BSFC	.384	.006	.233	.003
Relative Humidity	77.863	.374	77.863	.374
Reference Pressure, inHg	33.622		113.86	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1574

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.62 in-Hg
Speed :	2201 RPM
Load :	402.1 lb-ft
Fuel Flow :	68.1 lb/hr
Brake Power :	168.51 bhp
BSFC :	.404 lb/bhp-hr
Indicated Power :	21.72 kW/cyl
Peak Pressure :	9.619 MPa
Peak Rate of Pressure Rise:	547.8 kPa/deg
Peak Heat Release Rate :	51.1 Joules/deg
Cumulative Heat Release :	1187.45 Joules
Apparent Combustion Efficiency :	71.0 %
Indicated Thermal Efficiency :	35.4 %
Brake Thermal Efficiency :	34.1 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	11.31 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.22854

880201.104119 AL-15299-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	69.718	.057	20.954	.032
Wet Bulb Temperature, F	64.930	.025	18.295	.014
P11-Baro (Vent), "Hg ABS	29.017	.000	98.261	.001
P3 C3 Fuel Pressure,psig	70.353	.132	485.07	.912
P4 C3 Oil Pressure, psig	42.819	.011	295.22	.076
P5 C3 Airbox Pres., psig	1.803	.010	12.434	.067
P10 C3 Exh Comm, inH20g	12.726	.117	3.167	.029
P11 C3 Intake Vac,inH20v	8.131	.054	2.023	.013
P12 C3 Blowby, inH20g	-.012	.002	-.003	.000
C3 Speed, RPM	1800.1	1.692	1800.1	1.692
C3 Fuel Flow, lb/hr	61.315	.159	27.812	.072
C3 Smoke, %	17.115	.174	17.115	.174
Cell 3 Load, lb-ft	404.99	.725	549.08	.983
K1 C3 Exhaust 1, F	682.58	.478	361.43	.266
K2 C3 Exhaust 2, F	794.22	.599	423.45	.333
K3 C3 Exhaust 3, F	878.49	.469	470.27	.260
K4 C3 Exhaust 4, F	738.23	.538	392.35	.299
K5 C3 Exhaust 5, F	925.56	.834	496.42	.463
K6 C3 Exhaust 6, F	931.06	.481	499.48	.267
K7-C3 Exhaust Comm, F	706.03	.140	374.46	.078
J1 C3 Water In, F	154.97	.050	68.314	.028
J2 C3 Water Out, F	169.34	.049	76.298	.027
J3 C3 Oil Sump, F	235.20	.232	112.89	.129
J4 C3 Fuel In, F	90.164	.018	32.313	.010
J5 C3 Inlet Air, F	103.29	.049	39.606	.027
J6 C3 Airbox, F	170.58	.177	76.988	.098
Horsepower	138.81	.320	103.49	.239
Corrected Horsepower	146.39	.338	109.14	.252
BSFC, lb/hp-hr	.442	.002	.269	.001
Corrected BSFC	.419	.002	.255	.001
Relative Humidity	77.689	.145	77.689	.145
Reference Pressure, inHg	32.090		108.67	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1576

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.09 in-Hg
Speed :	1800 RPM
Load :	405.0 lb-ft
Fuel Flow :	61.3 lb/hr
Brake Power :	138.80 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	17.23 kW/cyl
Peak Pressure :	9.713 MPa
Peak Rate of Pressure Rise:	593.3 kPa/deg
Peak Heat Release Rate :	59.1 Joules/deg
Cumulative Heat Release :	1165.50 Joules
Apparent Combustion Efficiency :	63.3 %
Indicated Thermal Efficiency :	31.2 %
Brake Thermal Efficiency :	31.2 %
Ignition Delay :	6.1 degrees
Centroid Phasing :	196.8 degrees
Centroid Magnitude :	12.04 J/degree
Sensitivity :	28.7 degrees
Premixed/Diffusion Ratio :	.21192

880201.105303 AL-15299-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	69.881	.083	21.045	.046
Wet Bulb Temperature, F	64.922	.020	18.290	.011
P11-Baro (Vent), "Hg ABS	29.015	.001	98.254	.002
P3 C3 Fuel Pressure,psig	68.683	.174	473.55	1.200
P4 C3 Oil Pressure, psig	32.431	.010	223.60	.069
P5 C3 Airbox Pres., psig	1.230	.011	8.478	.077
P10 C3 Exh Comm, inH2Og	8.535	.079	2.124	.020
P11 C3 Intake Vac,inH2Ov	4.748	.051	1.181	.013
P12 C3 Blowby, inH2Og	-.016	.002	-.004	.001
C3 Speed, RPM	1399.8	1.224	1399.8	1.224
C3 Fuel Flow, lb/hr	52.103	.081	23.634	.037
C3 Smoke, %	53.021	1.729	53.021	1.729
Cell 3 Load, lb-ft	379.34	1.365	514.32	1.850
K1 C3 Exhaust 1, F	635.83	.404	335.46	.224
K2 C3 Exhaust 2, F	706.67	.259	374.82	.144
K3 C3 Exhaust 3, F	794.11	.954	423.39	.530
K4 C3 Exhaust 4, F	670.70	.593	354.83	.329
K5 C3 Exhaust 5, F	824.72	.766	440.40	.426
K6 C3 Exhaust 6, F	782.33	.354	416.85	.197
K7-C3 Exhaust Comm, F	609.74	.353	320.96	.196
J1 C3 Water In, F	154.56	.069	68.090	.038
J2 C3 Water Out, F	169.95	.053	76.640	.029
J3 C3 Oil Sump, F	235.60	.116	113.11	.065
J4 C3 Fuel In, F	88.695	.037	31.497	.021
J5 C3 Inlet Air, F	102.77	.061	39.314	.034
J6 C3 Airbox, F	163.85	.091	73.251	.051
Horsepower	101.11	.403	75.382	.301
Corrected Horsepower	106.58	.425	79.459	.317
BSFC, lb/hp-hr	.515	.002	.314	.001
Corrected BSFC	.489	.002	.297	.001
Relative Humidity	76.980	.309	76.980	.309
Reference Pressure, inHg	31.169		105.55	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1578

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.17 in-Hg
Speed :	1400 RPM
Load :	379.3 lb-ft
Fuel Flow :	52.1 lb/hr
Brake Power :	101.11 bhp
BSFC :	.515 lb/bhp-hr
Indicated Power :	13.27 kW/cyl
Peak Pressure :	10.07 MPa
Peak Rate of Pressure Rise:	667.0 kPa/deg
Peak Heat Release Rate :	72.5 Joules/deg
Cumulative Heat Release :	1169.76 Joules
Apparent Combustion Efficiency :	58.2 %
Indicated Thermal Efficiency :	28.3 %
Brake Thermal Efficiency :	26.8 %
Ignition Delay :	5.4 degrees
Centroid Phasing :	195.4 degrees
Centroid Magnitude :	13.49 J/degree
Sensitivity :	28.0 degrees
Premixed/Diffusion Ratio :	.19106

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 8 FUEL ____ DATE 2-1-88 PAGE 43

TF07N11U87

Operator Gray							
Time	11:25	11:35	11:45	12:00	12:15	12:25	12:35
Test Hour	20min	10min	10min	15min	15min	10min	10min
Speed, RPM	2799	2500	2500	2199	2199	1801	1801
Load, lb-ft	367.1	404.5	284.4	419.8	227.0	413.1	276.5
Fuel Flow, lb/hr	91.1	83.3	59.1	78.7	41.9	69.3	38.2
Exh. Opacity, %	6.0	4.0	0	9.5	0	37.5	0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	770	800	580	750	500	760	500
Exhaust Cyl. L2	810	850	605	820	505	800	330
Exhaust Cyl. L3	900	950	690	950	555	870	390
Exhaust Cyl. R1	810	810	600	760	500	730	500
Exhaust Cyl. R2	910	945	660	950	550	900	610
Exhaust Cyl. R3	920	950	690	950	550	900	600
Exhaust Common	740	750	550	735	430	700	460
Water In	155	155	159	155	158	153	158
Water Out	169	169	169	168	169	170	169
Oil Sump	246	244	232	243	222	236	221
Fuel	89	91	92	92	93	92	94
Inlet Air	98	99	98	100	99	101	102
Airbox	208	204	181	194	168	170	138
Wet Bulb	69.5	69.7	69.5	69.2	70.3	70.5	70.5
Dry Bulb	75.2	75.8	76.0	76.5	77.0	77.0	77.5
PRESSURES, PSIG							
Oil Gallery	51.5	49.5	52.0	46.5	50.0	42.0	44.5
Air After Blower	5.0	4.0	3.9	3.0	2.9	2.0	1.8
Fuel Transfer	75.0	72.0	72.5	70.0	72.0	68.0	69.5
LOW PRESSURES							
Intake Vac., in.water	14.0	16.0	16.0	12.9	13.1	8.8	9.0
Exh. Comm., in.Water	17.5	24.0	20.0	14.0	14.0	14.0	11.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.01	29.01	29.01	29.00	28.99	28.98	28.98

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 8 FUEL TF87N11087 DATE 2-1-88 PAGE 44

Operator Greg							
Time	12:45	12:55	1:10	1:25			
Test Hour	10 min	10 min	15 min	15 min			
Speed, RPM	1801	1801	1379	1379			
Load, lb-ft	149.1	81.2	379.2	97.3			
Fuel Flow, lb/hr	24.9	17.8	58.3	15.2			
Exh. Opacity, %	0	0	20.0	0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	350	610	345			
Exhaust Cyl. L2	390	345	620	315			
Exhaust Cyl. L3	420	353	770	350			
Exhaust Cyl. R1	350	280	640	260			
Exhaust Cyl. R2	380	270	780	260			
Exhaust Cyl. R3	380	290	740	290			
Exhaust Common	340	283	600	270			
Water In	159	162	153	159			
Water Out	168	170	169	167			
Oil Sump	209	206	233	203			
Fuel	91	91	90	91			
Inlet Air	99	99	102	102			
Airbox	151	149	162	145			
Wet Bulb	70.8	70.0	70.2	70.0			
Dry Bulb	77.5	77.3	78.0	79.0			
PRESSURES, PSIG							
Oil Gallery	47.0	48.0	32.0	37.5			
Air After Blower	1.9	1.8	1.5	1.3			
Fuel Transfer	70.0	70.5	66.0	68.0			
LOW PRESSURES							
Intake Vac., in.water	9.1	9.0	5.3	5.4			
Exh. Comm., in.Water	9.0	8.0	9.0	5.5			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	28.97	28.96	28.95	28.95			

880201.112318 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	71.533	.074	21.963	.041
Wet Bulb Temperature, F	65.432	.016	18.573	.009
P11-Baro (Vent), "Hg ABS	29.012	.000	98.246	.002
P3 C3 Fuel Pressure,psig	75.442	.327	520.15	2.254
P4 C3 Oil Pressure, psig	51.674	.031	356.28	.212
P5 C3 Airbox Pres., psig	4.958	.014	34.184	.098
P10 C3 Exh Comm, inH2Og	27.862	.136	6.933	.034
P11 C3 Intake Vac,inH2Ov	18.989	.109	4.725	.027
P12 C3 Blowby, inH2Og	.028	.003	.007	.001
C3 Speed, RPM	2800.5	1.954	2800.5	1.954
C3 Fuel Flow, lb/hr	91.711	.153	41.599	.070
C3 Smoke, %	5.654	.486	5.654	.486
Cell 3 Load, lb-ft	365.41	.849	495.43	1.151
K1 C3 Exhaust 1, F	794.15	1.036	423.42	.576
K2 C3 Exhaust 2, F	835.66	.960	446.48	.533
K3 C3 Exhaust 3, F	931.72	.611	499.84	.340
K4 C3 Exhaust 4, F	848.61	1.284	453.67	.713
K5 C3 Exhaust 5, F	946.20	1.397	507.89	.776
K6 C3 Exhaust 6, F	956.88	.509	513.82	.283
K7-C3 Exhaust Comm, F	737.79	.914	392.10	.508
J1 C3 Water In, F	155.45	.089	68.584	.050
J2 C3 Water Out, F	168.70	.031	75.943	.017
J3 C3 Oil Sump, F	245.44	.602	118.58	.334
J4 C3 Fuel In, F	89.401	.029	31.890	.016
J5 C3 Inlet Air, F	95.960	1.083	35.533	.602
J6 C3 Airbox, F	207.57	.352	97.539	.196
Horsepower	194.84	.423	145.27	.316
Corrected Horsepower	204.15	.443	152.21	.331
BSFC, lb/hp-hr	.471	.002	.286	.001
Corrected BSFC	.449	.001	.273	.001
Relative Humidity	72.609	.229	72.609	.229
Reference Pressure, inHg	37.710		127.70	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1580

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.71 in-Hg
Speed :	2801 RPM
Load :	365.4 lb-ft
Fuel Flow :	91.7 lb/hr
Brake Power :	194.88 bhp
BSFC :	.471 lb/bhp-hr
Indicated Power :	28.83 kW/cyl
Peak Pressure :	9.471 MPa
Peak Rate of Pressure Rise:	471.0 kPa/deg
Peak Heat Release Rate :	39.8 Joules/deg
Cumulative Heat Release :	1218.13 Joules
Apparent Combustion Efficiency :	69.3 %
Indicated Thermal Efficiency :	35.1 %
Brake Thermal Efficiency :	29.5 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	198.6 degrees
Centroid Magnitude :	11.58 J/degree
Sensitivity :	29.0 degrees
Premixed/Diffusion Ratio :	.26241

980201.113626 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	72.083	.135	22.269	.075
Wet Bulb Temperature, F	65.676	.031	18.709	.017
P11-Baro (Vent), "Hg ABS	29.008	.000	98.231	.001
P3 C3 Fuel Pressure,psig	71.935	.407	495.98	2.806
P4 C3 Oil Pressure, psig	49.664	.013	342.42	.092
P5 C3 Airbox Pres., psig	3.879	.017	26.747	.121
P10 C3 Exh Comm, inH2Og	23.689	.138	5.895	.034
P11 C3 Intake Vac,inH2Ov	15.507	.114	3.859	.028
P12 C3 Blowby, inH2Og	.012	.002	.003	.001
C3 Speed, RPM	2501.9	2.256	2501.9	2.256
C3 Fuel Flow, lb/hr	86.431	.104	39.204	.047
C3 Smoke, %	3.500	.162	3.500	.162
Cell 3 Load, lb-ft	404.25	.994	548.09	1.348
K1 C3 Exhaust 1, F	823.00	.632	439.45	.351
K2 C3 Exhaust 2, F	875.53	.413	468.63	.230
K3 C3 Exhaust 3, F	983.25	.583	528.47	.324
K4 C3 Exhaust 4, F	840.87	.445	449.37	.247
K5 C3 Exhaust 5, F	972.35	.474	522.42	.263
K6 C3 Exhaust 6, F	980.38	.494	526.88	.274
K7-C3 Exhaust Comm, F	759.48	.350	404.16	.194
J1 C3 Water In, F	155.56	.073	68.646	.040
J2 C3 Water Out, F	169.12	.033	76.180	.019
J3 C3 Oil Sump, F	243.28	.171	117.38	.095
J4 C3 Fuel In, F	90.487	.023	32.493	.013
J5 C3 Inlet Air, F	99.778	.109	37.654	.061
J6 C3 Airbox, F	203.70	.082	95.388	.045
Horsepower	192.59	.486	143.58	.362
Corrected Horsepower	202.51	.511	150.99	.381
BSFC, lb/hp-hr	.449	.001	.273	.001
Corrected BSFC	.427	.001	.260	.001
Relative Humidity	71.530	.424	71.530	.424
Reference Pressure, inHg	35.765		121.12	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1582

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.77 in-Hg
Speed :	2502 RPM
Load :	404.3 lb-ft
Fuel Flow :	86.4 lb/hr
Brake Power :	192.60 bhp
BSFC :	.449 lb/bhp-hr
Indicated Power :	25.05 kW/cyl
Peak Pressure :	9.604 MPa
Peak Rate of Pressure Rise:	499.0 kPa/deg
Peak Heat Release Rate :	43.0 Joules/deg
Cumulative Heat Release :	1215.45 Joules
Apparent Combustion Efficiency :	65.6 %
Indicated Thermal Efficiency :	32.4 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	6.8 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	11.00 J/degree
Sensitivity :	30.1 degrees
Premixed/Diffusion Ratio :	.22724

880201.114747 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	72.804	.024	22.669	.013
Wet Bulb Temperature, F	66.028	.015	18.904	.008
P11-Baro (Vent), "Hg ABS	29.005	.001	98.223	.002
P3 C3 Fuel Pressure,psig	72.395	.168	499.15	1.162
P4 C3 Oil Pressure, psig	52.112	.025	359.30	.170
P5 C3 Airbox Pres., psig	3.640	.017	25.096	.120
P10 C3 Exh Comm, inH2Og	19.497	.152	4.852	.038
P11 C3 Intake Vac,inH2Ov	15.865	.077	3.948	.019
P12 C3 Blowby, inH2Og	.010	.002	.002	.001
C3 Speed, RPM	2502.5	2.053	2502.5	2.053
C3 Fuel Flow, lb/hr	59.721	.059	27.089	.027
C3 Smoke, %	-2.109	.050	-2.109	.050
Cell 3 Load, lb-ft	284.84	.756	386.19	1.025
K1 C3 Exhaust 1, F	590.80	.471	310.44	.262
K2 C3 Exhaust 2, F	634.33	.485	334.63	.270
K3 C3 Exhaust 3, F	713.24	.411	378.46	.228
K4 C3 Exhaust 4, F	629.35	.214	331.86	.119
K5 C3 Exhaust 5, F	700.42	.316	371.34	.175
K6 C3 Exhaust 6, F	711.40	.398	377.44	.221
K7-C3 Exhaust Comm, F	570.04	.590	298.91	.328
J1 C3 Water In, F	158.56	.060	70.313	.033
J2 C3 Water Out, F	169.36	.032	76.313	.018
J3 C3 Oil Sump, F	232.07	.291	111.15	.162
J4 C3 Fuel In, F	91.902	.018	33.279	.010
J5 C3 Inlet Air, F	98.602	.084	37.001	.047
J6 C3 Airbox, F	182.48	.204	83.598	.113
Horsepower	135.72	.304	101.19	.227
Corrected Horsepower	142.60	.320	106.32	.238
BSFC, lb/hp-hr	.440	.001	.268	.001
Corrected BSFC	.419	.001	.255	.001
Relative Humidity	70.281	.102	70.281	.102
Reference Pressure, inHg	35.249		119.37	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1584

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.25 in-Hg
Speed :	2503 RPM
Load :	284.8 lb-ft
Fuel Flow :	59.7 lb/hr
Brake Power :	135.73 bhp
BSFC :	.440 lb/bhp-hr
Indicated Power :	18.49 kW/cyl
Peak Pressure :	8.504 MPa
Peak Rate of Pressure Rise:	549.0 kPa/deg
Peak Heat Release Rate :	52.1 Joules/deg
Cumulative Heat Release :	871.891 Joules
Apparent Combustion Efficiency :	68.1 %
Indicated Thermal Efficiency :	34.6 %
Brake Thermal Efficiency :	31.6 %
Ignition Delay :	9.1 degrees
Centroid Phasing :	197.0 degrees
Centroid Magnitude :	10.42 J/degree
Sensitivity :	25.9 degrees
Premixed/Diffusion Ratio :	.35104

880201.120110 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	72.942	.041	22.746	.023
Wet Bulb Temperature, F	66.086	.015	18.937	.008
P11-Baro (Vent), "Hg ABS	28.998	.000	98.200	.001
P3 C3 Fuel Pressure,psig	69.688	.177	480.48	1.218
P4 C3 Oil Pressure, psig	46.865	.020	323.12	.141
P5 C3 Airbox Pres., psig	2.741	.008	18.897	.056
P10 C3 Exh Comm, inH2Og	18.857	.229	4.692	.057
P11 C3 Intake Vac,inH2Ov	12.436	.058	3.095	.014
P12 C3 Blowby, inH2Og	.001	.003	.000	.001
C3 Speed, RPM	2200.9	2.418	2200.9	2.418
C3 Fuel Flow, lb/hr	79.196	.117	35.923	.053
C3 Smoke, %	8.987	.181	8.987	.181
Cell 3 Load, lb-ft	418.47	.429	567.36	.581
K1 C3 Exhaust 1, F	765.90	.306	407.72	.170
K2 C3 Exhaust 2, F	856.35	.469	457.97	.260
K3 C3 Exhaust 3, F	976.18	.364	524.54	.202
K4 C3 Exhaust 4, F	807.00	.352	430.55	.196
K5 C3 Exhaust 5, F	981.84	.742	527.69	.412
K6 C3 Exhaust 6, F	993.07	.491	533.93	.273
K7-C3 Exhaust Comm, F	769.02	.371	409.45	.206
J1 C3 Water In, F	154.71	.059	68.174	.033
J2 C3 Water Out, F	168.70	.045	75.944	.025
J3 C3 Oil Sump, F	242.04	.298	116.69	.165
J4 C3 Fuel In, F	91.860	.025	33.255	.014
J5 C3 Inlet Air, F	100.82	.180	38.234	.100
J6 C3 Airbox, F	193.12	.063	89.512	.035
Horsepower	175.36	.190	130.75	.141
Corrected Horsepower	184.67	.200	137.68	.149
BSFC, lb/hp-hr	.452	.001	.275	.000
Corrected BSFC	.429	.001	.261	.000
Relative Humidity	70.010	.142	70.010	.142
Reference Pressure, inHg	33.664		114.00	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1586

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.66 in-Hg
Speed :	2201 RPM
Load :	418.5 lb-ft
Fuel Flow :	79.2 lb/hr
Brake Power :	175.38 bhp
BSFC :	.452 lb/bhp-hr
Indicated Power :	23.71 kW/cyl
Peak Pressure :	9.826 MPa
Peak Rate of Pressure Rise:	530.5 kPa/deg
Peak Heat Release Rate :	48.8 Joules/deg
Cumulative Heat Release :	1290.50 Joules
Apparent Combustion Efficiency :	66.8 %
Indicated Thermal Efficiency :	33.5 %
Brake Thermal Efficiency :	30.8 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	197.1 degrees
Centroid Magnitude :	12.38 J/degree
Sensitivity :	28.4 degrees
Premixed/Diffusion Ratio :	.23662

880201.121408 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	73.547	.074	23.082	.041
Wet Bulb Temperature, F	66.201	.044	19.000	.024
P11-Baro (Vent), "Hg ABS	28.987	.000	98.160	.002
P3 C3 Fuel Pressure,psig	71.539	.161	493.24	1.108
P4 C3 Oil Pressure, psig	50.726	.035	349.74	.242
P5 C3 Airbox Pres., psig	2.525	.012	17.407	.080
P10 C3 Exh Comm, inH2Og	14.187	.103	3.530	.026
P11 C3 Intake Vac,inH2Ov	12.972	.080	3.228	.020
P12 C3 Blowby, inH2Og	-.003	.002	-.001	.000
C3 Speed, RPM	2199.3	1.829	2199.3	1.829
C3 Fuel Flow, lb/hr	42.482	.063	19.269	.029
C3 Smoke, %	-.782	.041	-.782	.041
Cell 3 Load, lb-ft	225.56	.896	305.82	1.214
K1 C3 Exhaust 1, F	513.28	.375	267.38	.208
K2 C3 Exhaust 2, F	526.00	.597	274.45	.331
K3 C3 Exhaust 3, F	581.04	.321	305.02	.178
K4 C3 Exhaust 4, F	516.12	.335	268.95	.186
K5 C3 Exhaust 5, F	573.00	.475	300.56	.264
K6 C3 Exhaust 6, F	573.54	.431	300.86	.239
K7-C3 Exhaust Comm, F	455.18	1.051	235.10	.584
J1 C3 Water In, F	158.10	.053	70.056	.029
J2 C3 Water Out, F	167.86	.037	75.478	.020
J3 C3 Oil Sump, F	223.10	.093	106.16	.052
J4 C3 Fuel In, F	92.850	.020	33.806	.011
J5 C3 Inlet Air, F	99.551	.071	37.529	.040
J6 C3 Airbox, F	170.04	.292	76.690	.162
Horsepower	94.456	.391	70.424	.292
Corrected Horsepower	99.387	.412	74.100	.307
BSFC, lb/hp-hr	.450	.002	.274	.001
Corrected BSFC	.427	.002	.260	.001
Relative Humidity	68.275	.148	68.275	.148
Reference Pressure, inHg	33.173		112.34	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1588

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.17 in-Hg
Speed :	2199 RPM
Load :	225.6 lb-ft
Fuel Flow :	42.5 lb/hr
Brake Power :	94.46 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	13.32 kW/cyl
Peak Pressure :	7.872 MPa
Peak Rate of Pressure Rise:	629.8 kPa/deg
Peak Heat Release Rate :	66.3 Joules/deg
Cumulative Heat Release :	700.198 Joules
Apparent Combustion Efficiency :	67.5 %
Indicated Thermal Efficiency :	35.0 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	9.9 degrees
Centroid Phasing :	194.3 degrees
Centroid Magnitude :	11.69 J/degree
Sensitivity :	22.4 degrees
Premixed/Diffusion Ratio :	.44298

880201.122714 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	73.677	.048	23.154	.027
Wet Bulb Temperature, F	66.245	.023	19.025	.013
P11-Baro (Vent), "Hg ABS	28.980	.000	98.138	.001
P3 C3 Fuel Pressure,psig	67.538	.213	465.66	1.469
P4 C3 Oil Pressure, psig	42.520	.014	293.16	.094
P5 C3 Airbox Pres., psig	1.844	.004	12.716	.030
P10 C3 Exh Comm, inH2Og	13.321	.137	3.315	.034
P11 C3 Intake Vac,inH2Ov	8.683	.049	2.161	.012
P12 C3 Blowby, inH2Og	-.004	.002	-.001	.001
C3 Speed, RPM	1803.1	1.214	1803.1	1.214
C3 Fuel Flow, lb/hr	69.639	.250	31.588	.113
C3 Smoke, %	36.745	.446	36.745	.446
Cell 3 Load, lb-ft	411.60	1.080	558.06	1.465
K1 C3 Exhaust 1, F	700.64	.257	371.47	.143
K2 C3 Exhaust 2, F	819.86	.555	437.70	.308
K3 C3 Exhaust 3, F	904.50	.535	484.72	.297
K4 C3 Exhaust 4, F	754.72	.555	401.51	.308
K5 C3 Exhaust 5, F	946.21	.812	507.90	.451
K6 C3 Exhaust 6, F	943.48	.320	506.38	.178
K7-C3 Exhaust Comm, F	725.32	.338	385.18	.188
J1 C3 Water In, F	155.63	.050	68.681	.028
J2 C3 Water Out, F	170.24	.035	76.799	.020
J3 C3 Oil Sump, F	235.71	.163	113.17	.090
J4 C3 Fuel In, F	91.370	.015	32.983	.008
J5 C3 Inlet Air, F	101.58	.219	38.653	.122
J6 C3 Airbox, F	169.61	.183	76.452	.102
Horsepower	141.31	.400	105.36	.299
Corrected Horsepower	148.99	.422	111.08	.315
BSFC, lb/hp-hr	.493	.002	.300	.001
Corrected BSFC	.467	.002	.284	.001
Relative Humidity	67.987	.161	67.987	.161
Reference Pressure, inHg	32.097		108.69	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1590

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.10 in-Hg
Speed :	1803 RPM
Load :	411.6 lb-ft
Fuel Flow :	69.6 lb/hr
Brake Power :	141.30 bhp
BSFC :	.493 lb/bhp-hr
Indicated Power :	17.73 kW/cyl
Peak Pressure :	9.900 MPa
Peak Rate of Pressure Rise:	622.3 kPa/deg
Peak Heat Release Rate :	63.9 Joules/deg
Cumulative Heat Release :	1198.61 Joules
Apparent Combustion Efficiency :	57.8 %
Indicated Thermal Efficiency :	28.5 %
Brake Thermal Efficiency :	28.2 %
Ignition Delay :	6.1 degrees
Centroid Phasing :	196.7 degrees
Centroid Magnitude :	12.54 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.21487

880201.123722 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	73.408	.381	23.005	.212
Wet Bulb Temperature, F	66.113	.114	18.952	.063
P11-Baro (Vent), "Hg ABS	28.976	.000	98.123	.001
P3 C3 Fuel Pressure,psig	69.087	.149	476.34	1.026
P4 C3 Oil Pressure, psig	44.983	.036	310.15	.251
P5 C3 Airbox Pres., psig	1.596	.009	11.003	.062
P10 C3 Exh Comm, inH20g	10.858	.109	2.702	.027
P11 C3 Intake Vac,inH20v	9.127	.051	2.271	.013
P12 C3 Blowby, inH20g	-.003	.003	-.001	.001
C3 Speed, RPM	1802.7	1.008	1802.7	1.008
C3 Fuel Flow, lb/hr	38.766	.117	17.584	.053
C3 Smoke, %	-2.570	.067	-2.570	.067
Cell 3 Load, lb-ft	275.81	.534	373.95	.724
K1 C3 Exhaust 1, F	499.57	.205	259.76	.114
K2 C3 Exhaust 2, F	548.32	.757	286.85	.421
K3 C3 Exhaust 3, F	602.30	.443	316.84	.246
K4 C3 Exhaust 4, F	521.39	.363	271.88	.202
K5 C3 Exhaust 5, F	636.74	.464	335.96	.258
K6 C3 Exhaust 6, F	616.02	.265	324.45	.147
K7-C3 Exhaust Comm, F	495.25	1.974	257.36	1.097
J1 C3 Water In, F	157.72	.039	69.845	.022
J2 C3 Water Out, F	168.43	.017	75.793	.010
J3 C3 Oil Sump, F	222.72	.350	105.96	.194
J4 C3 Fuel In, F	93.469	.160	34.149	.089
J5 C3 Inlet Air, F	98.946	.317	37.192	.176
J6 C3 Airbox, F	159.88	.320	71.044	.178
Horsepower	94.672	.228	70.585	.170
Corrected Horsepower	99.593	.240	74.254	.179
BSFC, lb/hp-hr	.409	.001	.249	.001
Corrected BSFC	.389	.001	.237	.001
Relative Humidity	68.435	.945	68.435	.945
Reference Pressure, inHg	31.554		106.85	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1592

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.55 in-Hg
Speed :	1803 RPM
Load :	275.8 lb-ft
Fuel Flow :	39.8 lb/hr
Brake Power :	94.68 bhp
BSFC :	.410 lb/bhp-hr
Indicated Power :	11.95 kW/cyl
Peak Pressure :	8.150 MPa
Peak Rate of Pressure Rise:	614.3 kPa/deg
Peak Heat Release Rate :	64.1 Joules/deg
Cumulative Heat Release :	769.504 Joules
Apparent Combustion Efficiency :	66.6 %
Indicated Thermal Efficiency :	34.4 %
Brake Thermal Efficiency :	33.9 %
Ignition Delay :	8.9 degrees
Centroid Phasing :	193.1 degrees
Centroid Magnitude :	11.98 J/degree
Sensitivity :	22.3 degrees
Premixed/Diffusion Ratio :	.39946

880201.124806 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	72.970	.045	22.761	.025
Wet Bulb Temperature, F	65.693	.025	18.719	.014
P11-Baro (Vent), "Hg ABS	28.964	.000	98.084	.002
P3 C3 Fuel Pressure,psig	70.060	.207	483.05	1.430
P4 C3 Oil Pressure, psig	47.309	.032	326.18	.220
P5 C3 Airbox Pres., psig	1.580	.006	10.894	.043
P10 C3 Exh Comm, inH2Og	9.142	.110	2.275	.027
P11 C3 Intake Vac,inH2Ov	9.385	.054	2.335	.014
P12 C3 Blowby, inH2Og	-.013	.003	-.003	.001
C3 Speed, RPM	1802.8	1.148	1802.8	1.148
C3 Fuel Flow, lb/hr	25.418	.084	11.529	.038
C3 Smoke, %	-1.462	.027	-1.462	.027
Cell 3 Load, lb-ft	148.92	.593	201.90	.804
K1 C3 Exhaust 1, F	396.55	.427	202.53	.237
K2 C3 Exhaust 2, F	408.11	.672	208.95	.373
K3 C3 Exhaust 3, F	442.97	.385	228.32	.214
K4 C3 Exhaust 4, F	372.94	.434	189.41	.241
K5 C3 Exhaust 5, F	397.47	.543	203.04	.302
K6 C3 Exhaust 6, F	398.09	.227	203.38	.126
K7-C3 Exhaust Comm, F	354.75	1.134	179.31	.630
J1 C3 Water In, F	158.99	.066	70.549	.037
J2 C3 Water Out, F	167.34	.040	75.186	.022
J3 C3 Oil Sump, F	211.20	.320	99.554	.178
J4 C3 Fuel In, F	90.126	.030	32.292	.017
J5 C3 Inlet Air, F	99.955	.248	37.753	.138
J6 C3 Airbox, F	152.15	.166	66.749	.092
Horsepower	51.116	.203	38.111	.152
Corrected Horsepower	53.827	.214	40.132	.160
BSFC, lb/hp-hr	.497	.001	.303	.001
Corrected BSFC	.472	.001	.287	.001
Relative Humidity	68.332	.161	68.332	.161
Reference Pressure, inHg	31.491		106.64	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1594

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.49 in-Hg
Speed :	1803 RPM
Load :	148.9 lb-ft
Fuel Flow :	25.4 lb/hr
Brake Power :	51.12 bhp
BSFC :	.497 lb/bhp-hr
Indicated Power :	8.01 kW/cyl
Peak Pressure :	7.171 MPa
Peak Rate of Pressure Rise:	694.4 kPa/deg
Peak Heat Release Rate :	77.4 Joules/deg
Cumulative Heat Release :	515.288 Joules
Apparent Combustion Efficiency :	68.1 %
Indicated Thermal Efficiency :	35.3 %
Brake Thermal Efficiency :	28.0 %
Ignition Delay :	10.6 degrees
Centroid Phasing :	193.0 degrees
Centroid Magnitude :	14.51 J/degree
Sensitivity :	20.4 degrees
Premixed/Diffusion Ratio :	.52027

880201.125634 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	72.648	.023	22.582	.013
Wet Bulb Temperature, F	65.661	.016	18.700	.009
P11-Baro (Vent), "Hg ABS	28.962	.000	98.076	.001
P3 C3 Fuel Pressure,psig	70.540	.331	486.35	2.284
P4 C3 Oil Pressure, psig	47.987	.019	330.86	.134
P5 C3 Airbox Pres., psig	1.638	.007	11.296	.048
P10 C3 Exh Comm, inH2Og	8.261	.081	2.056	.020
P11 C3 Intake Vac,inH2Ov	9.292	.057	2.312	.014
P12 C3 Blowby, inH2Og	-.007	.002	-.002	.001
C3 Speed, RPM	1802.8	1.388	1802.8	1.388
C3 Fuel Flow, lb/hr	18.542	.186	8.411	.084
C3 Smoke, %	-1.513	.038	-1.513	.038
Cell 3 Load, lb-ft	80.963	.649	109.77	.880
K1 C3 Exhaust 1, F	351.54	.381	177.52	.211
K2 C3 Exhaust 2, F	351.70	.701	177.61	.389
K3 C3 Exhaust 3, F	378.76	.348	192.65	.193
K4 C3 Exhaust 4, F	291.13	.453	143.96	.252
K5 C3 Exhaust 5, F	289.94	.569	143.30	.316
K6 C3 Exhaust 6, F	298.73	.561	148.18	.312
K7-C3 Exhaust Comm, F	301.09	1.263	149.50	.701
J1 C3 Water In, F	163.31	.089	72.948	.049
J2 C3 Water Out, F	170.75	.052	77.081	.029
J3 C3 Oil Sump, F	207.30	.093	97.390	.052
J4 C3 Fuel In, F	91.102	.046	32.834	.026
J5 C3 Inlet Air, F	100.19	.149	37.882	.083
J6 C3 Airbox, F	149.15	.123	65.085	.068
Horsepower	27.792	.235	20.721	.175
Corrected Horsepower	29.276	.247	21.828	.184
BSFC, lb/hp-hr	.667	.007	.406	.004
Corrected BSFC	.633	.006	.385	.004
Relative Humidity	69.377	.056	69.377	.056
Reference Pressure, inHg	31.614		107.06	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1596

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.61 in-Hg
Speed :	1803 RPM
Load :	81.0 lb-ft
Fuel Flow :	18.5 lb/hr
Brake Power :	27.81 bhp
BSFC :	.665 lb/bhp-hr
Indicated Power :	6.11 kW/cyl
Peak Pressure :	6.777 MPa
Peak Rate of Pressure Rise:	686.8 kPa/deg
Peak Heat Release Rate :	77.8 Joules/deg
Cumulative Heat Release :	396.436 Joules
Apparent Combustion Efficiency :	72.0 %
Indicated Thermal Efficiency :	36.9 %
Brake Thermal Efficiency :	20.9 %
Ignition Delay :	11.3 degrees
Centroid Phasing :	193.1 degrees
Centroid Magnitude :	15.62 J/degree
Sensitivity :	19.7 degrees
Premixed/Diffusion Ratio :	.57440

880201.131050 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	73.894	.039	23.274	.022
Wet Bulb Temperature, F	65.727	.019	18.737	.011
P11-Baro (Vent), "Hg ABS	28.950	.000	98.034	.001
P3 C3 Fuel Pressure,psig	65.419	.122	451.05	.841
P4 C3 Oil Pressure, psig	32.803	.025	226.17	.174
P5 C3 Airbox Pres., psig	1.221	.005	8.421	.033
P10 C3 Exh Comm, inH2Og	8.939	.120	2.224	.030
P11 C3 Intake Vac,inH2Ov	5.769	.042	1.436	.011
P12 C3 Blowby, inH2Og	.005	.002	.001	.001
C3 Speed, RPM	1400.2	.891	1400.2	.891
C3 Fuel Flow, lb/hr	58.627	.139	26.593	.063
C3 Smoke, %	70.473	1.169	70.473	1.169
Cell 3 Load, lb-ft	377.79	.824	512.22	1.117
K1 C3 Exhaust 1, F	623.87	.483	328.82	.268
K2 C3 Exhaust 2, F	701.96	.575	372.20	.319
K3 C3 Exhaust 3, F	801.00	.681	427.22	.378
K4 C3 Exhaust 4, F	662.67	.891	350.37	.495
K5 C3 Exhaust 5, F	808.09	.801	431.16	.445
K6 C3 Exhaust 6, F	764.22	.508	406.79	.282
K7-C3 Exhaust Comm, F	611.12	.835	321.73	.464
J1 C3 Water In, F	153.28	.082	67.378	.046
J2 C3 Water Out, F	168.98	.041	76.101	.023
J3 C3 Oil Sump, F	233.30	.268	111.83	.149
J4 C3 Fuel In, F	89.996	.139	32.220	.077
J5 C3 Inlet Air, F	103.09	.120	39.494	.067
J6 C3 Airbox, F	160.55	.282	71.416	.157
Horsepower	100.72	.227	75.096	.169
Corrected Horsepower	106.38	.239	79.314	.179
BSFC, lb/hp-hr	.582	.002	.354	.001
Corrected BSFC	.551	.002	.335	.001
Relative Humidity	65.192	.150	65.192	.150
Reference Pressure, inHg	31.012		105.02	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1598

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.01 in-Hg
Speed :	1400 RPM
Load :	377.8 lb-ft
Fuel Flow :	58.6 lb/hr
Brake Power :	100.71 bhp
BSFC :	.582 lb/bhp-hr
Indicated Power :	13.28 kW/cyl
Peak Pressure :	10.17 MPa
Peak Rate of Pressure Rise:	692.1 kPa/deg
Peak Heat Release Rate :	75.9 Joules/deg
Cumulative Heat Release :	1172.88 Joules
Apparent Combustion Efficiency :	52.2 %
Indicated Thermal Efficiency :	25.3 %
Brake Thermal Efficiency :	23.9 %
Ignition Delay :	5.3 degrees
Centroid Phasing :	195.1 degrees
Centroid Magnitude :	13.98 J/degree
Sensitivity :	27.8 degrees
Premixed/Diffusion Ratio :	.18959

880201.132407 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	73.499	.022	23.055	.012
Wet Bulb Temperature, F	65.762	.002	18.757	.001
P11-Baro (Vent), "Hg ABS	28.945	.001	98.020	.003
P3 C3 Fuel Pressure,psig	67.529	.224	465.60	1.547
P4 C3 Oil Pressure, psig	38.189	.036	263.31	.251
P5 C3 Airbox Pres., psig	1.155	.007	7.965	.051
P10 C3 Exh Comm, inH2Og	5.547	.042	1.380	.010
P11 C3 Intake Vac,inH2Ov	6.026	.044	1.499	.011
P12 C3 Blowby, inH2Og	-.009	.005	-.002	.001
C3 Speed, RPM	1400.2	1.244	1400.2	1.244
C3 Fuel Flow, lb/hr	11.287	.161	5.120	.073
C3 Smoke, %	-2.059	.092	-2.059	.092
Cell 3 Load, lb-ft	97.650	.602	132.39	.817
K1 C3 Exhaust 1, F	341.28	.242	171.82	.134
K2 C3 Exhaust 2, F	329.56	.260	165.31	.145
K3 C3 Exhaust 3, F	369.54	.210	187.52	.117
K4 C3 Exhaust 4, F	277.53	.202	136.41	.112
K5 C3 Exhaust 5, F	277.65	.091	136.47	.051
K6 C3 Exhaust 6, F	294.36	.243	145.75	.135
K7-C3 Exhaust Comm, F	290.50	1.451	143.61	.806
J1 C3 Water In, F	159.74	.212	70.967	.118
J2 C3 Water Out, F	167.84	.143	75.467	.080
J3 C3 Oil Sump, F	204.97	.149	96.096	.083
J4 C3 Fuel In, F	90.754	.124	32.641	.069
J5 C3 Inlet Air, F	102.05	.032	38.916	.018
J6 C3 Airbox, F	149.29	.189	65.161	.105
Horsepower	26.033	.176	19.410	.131
Corrected Horsepower	27.480	.185	20.488	.138
BSFC, lb/hp-hr	.434	.006	.264	.004
Corrected BSFC	.411	.006	.250	.004
Relative Humidity	66.717	.080	66.717	.080
Reference Pressure, inHg	30.854		104.48	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1600

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	30.85 in-Hg
Speed :	1400 RPM
Load :	97.7 lb-ft
Fuel Flow :	11.2 lb/hr
Brake Power :	26.04 bhp
BSFC :	.430 lb/bhp-hr
Indicated Power :	4.88 kW/cyl
Peak Pressure :	6.799 MPa
Peak Rate of Pressure Rise:	783.4 kPa/deg
Peak Heat Release Rate :	90.6 Joules/deg
Cumulative Heat Release :	408.740 Joules
Apparent Combustion Efficiency :	95.2 %
Indicated Thermal Efficiency :	48.7 %
Brake Thermal Efficiency :	32.3 %
Ignition Delay :	10.5 degrees
Centroid Phasing :	190.6 degrees
Centroid Magnitude :	18.30 J/degree
Sensitivity :	18.1 degrees
Premixed/Diffusion Ratio :	.58278

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 9 FUEL BFD2U13L86 DATE 2-2-88 PAGE 45

Operator Greg							
Time	9:35	9:45	10:00	10:10	10:20		
Test Hour	35min	10min	15min	10min	10min		
Speed, RPM	2801	2501	2200	1799	1401		
Load, lb-ft	350.4	384.3	403.1	408.4	383.3		
Fuel Flow, lb/hr	78.6	74.6	69.1	61.0	52.2		
Exh. Opacity, %	3.0	2.0	3.5	20.0	48.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	745	745	710	660	610		
Exhaust Cyl. L2	770	770	770	755	680		
Exhaust Cyl. L3	850	870	890	850	760		
Exhaust Cyl. R1	760	750	730	700	640		
Exhaust Cyl. R2	835	850	895	890	800		
Exhaust Cyl. R3	870	860	900	900	755		
Exhaust Common	695	695	695	670	600		
Water In	155	154	154	155	154		
Water Out	169	168	168	170	170		
Oil Sump	242	237	238	233	234		
Fuel	92	93	92	92	91		
Inlet Air	98	97	98	99	98		
Airbox	200	189	180	162	157		
Wet Bulb	59.5	60.2	58.9	58.9	60.0		
Dry Bulb	70.2	72.5	69.5	69.6	77.4		
PRESSURES, PSIG							
Oil Gallery	52.0	50.0	47.0	42.0	32.0		
Air After Blower	5.0	4.0	3.0	2.0	1.4		
Fuel Transfer	76.0	74.0	72.5	70.0	69.0		
LOW PRESSURES							
Intake Vac., in.water	19.0	16.0	13.0	8.9	5.3		
Exh. Comm., in.Water	27.0	22.5	18.3	13.5	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.17	29.18	29.19	29.19	29.19		

980202.093606 AL-15299-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	72.800	.947	22.667	.526
Wet Bulb Temperature, F	58.742	.355	14.857	.197
P11-Baro (Vent), "Hg ABS	29.166	.000	98.766	.001
P3 C3 Fuel Pressure,psig	76.416	.567	526.87	3.912
P4 C3 Oil Pressure, psig	52.274	.014	360.42	.096
P5 C3 Airbox Pres., psig	4.969	.009	34.263	.061
P10 C3 Exh Comm, inH2Og	27.666	.169	6.884	.042
P11 C3 Intake Vac,inH2Ov	19.194	.174	4.776	.043
P12 C3 Blowby, inH2Og	.028	.003	.007	.001
C3 Speed, RPM	2802.1	2.871	2802.1	2.871
C3 Fuel Flow, lb/hr	79.339	.184	35.987	.083
C3 Smoke, %	3.272	.172	3.272	.172
Cell 3 Load, lb-ft	350.49	1.022	475.20	1.386
K1 C3 Exhaust 1, F	757.82	.756	403.23	.420
K2 C3 Exhaust 2, F	809.51	.409	431.95	.227
K3 C3 Exhaust 3, F	892.88	1.105	478.26	.614
K4 C3 Exhaust 4, F	804.68	.919	429.27	.510
K5 C3 Exhaust 5, F	899.67	.921	482.04	.512
K6 C3 Exhaust 6, F	916.01	.824	491.12	.458
K7-C3 Exhaust Comm, F	727.46	.371	386.36	.206
J1 C3 Water In, F	155.82	.046	68.791	.026
J2 C3 Water Out, F	169.79	.074	76.549	.041
J3 C3 Oil Sump, F	242.81	.296	117.12	.164
J4 C3 Fuel In, F	92.882	.078	33.823	.043
J5 C3 Inlet Air, F	99.635	.625	37.575	.347
J6 C3 Airbox, F	200.62	.077	93.676	.043
Horsepower	187.00	.598	139.42	.446
Corrected Horsepower	194.03	.620	144.66	.462
BSFC, lb/hp-hr	.424	.002	.258	.001
Corrected BSFC	.409	.002	.249	.001
Relative Humidity	42.629	1.772	42.629	1.772
Reference Pressure, inHg	37.872		128.25	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1602

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	37.87 in-Hg
Speed :	2802 RPM
Load :	350.5 lb-ft
Fuel Flow :	79.3 lb/hr
Brake Power :	187.00 bhp
BSFC :	.424 lb/bhp-hr
Indicated Power :	26.28 kW/cyl
Peak Pressure :	9.401 MPa
Peak Rate of Pressure Rise:	467.1 kPa/deg
Peak Heat Release Rate :	36.6 Joules/deg
Cumulative Heat Release :	1115.44 Joules
Apparent Combustion Efficiency :	72.9 %
Indicated Thermal Efficiency :	36.8 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	10.47 J/degree
Sensitivity :	29.8 degrees
Premixed/Diffusion Ratio :	.23914

880202.094637 AL-15299-F	AL-12920-L	6V53N		8
Dry Bulb Temperature, F	74.229	.608	23.460	.338
Wet Bulb Temperature, F	58.787	.119	14.881	.066
P11-Baro (Vent), "Hg ABS	29.181	.000	98.818	.001
P3 C3 Fuel Pressure,psig	74.978	.394	516.96	2.715
P4 C3 Oil Pressure, psig	50.589	.016	348.80	.113
P5 C3 Airbox Pres., psig	3.946	.028	27.209	.192
P10 C3 Exh Comm, inH2Og	23.222	.202	5.779	.050
P11 C3 Intake Vac,inH2Ov	15.362	.130	3.823	.032
P12 C3 Blowby, inH2Og	.016	.003	.004	.001
C3 Speed, RPM	2505.2	2.562	2505.2	2.562
C3 Fuel Flow, lb/hr	75.306	.145	34.158	.066
C3 Smoke, %	1.585	.106	1.585	.106
Cell 3 Load, lb-ft	383.29	.594	519.67	.805
K1 C3 Exhaust 1, F	758.20	.615	403.44	.342
K2 C3 Exhaust 2, F	808.51	.162	431.39	.090
K3 C3 Exhaust 3, F	913.62	.493	489.79	.274
K4 C3 Exhaust 4, F	788.38	.410	420.21	.228
K5 C3 Exhaust 5, F	897.61	.773	480.90	.429
K6 C3 Exhaust 6, F	909.12	.582	487.29	.323
K7-C3 Exhaust Comm, F	725.91	.374	385.50	.208
J1 C3 Water In, F	154.08	.066	67.824	.036
J2 C3 Water Out, F	167.82	.126	75.458	.070
J3 C3 Oil Sump, F	238.82	.162	114.90	.090
J4 C3 Fuel In, F	93.375	.093	34.097	.052
J5 C3 Inlet Air, F	98.488	.249	36.938	.139
J6 C3 Airbox, F	190.67	.167	88.148	.093
Horsepower	182.83	.322	136.31	.240
Corrected Horsepower	189.31	.334	141.15	.249
BSFC, lb/hp-hr	.412	.001	.251	.000
Corrected BSFC	.398	.001	.242	.000
Relative Humidity	38.940	1.249	38.940	1.249
Reference Pressure, inHg	36.086		122.20	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1604

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.09 in-Hg
Speed :	2505 RPM
Load :	383.3 lb-ft
Fuel Flow :	75.3 lb/hr
Brake Power :	182.82 bhp
BSFC :	.412 lb/bhp-hr
Indicated Power :	24.38 kW/cyl
Peak Pressure :	9.547 MPa
Peak Rate of Pressure Rise:	495.7 kPa/deg
Peak Heat Release Rate :	41.8 Joules/deg
Cumulative Heat Release :	1171.30 Joules
Apparent Combustion Efficiency :	72.1 %
Indicated Thermal Efficiency :	35.9 %
Brake Thermal Efficiency :	33.5 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	198.2 degrees
Centroid Magnitude :	11.06 J/degree
Sensitivity :	29.3 degrees
Premixed/Diffusion Ratio :	.23365

880202.100004 AL-15299-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	70.335	.549	21.297	.305
Wet Bulb Temperature, F	56.985	.086	13.881	.048
P11-Baro (Vent), "Hg ABS	29.191	.000	98.852	.001
P3 C3 Fuel Pressure,psig	72.850	.202	502.29	1.393
P4 C3 Oil Pressure, psig	47.472	.007	327.31	.049
P5 C3 Airbox Pres., psig	2.830	.011	19.513	.073
P10 C3 Exh Comm, inH2Og	19.012	.140	4.731	.035
P11 C3 Intake Vac,inH2Ov	12.129	.077	3.018	.019
P12 C3 Blowby, inH2Og	-.007	.008	-.002	.002
C3 Speed, RPM	2201.4	2.598	2201.4	2.598
C3 Fuel Flow, lb/hr	69.787	.169	31.655	.077
C3 Smoke, %	3.124	.145	3.124	.145
Cell 3 Load, lb-ft	403.32	.521	546.83	.706
K1 C3 Exhaust 1, F	733.49	.432	389.72	.240
K2 C3 Exhaust 2, F	812.83	.537	433.79	.298
K3 C3 Exhaust 3, F	926.54	.590	496.97	.328
K4 C3 Exhaust 4, F	766.88	.562	408.27	.312
K5 C3 Exhaust 5, F	928.68	.558	498.15	.310
K6 C3 Exhaust 6, F	938.93	.629	503.85	.349
K7-C3 Exhaust Comm, F	730.08	.385	387.82	.214
J1 C3 Water In, F	155.44	.304	68.577	.169
J2 C3 Water Out, F	169.77	.236	76.539	.131
J3 C3 Oil Sump, F	238.87	.107	114.93	.059
J4 C3 Fuel In, F	92.425	.023	33.569	.013
J5 C3 Inlet Air, F	98.700	.452	37.055	.251
J6 C3 Airbox, F	180.97	.336	82.762	.187
Horsepower	169.06	.301	126.04	.225
Corrected Horsepower	174.97	.312	130.45	.233
BSFC, lb/hp-hr	.413	.001	.251	.001
Corrected BSFC	.399	.001	.243	.001
Relative Humidity	43.274	1.356	43.274	1.356
Reference Pressure, inHg	34.061		115.34	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1606

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.06 in-Hg
Speed :	2201 RPM
Load :	403.3 lb-ft
Fuel Flow :	69.8 lb/hr
Brake Power :	169.01 bhp
BSFC :	.413 lb/bhp-hr
Indicated Power :	22.07 kW/cyl
Peak Pressure :	9.712 MPa
Peak Rate of Pressure Rise:	520.2 kPa/deg
Peak Heat Release Rate :	47.0 Joules/deg
Cumulative Heat Release :	1199.16 Joules
Apparent Combustion Efficiency :	70.0 %
Indicated Thermal Efficiency :	35.1 %
Brake Thermal Efficiency :	33.4 %
Ignition Delay :	6.5 degrees
Centroid Phasing :	196.8 degrees
Centroid Magnitude :	11.63 J/degree
Sensitivity :	28.3 degrees
Premixed/Diffusion Ratio :	.23024

880202.101136 AL-15299-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	68.223	.282	20.124	.157
Wet Bulb Temperature, F	55.931	.055	13.295	.031
P11-Baro (Vent), "Hg ABS	29.186	.001	98.835	.002
P3 C3 Fuel Pressure,psig	70.320	.150	484.84	1.033
P4 C3 Oil Pressure, psig	42.962	.010	296.21	.066
P5 C3 Airbox Pres., psig	1.921	.013	13.246	.088
P10 C3 Exh Comm, inH2Og	13.592	.114	3.382	.028
P11 C3 Intake Vac,inH2Ov	7.954	.080	1.979	.020
P12 C3 Blowby, inH2Og	-.020	.004	-.005	.001
C3 Speed, RPM	1801.4	1.226	1801.4	1.226
C3 Fuel Flow, lb/hr	61.685	.166	27.980	.075
C3 Smoke, %	19.936	.424	19.936	.424
Cell 3 Load, lb-ft	406.95	.581	551.75	.788
K1 C3 Exhaust 1, F	689.67	.358	365.37	.199
K2 C3 Exhaust 2, F	793.90	.488	423.28	.271
K3 C3 Exhaust 3, F	876.02	.562	468.90	.312
K4 C3 Exhaust 4, F	733.63	.369	389.80	.205
K5 C3 Exhaust 5, F	921.65	.433	494.25	.241
K6 C3 Exhaust 6, F	937.38	.549	502.99	.305
K7-C3 Exhaust Comm, F	689.83	.238	365.46	.132
J1 C3 Water In, F	155.19	.120	68.439	.067
J2 C3 Water Out, F	169.94	.131	76.636	.073
J3 C3 Oil Sump, F	233.73	.142	112.07	.079
J4 C3 Fuel In, F	91.271	.121	32.929	.067
J5 C3 Inlet Air, F	97.894	.159	36.608	.088
J6 C3 Airbox, F	163.63	.237	73.127	.132
Horsepower	139.58	.193	104.07	.144
Corrected Horsepower	144.35	.200	107.63	.149
BSFC, lb/hp-hr	.442	.001	.269	.001
Corrected BSFC	.427	.001	.260	.001
Relative Humidity	45.651	.786	45.651	.786
Reference Pressure, inHg	32.512		110.10	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1603

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.51 in-Hg
Speed :	1801 RPM
Load :	407.0 lb-ft
Fuel Flow :	61.7 lb/hr
Brake Power :	139.57 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	17.49 kW/cyl
Peak Pressure :	9.765 MPa
Peak Rate of Pressure Rise:	571.8 kPa/deg
Peak Heat Release Rate :	57.0 Joules/deg
Cumulative Heat Release :	1182.34 Joules
Apparent Combustion Efficiency :	63.9 %
Indicated Thermal Efficiency :	31.5 %
Brake Thermal Efficiency :	31.2 %
Ignition Delay :	6.2 degrees
Centroid Phasing :	196.9 degrees
Centroid Magnitude :	12.02 J/degree
Sensitivity :	28.7 degrees
Premixed/Diffusion Ratio :	.21417

880202.102300 AL-15299-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	66.930	.113	19.406	.063
Wet Bulb Temperature, F	55.036	.129	12.798	.072
P11-Baro (Vent), "Hg ABS	29.185	.000	98.832	.001
P3 C3 Fuel Pressure,psig	68.753	.177	474.04	1.223
P4 C3 Oil Pressure, psig	32.551	.008	224.43	.057
P5 C3 Airbox Pres., psig	1.338	.011	9.224	.075
P10 C3 Exh Comm, inH2Og	9.319	.101	2.319	.025
P11 C3 Intake Vac,inH2Ov	4.498	.057	1.119	.014
P12 C3 Blowby, inH2Og	-.026	.004	-.006	.001
C3 Speed, RPM	1402.4	2.540	1402.4	2.540
C3 Fuel Flow, lb/hr	53.055	.318	24.065	.144
C3 Smoke, %	48.235	1.057	48.235	1.057
Cell 3 Load, lb-ft	383.09	.721	519.40	.978
K1 C3 Exhaust 1, F	626.52	.400	330.29	.222
K2 C3 Exhaust 2, F	708.12	.631	375.62	.351
K3 C3 Exhaust 3, F	797.04	.546	425.02	.303
K4 C3 Exhaust 4, F	668.07	.324	353.37	.180
K5 C3 Exhaust 5, F	836.63	.861	447.02	.478
K6 C3 Exhaust 6, F	795.07	.619	423.93	.344
K7-C3 Exhaust Comm, F	630.49	.281	332.49	.156
J1 C3 Water In, F	154.33	.179	67.962	.100
J2 C3 Water Out, F	170.43	.158	76.908	.088
J3 C3 Oil Sump, F	233.87	.136	112.15	.075
J4 C3 Fuel In, F	89.959	.145	32.200	.081
J5 C3 Inlet Air, F	97.547	.168	36.415	.093
J6 C3 Airbox, F	157.01	.263	69.452	.146
Horsepower	102.29	.308	76.268	.230
Corrected Horsepower	105.73	.318	78.826	.237
BSFC, lb/hp-hr	.519	.003	.316	.002
Corrected BSFC	.502	.003	.305	.002
Relative Humidity	46.217	.337	46.217	.337
Reference Pressure, inHg	31.578		106.94	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1610

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.58 in-Hg
Speed :	1402 RPM
Load :	383.1 lb-ft
Fuel Flow :	53.1 lb/hr
Brake Power :	102.27 bhp
BSFC :	.519 lb/bhp-hr
Indicated Power :	13.60 kW/cyl
Peak Pressure :	10.16 MPa
Peak Rate of Pressure Rise:	662.1 kPa/deg
Peak Heat Release Rate :	71.4 Joules/deg
Cumulative Heat Release :	1188.62 Joules
Apparent Combustion Efficiency :	58.1 %
Indicated Thermal Efficiency :	28.4 %
Brake Thermal Efficiency :	26.6 %
Ignition Delay :	5.3 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	13.56 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.19031

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 8 FUEL TF47N11087 DATE 2-2-88 PAGE 46

Operator Greg							
Time	11:10	11:20	11:30	11:45	12:00	12:10	12:20
Test Hour	25 min	10 min	10 min	15 min	15 min	10 min	10 min
Speed, RPM	2800	2449	2448	2201	2201	1800	1800
Load, lb-ft	374.3	409.1	286.5	421.6	225.8	415.4	278.7
Fuel Flow, lb/hr	93.9	88.2	61.3	79.9	43.7	70.4	41.1
Exh. Opacity, %	5.3	5.0	0	8.5	0	37.0	0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	780	800	590	750	500	690	500
Exhaust Cyl. L2	810	850	610	810	505	800	530
Exhaust Cyl. L3	910	950	690	940	550	960	590
Exhaust Cyl. R1	820	800	600	760	500	710	500
Exhaust Cyl. R2	910	940	670	940	543	910	610
Exhaust Cyl. R3	930	945	690	950	545	910	595
Exhaust Common	740	750	543	730	445	700	460
Water In	154	154	157	155	159	157	159
Water Out	168	164	169	170	170	168	170
Oil Sump	244	241	229	242	221	234	220
Fuel	92	93	93	94	93	93	93
Inlet Air	100	99	100	100	98	99	97
Airbox	208	198	176	193	163	160	148
Wet Bulb	60.0	60.8	61.9	60.2	61.0	60.9	60.8
Dry Bulb	72.2	74.0	73.5	73.1	73.4	73.6	74.0
PRESSURES, PSIG							
Oil Gallery	51.0	49.0	52.0	46.5	50.5	42.0	44.5
Air After Blower	5.1	4.0	3.9	3.0	2.9	2.0	2.0
Fuel Transfer	73.0	71.0	72.0	70.0	72.0	68.0	69.5
LOW PRESSURES							
Intake Vac., in.water	17.0	16.0	16.0	13.0	13.4	8.9	9.1
Exh. Comm., in.Water	28.0	24.0	20.0	19.0	14.5	13.8	11.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.19	29.19	29.19	29.19	29.17	29.16	29.17

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 8 FUEL TF47N11087 DATE 2-2-88 PAGE 47

Operator Grey							
Time	12:30	12:40	12:55	1:05			
Test Hour	10 min	10 min	15 min	10 min			
Speed, RPM	1800	1800	1400	1400			
Load, lb-ft	1470	88.3	381.4	100.3			
Fuel Flow, lb/hr	25.6	19.2	59.2	15.9			
Exh. Opacity, %	0	0	68.0	0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	390	350	630	343			
Exhaust Cyl. L2	395	350	690	320			
Exhaust Cyl. L3	410	360	790	335			
Exhaust Cyl. R1	350	290	640	270			
Exhaust Cyl. R2	380	295	790	290			
Exhaust Cyl. R3	380	300	745	290			
Exhaust Common	340	280	600	290			
Water In	159	161	153	158			
Water Out	169	170	170	168			
Oil Sump	210	205	233	203			
Fuel	93	93	92	93			
Inlet Air	97	97	101	102			
Airbox	144	143	155	147			
Wet Bulb	60.9	61.8	60.5	60.8			
Dry Bulb	73.4	73.9	73.6	73.8			
PRESSURES, PSIG							
Oil Gallery	46.5	48.0	32.0	37.5			
Air After Blower	1.9	1.9	1.4	1.4			
Fuel Transfer	71.0	76.5	65.5	68.0			
LOW PRESSURES							
Intake Vac., in.water	9.1	9.1	5.4	3.4			
Exh. Comm., in.Water	9.5	9.0	9.0	5.5			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	29.15	29.14	29.13	29.12			

880202.110834 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	69.322	.123	20.735	.069
Wet Bulb Temperature, F	56.113	.045	13.396	.025
P11-Baro (Vent), "Hg ABS	29.182	.001	98.823	.002
P3 C3 Fuel Pressure,psig	75.349	.325	519.51	2.242
P4 C3 Oil Pressure, psig	51.890	.029	357.77	.197
P5 C3 Airbox Pres., psig	5.082	.013	35.039	.091
P10 C3 Exh Comm, inH2Og	28.780	.256	7.162	.064
P11 C3 Intake Vac,inH2Ov	18.965	.165	4.719	.041
P12 C3 Blowby, inH2Og	.019	.004	.005	.001
C3 Speed, RPM	2800.2	2.861	2800.2	2.861
C3 Fuel Flow, lb/hr	94.472	.181	42.852	.082
C3 Smoke, %	4.878	.222	4.878	.222
Cell 3 Load, lb-ft	373.82	.664	506.83	.900
K1 C3 Exhaust 1, F	789.84	.865	421.02	.480
K2 C3 Exhaust 2, F	844.47	.622	451.37	.345
K3 C3 Exhaust 3, F	942.23	.959	505.68	.533
K4 C3 Exhaust 4, F	848.80	1.039	453.78	.577
K5 C3 Exhaust 5, F	949.42	.575	509.68	.319
K6 C3 Exhaust 6, F	961.83	.630	516.57	.350
K7-C3 Exhaust Comm, F	766.73	.686	408.18	.381
J1 C3 Water In, F	154.07	.054	67.819	.030
J2 C3 Water Out, F	168.19	.042	75.663	.024
J3 C3 Oil Sump, F	243.77	.327	117.65	.182
J4 C3 Fuel In, F	91.864	.038	33.258	.021
J5 C3 Inlet Air, F	98.895	.283	37.164	.157
J6 C3 Airbox, F	206.00	.234	96.665	.130
Horsepower	199.31	.300	148.60	.224
Corrected Horsepower	206.29	.311	153.80	.232
BSFC, lb/hp-hr	.474	.001	.288	.000
Corrected BSFC	.458	.001	.279	.000
Relative Humidity	42.996	.241	42.996	.241
Reference Pressure, inHg	38.135		129.14	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1612

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	38.14 in-Hg
Speed :	2800 RPM
Load :	373.8 lb-ft
Fuel Flow :	94.5 lb/hr
Brake Power :	199.28 bhp
BSFC :	.474 lb/bhp-hr
Indicated Power :	27.51 kW/cyl
Peak Pressure :	9.578 MPa
Peak Rate of Pressure Rise:	434.7 kPa/deg
Peak Heat Release Rate :	37.7 Joules/deg
Cumulative Heat Release :	1183.80 Joules
Apparent Combustion Efficiency :	65.3 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	29.3 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	199.9 degrees
Centroid Magnitude :	10.53 J/degree
Sensitivity :	31.2 degrees
Premixed/Diffusion Ratio :	.21407

880202.112154 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	70.003	.166	21.113	.092
Wet Bulb Temperature, F	56.417	.034	13.565	.019
P11-Baro (Vent), "Hg ABS	29.193	.001	98.857	.003
P3 C3 Fuel Pressure,psig	71.901	.329	495.74	2.266
P4 C3 Oil Pressure, psig	49.762	.012	343.10	.085
P5 C3 Airbox Pres., psig	4.019	.019	27.709	.133
P10 C3 Exh Comm, inH20g	24.577	.152	6.116	.038
P11 C3 Intake Vac,inH20v	15.144	.174	3.768	.043
P12 C3 Blowby, inH20g	.005	.004	.001	.001
C3 Speed, RPM	2499.7	3.169	2499.7	3.169
C3 Fuel Flow, lb/hr	89.062	.129	40.398	.059
C3 Smoke, %	4.336	.183	4.336	.183
Cell 3 Load, lb-ft	408.10	.823	553.30	1.116
K1 C3 Exhaust 1, F	810.72	1.020	432.62	.567
K2 C3 Exhaust 2, F	880.07	1.047	471.15	.582
K3 C3 Exhaust 3, F	986.79	.812	530.44	.451
K4 C3 Exhaust 4, F	844.44	.869	451.36	.483
K5 C3 Exhaust 5, F	974.66	.814	523.70	.452
K6 C3 Exhaust 6, F	984.15	.820	528.97	.456
K7-C3 Exhaust Comm, F	782.41	.767	416.89	.426
J1 C3 Water In, F	153.85	.140	67.696	.078
J2 C3 Water Out, F	168.24	.091	75.690	.051
J3 C3 Oil Sump, F	241.65	.177	116.47	.098
J4 C3 Fuel In, F	92.648	.062	33.694	.034
J5 C3 Inlet Air, F	99.405	.839	37.447	.466
J6 C3 Airbox, F	198.59	.188	92.548	.105
Horsepower	194.23	.468	144.81	.349
Corrected Horsepower	201.06	.485	149.90	.361
BSFC, lb/hp-hr	.459	.001	.279	.001
Corrected BSFC	.443	.001	.269	.001
Relative Humidity	42.122	.403	42.122	.403
Reference Pressure, inHg	36.261		122.79	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1614

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	36.26 in-Hg
Speed :	2500 RPM
Load :	408.1 lb-ft
Fuel Flow :	89.1 lb/hr
Brake Power :	194.26 bhp
BSFC :	.459 lb/bhp-hr
Indicated Power :	25.38 kW/cyl
Peak Pressure :	9.747 MPa
Peak Rate of Pressure Rise:	485.3 kPa/deg
Peak Heat Release Rate :	40.5 Joules/deg
Cumulative Heat Release :	1232.26 Joules
Apparent Combustion Efficiency :	64.4 %
Indicated Thermal Efficiency :	31.8 %
Brake Thermal Efficiency :	30.3 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	198.8 degrees
Centroid Magnitude :	11.03 J/degree
Sensitivity :	30.2 degrees
Premixed/Diffusion Ratio :	.21709

880202.113342 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	69.599	.066	20.889	.037
Wet Bulb Temperature, F	56.207	.021	13.448	.012
P11-Baro (Vent), "Hg ABS	29.193	.001	98.858	.002
P3 C3 Fuel Pressure,psig	72.503	.179	499.89	1.234
P4 C3 Oil Pressure, psig	52.261	.029	360.33	.200
P5 C3 Airbox Pres., psig	3.760	.015	25.926	.101
P10 C3 Exh Comm, inH20g	20.482	.247	5.097	.062
P11 C3 Intake Vac,inH20v	15.533	.126	3.865	.031
P12 C3 Blowby, inH20g	-.000	.005	-.000	.001
C3 Speed, RPM	2499.8	3.035	2499.8	3.035
C3 Fuel Flow, lb/hr	61.901	.080	28.078	.036
C3 Smoke, %	-.764	.040	-.764	.040
Cell 3 Load, lb-ft	285.62	.563	387.24	.764
K1 C3 Exhaust 1, F	599.05	.403	315.03	.224
K2 C3 Exhaust 2, F	632.59	.467	333.66	.260
K3 C3 Exhaust 3, F	710.94	.358	377.19	.199
K4 C3 Exhaust 4, F	627.48	.257	330.82	.143
K5 C3 Exhaust 5, F	699.07	.310	370.60	.172
K6 C3 Exhaust 6, F	711.39	.373	377.44	.207
K7-C3 Exhaust Comm, F	552.92	.623	289.40	.346
J1 C3 Water In, F	157.01	.059	69.449	.033
J2 C3 Water Out, F	168.48	.025	75.821	.014
J3 C3 Oil Sump, F	230.48	.232	110.27	.129
J4 C3 Fuel In, F	93.599	.348	34.222	.193
J5 C3 Inlet Air, F	98.274	.376	36.819	.209
J6 C3 Airbox, F	176.84	.196	80.466	.109
Horsepower	135.95	.318	101.36	.237
Corrected Horsepower	140.58	.329	104.81	.245
BSFC, lb/hp-hr	.455	.001	.277	.001
Corrected BSFC	.440	.001	.268	.001
Relative Humidity	42.521	.183	42.521	.183
Reference Pressure, inHg	35.706		120.92	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1616

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	35.71 in-Hg
Speed :	2500 RPM
Load :	285.6 lb-ft
Fuel Flow :	61.9 lb/hr
Brake Power :	135.95 bhp
BSFC :	.455 lb/bhp-hr
Indicated Power :	18.52 kW/cyl
Peak Pressure :	8.554 MPa
Peak Rate of Pressure Rise:	506.1 kPa/deg
Peak Heat Release Rate :	45.8 Joules/deg
Cumulative Heat Release :	875.560 Joules
Apparent Combustion Efficiency :	65.9 %
Indicated Thermal Efficiency :	33.4 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	8.8 degrees
Centroid Phasing :	197.2 degrees
Centroid Magnitude :	10.12 J/degree
Sensitivity :	26.4 degrees
Premixed/Diffusion Ratio :	.33267

880202.114624 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	69.910	.149	21.061	.083
Wet Bulb Temperature, F	56.286	.026	13.492	.015
P11-Baro (Vent), "Hg ABS	29.180	.001	98.814	.002
P3 C3 Fuel Pressure,psig	70.292	.184	484.65	1.271
P4 C3 Oil Pressure, psig	46.827	.020	322.86	.141
P5 C3 Airbox Pres., psig	2.867	.015	19.768	.105
P10 C3 Exh Comm, inH2Og	19.954	.164	4.965	.041
P11 C3 Intake Vac,inH2Ov	12.330	.149	3.068	.037
P12 C3 Blowby, inH2Og	-.014	.003	-.003	.001
C3 Speed, RPM	2202.7	2.471	2202.7	2.471
C3 Fuel Flow, lb/hr	80.734	.111	36.620	.050
C3 Smoke, %	8.062	.232	8.062	.232
Cell 3 Load, lb-ft	421.03	.427	570.83	.579
K1 C3 Exhaust 1, F	765.74	.640	407.63	.355
K2 C3 Exhaust 2, F	854.09	.692	456.72	.385
K3 C3 Exhaust 3, F	974.88	.643	523.82	.357
K4 C3 Exhaust 4, F	803.93	.663	428.85	.369
K5 C3 Exhaust 5, F	977.66	.853	525.36	.474
K6 C3 Exhaust 6, F	990.46	.366	532.48	.203
K7-C3 Exhaust Comm, F	766.21	.513	407.90	.285
J1 C3 Water In, F	155.25	.889	68.470	.494
J2 C3 Water Out, F	169.78	.067	76.544	.037
J3 C3 Oil Sump, F	241.08	.154	116.15	.086
J4 C3 Fuel In, F	93.467	.149	34.148	.083
J5 C3 Inlet Air, F	100.26	.309	37.922	.172
J6 C3 Airbox, F	186.60	.222	85.886	.123
Horsepower	176.58	.260	131.65	.194
Corrected Horsepower	182.99	.269	136.43	.201
BSFC, lb/hp-hr	.457	.001	.278	.001
Corrected BSFC	.441	.001	.268	.001
Relative Humidity	41.916	.371	41.916	.371
Reference Pressure, inHg	34.110		115.51	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1618

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	34.11 in-Hg
Speed :	2203 RPM
Load :	421.0 lb-ft
Fuel Flow :	80.7 lb/hr
Brake Power :	176.59 bhp
BSFC :	.457 lb/bhp-hr
Indicated Power :	22.67 kW/cyl
Peak Pressure :	9.966 MPa
Peak Rate of Pressure Rise:	517.5 kPa/deg
Peak Heat Release Rate :	45.6 Joules/deg
Cumulative Heat Release :	1240.79 Joules
Apparent Combustion Efficiency :	63.1 %
Indicated Thermal Efficiency :	31.4 %
Brake Thermal Efficiency :	30.4 %
Ignition Delay :	6.1 degrees
Centroid Phasing :	197.6 degrees
Centroid Magnitude :	11.59 J/degree
Sensitivity :	29.5 degrees
Premixed/Diffusion Ratio :	.20745

880202.115824 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	71.031	.214	21.684	.119
Wet Bulb Temperature, F	56.766	.045	13.759	.025
P11-Baro (Vent), "Hg ABS	29.161	.001	98.752	.003
P3 C3 Fuel Pressure,psig	72.229	.318	498.00	2.192
P4 C3 Oil Pressure, psig	50.848	.012	350.59	.085
P5 C3 Airbox Pres., psig	2.656	.013	18.314	.093
P10 C3 Exh Comm, inH2Og	15.199	.140	3.782	.035
P11 C3 Intake Vac,inH2Ov	12.866	.101	3.202	.025
P12 C3 Blowby, inH2Og	-.016	.005	-.004	.001
C3 Speed, RPM	2202.4	2.915	2202.4	2.915
C3 Fuel Flow, lb/hr	44.386	.050	20.133	.023
C3 Smoke, %	.317	.047	.317	.047
Cell 3 Load, lb-ft	225.10	.900	305.20	1.220
K1 C3 Exhaust 1, F	505.21	.339	262.89	.188
K2 C3 Exhaust 2, F	526.20	.437	274.56	.243
K3 C3 Exhaust 3, F	579.88	.340	304.38	.189
K4 C3 Exhaust 4, F	513.53	.471	267.52	.262
K5 C3 Exhaust 5, F	570.65	.176	299.25	.098
K6 C3 Exhaust 6, F	573.54	.312	300.86	.173
K7-C3 Exhaust Comm, F	464.25	1.184	240.14	.658
J1 C3 Water In, F	158.49	.174	70.273	.097
J2 C3 Water Out, F	168.75	.145	75.975	.080
J3 C3 Oil Sump, F	221.79	.144	105.44	.080
J4 C3 Fuel In, F	92.255	.168	33.475	.093
J5 C3 Inlet Air, F	97.490	.155	36.383	.086
J6 C3 Airbox, F	163.59	.339	73.103	.189
Horsepower	94.394	.345	70.378	.258
Corrected Horsepower	97.645	.357	72.801	.266
BSFC, lb/hp-hr	.470	.002	.286	.001
Corrected BSFC	.455	.002	.277	.001
Relative Humidity	40.491	.540	40.491	.540
Reference Pressure, inHg	33.623		113.86	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1620

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	33.62 in-Hg
Speed :	2202 RPM
Load :	225.1 lb-ft
Fuel Flow :	44.4 lb/hr
Brake Power :	94.38 bhp
BSFC :	.470 lb/bhp-hr
Indicated Power :	13.45 kW/cyl
Peak Pressure :	7.984 MPa
Peak Rate of Pressure Rise:	603.6 kPa/deg
Peak Heat Release Rate :	62.3 Joules/deg
Cumulative Heat Release :	707.095 Joules
Apparent Combustion Efficiency :	65.3 %
Indicated Thermal Efficiency :	33.9 %
Brake Thermal Efficiency :	29.5 %
Ignition Delay :	9.8 degrees
Centroid Phasing :	194.4 degrees
Centroid Magnitude :	11.53 J/degree
Sensitivity :	22.6 degrees
Premixed/Diffusion Ratio :	.43409

980202.121106 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	70.959	.141	21.644	.079
Wet Bulb Temperature, F	56.834	.022	13.796	.012
P11-Baro (Vent), "Hg ABS	29.164	.000	98.760	.002
P3 C3 Fuel Pressure,psig	67.908	.127	468.21	.874
P4 C3 Oil Pressure, psig	42.741	.011	294.69	.075
P5 C3 Airbox Pres., psig	1.958	.009	13.498	.065
P10 C3 Exh Comm, inH2Og	14.125	.135	3.515	.034
P11 C3 Intake Vac,inH2Ov	8.288	.062	2.062	.016
P12 C3 Blowby, inH2Og	-.020	.003	-.005	.001
C3 Speed, RPM	1801.3	1.962	1801.3	1.962
C3 Fuel Flow, lb/hr	70.929	.071	32.173	.032
C3 Smoke, %	36.208	.884	36.208	.884
Cell 3 Load, lb-ft	414.49	.824	561.97	1.117
K1 C3 Exhaust 1, F	695.88	.309	368.82	.172
K2 C3 Exhaust 2, F	818.50	.688	436.95	.382
K3 C3 Exhaust 3, F	902.62	.726	483.68	.403
K4 C3 Exhaust 4, F	749.15	.517	398.42	.287
K5 C3 Exhaust 5, F	946.77	.581	508.20	.323
K6 C3 Exhaust 6, F	951.55	.776	510.86	.431
K7-C3 Exhaust Comm, F	725.92	.543	385.51	.302
J1 C3 Water In, F	153.74	.174	67.632	.097
J2 C3 Water Out, F	169.16	.109	76.200	.060
J3 C3 Oil Sump, F	234.13	.173	112.29	.096
J4 C3 Fuel In, F	92.925	.141	33.847	.079
J5 C3 Inlet Air, F	97.618	.569	36.454	.316
J6 C3 Airbox, F	160.32	.035	71.291	.019
Horsepower	142.16	.376	105.99	.280
Corrected Horsepower	147.07	.389	109.65	.290
BSFC, lb/hp-hr	.499	.002	.304	.001
Corrected BSFC	.482	.002	.293	.001
Relative Humidity	40.935	.380	40.935	.380
Reference Pressure, inHg	32.540		110.19	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1622

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.54 in-Hg
Speed :	1801 RPM
Load :	414.5 lb-ft
Fuel Flow :	70.9 lb/hr
Brake Power :	142.14 bhp
BSFC :	.499 lb/bhp-hr
Indicated Power :	17.92 kW/cyl
Peak Pressure :	9.999 MPa
Peak Rate of Pressure Rise:	616.4 kPa/deg
Peak Heat Release Rate :	63.3 Joules/deg
Cumulative Heat Release :	1219.64 Joules
Apparent Combustion Efficiency :	57.7 %
Indicated Thermal Efficiency :	28.3 %
Brake Thermal Efficiency :	27.9 %
Ignition Delay :	5.9 degrees
Centroid Phasing :	197.0 degrees
Centroid Magnitude :	12.47 J/degree
Sensitivity :	29.0 degrees
Premixed/Diffusion Ratio :	.20458

980202.122158 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	71.618	.275	22.010	.153
Wet Bulb Temperature, F	57.085	.033	13.936	.019
P11-Baro (Vent), "Hg ABS	29.163	.001	98.756	.002
P3 C3 Fuel Pressure,psig	69.479	.193	479.04	1.329
P4 C3 Oil Pressure, psig	45.189	.011	311.57	.078
P5 C3 Airbox Pres., psig	1.698	.006	11.710	.040
P10 C3 Exh Comm, inH2Og	11.531	.131	2.869	.033
P11 C3 Intake Vac,inH2Ov	8.681	.093	2.160	.023
P12 C3 Blowby, inH2Og	-.022	.002	-.005	.001
C3 Speed, RPM	1801.5	2.089	1801.5	2.089
C3 Fuel Flow, lb/hr	41.977	.111	19.041	.051
C3 Smoke, %	-.862	.044	-.862	.044
Cell 3 Load, lb-ft	277.75	.581	376.57	.788
K1 C3 Exhaust 1, F	502.02	.591	261.12	.328
K2 C3 Exhaust 2, F	549.09	.527	287.27	.293
K3 C3 Exhaust 3, F	604.05	.395	317.81	.220
K4 C3 Exhaust 4, F	519.52	.475	270.84	.264
K5 C3 Exhaust 5, F	637.29	.756	336.27	.420
K6 C3 Exhaust 6, F	615.43	.734	324.13	.408
K7-C3 Exhaust Comm, F	488.83	1.395	253.79	.775
J1 C3 Water In, F	158.98	.151	70.543	.084
J2 C3 Water Out, F	170.18	.149	76.768	.083
J3 C3 Oil Sump, F	220.99	.265	104.99	.147
J4 C3 Fuel In, F	91.182	.034	32.879	.019
J5 C3 Inlet Air, F	97.977	.120	36.654	.067
J6 C3 Airbox, F	149.48	.166	65.269	.092
Horsepower	95.270	.257	71.031	.192
Corrected Horsepower	98.597	.266	73.511	.198
BSFC, lb/hp-hr	.441	.002	.268	.001
Corrected BSFC	.426	.002	.259	.001
Relative Humidity	40.007	.731	40.007	.731
Reference Pressure, inHg	31.982		108.30	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1624

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.98 in-Hg
Speed :	1802 RPM
Load :	277.8 lb-ft
Fuel Flow :	42.0 lb/hr
Brake Power :	95.32 bhp
BSFC :	.441 lb/bhp-hr
Indicated Power :	12.08 kW/cyl
Peak Pressure :	8.243 MPa
Peak Rate of Pressure Rise:	606.8 kPa/deg
Peak Heat Release Rate :	62.5 Joules/deg
Cumulative Heat Release :	786.988 Joules
Apparent Combustion Efficiency :	62.9 %
Indicated Thermal Efficiency :	32.2 %
Brake Thermal Efficiency :	31.5 %
Ignition Delay :	8.8 degrees
Centroid Phasing :	193.9 degrees
Centroid Magnitude :	11.73 J/degree
Sensitivity :	23.1 degrees
Premixed/Diffusion Ratio :	.38037

980202.123230 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	70.531	.193	21.406	.107
Wet Bulb Temperature, F	56.670	.052	13.705	.029
P11-Baro (Vent), "Hg ABS	29.147	.001	98.704	.002
P3 C3 Fuel Pressure,psig	71.032	.344	489.75	2.372
P4 C3 Oil Pressure, psig	47.223	.017	325.59	.118
P5 C3 Airbox Pres., psig	1.684	.005	11.609	.033
P10 C3 Exh Comm, inH2Og	9.762	.097	2.429	.024
P11 C3 Intake Vac,inH2Ov	8.878	.067	2.209	.017
P12 C3 Blowby, inH2Og	-.026	.002	-.006	.001
C3 Speed, RPM	1801.0	1.426	1801.0	1.426
C3 Fuel Flow, lb/hr	26.103	.068	11.840	.031
C3 Smoke, %	-1.298	.055	-1.298	.055
Cell 3 Load, lb-ft	146.34	.552	198.41	.748
K1 C3 Exhaust 1, F	393.70	.242	200.94	.134
K2 C3 Exhaust 2, F	404.36	.374	206.87	.208
K3 C3 Exhaust 3, F	439.63	.286	226.46	.159
K4 C3 Exhaust 4, F	370.94	.280	188.30	.155
K5 C3 Exhaust 5, F	394.76	.255	201.54	.142
K6 C3 Exhaust 6, F	395.04	.341	201.69	.190
K7-C3 Exhaust Comm, F	350.58	.934	176.99	.519
J1 C3 Water In, F	160.03	.107	71.129	.059
J2 C3 Water Out, F	169.09	.081	76.161	.045
J3 C3 Oil Sump, F	210.93	.074	99.406	.041
J4 C3 Fuel In, F	92.638	.112	33.688	.062
J5 C3 Inlet Air, F	97.135	.258	36.186	.143
J6 C3 Airbox, F	144.81	.193	62.671	.107
Horsepower	50.182	.199	37.415	.149
Corrected Horsepower	51.924	.206	38.713	.154
BSFC, lb/hp-hr	.520	.003	.316	.002
Corrected BSFC	.503	.003	.306	.002
Relative Humidity	41.562	.432	41.562	.432
Reference Pressure, inHg	31.922		108.10	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1626

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.92 in-Hg
Speed :	1801 RPM
Load :	146.3 lb-ft
Fuel Flow :	26.1 lb/hr
Brake Power :	50.17 bhp
BSFC :	.520 lb/bhp-hr
Indicated Power :	8.00 kW/cyl
Peak Pressure :	7.174 MPa
Peak Rate of Pressure Rise:	657.5 kPa/deg
Peak Heat Release Rate :	72.3 Joules/deg
Cumulative Heat Release :	517.701 Joules
Apparent Combustion Efficiency :	66.6 %
Indicated Thermal Efficiency :	34.3 %
Brake Thermal Efficiency :	26.7 %
Ignition Delay :	10.6 degrees
Centroid Phasing :	193.3 degrees
Centroid Magnitude :	13.53 J/degree
Sensitivity :	20.7 degrees
Premixed/Diffusion Ratio :	.51011

880202.124136 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	71.036	.622	21.687	.345
Wet Bulb Temperature, F	56.712	.172	13.729	.096
P11-Baro (Vent), "Hg ABS	29.140	.000	98.678	.001
P3 C3 Fuel Pressure,psig	74.589	.688	514.27	4.740
P4 C3 Oil Pressure, psig	48.126	.011	331.82	.074
P5 C3 Airbox Pres., psig	1.729	.007	11.919	.051
P10 C3 Exh Comm, inH2Og	9.040	.060	2.249	.015
P11 C3 Intake Vac,inH2Ov	8.912	.040	2.218	.010
P12 C3 Blowby, inH2Og	-.027	.003	-.007	.001
C3 Speed, RPM	1801.2	1.455	1801.2	1.455
C3 Fuel Flow, lb/hr	19.940	.077	9.045	.035
C3 Smoke, %	-1.320	.034	-1.320	.034
Cell 3 Load, lb-ft	88.178	.562	119.55	.761
K1 C3 Exhaust 1, F	356.52	.105	180.29	.058
K2 C3 Exhaust 2, F	354.14	.296	178.97	.165
K3 C3 Exhaust 3, F	384.19	.476	195.66	.264
K4 C3 Exhaust 4, F	301.99	.225	150.00	.125
K5 C3 Exhaust 5, F	301.62	.300	149.79	.167
K6 C3 Exhaust 6, F	309.52	.336	154.18	.187
K7-C3 Exhaust Comm, F	299.46	.702	148.59	.390
J1 C3 Water In, F	161.46	.043	71.924	.024
J2 C3 Water Out, F	169.69	.050	76.492	.028
J3 C3 Oil Sump, F	206.03	.145	96.686	.080
J4 C3 Fuel In, F	92.779	.135	33.766	.075
J5 C3 Inlet Air, F	98.258	.110	36.810	.061
J6 C3 Airbox, F	142.99	.033	61.661	.018
Horsepower	30.241	.194	22.547	.145
Corrected Horsepower	31.327	.201	23.356	.150
BSFC, lb/hp-hr	.659	.005	.401	.003
Corrected BSFC	.637	.005	.387	.003
Relative Humidity	40.314	1.260	40.314	1.260
Reference Pressure, inHg	32.004		108.38	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1628

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	32.00 in-Hg
Speed :	1801 RPM
Load :	88.2 lb-ft
Fuel Flow :	19.9 lb/hr
Brake Power :	30.25 bhp
BSFC :	.658 lb/bhp-hr
Indicated Power :	6.36 kW/cyl
Peak Pressure :	6.867 MPa
Peak Rate of Pressure Rise:	652.8 kPa/deg
Peak Heat Release Rate :	72.5 Joules/deg
Cumulative Heat Release :	412.401 Joules
Apparent Combustion Efficiency :	69.5 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	21.1 %
Ignition Delay :	11.1 degrees
Centroid Phasing :	193.1 degrees
Centroid Magnitude :	14.77 J/degree
Sensitivity :	20.0 degrees
Premixed/Diffusion Ratio :	.55239

880202.125649 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	72.252	.319	22.362	.177
Wet Bulb Temperature, F	57.273	.100	14.041	.055
P11-Baro (Vent), "Hg ABS	29.128	.000	98.639	.002
P3 C3 Fuel Pressure,psig	65.591	.138	452.23	.949
P4 C3 Oil Pressure, psig	32.731	.022	225.67	.149
P5 C3 Airbox Pres., psig	1.328	.011	9.155	.076
P10 C3 Exh Comm, inH2Og	9.758	.100	2.428	.025
P11 C3 Intake Vac,inH2Ov	5.403	.041	1.345	.010
P12 C3 Blowby, inH2Og	-.032	.003	-.008	.001
C3 Speed, RPM	1402.3	1.561	1402.3	1.561
C3 Fuel Flow, lb/hr	59.998	.055	27.215	.025
C3 Smoke, %	67.924	1.065	67.924	1.065
Cell 3 Load, lb-ft	380.55	1.155	515.96	1.566
K1 C3 Exhaust 1, F	631.02	.324	332.79	.180
K2 C3 Exhaust 2, F	711.84	.617	377.69	.343
K3 C3 Exhaust 3, F	807.88	.666	431.04	.370
K4 C3 Exhaust 4, F	660.08	.660	348.94	.367
K5 C3 Exhaust 5, F	813.05	.481	433.92	.267
K6 C3 Exhaust 6, F	770.80	1.039	410.45	.577
K7-C3 Exhaust Comm, F	621.66	.413	327.59	.229
J1 C3 Water In, F	152.92	.062	67.175	.035
J2 C3 Water Out, F	169.38	.062	76.324	.035
J3 C3 Oil Sump, F	232.53	.150	111.40	.084
J4 C3 Fuel In, F	91.145	.172	32.858	.096
J5 C3 Inlet Air, F	100.72	.204	38.179	.113
J6 C3 Airbox, F	155.03	.035	68.352	.019
Horsepower	101.61	.327	75.758	.244
Corrected Horsepower	105.54	.340	78.687	.253
BSFC, lb/hp-hr	.590	.002	.359	.001
Corrected BSFC	.569	.002	.346	.001
Relative Humidity	38.979	.734	38.979	.734
Reference Pressure, inHg	31.434		106.45	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1630

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.43 in-Hg
Speed :	1402 RPM
Load :	380.5 lb-ft
Fuel Flow :	60.0 lb/hr
Brake Power :	101.57 bhp
BSFC :	.591 lb/bhp-hr
Indicated Power :	13.79 kW/cyl
Peak Pressure :	10.32 MPa
Peak Rate of Pressure Rise:	666.6 kPa/deg
Peak Heat Release Rate :	71.6 Joules/deg
Cumulative Heat Release :	1205.97 Joules
Apparent Combustion Efficiency :	52.5 %
Indicated Thermal Efficiency :	25.7 %
Brake Thermal Efficiency :	23.5 %
Ignition Delay :	5.2 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	13.94 J/degree
Sensitivity :	27.8 degrees
Premixed/Diffusion Ratio :	.18673

880202.130738 AL-16084-F AL-12920-L 6V53N				8
Dry Bulb Temperature, F	73.012	.680	22.785	.378
Wet Bulb Temperature, F	57.546	.129	14.192	.072
P11-Baro (Vent), "Hg ABS	29.115	.001	98.596	.003
P3 C3 Fuel Pressure,psig	67.992	.167	468.79	1.149
P4 C3 Oil Pressure, psig	37.931	.089	261.53	.615
P5 C3 Airbox Pres., psig	1.244	.005	8.574	.033
P10 C3 Exh Comm, inH2Og	6.272	.069	1.561	.017
P11 C3 Intake Vac,inH2Ov	5.706	.047	1.420	.012
P12 C3 Blowby, inH2Og	-.031	.002	-.008	.001
C3 Speed, RPM	1402.9	1.291	1402.9	1.291
C3 Fuel Flow, lb/hr	16.543	.045	7.504	.021
C3 Smoke, %	-1.227	.069	-1.227	.069
Cell 3 Load, lb-ft	99.568	.268	135.00	.364
K1 C3 Exhaust 1, F	345.85	.257	174.36	.143
K2 C3 Exhaust 2, F	335.51	.654	168.62	.363
K3 C3 Exhaust 3, F	374.37	.133	190.21	.074
K4 C3 Exhaust 4, F	284.31	.253	140.17	.141
K5 C3 Exhaust 5, F	285.81	.362	141.01	.201
K6 C3 Exhaust 6, F	301.82	.417	149.90	.232
K7-C3 Exhaust Comm, F	311.13	2.583	155.07	1.435
J1 C3 Water In, F	157.22	.217	69.564	.121
J2 C3 Water Out, F	166.26	.165	74.591	.092
J3 C3 Oil Sump, F	205.46	.281	96.365	.156
J4 C3 Fuel In, F	91.910	.015	33.283	.008
J5 C3 Inlet Air, F	102.12	.300	38.956	.166
J6 C3 Airbox, F	147.38	.254	64.100	.141
Horsepower	26.596	.086	19.830	.064
Corrected Horsepower	27.671	.090	20.630	.067
BSFC, lb/hp-hr	.622	.003	.378	.002
Corrected BSFC	.598	.003	.364	.002
Relative Humidity	37.940	1.439	37.940	1.439
Reference Pressure, inHg	31.228		105.75	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1632

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	31.23 in-Hg
Speed :	1403 RPM
Load :	99.6 lb-ft
Fuel Flow :	16.5 lb/hr
Brake Power :	26.61 bhp
BSFC :	.620 lb/bhp-hr
Indicated Power :	4.96 kW/cyl
Peak Pressure :	6.838 MPa
Peak Rate of Pressure Rise:	756.9 kPa/deg
Peak Heat Release Rate :	86.2 Joules/deg
Cumulative Heat Release :	411.784 Joules
Apparent Combustion Efficiency :	65.2 %
Indicated Thermal Efficiency :	33.6 %
Brake Thermal Efficiency :	22.4 %
Ignition Delay :	10.3 degrees
Centroid Phasing :	190.5 degrees
Centroid Magnitude :	17.38 J/degree
Sensitivity :	18.3 degrees
Premixed/Diffusion Ratio :	.56127

APPENDIX F9
DDC 6V-53N DATA SHEETS
FUEL BLEND TF34

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: DDA 6V-53N Engine Tester: G. Phillips
Test Fuel: TF34NJ28J88 Date: 3-30-88

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressure:
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF34NJ28J88 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressure:
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF34NJ28J88 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF34N28T88 Date: 3-30-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	276	DN1633	DN1634
2500	277	DN1635	DN1636
2200	278	DN1637	DN1638
1800	279	DN1639	DN1640
1400	280	DN1641	DN1642

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF34N28T88

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	281	DN1643	DN1644
2500	Full-Rack	282	DN1645	DN1646
2500	145	283	DN1647	DN1648
2200	Full-Rack	284	DN1649	DN1650
2200	100	285	DN1651	DN1652
1800	Full-Rack	286	DN1653	DN1654
1800	100	287	DN1655	DN1656
1800	54	288	DN1657	DN1658
1800	20	289	DN1659	DN1660
1400	Full-Rack	290	DN1661	DN1662
1400	28	291	DN1663	DN1664

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: DDA 6V-53N Engine Tester: BFLRF(SwRI)

Fuel Blend: TF34N28J88 Date: 3-31-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

DDA 6V-53N Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2800	292	DN1665	DN1666
2500	293	DN1667	DN1668
2200	294	DN1669	DN1670
1800	295	DN1671	DN1672
1400	296	DN1673	DN1674

DDA 6V-53N Speed-Power Points for Performance Evaluations

Fuel Blend: TF34N28J88

Speed	CBHP	Run #	RAW File	AVG File
2800	Full-Rack	297	DN1675	DN1676
2500	Full-Rack	298	DN1677	DN1678
2500	145	299	DN1679	DN1680
2200	Full-Rack	300	DN1681	DN1682
2200	100	301	DN1683	DN1684
1800	Full-Rack	302	DN1685	DN1686
1800	100	303	DN1687	DN1688
1800	54	304	DN1689	DN1690
1800	20	305	DN1691	DN1692
1400	Full-Rack	306	DN1693	DN1694
1400	28	307	DN1695	DN1696

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 4 FUEL BF02V31587 DATE 3-30-88 PAGE 48

Operator Gray							
Time	12:45	1:00	1:10	1:20	1:30		
Test Hour	30min	15min	10min	10min	10min		
Speed, RPM	2800	2500	2200	1900	1400		
Load, lb-ft	351.4	385.9	406.2	409.7	378.4		
Fuel Flow, lb/hr	78.2	74.5	68.9	61.3	52.3		
Exh. Opacity, %	5	0	1.0	15.5	48.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	760	755	720	670	620		
Exhaust Cyl. L2	770	800	790	760	700		
Exhaust Cyl. L3	860	890	900	850	770		
Exhaust Cyl. R1	770	755	740	720	650		
Exhaust Cyl. R2	860	860	900	900	810		
Exhaust Cyl. R3	870	870	900	910	770		
Exhaust Common	695	700	700	685	600		
Water In	156	154	153	154	156		
Water Out	169	168	167	169	171		
Oil Sump	240	238	236	234	235		
Fuel	91	92	91	90	89		
Inlet Air	98	97	98	100	99		
Airbox	190	182	172	163	158		
Wet Bulb	59.2	59.3	59.8	59.5	60.0		
Dry Bulb	77.8	77.5	77.0	77.5	77.9		
PRESSURES, PSIG							
Oil Gallery	52.0	49.5	46.5	41.5	31.5		
Air After Blower	5.0	4.0	3.0	2.0	1.4		
Fuel Transfer	76.0	75.0	72.0	70.0	68.5		
LOW PRESSURES							
Intake Vac., in.water	19.0	16.0	13.1	8.8	5.3		
Exh. Comm., in.Water	27.5	22.5	18.5	13.5	9.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.04	29.07	29.07	29.07	29.07		

880330.124822 AL-17355-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	75.023	1.084	23.901	.602
Wet Bulb Temperature, F	59.532	.481	15.296	.267
P11-Baro (Vent), "Hg ABS	29.034	.001	98.320	.002
P3 C3 Fuel Pressure,psig	75.798	.714	522.61	4.925
P4 C3 Oil Pressure, psig	52.328	.036	360.79	.251
P5 C3 Airbox Pres., psig	4.886	.010	33.687	.070
P10 C3 Exh Comm, inH2Og	27.190	.161	6.766	.040
P11 C3 Intake Vac,inH2Ov	20.163	.067	5.017	.017
P12 C3 Blowby, inH2Og	.012	.003	.003	.001
C3 Speed, RPM	2801.4	2.752	2801.4	2.752
C3 Fuel Flow, lb/hr	79.153	.204	35.903	.093
C3 Smoke, %	-1.528	.181	-1.528	.181
Cell 3 Load, lb-ft	351.20	.683	476.16	.926
K1 C3 Exhaust 1, F	759.43	.679	404.13	.377
K2 C3 Exhaust 2, F	806.18	.537	430.10	.299
K3 C3 Exhaust 3, F	894.55	1.322	479.20	.734
K4 C3 Exhaust 4, F	803.72	.992	428.73	.551
K5 C3 Exhaust 5, F	895.99	.427	479.99	.237
K6 C3 Exhaust 6, F	911.51	1.057	488.62	.587
K7-C3 Exhaust Comm, F	721.74	.392	383.19	.218
J1 C3 Water In, F	156.19	.151	68.992	.084
J2 C3 Water Out, F	169.22	.186	76.236	.103
J3 C3 Oil Sump, F	240.72	.239	115.95	.133
J4 C3 Fuel In, F	91.285	.049	32.936	.027
J5 C3 Inlet Air, F	96.595	.371	35.886	.206
J6 C3 Airbox, F	191.38	.253	88.546	.140
Horsepower	187.33	.441	139.67	.329
Corrected Horsepower	194.72	.458	145.18	.342
BSFC, lb/hp-hr	.423	.001	.257	.001
Corrected BSFC	.406	.001	.247	.001
Relative Humidity	39.497	1.217	39.497	1.217
Reference Pressure, inHg	37.499		126.99	

HAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1634

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	37.50 in-Hg
Speed :	2801 RPM
Load :	351.2 lb-ft
Fuel Flow :	79.2 lb/hr
Brake Power :	187.30 bhp
BSFC :	.423 lb/bhp-hr
Indicated Power :	25.52 kW/cyl
Peak Pressure :	9.286 MPa
Peak Rate of Pressure Rise:	450.3 kPa/deg
Peak Heat Release Rate :	33.9 Joules/deg
Cumulative Heat Release :	1044.11 Joules
Apparent Combustion Efficiency :	68.1 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	6.8 degrees
Centroid Phasing :	198.7 degrees
Centroid Magnitude :	9.542 J/degree
Sensitivity :	29.9 degrees
Premixed/Diffusion Ratio :	.22677

880330.130041 AL-17355-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	74.072	.628	23.373	.349
Wet Bulb Temperature, F	58.511	.133	14.728	.074
P11-Baro (Vent), "Hg ABS	29.024	.000	98.285	.002
P3 C3 Fuel Pressure,psig	74.286	.447	512.19	3.085
P4 C3 Oil Pressure, psig	49.754	.018	343.04	.125
P5 C3 Airbox Pres., psig	3.807	.018	26.249	.122
P10 C3 Exh Comm, inH2Og	22.695	.141	5.647	.035
P11 C3 Intake Vac,inH2Ov	16.429	.138	4.088	.034
P12 C3 Blowby, inH2Og	-.002	.002	-.000	.001
C3 Speed, RPM	2499.6	3.063	2499.6	3.063
C3 Fuel Flow, lb/hr	74.995	.228	34.017	.103
C3 Smoke, %	-.642	.160	-.642	.160
Cell 3 Load, lb-ft	384.75	.679	521.65	.921
K1 C3 Exhaust 1, F	774.65	.498	412.59	.277
K2 C3 Exhaust 2, F	824.21	.534	440.12	.296
K3 C3 Exhaust 3, F	923.96	.527	495.53	.293
K4 C3 Exhaust 4, F	795.27	.254	424.04	.141
K5 C3 Exhaust 5, F	905.29	.285	485.16	.158
K6 C3 Exhaust 6, F	919.84	.368	493.25	.204
K7-C3 Exhaust Comm, F	726.08	.298	385.60	.165
J1 C3 Water In, F	156.29	.117	69.049	.065
J2 C3 Water Out, F	169.79	.087	76.549	.048
J3 C3 Oil Sump, F	240.42	.444	115.79	.247
J4 C3 Fuel In, F	92.287	.109	33.493	.060
J5 C3 Inlet Air, F	98.931	.188	37.184	.104
J6 C3 Airbox, F	186.99	.085	86.104	.047
Horsepower	183.11	.379	136.53	.283
Corrected Horsepower	190.69	.395	142.17	.294
BSFC, lb/hp-hr	.410	.002	.249	.001
Corrected BSFC	.393	.001	.239	.001
Relative Humidity	38.527	1.460	38.527	1.460
Reference Pressure, inHg	35.566		120.44	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1636

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	35.57 in-Hg
Speed :	2500 RPM
Load :	384.8 lb-ft
Fuel Flow :	75.0 lb/hr
Brake Power :	183.17 bhp
BSFC :	.409 lb/bhp-hr
Indicated Power :	23.29 kW/cyl
Peak Pressure :	9.390 MPa
Peak Rate of Pressure Rise:	477.6 kPa/deg
Peak Heat Release Rate :	40.6 Joules/deg
Cumulative Heat Release :	1084.64 Joules
Apparent Combustion Efficiency :	66.7 %
Indicated Thermal Efficiency :	34.4 %
Brake Thermal Efficiency :	33.6 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	11.39 J/degree
Sensitivity :	27.5 degrees
Premixed/Diffusion Ratio :	.25923

980330.130930 AL-17355-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	72.309	.402	22.394	.223
Wet Bulb Temperature, F	57.850	.116	14.361	.065
P11-Baro (Vent), "Hg ABS	29.019	.000	98.269	.001
P3 C3 Fuel Pressure,psig	72.162	.327	497.54	2.255
P4 C3 Oil Pressure, psig	46.886	.015	323.27	.105
P5 C3 Airbox Pres., psig	2.729	.011	18.814	.075
P10 C3 Exh Comm, inH2Og	18.375	.215	4.573	.053
P11 C3 Intake Vac,inH2Ov	13.479	.098	3.354	.024
P12 C3 Blowby, inH2Og	-.020	.002	-.005	.001
C3 Speed, RPM	2200.9	2.303	2200.9	2.303
C3 Fuel Flow, lb/hr	69.380	.191	31.470	.087
C3 Smoke, %	1.067	.083	1.067	.083
Cell 3 Load, lb-ft	405.61	.764	549.93	1.036
K1 C3 Exhaust 1, F	742.50	.292	394.72	.162
K2 C3 Exhaust 2, F	822.27	.672	439.04	.373
K3 C3 Exhaust 3, F	934.06	.910	501.15	.505
K4 C3 Exhaust 4, F	778.50	.446	414.72	.248
K5 C3 Exhaust 5, F	935.80	.938	502.11	.521
K6 C3 Exhaust 6, F	944.49	.554	506.94	.308
K7-C3 Exhaust Comm, F	730.07	.207	387.82	.115
J1 C3 Water In, F	155.38	.069	68.544	.038
J2 C3 Water Out, F	169.45	.035	76.359	.019
J3 C3 Oil Sump, F	236.48	6.489	113.60	3.605
J4 C3 Fuel In, F	91.852	.121	33.251	.067
J5 C3 Inlet Air, F	100.34	.131	37.968	.073
J6 C3 Airbox, F	175.41	.357	79.670	.198
Horsepower	169.97	.422	126.73	.314
Corrected Horsepower	177.26	.440	132.16	.328
BSFC, lb/hp-hr	.408	.001	.248	.001
Corrected BSFC	.391	.001	.238	.001
Relative Humidity	40.916	.783	40.916	.783
Reference Pressure, inHg	33.583		113.73	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1638

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	33.58 in-Hg
Speed :	2201 RPM
Load :	405.6 lb-ft
Fuel Flow :	69.4 lb/hr
Brake Power :	169.98 bhp
BSFC :	.408 lb/bhp-hr
Indicated Power :	21.16 kW/cyl
Peak Pressure :	9.586 MPa
Peak Rate of Pressure Rise:	521.1 kPa/deg
Peak Heat Release Rate :	47.3 Joules/deg
Cumulative Heat Release :	1134.14 Joules
Apparent Combustion Efficiency :	66.4 %
Indicated Thermal Efficiency :	33.7 %
Brake Thermal Efficiency :	33.7 %
Ignition Delay :	6.4 degrees
Centroid Phasing :	197.3 degrees
Centroid Magnitude :	11.00 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.22225

880330.132222 AL-17355-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	73.559	.822	23.088	.457
Wet Bulb Temperature, F	58.725	.223	14.847	.124
P11-Baro (Vent), "Hg ABS	29.008	.000	98.231	.001
P3 C3 Fuel Pressure,psig	69.776	.110	481.09	.758
P4 C3 Oil Pressure, psig	42.448	.016	292.67	.112
P5 C3 Airbox Pres., psig	1.830	.012	12.620	.080
P10 C3 Exh Comm, inH2Og	13.037	.101	3.244	.025
P11 C3 Intake Vac,inH2Ov	9.407	.062	2.341	.015
P12 C3 Blowby, inH2Og	-.030	.003	-.007	.001
C3 Speed, RPM	1801.4	2.107	1801.4	2.107
C3 Fuel Flow, lb/hr	61.991	.237	28.119	.108
C3 Smoke, %	16.917	.499	16.917	.499
Cell 3 Load, lb-ft	409.01	.903	554.54	1.224
K1 C3 Exhaust 1, F	685.15	.390	362.86	.216
K2 C3 Exhaust 2, F	798.19	.408	425.66	.227
K3 C3 Exhaust 3, F	881.44	.324	471.91	.180
K4 C3 Exhaust 4, F	751.91	.497	399.95	.276
K5 C3 Exhaust 5, F	926.56	.756	496.98	.420
K6 C3 Exhaust 6, F	948.27	.385	509.04	.214
K7-C3 Exhaust Comm, F	713.74	.210	378.74	.117
J1 C3 Water In, F	154.55	.196	68.084	.109
J2 C3 Water Out, F	169.34	.106	76.298	.059
J3 C3 Oil Sump, F	234.04	.124	112.25	.069
J4 C3 Fuel In, F	89.905	.176	32.169	.098
J5 C3 Inlet Air, F	101.83	.112	38.792	.062
J6 C3 Airbox, F	161.13	.108	71.736	.060
Horsepower	140.29	.341	104.60	.254
Corrected Horsepower	146.61	.357	109.31	.266
BSFC, lb/hp-hr	.442	.002	.269	.001
Corrected BSFC	.423	.002	.257	.001
Relative Humidity	40.609	1.560	40.609	1.560
Reference Pressure, inHg	32.042		108.51	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1640

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	32.04 in-Hg
Speed :	1801 RPM
Load :	409.0 lb-ft
Fuel Flow :	62.0 lb/hr
Brake Power :	140.25 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	17.61 kW/cyl
Peak Pressure :	9.738 MPa
Peak Rate of Pressure Rise:	583.0 kPa/deg
Peak Heat Release Rate :	57.7 Joules/deg
Cumulative Heat Release :	1167.42 Joules
Apparent Combustion Efficiency :	62.6 %
Indicated Thermal Efficiency :	31.4 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	6.1 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	12.16 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.21331

880330.133155 AL-17355-F	AL-12920-L	6V53N			9
Dry Bulb Temperature, F	73.293	.201	22.941	.112
Wet Bulb Temperature, F	58.416	.083	14.676	.046
P11-Baro (Vent), "Hg ABS	28.998	.001	98.198	.002
P3 C3 Fuel Pressure,psig	68.211	.159	470.30	1.093
P4 C3 Oil Pressure, psig	31.875	.006	219.77	.042
P5 C3 Airbox Pres., psig	1.245	.011	8.585	.074
P10 C3 Exh Comm, inH2Og	8.878	.138	2.209	.034
P11 C3 Intake Vac,inH2Ov	6.097	.053	1.517	.013
P12 C3 Blowby, inH2Og	-.032	.002	-.008	.000
C3 Speed, RPM	1401.2	1.098	1401.2	1.098
C3 Fuel Flow, lb/hr	52.373	.270	23.756	.122
C3 Smoke, %	45.908	.565	45.908	.565
Cell 3 Load, lb-ft	382.99	1.674	519.26	2.269
K1 C3 Exhaust 1, F	628.63	.486	331.46	.270
K2 C3 Exhaust 2, F	713.08	.429	378.38	.238
K3 C3 Exhaust 3, F	799.49	.799	426.38	.444
K4 C3 Exhaust 4, F	676.41	.483	358.01	.268
K5 C3 Exhaust 5, F	845.97	.631	452.21	.350
K6 C3 Exhaust 6, F	799.60	1.132	426.44	.629
K7-C3 Exhaust Comm, F	628.14	.289	331.19	.161
J1 C3 Water In, F	155.32	.144	68.512	.080
J2 C3 Water Out, F	171.32	.197	77.403	.109
J3 C3 Oil Sump, F	235.46	.141	113.03	.078
J4 C3 Fuel In, F	89.864	2.691	32.147	1.495
J5 C3 Inlet Air, F	98.776	.152	37.098	.085
J6 C3 Airbox, F	157.50	.280	69.725	.155
Horsepower	102.18	.477	76.183	.356
Corrected Horsepower	106.51	.497	79.409	.371
BSFC, lb/hp-hr	.513	.003	.312	.002
Corrected BSFC	.492	.003	.299	.002
Relative Humidity	40.238	.353	40.238	.353
Reference Pressure, inHg	31.084		105.26	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1642

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	31.08 in-Hg
Speed :	1401 RPM
Load :	383.0 lb-ft
Fuel Flow :	52.4 lb/hr
Brake Power :	102.17 bhp
BSFC :	.513 lb/bhp-hr
Indicated Power :	13.93 kW/cyl
Peak Pressure :	10.06 MPa
Peak Rate of Pressure Rise:	632.3 kPa/deg
Peak Heat Release Rate :	66.4 Joules/deg
Cumulative Heat Release :	1170.98 Joules
Apparent Combustion Efficiency :	57.8 %
Indicated Thermal Efficiency :	29.4 %
Brake Thermal Efficiency :	26.8 %
Ignition Delay :	5.6 degrees
Centroid Phasing :	193.5 degrees
Centroid Magnitude :	14.03 J/degree
Sensitivity :	25.9 degrees
Premixed/Diffusion Ratio :	.21650

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 9 FUEL TF34N28388 DATE ~~3-30-88~~ PAGE 44

Operator Greg							
Time	2:20	2:30	2:45	3:00	3:10	3:25	3:35
Test Hour	30 min	10 min	15 min	15 min	10 min	15 min	10 min
Speed, RPM	2800	2499	2500	2500	2200	1800	1800
Load, lb-ft	384.7	418.8	288.6	431.8	224.8	412.6	276.4
Fuel Flow, lb/hr	105.4	100.8	65.8	91.3	46.1	80.0	43.4
Exh. Opacity, %	3.5	2.0	0	16.0	0	36.0	0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	800	840	575	790	500	700	500
Exhaust Cyl. L2	830	~~880~~	610	855	505	805	530
Exhaust Cyl. L3	950	995	700	990	555	890	590
Exhaust Cyl. R1	850	850	605	810	490	730	500
Exhaust Cyl. R2	950	990	670	980	540	910	600
Exhaust Cyl. R3	955	990	700	995	545	900	580
Exhaust Common	760	780	550	760	450	700	460
Water In	156	154	158	153	159	153	157
Water Out	170	169	170	167	169	170	169
Oil Sump	246	244	230	242	222	237	223
Fuel	94	94	94	94	93	91	91
Inlet Air	101	98	101	100	98	101	100
Airbox	202	190	168	189	160	163	152
Wet Bulb 58.8	~~75.0~~	58.5	58.0	59.9	58.2	58.9	59.7
Dry Bulb 75.0	~~88.3~~	74.0	74.0	75.0	74.3	73.6	74.5
PRESSURES, PSIG							
Oil Gallery	51.0	48.5	51.5	45.5	49.5	42.0	43.5
Air After Blower	5.0	4.0	3.8	3.0	2.8	2.0	1.8
Fuel Transfer	72.5	69.0	70.0	66.0	68.0	63.0	65.5
LOW PRESSURES							
Intake Vac., in.water			16.0	13.1	13.5	9.9	9.1
Exh. Comm., in.Water	17.5	14.0	20.0	19.5	14.5	14.0	11.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	28.98	25.96	28.95	28.95	28.94	28.93	28.92

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 9 FUEL TF34N38380 DATE 3-30-88 PAGE 50

Operator Greg							
Time	3:45	3:50	4:05	4:15			
Test Hour	10MIN	5 MIN	15MIN	10MIN			
Speed, RPM	1800	1800	1400	1400			
Load, lb-ft	149.8	87.2	378.1	100.2			
Fuel Flow, lb/hr	27.3	20.2	66.6	16.6			
Exh. Opacity, %	0	0	69.0	0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	400	350	600	350			
Exhaust Cyl. L2	400	350	690	330			
Exhaust Cyl. L3	430	360	760	350			
Exhaust Cyl. R1	350	280	610	255			
Exhaust Cyl. R2	360	280	750	260			
Exhaust Cyl. R3	360	280	710	270			
Exhaust Common	345	290	580	300			
Water In	160	162	153	161			
Water Out	169	170	169	169			
Oil Sump	213	208	235	206			
Fuel	91	90	89	90			
Inlet Air	99	99	97	99			
Airbox	146	142	154	142			
Wet Bulb	59.5	60.0	60.0	60.3			
Dry Bulb	73.9	74.0	73.5	73.3			
PRESSURES, PSIG							
Oil Gallery	46.0	47.0	32.5	36.5			
Air After Blower	1.9	1.9	1.4	1.3			
Fuel Transfer	67.0	67.5	63.5	66.0			
LOW PRESSURES							
Intake Vac., in.water	9.1	9.1	5.4	5.5			
Exh. Comm., in.Water	9.5	9.5	9.0	6.0			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	28.92	28.91	28.91	28.90			

880330.141915 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	71.399	.364	21.888	.202
Wet Bulb Temperature, F	57.825	.080	14.347	.044
P11-Baro (Vent), "Hg ABS	28.975	.001	98.119	.003
P3 C3 Fuel Pressure,psig	72.424	.307	499.35	2.117
P4 C3 Oil Pressure, psig	51.134	.024	352.56	.166
P5 C3 Airbox Pres., psig	4.936	.018	34.031	.127
P10 C3 Exh Comm, inH2Og	28.133	.189	7.001	.047
P11 C3 Intake Vac,inH2Ov	20.744	.099	5.162	.025
P12 C3 Blowby, inH2Og	.011	.002	.003	.000
C3 Speed, RPM	2803.1	1.902	2803.1	1.902
C3 Fuel Flow, lb/hr	107.28	.237	48.662	.108
C3 Smoke, %	4.299	.354	4.299	.354
Cell 3 Load, lb-ft	385.71	.901	522.95	1.221
K1 C3 Exhaust 1, F	816.06	.701	435.59	.389
K2 C3 Exhaust 2, F	873.99	.412	467.77	.229
K3 C3 Exhaust 3, F	979.02	1.475	526.12	.820
K4 C3 Exhaust 4, F	886.92	1.721	474.95	.956
K5 C3 Exhaust 5, F	991.87	1.250	533.26	.694
K6 C3 Exhaust 6, F	997.69	1.137	536.50	.631
K7-C3 Exhaust Comm, F	791.67	1.234	422.04	.685
J1 C3 Water In, F	154.71	.093	68.175	.052
J2 C3 Water Out, F	168.97	.132	76.092	.074
J3 C3 Oil Sump, F	246.32	.235	119.06	.130
J4 C3 Fuel In, F	94.329	.184	34.627	.102
J5 C3 Inlet Air, F	100.43	.504	38.019	.280
J6 C3 Airbox, F	200.50	.450	93.614	.250
Horsepower	205.86	.433	153.49	.323
Corrected Horsepower	215.11	.452	160.38	.337
BSFC, lb/hp-hr	.521	.001	.317	.001
Corrected BSFC	.499	.001	.303	.001
Relative Humidity	43.402	.838	43.402	.838
Reference Pressure, inHg	37.498		126.98	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1644

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	37.50 in-Hg
Speed :	2803 RPM
Load :	385.7 lb-ft
Fuel Flow :	107.3 lb/hr
Brake Power :	205.85 bhp
BSFC :	.521 lb/bhp-hr
Indicated Power :	27.78 kW/cyl
Peak Pressure :	9.662 MPa
Peak Rate of Pressure Rise:	606.5 kPa/deg
Peak Heat Release Rate :	56.6 Joules/deg
Cumulative Heat Release :	1152.87 Joules
Apparent Combustion Efficiency :	57.9 %
Indicated Thermal Efficiency :	29.8 %
Brake Thermal Efficiency :	27.5 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	199.4 degrees
Centroid Magnitude :	11.11 J/degree
Sensitivity :	29.7 degrees
Premixed/Diffusion Ratio :	.25707

880330.143307 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	73.072	.184	22.818	.102
Wet Bulb Temperature, F	58.798	.059	14.888	.033
P11-Baro (Vent), "Hg ABS	28.960	.001	98.068	.002
P3 C3 Fuel Pressure,psig	68.641	.263	473.27	1.815
P4 C3 Oil Pressure, psig	48.830	.022	336.67	.154
P5 C3 Airbox Pres., psig	3.872	.014	26.696	.096
P10 C3 Exh Comm, inH2Og	24.065	.174	5.988	.043
P11 C3 Intake Vac,inH2Ov	17.145	.144	4.266	.036
P12 C3 Blowby, inH2Og	-.007	.002	-.002	.000
C3 Speed, RPM	2500.9	2.366	2500.9	2.366
C3 Fuel Flow, lb/hr	101.22	.100	45.914	.046
C3 Smoke, %	2.052	.268	2.052	.268
Cell 3 Load, lb-ft	417.64	.779	566.24	1.056
K1 C3 Exhaust 1, F	844.64	7.323	451.47	4.068
K2 C3 Exhaust 2, F	913.10	.418	489.50	.232
K3 C3 Exhaust 3, F	1017.7	8.204	547.63	4.558
K4 C3 Exhaust 4, F	877.78	.830	469.88	.461
K5 C3 Exhaust 5, F	1017.6	.912	547.56	.507
K6 C3 Exhaust 6, F	1022.5	.431	550.29	.240
K7-C3 Exhaust Comm, F	804.78	.389	429.32	.216
J1 C3 Water In, F	153.90	.207	67.719	.115
J2 C3 Water Out, F	168.59	.204	75.879	.114
J3 C3 Oil Sump, F	244.83	.219	118.24	.122
J4 C3 Fuel In, F	94.624	.188	34.791	.105
J5 C3 Inlet Air, F	99.176	.485	37.320	.269
J6 C3 Airbox, F	190.29	.225	87.941	.125
Horsepower	198.87	.433	148.27	.323
Corrected Horsepower	207.74	.452	154.89	.337
BSFC, lb/hp-hr	.509	.001	.310	.001
Corrected BSFC	.487	.001	.296	.001
Relative Humidity	42.180	.327	42.180	.327
Reference Pressure, inHg	35.582		120.49	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1646

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	35.58 in-Hg
Speed :	2501 RPM
Load :	417.6 lb-ft
Fuel Flow :	101.2 lb/hr
Brake Power :	198.86 bhp
BSFC :	.509 lb/bhp-hr
Indicated Power :	24.93 kW/cyl
Peak Pressure :	9.857 MPa
Peak Rate of Pressure Rise:	724.0 kPa/deg
Peak Heat Release Rate :	74.3 Joules/deg
Cumulative Heat Release :	1175.99 Joules
Apparent Combustion Efficiency :	55.8 %
Indicated Thermal Efficiency :	28.4 %
Brake Thermal Efficiency :	28.2 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	198.8 degrees
Centroid Magnitude :	12.73 J/degree
Sensitivity :	29.2 degrees
Premixed/Diffusion Ratio :	.26226

880330.144829 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	73.315	.168	22.953	.093
Wet Bulb Temperature, F	59.219	.051	15.121	.028
P11-Baro (Vent), "Hg ABS	28.949	.001	98.032	.002
P3 C3 Fuel Pressure,psig	69.965	.244	482.39	1.679
P4 C3 Oil Pressure, psig	51.994	.023	358.48	.161
P5 C3 Airbox Pres., psig	3.564	.018	24.573	.121
P10 C3 Exh Comm, inH2Og	19.230	.168	4.785	.042
P11 C3 Intake Vac,inH2Ov	17.556	.136	4.369	.034
P12 C3 Blowby, inH2Og	-.009	.002	-.002	.001
C3 Speed, RPM	2500.4	1.782	2500.4	1.782
C3 Fuel Flow, lb/hr	65.566	.155	29.740	.070
C3 Smoke, %	-.265	.071	-.265	.071
Cell 3 Load, lb-ft	287.68	1.464	390.04	1.985
K1 C3 Exhaust 1, F	603.21	6.833	317.34	3.796
K2 C3 Exhaust 2, F	634.36	.862	334.64	.479
K3 C3 Exhaust 3, F	714.66	4.642	379.26	2.579
K4 C3 Exhaust 4, F	630.69	5.096	332.61	2.831
K5 C3 Exhaust 5, F	700.28	4.386	371.26	2.437
K6 C3 Exhaust 6, F	708.54	6.963	375.86	3.868
K7-C3 Exhaust Comm, F	561.08	.444	293.93	.247
J1 C3 Water In, F	157.48	.204	69.713	.113
J2 C3 Water Out, F	168.88	.231	76.047	.128
J3 C3 Oil Sump, F	230.14	.283	110.08	.157
J4 C3 Fuel In, F	94.608	.075	34.782	.042
J5 C3 Inlet Air, F	100.90	.168	38.277	.093
J6 C3 Airbox, F	167.63	.155	75.350	.086
Horsepower	136.96	.759	102.12	.566
Corrected Horsepower	143.39	.794	106.91	.592
BSFC, lb/hp-hr	.479	.002	.291	.001
Corrected BSFC	.457	.002	.278	.001
Relative Humidity	42.984	.339	42.984	.339
Reference Pressure, inHg	34.914		118.23	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1648

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	34.91 in-Hg
Speed :	2500 RPM
Load :	287.7 lb-ft
Fuel Flow :	65.6 lb/hr
Brake Power :	136.95 bhp
BSFC :	.479 lb/bhp-hr
Indicated Power :	17.71 kW/cyl
Peak Pressure :	8.626 MPa
Peak Rate of Pressure Rise:	802.1 kPa/deg
Peak Heat Release Rate :	89.5 Joules/deg
Cumulative Heat Release :	799.678 Joules
Apparent Combustion Efficiency :	58.6 %
Indicated Thermal Efficiency :	31.1 %
Brake Thermal Efficiency :	29.9 %
Ignition Delay :	10.9 degrees
Centroid Phasing :	196.3 degrees
Centroid Magnitude :	15.99 J/degree
Sensitivity :	23.4 degrees
Premixed/Diffusion Ratio :	.46471

880330.150131 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	72.685	.096	22.603	.053
Wet Bulb Temperature, F	59.044	.022	15.024	.012
P11-Baro (Vent), "Hg ABS	28.940	.000	98.002	.002
P3 C3 Fuel Pressure,psig	65.940	.336	454.64	2.319
P4 C3 Oil Pressure, psig	46.244	.028	318.84	.190
P5 C3 Airbox Pres., psig	2.731	.014	18.828	.093
P10 C3 Exh Comm, inH2Og	18.938	.160	4.712	.040
P11 C3 Intake Vac,inH2Ov	14.354	.098	3.572	.025
P12 C3 Blowby, inH2Og	-.018	.003	-.004	.001
C3 Speed, RPM	2201.0	2.219	2201.0	2.219
C3 Fuel Flow, lb/hr	92.545	.179	41.978	.081
C3 Smoke, %	16.320	.502	16.320	.502
Cell 3 Load, lb-ft	432.02	1.260	585.73	1.708
K1 C3 Exhaust 1, F	797.00	.400	425.00	.222
K2 C3 Exhaust 2, F	894.35	.494	479.09	.274
K3 C3 Exhaust 3, F	1017.9	.760	547.73	.422
K4 C3 Exhaust 4, F	844.88	.376	451.60	.209
K5 C3 Exhaust 5, F	1018.8	.739	548.23	.410
K6 C3 Exhaust 6, F	1029.4	1.256	554.12	.698
K7-C3 Exhaust Comm, F	800.67	.364	427.04	.202
J1 C3 Water In, F	151.58	.079	66.431	.044
J2 C3 Water Out, F	166.97	.134	74.981	.074
J3 C3 Oil Sump, F	241.82	.099	116.57	.055
J4 C3 Fuel In, F	94.007	.198	34.448	.110
J5 C3 Inlet Air, F	102.69	.725	39.274	.403
J6 C3 Airbox, F	188.16	.310	86.758	.172
Horsepower	181.05	.632	134.98	.471
Corrected Horsepower	189.92	.663	141.60	.494
BSFC, lb/hp-hr	.511	.003	.311	.002
Corrected BSFC	.487	.003	.296	.002
Relative Humidity	44.127	.248	44.127	.248
Reference Pressure, inHg	33.444		113.25	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1650

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	33.44 in-Hg
Speed :	2201 RPM
Load :	432.0 lb-ft
Fuel Flow :	92.5 lb/hr
Brake Power :	181.04 bhp
BSFC :	.511 lb/bhp-hr
Indicated Power :	22.43 kW/cyl
Peak Pressure :	10.13 MPa
Peak Rate of Pressure Rise:	838.3 kPa/deg
Peak Heat Release Rate :	91.0 Joules/deg
Cumulative Heat Release :	1198.98 Joules
Apparent Combustion Efficiency :	54.8 %
Indicated Thermal Efficiency :	27.9 %
Brake Thermal Efficiency :	28.0 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	198.0 degrees
Centroid Magnitude :	14.92 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.26581

880330.151406 AL-17233-F AL-12920-L 6V53N 9

Dry Bulb Temperature, F	72.633	.057	22.574	.032
Wet Bulb Temperature, F	59.176	.020	15.098	.011
P11-Baro (Vent), "Hg ABS	28.932	.000	97.976	.001
P3 C3 Fuel Pressure,psig	67.450	.146	465.05	1.005
P4 C3 Oil Pressure, psig	50.175	.020	345.95	.136
P5 C3 Airbox Pres., psig	2.473	.015	17.051	.100
P10 C3 Exh Comm, inH2Og	13.740	.122	3.419	.030
P11 C3 Intake Vac,inH2Ov	14.857	.099	3.697	.025
P12 C3 Blowby, inH2Og	-.021	.003	-.005	.001
C3 Speed, RPM	2201.1	1.605	2201.1	1.605
C3 Fuel Flow, lb/hr	45.489	.154	20.634	.070
C3 Smoke, %	-1.514	.044	-1.514	.044
Cell 3 Load, lb-ft	221.71	.788	300.60	1.068
K1 C3 Exhaust 1, F	506.98	.320	263.88	.178
K2 C3 Exhaust 2, F	523.74	.473	273.19	.263
K3 C3 Exhaust 3, F	576.06	.680	302.25	.378
K4 C3 Exhaust 4, F	500.58	.737	260.32	.409
K5 C3 Exhaust 5, F	546.78	.991	285.99	.551
K6 C3 Exhaust 6, F	551.60	1.246	288.66	.692
K7-C3 Exhaust Comm, F	456.36	.711	235.76	.395
J1 C3 Water In, F	160.00	.177	71.112	.098
J2 C3 Water Out, F	170.12	.147	76.732	.082
J3 C3 Oil Sump, F	224.21	.153	106.78	.085
J4 C3 Fuel In, F	92.009	.092	33.338	.051
J5 C3 Inlet Air, F	101.80	.453	38.778	.252
J6 C3 Airbox, F	159.62	.110	70.903	.061
Horsepower	92.922	.347	69.280	.259
Corrected Horsepower	97.442	.364	72.650	.272
BSFC, lb/hp-hr	.490	.003	.298	.002
Corrected BSFC	.467	.003	.284	.002
Relative Humidity	44.748	.174	44.748	.174
Reference Pressure, inHg	32.875		111.33	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1652

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	32.88 in-Hg
Speed :	2201 RPM
Load :	221.7 lb-ft
Fuel Flow :	45.5 lb/hr
Brake Power :	92.91 bhp
BSFC :	.490 lb/bhp-hr
Indicated Power :	12.63 kW/cyl
Peak Pressure :	8.155 MPa
Peak Rate of Pressure Rise:	1074. kPa/deg
Peak Heat Release Rate :	130.8 Joules/deg
Cumulative Heat Release :	657.868 Joules
Apparent Combustion Efficiency :	61.1 %
Indicated Thermal Efficiency :	32.0 %
Brake Thermal Efficiency :	29.3 %
Ignition Delay :	12.5 degrees
Centroid Phasing :	196.2 degrees
Centroid Magnitude :	28.32 J/degree
Sensitivity :	21.7 degrees
Premixed/Diffusion Ratio :	.57677

880330.152643 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	70.844	.127	21.580	.071
Wet Bulb Temperature, F	58.494	.103	14.719	.057
P11-Baro (Vent), "Hg ABS	28.924	.001	97.949	.002
P3 C3 Fuel Pressure,psig	62.696	.134	432.27	.922
P4 C3 Oil Pressure, psig	42.062	.015	290.01	.102
P5 C3 Airbox Pres., psig	1.819	.011	12.538	.076
P10 C3 Exh Comm, inH2Og	13.086	.118	3.256	.029
P11 C3 Intake Vac,inH2Ov	10.497	.059	2.612	.015
P12 C3 Blowby, inH2Og	-.033	.003	-.008	.001
C3 Speed, RPM	1801.3	1.600	1801.3	1.600
C3 Fuel Flow, lb/hr	79.795	.037	36.194	.017
C3 Smoke, %	36.461	.729	36.461	.729
Cell 3 Load, lb-ft	419.22	.742	568.39	1.006
K1 C3 Exhaust 1, F	716.45	1.271	380.25	.706
K2 C3 Exhaust 2, F	835.03	.493	446.13	.274
K3 C3 Exhaust 3, F	915.34	.362	490.75	.201
K4 C3 Exhaust 4, F	753.42	.780	400.79	.434
K5 C3 Exhaust 5, F	948.28	.791	509.04	.440
K6 C3 Exhaust 6, F	936.30	.757	502.39	.420
K7-C3 Exhaust Comm, F	733.34	.275	389.63	.153
J1 C3 Water In, F	153.25	.179	67.363	.099
J2 C3 Water Out, F	168.98	.144	76.898	.080
J3 C3 Oil Sump, F	237.28	.120	114.04	.066
J4 C3 Fuel In, F	89.378	.063	31.876	.035
J5 C3 Inlet Air, F	101.60	.050	38.665	.028
J6 C3 Airbox, F	162.88	.299	72.709	.166
Horsepower	143.78	.353	107.20	.263
Corrected Horsepower	150.79	.370	112.43	.276
BSFC, lb/hp-hr	.555	.001	.338	.001
Corrected BSFC	.529	.001	.322	.001
Relative Humidity	47.516	.548	47.516	.548
Reference Pressure, inHg	31.855		107.87	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1654

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	31.86 in-Hg
Speed :	1801 RPM
Load :	419.2 lb-ft
Fuel Flow :	79.8 lb/hr
Brake Power :	143.75 bhp
BSFC :	.555 lb/bhp-hr
Indicated Power :	17.70 kW/cyl
Peak Pressure :	10.30 MPa
Peak Rate of Pressure Rise:	1169. kPa/deg
Peak Heat Release Rate :	140.2 Joules/deg
Cumulative Heat Release :	1170.01 Joules
Apparent Combustion Efficiency :	50.7 %
Indicated Thermal Efficiency :	25.6 %
Brake Thermal Efficiency :	25.8 %
Ignition Delay :	8.1 degrees
Centroid Phasing :	196.0 degrees
Centroid Magnitude :	22.04 J/degree
Sensitivity :	25.9 degrees
Premixed/Diffusion Ratio :	.31352

880330.153520 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	73.070	.157	22.817	.087
Wet Bulb Temperature, F	59.473	.062	15.263	.034
P11-Baro (Vent), "Hg ABS	28.921	.001	97.939	.003
P3 C3 Fuel Pressure,psig	65.502	.134	451.62	.921
P4 C3 Oil Pressure, psig	44.519	.052	306.95	.362
P5 C3 Airbox Pres., psig	1.560	.003	10.752	.024
P10 C3 Exh Comm, inH2Og	10.496	.110	2.612	.027
P11 C3 Intake Vac,inH2Ov	10.914	.064	2.716	.016
P12 C3 Blowby, inH2Og	-.040	.005	-.010	.001
C3 Speed, RPM	1800.9	1.238	1800.9	1.238
C3 Fuel Flow, lb/hr	43.693	.035	19.819	.016
C3 Smoke, %	-.008	.082	-.008	.082
Cell 3 Load, lb-ft	275.35	.929	373.32	1.259
K1 C3 Exhaust 1, F	506.27	.312	263.48	.174
K2 C3 Exhaust 2, F	547.74	1.371	286.52	.762
K3 C3 Exhaust 3, F	604.30	.704	317.95	.391
K4 C3 Exhaust 4, F	516.69	.609	269.27	.338
K5 C3 Exhaust 5, F	619.86	1.129	326.59	.627
K6 C3 Exhaust 6, F	603.85	.670	317.69	.372
K7-C3 Exhaust Comm, F	494.97	2.914	257.20	1.619
J1 C3 Water In, F	157.41	.083	69.674	.046
J2 C3 Water Out, F	168.65	.053	75.919	.029
J3 C3 Oil Sump, F	223.74	.519	106.52	.288
J4 C3 Fuel In, F	90.332	.113	32.407	.063
J5 C3 Inlet Air, F	99.608	1.510	37.560	.839
J6 C3 Airbox, F	153.18	.504	67.322	.280
Horsepower	94.417	.308	70.395	.230
Corrected Horsepower	98.867	.323	73.712	.241
BSFC, lb/hp-hr	.463	.002	.282	.001
Corrected BSFC	.442	.002	.269	.001
Relative Humidity	44.574	.255	44.574	.255
Reference Pressure, inHg	31.294		105.97	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1656

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	31.29 in-Hg
Speed :	1801 RPM
Load :	275.4 lb-ft
Fuel Flow :	43.7 lb/hr
Brake Power :	94.44 bhp
BSFC :	.463 lb/bhp-hr
Indicated Power :	11.46 kW/cyl
Peak Pressure :	8.403 MPa
Peak Rate of Pressure Rise:	1137. kPa/deg
Peak Heat Release Rate :	137.4 Joules/deg
Cumulative Heat Release :	724.992 Joules
Apparent Combustion Efficiency :	57.4 %
Indicated Thermal Efficiency :	30.2 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	11.2 degrees
Centroid Phasing :	193.9 degrees
Centroid Magnitude :	27.48 J/degree
Sensitivity :	20.7 degrees
Premixed/Diffusion Ratio :	.54124

880330.154529 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	72.482	.245	22.490	.136
Wet Bulb Temperature, F	59.411	.039	15.228	.022
P11-Baro (Vent), "Hg ABS	28.918	.000	97.928	.002
P3 C3 Fuel Pressure,psig	66.918	.167	461.39	1.148
P4 C3 Oil Pressure, psig	46.692	.019	321.93	.129
P5 C3 Airbox Pres., psig	1.562	.005	10.771	.032
P10 C3 Exh Comm, inH2Og	8.684	.090	2.161	.022
P11 C3 Intake Vac,inH2Ov	10.889	.087	2.710	.022
P12 C3 Blowby, inH2Og	-.040	.003	-.010	.001
C3 Speed, RPM	1801.3	1.301	1801.3	1.301
C3 Fuel Flow, lb/hr	28.084	.037	12.739	.017
C3 Smoke, %	.561	.035	.561	.035
Cell 3 Load, lb-ft	147.80	.685	200.39	.928
K1 C3 Exhaust 1, F	404.78	.152	207.10	.085
K2 C3 Exhaust 2, F	408.45	.338	209.14	.188
K3 C3 Exhaust 3, F	445.03	.288	229.46	.160
K4 C3 Exhaust 4, F	357.49	.240	180.83	.133
K5 C3 Exhaust 5, F	373.67	.276	189.82	.153
K6 C3 Exhaust 6, F	376.73	.327	191.52	.182
K7-C3 Exhaust Comm, F	346.11	1.013	174.50	.563
J1 C3 Water In, F	159.67	.091	70.930	.051
J2 C3 Water Out, F	168.50	.079	75.833	.044
J3 C3 Oil Sump, F	212.62	.154	100.35	.086
J4 C3 Fuel In, F	90.852	.029	32.696	.016
J5 C3 Inlet Air, F	100.24	.247	37.910	.137
J6 C3 Airbox, F	143.57	.169	61.982	.094
Horsepower	50.693	.254	37.796	.189
Corrected Horsepower	53.128	.266	39.610	.198
BSFC, lb/hp-hr	.554	.003	.337	.002
Corrected BSFC	.529	.003	.322	.002
Relative Humidity	46.034	.590	46.034	.590
Reference Pressure, inHg	31.298		105.99	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1658

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	31.30 in-Hg
Speed :	1801 RPM
Load :	147.8 lb-ft
Fuel Flow :	28.1 lb/hr
Brake Power :	50.68 bhp
BSFC :	.554 lb/bhp-hr
Indicated Power :	7.78 kW/cyl
Peak Pressure :	7.662 MPa
Peak Rate of Pressure Rise:	1101. kPa/deg
Peak Heat Release Rate :	136.3 Joules/deg
Cumulative Heat Release :	477.934 Joules
Apparent Combustion Efficiency :	58.9 %
Indicated Thermal Efficiency :	31.9 %
Brake Thermal Efficiency :	25.8 %
Ignition Delay :	13.0 degrees
Centroid Phasing :	191.9 degrees
Centroid Magnitude :	37.57 J/degree
Sensitivity :	16.9 degrees
Premixed/Diffusion Ratio :	.77267

880330.155123 AL-17233-F	AL-12920-L	6V53N			9
Dry Bulb Temperature, F	72.848	.135	22.693	.075
Wet Bulb Temperature, F	59.564	.031	15.314	.017
P11-Baro (Vent), "Hg ABS	28.915	.000	97.918	.001
P3 C3 Fuel Pressure,psig	67.014	.110	462.05	.757
P4 C3 Oil Pressure, psig	47.448	.033	327.14	.230
P5 C3 Airbox Pres., psig	1.618	.008	11.157	.057
P10 C3 Exh Comm, inH2Og	7.966	.063	1.982	.016
P11 C3 Intake Vac,inH2Ov	10.982	.062	2.733	.015
P12 C3 Blowby, inH2Og	-.042	.004	-.010	.001
C3 Speed, RPM	1799.8	1.284	1799.8	1.284
C3 Fuel Flow, lb/hr	20.627	.022	9.356	.010
C3 Smoke, %	.684	.021	.684	.021
Cell 3 Load, lb-ft	84.620	.618	114.73	.838
K1 C3 Exhaust 1, F	357.18	.092	180.66	.051
K2 C3 Exhaust 2, F	354.48	.620	179.16	.344
K3 C3 Exhaust 3, F	381.58	.221	194.21	.123
K4 C3 Exhaust 4, F	286.08	.351	141.15	.195
K5 C3 Exhaust 5, F	286.35	.417	141.30	.232
K6 C3 Exhaust 6, F	289.55	.546	143.09	.304
K7-C3 Exhaust Comm, F	297.65	1.414	147.58	.785
J1 C3 Water In, F	162.71	1.138	72.617	.632
J2 C3 Water Out, F	171.03	.943	77.237	.524
J3 C3 Oil Sump, F	208.46	.067	98.032	.037
J4 C3 Fuel In, F	89.461	.059	31.923	.033
J5 C3 Inlet Air, F	99.076	.075	37.264	.042
J6 C3 Airbox, F	141.44	.151	60.801	.084
Horsepower	28.998	.224	21.620	.167
Corrected Horsepower	30.363	.234	22.637	.175
BSFC, lb/hp-hr	.711	.006	.433	.003
Corrected BSFC	.679	.005	.413	.003
Relative Humidity	45.531	.358	45.531	.358
Reference Pressure, inHg	31.402		106.34	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1660

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	31.40 in-Hg
Speed :	1800 RPM
Load :	84.6 lb-ft
Fuel Flow :	20.6 lb/hr
Brake Power :	28.99 bhp
BSFC :	.710 lb/bhp-hr
Indicated Power :	6.01 kW/cyl
Peak Pressure :	7.138 MPa
Peak Rate of Pressure Rise:	996.4 kPa/deg
Peak Heat Release Rate :	124.3 Joules/deg
Cumulative Heat Release :	374.699 Joules
Apparent Combustion Efficiency :	62.9 %
Indicated Thermal Efficiency :	33.6 %
Brake Thermal Efficiency :	20.2 %
Ignition Delay :	13.7 degrees
Centroid Phasing :	193.3 degrees
Centroid Magnitude :	38.27 J/degree
Sensitivity :	17.7 degrees
Premixed/Diffusion Ratio :	.77224

880330.160557 AL-17233-F AL-12920-L 6V53N 9

Dry Bulb Temperature, F	71.643	.220	22.024	.122
Wet Bulb Temperature, F	59.213	.063	15.118	.035
P11-Baro (Vent), "Hg ABS	28.911	.001	97.905	.002
P3 C3 Fuel Pressure,psig	62.942	.099	433.97	.686
P4 C3 Oil Pressure, psig	32.253	.025	222.38	.173
P5 C3 Airbox Pres., psig	1.219	.011	8.405	.077
P10 C3 Exh Comm, inH2Og	8.709	.153	2.167	.038
P11 C3 Intake Vac,inH2Ov	7.300	.059	1.817	.015
P12 C3 Blowby, inH2Og	-.037	.002	-.009	.000
C3 Speed, RPM	1402.5	.995	1402.5	.995
C3 Fuel Flow, lb/hr	67.078	.064	30.426	.029
C3 Smoke, %	68.729	1.300	68.729	1.300
Cell 3 Load, lb-ft	380.81	1.572	516.31	2.131
K1 C3 Exhaust 1, F	615.11	6.887	323.95	3.826
K2 C3 Exhaust 2, F	705.83	4.072	374.35	2.262
K3 C3 Exhaust 3, F	793.65	1.444	423.14	.802
K4 C3 Exhaust 4, F	631.22	4.348	332.90	2.416
K5 C3 Exhaust 5, F	777.45	4.978	414.14	2.766
K6 C3 Exhaust 6, F	741.33	.786	394.07	.437
K7-C3 Exhaust Comm, F	595.63	1.278	313.13	.710
J1 C3 Water In, F	153.06	.081	67.258	.045
J2 C3 Water Out, F	169.00	.059	76.110	.033
J3 C3 Oil Sump, F	234.63	.270	112.57	.150
J4 C3 Fuel In, F	88.132	.032	31.184	.018
J5 C3 Inlet Air, F	96.645	.207	35.914	.115
J6 C3 Airbox, F	153.79	.180	67.660	.100
Horsepower	101.69	.453	75.818	.338
Corrected Horsepower	106.27	.474	79.231	.353
BSFC, lb/hp-hr	.660	.003	.401	.002
Corrected BSFC	.631	.002	.384	.001
Relative Humidity	47.785	.475	47.785	.475
Reference Pressure, inHg	30.856		104.49	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1662

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	30.86 in-Hg
Speed :	1403 RPM
Load :	380.8 lb-ft
Fuel Flow :	67.1 lb/hr
Brake Power :	101.73 bhp
BSFC :	.660 lb/bhp-hr
Indicated Power :	13.70 kW/cyl
Peak Pressure :	10.70 MPa
Peak Rate of Pressure Rise:	1330. kPa/deg
Peak Heat Release Rate :	165.1 Joules/deg
Cumulative Heat Release :	1152.49 Joules
Apparent Combustion Efficiency :	46.3 %
Indicated Thermal Efficiency :	23.5 %
Brake Thermal Efficiency :	21.7 %
Ignition Delay :	7.5 degrees
Centroid Phasing :	193.5 degrees
Centroid Magnitude :	28.28 J/degree
Sensitivity :	24.1 degrees
Premixed/Diffusion Ratio :	.31083

980330.161712 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	72.190	.181	22.328	.101
Wet Bulb Temperature, F	59.390	.036	15.217	.020
P11-Baro (Vent), "Hg ABS	28.910	.001	97.900	.002
P3 C3 Fuel Pressure,psig	65.512	.143	451.69	.989
P4 C3 Oil Pressure, psig	37.405	.028	257.90	.192
P5 C3 Airbox Pres., psig	1.163	.007	8.020	.045
P10 C3 Exh Comm, inH2Og	5.351	.066	1.332	.016
P11 C3 Intake Vac,inH2Ov	7.421	.067	1.847	.017
P12 C3 Blowby, inH2Og	-.038	.002	-.010	.000
C3 Speed, RPM	1402.0	.772	1402.0	.772
C3 Fuel Flow, lb/hr	17.560	.027	7.965	.012
C3 Smoke, %	.494	.173	.494	.173
Cell 3 Load, lb-ft	98.754	.659	133.89	.893
K1 C3 Exhaust 1, F	352.42	.307	178.01	.170
K2 C3 Exhaust 2, F	335.39	.312	168.55	.173
K3 C3 Exhaust 3, F	371.27	.217	188.48	.121
K4 C3 Exhaust 4, F	268.80	.077	131.56	.043
K5 C3 Exhaust 5, F	272.30	.094	133.50	.052
K6 C3 Exhaust 6, F	286.61	.164	141.45	.091
K7-C3 Exhaust Comm, F	286.33	1.459	141.29	.811
J1 C3 Water In, F	161.14	.039	71.746	.022
J2 C3 Water Out, F	169.15	.055	76.192	.031
J3 C3 Oil Sump, F	206.14	.225	96.745	.125
J4 C3 Fuel In, F	88.561	.028	31.423	.016
J5 C3 Inlet Air, F	99.480	.315	37.489	.175
J6 C3 Airbox, F	141.33	.058	60.738	.032
Horsepower	26.363	.183	19.656	.137
Corrected Horsepower	27.620	.192	20.593	.143
BSFC, lb/hp-hr	.666	.005	.405	.003
Corrected BSFC	.636	.004	.387	.003
Relative Humidity	46.813	.458	46.813	.458
Reference Pressure, inHg	30.733		104.07	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1664

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	30.73 in-Hg
Speed :	1402 RPM
Load :	98.8 lb-ft
Fuel Flow :	17.6 lb/hr
Brake Power :	26.37 bhp
BSFC :	.667 lb/bhp-hr
Indicated Power :	4.90 kW/cyl
Peak Pressure :	7.321 MPa
Peak Rate of Pressure Rise:	1173. kPa/deg
Peak Heat Release Rate :	145.3 Joules/deg
Cumulative Heat Release :	383.673 Joules
Apparent Combustion Efficiency :	58.7 %
Indicated Thermal Efficiency :	32.1 %
Brake Thermal Efficiency :	21.5 %
Ignition Delay :	12.6 degrees
Centroid Phasing :	190.1 degrees
Centroid Magnitude :	45.98 J/degree
Sensitivity :	15.4 degrees
Premixed/Diffusion Ratio :	.81723

DETROIT DIESEL 6V–53N LOG SHEET

TEST NO. 9 FUEL BF42V3157 DATE 3/31/86 PAGE 5/

Operator Grey							
Time	10:40	10:50	11:05	11:20	11:30		
Test Hour	40 min	50 min	5 am	15 min	10 min		
Speed, RPM	1800	2500	2200	1801	1400		
Load, lb–ft	333.7	382.1	402.2	402.6	379.6		
Fuel Flow, lb/hr	78.2	73.1	68.1	60.3	51.6		
Exh. Opacity, %	1.0	2.0	2.0	15.0	45.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	750	750	720	660	610		
Exhaust Cyl. L2	770	780	790	755	675		
Exhaust Cyl. L3	855	880	900	850	755		
Exhaust Cyl. R1	770	755	745	700	650		
Exhaust Cyl. R2	860	860	900	890	800		
Exhaust Cyl. R3	880	880	900	900	750		
Exhaust Common	700	700	700	680	600		
Water In	154	156	155	153	154		
Water Out	167	169	169	168	169		
Oil Sump	238	236	236	230	230		
Fuel	90	91	89	88	87		
Inlet Air	97	99	101	102	102		
Airbox	192	185	178	164	158		
Wet Bulb	66.2	65.9	66.0	66.0	66.5		
Dry Bulb	73.0	72.6	72.8	73.0	73.5		
PRESSURES, PSIG							
Oil Gallery	52.0	50.0	47.0	42.5	32.0		
Air After Blower	5.0	4.0	3.0	2.0	1.3		
Fuel Transfer	76.5	75.0	73.0	70.5	68.5		
LOW PRESSURES							
Intake Vac., in.water		19.0	13.1	8.7	5.4		
Exh. Comm., in.Water	17.0	22.0	18.0	13.0	8.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.84	29.84	29.83	29.82	29.82		

980331.104112 AL-17355-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	78.855	.149	26.031	.083
Wet Bulb Temperature, F	67.153	.092	19.529	.051
P11-Baro (Vent), "Hg ABS	28.838	.000	97.657	.001
P3 C3 Fuel Pressure,psig	76.473	.534	527.26	3.680
P4 C3 Oil Pressure, psig	52.611	.017	362.74	.118
P5 C3 Airbox Pres., psig	4.730	.013	32.610	.089
P10 C3 Exh Comm, inH2Og	26.743	.244	6.655	.061
P11 C3 Intake Vac,inH2Ov	22.610	.170	5.626	.042
P12 C3 Blowby, inH2Og	.032	.002	.008	.000
C3 Speed, RPM	2800.7	2.332	2800.7	2.332
C3 Fuel Flow, lb/hr	79.024	.230	35.845	.104
C3 Smoke, %	1.121	.215	1.121	.215
Cell 3 Load, lb-ft	352.47	.929	477.88	1.260
K1 C3 Exhaust 1, F	778.50	.958	414.72	.532
K2 C3 Exhaust 2, F	808.00	.493	431.11	.274
K3 C3 Exhaust 3, F	895.67	.776	479.82	.431
K4 C3 Exhaust 4, F	812.79	1.254	433.77	.697
K5 C3 Exhaust 5, F	904.87	.595	484.93	.331
K6 C3 Exhaust 6, F	920.99	.669	493.88	.372
K7-C3 Exhaust Comm, F	710.26	.335	376.81	.186
J1 C3 Water In, F	154.14	.235	67.854	.131
J2 C3 Water Out, F	167.27	.201	75.152	.112
J3 C3 Oil Sump, F	238.17	.207	114.54	.115
J4 C3 Fuel In, F	90.373	.049	32.430	.027
J5 C3 Inlet Air, F	96.461	.317	35.811	.176
J6 C3 Airbox, F	191.36	.335	88.535	.186
Horsepower	187.96	.541	140.14	.403
Corrected Horsepower	198.09	.570	147.69	.425
BSFC, lb/hp-hr	.420	.002	.256	.001
Corrected BSFC	.399	.002	.243	.001
Relative Humidity	54.734	.356	54.734	.356
Reference Pressure, inHg	36.805		124.64	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1666

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	36.81 in-Hg
Speed :	2801 RPM
Load :	352.5 lb-ft
Fuel Flow :	79.0 lb/hr
Brake Power :	188.00 bhp
BSFC :	.420 lb/bhp-hr
Indicated Power :	25.42 kW/cyl
Peak Pressure :	9.270 MPa
Peak Rate of Pressure Rise:	480.2 kPa/deg
Peak Heat Release Rate :	38.2 Joules/deg
Cumulative Heat Release :	1027.94 Joules
Apparent Combustion Efficiency :	67.2 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	32.7 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	198.0 degrees
Centroid Magnitude :	9.804 J/degree
Sensitivity :	28.8 degrees
Premixed/Diffusion Ratio :	.24697

980331.105227 AL-17355-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	79.710	.676	26.505	.376
Wet Bulb Temperature, F	67.611	.099	19.784	.055
P11-Baro (Vent), "Hg ABS	28.835	.000	97.647	.001
P3 C3 Fuel Pressure,psig	74.691	.440	514.98	3.033
P4 C3 Oil Pressure, psig	50.392	.020	347.44	.136
P5 C3 Airbox Pres., psig	3.678	.024	25.357	.169
P10 C3 Exh Comm, inH20g	22.222	.197	5.530	.049
P11 C3 Intake Vac,inH20v	18.982	.134	4.723	.033
P12 C3 Blowby, inH20g	.018	.002	.005	.000
C3 Speed, RPM	2499.7	2.333	2499.7	2.333
C3 Fuel Flow, lb/hr	73.779	.275	33.466	.125
C3 Smoke, %	1.877	.078	1.877	.078
Cell 3 Load, lb-ft	382.17	.572	518.15	.775
K1 C3 Exhaust 1, F	767.44	.594	408.58	.330
K2 C3 Exhaust 2, F	811.75	.291	433.20	.162
K3 C3 Exhaust 3, F	918.63	.284	492.57	.158
K4 C3 Exhaust 4, F	796.00	.221	424.45	.123
K5 C3 Exhaust 5, F	901.76	.468	483.20	.260
K6 C3 Exhaust 6, F	918.89	.548	492.72	.305
K7-C3 Exhaust Comm, F	724.81	.276	384.89	.153
J1 C3 Water In, F	156.19	.185	68.996	.103
J2 C3 Water Out, F	169.48	.239	76.379	.133
J3 C3 Oil Sump, F	237.37	.187	114.10	.104
J4 C3 Fuel In, F	89.406	.164	31.892	.091
J5 C3 Inlet Air, F	98.786	.347	37.103	.193
J6 C3 Airbox, F	185.33	.124	85.182	.069
Horsepower	181.89	.334	135.62	.249
Corrected Horsepower	192.16	.353	143.27	.263
BSFC, lb/hp-hr	.406	.001	.247	.001
Corrected BSFC	.384	.001	.234	.001
Relative Humidity	53.869	1.692	53.869	1.692
Reference Pressure, inHg	34.927		118.28	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1668

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	34.93 in-Hg
Speed :	2500 RPM
Load :	382.2 lb-ft
Fuel Flow :	73.8 lb/hr
Brake Power :	181.93 bhp
BSFC :	.406 lb/bhp-hr
Indicated Power :	22.66 kW/cyl
Peak Pressure :	9.355 MPa
Peak Rate of Pressure Rise:	498.3 kPa/deg
Peak Heat Release Rate :	42.9 Joules/deg
Cumulative Heat Release :	1056.01 Joules
Apparent Combustion Efficiency :	66.0 %
Indicated Thermal Efficiency :	34.0 %
Brake Thermal Efficiency :	33.9 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	198.0 degrees
Centroid Magnitude :	10.25 J/degree
Sensitivity :	29.2 degrees
Premixed/Diffusion Ratio :	.23486

980331.110722 AL-17355-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	77.441	.465	25.245	.258
Wet Bulb Temperature, F	67.109	.080	19.505	.045
P11-Baro (Vent), "Hg ABS	28.827	.000	97.620	.001
P3 C3 Fuel Pressure,psig	72.901	.260	502.63	1.793
P4 C3 Oil Pressure, psig	47.616	.011	328.30	.074
P5 C3 Airbox Pres., psig	2.582	.012	17.805	.080
P10 C3 Exh Comm, inH2Og	17.934	.208	4.463	.052
P11 C3 Intake Vac,inH2Ov	15.925	.147	3.963	.037
P12 C3 Blowby, inH2Og	-.001	.002	-.000	.000
C3 Speed, RPM	2201.9	2.277	2201.9	2.277
C3 Fuel Flow, lb/hr	68.586	.257	31.110	.117
C3 Smoke, %	2.092	.110	2.092	.110
Cell 3 Load, lb-ft	402.35	.584	545.50	.792
K1 C3 Exhaust 1, F	741.08	6.128	393.93	3.405
K2 C3 Exhaust 2, F	808.79	4.742	431.55	2.635
K3 C3 Exhaust 3, F	930.32	5.609	499.07	3.116
K4 C3 Exhaust 4, F	775.24	.651	412.91	.361
K5 C3 Exhaust 5, F	936.25	.842	502.36	.468
K6 C3 Exhaust 6, F	944.09	.650	506.72	.361
K7-C3 Exhaust Comm, F	729.05	.175	387.25	.097
J1 C3 Water In, F	154.58	.340	68.100	.189
J2 C3 Water Out, F	168.43	.288	75.793	.160
J3 C3 Oil Sump, F	236.27	.207	113.48	.115
J4 C3 Fuel In, F	88.291	.079	31.273	.044
J5 C3 Inlet Air, F	101.60	.358	38.665	.199
J6 C3 Airbox, F	178.81	.090	81.560	.050
Horsepower	168.68	.305	125.77	.227
Corrected Horsepower	178.75	.323	133.27	.241
BSFC, lb/hp-hr	.407	.002	.247	.001
Corrected BSFC	.384	.002	.233	.001
Relative Humidity	58.811	1.186	58.811	1.186
Reference Pressure, inHg	32.914		111.46	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1670

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	32.91 in-Hg
Speed :	2202 RPM
Load :	402.4 lb-ft
Fuel Flow :	68.6 lb/hr
Brake Power :	168.71 bhp
BSFC :	.407 lb/bhp-hr
Indicated Power :	21.13 kW/cyl
Peak Pressure :	9.539 MPa
Peak Rate of Pressure Rise:	536.1 kPa/deg
Peak Heat Release Rate :	50.1 Joules/deg
Cumulative Heat Release :	1125.03 Joules
Apparent Combustion Efficiency :	66.6 %
Indicated Thermal Efficiency :	34.1 %
Brake Thermal Efficiency :	33.8 %
Ignition Delay :	6.5 degrees
Centroid Phasing :	197.1 degrees
Centroid Magnitude :	11.12 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.22939

880331.112223 AL-17355-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	80.282	.268	26.823	.149
Wet Bulb Temperature, F	68.062	.096	20.034	.053
P11-Baro (Vent), "Hg ABS	28.819	.001	97.592	.002
P3 C3 Fuel Pressure,psig	70.417	.110	485.51	.758
P4 C3 Oil Pressure, psig	43.226	.007	298.04	.047
P5 C3 Airbox Pres., psig	1.708	.011	11.775	.074
P10 C3 Exh Comm, inH20g	12.779	.123	3.180	.031
P11 C3 Intake Vac,inH20v	11.834	.084	2.945	.021
P12 C3 Blowby, inH20g	-.006	.002	-.002	.000
C3 Speed, RPM	1803.1	1.850	1803.1	1.850
C3 Fuel Flow, lb/hr	61.081	.585	27.706	.265
C3 Smoke, %	14.722	.290	14.722	.290
Cell 3 Load, lb-ft	404.63	.849	548.61	1.151
K1 C3 Exhaust 1, F	678.70	.321	359.28	.179
K2 C3 Exhaust 2, F	786.91	.751	419.39	.417
K3 C3 Exhaust 3, F	873.00	.521	467.22	.289
K4 C3 Exhaust 4, F	735.41	.510	390.78	.283
K5 C3 Exhaust 5, F	919.60	.822	493.11	.457
K6 C3 Exhaust 6, F	935.72	.429	502.07	.238
K7-C3 Exhaust Comm, F	705.72	.221	374.29	.123
J1 C3 Water In, F	153.73	.051	67.627	.028
J2 C3 Water Out, F	168.29	.025	75.719	.014
J3 C3 Oil Sump, F	230.89	.191	110.49	.106
J4 C3 Fuel In, F	87.949	.017	31.083	.009
J5 C3 Inlet Air, F	100.21	.225	37.896	.125
J6 C3 Airbox, F	163.06	.130	72.814	.072
Horsepower	138.92	.337	103.57	.251
Corrected Horsepower	147.08	.356	109.66	.266
BSFC, lb/hp-hr	.440	.004	.268	.003
Corrected BSFC	.415	.004	.253	.003
Relative Humidity	53.752	.440	53.752	.440
Reference Pressure, inHg	31.426		106.42	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1672

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	31.43 in-Hg
Speed :	1803 RPM
Load :	404.6 lb-ft
Fuel Flow :	61.1 lb/hr
Brake Power :	138.90 bhp
BSFC :	.440 lb/bhp-hr
Indicated Power :	18.50 kW/cyl
Peak Pressure :	9.628 MPa
Peak Rate of Pressure Rise:	605.1 kPa/deg
Peak Heat Release Rate :	61.4 Joules/deg
Cumulative Heat Release :	1197.40 Joules
Apparent Combustion Efficiency :	65.2 %
Indicated Thermal Efficiency :	33.5 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	6.8 degrees
Centroid Phasing :	195.4 degrees
Centroid Magnitude :	13.40 J/degree
Sensitivity :	26.6 degrees
Premixed/Diffusion Ratio :	.25777

880331.113159 AL-17355-F AL-12920-L 6V53N 9

Dry Bulb Temperature, F	80.342	.334	26.856	.186
Wet Bulb Temperature, F	68.184	.156	20.102	.087
P11-Baro (Vent), "Hg ABS	28.815	.001	97.578	.002
P3 C3 Fuel Pressure,psig	68.516	.191	472.40	1.314
P4 C3 Oil Pressure, psig	32.701	.010	225.46	.068
P5 C3 Airbox Pres., psig	1.128	.010	7.778	.068
P10 C3 Exh Comm, inH20g	8.624	.083	2.146	.021
P11 C3 Intake Vac,inH20v	8.553	.067	2.128	.017
P12 C3 Blowby, inH20g	-.010	.002	-.002	.001
C3 Speed, RPM	1402.1	1.762	1402.1	1.762
C3 Fuel Flow, lb/hr	51.769	.576	23.482	.261
C3 Smoke, %	44.198	1.495	44.198	1.495
Cell 3 Load, lb-ft	380.06	1.243	515.29	1.685
K1 C3 Exhaust 1, F	622.66	.510	328.15	.284
K2 C3 Exhaust 2, F	700.77	.442	371.54	.246
K3 C3 Exhaust 3, F	791.31	.702	421.84	.390
K4 C3 Exhaust 4, F	673.64	.452	356.46	.251
K5 C3 Exhaust 5, F	830.16	.564	443.42	.313
K6 C3 Exhaust 6, F	781.32	.842	416.29	.468
K7-C3 Exhaust Comm, F	619.75	.125	326.53	.069
J1 C3 Water In, F	153.25	.094	67.363	.052
J2 C3 Water Out, F	168.90	.079	76.056	.044
J3 C3 Oil Sump, F	230.67	.158	110.37	.088
J4 C3 Fuel In, F	91.297	15.068	32.943	8.371
J5 C3 Inlet Air, F	101.94	.176	38.856	.098
J6 C3 Airbox, F	158.03	.075	70.015	.041
Horsepower	101.47	.372	75.651	.278
Corrected Horsepower	107.62	.395	80.239	.294
BSFC, lb/hp-hr	.510	.006	.310	.004
Corrected BSFC	.481	.006	.293	.004
Relative Humidity	53.995	.802	53.995	.802
Reference Pressure, inHg	30.483		103.23	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1674

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	30.48 in-Hg
Speed :	1402 RPM
Load :	380.1 lb-ft
Fuel Flow :	51.8 lb/hr
Brake Power :	101.47 bhp
BSFC :	.511 lb/bhp-hr
Indicated Power :	13.44 kW/cyl
Peak Pressure :	10.03 MPa
Peak Rate of Pressure Rise:	663.2 kPa/deg
Peak Heat Release Rate :	72.2 Joules/deg
Cumulative Heat Release :	1138.18 Joules
Apparent Combustion Efficiency :	56.8 %
Indicated Thermal Efficiency :	28.7 %
Brake Thermal Efficiency :	26.9 %
Ignition Delay :	5.8 degrees
Centroid Phasing :	193.9 degrees
Centroid Magnitude :	14.60 J/degree
Sensitivity :	26.1 degrees
Premixed/Diffusion Ratio :	.22309

DETROIT DIESEL 6V–53N LOG SHEET

TEST NO. 9 FUEL TF34N28588 DATE 3-31-88 PAGE 52

Operator	BRSC						
Time	12:20	12:30	12:45	12:55	1:15	1:30	1:40
Test Hour	30 min	10 min	15 min	10 min	20 min	15 min	10 min
Speed, RPM	1800	2500	2500	2200	1200	1800	1800
Load, lb–ft	385.2	415.4	387.0	430.1	227.2	415.4	274.3
Fuel Flow, lb/hr	106.6	102.6	63.5	91.0	45.5	77.6	43.2
Exh. Opacity, %	8.0	8.0	2.0	16.0	0	38.0	0
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	800	840	600	790	500	700	500
Exhaust Cyl. L2	850	890	610	850	500	800	520
Exhaust Cyl. L3	950	1000	700	930	555	880	590
Exhaust Cyl. R1	850	850	610	800	490	710	500
Exhaust Cyl. R2	955	1000	670	940	540	900	600
Exhaust Cyl. R3	960	1000	690	940	545	890	580
Exhaust Common	770	795	550	750	540	700	450
Water In	155	155	154	154	153	153	157
Water Out	169	170	170	169	169	169	169
Oil Sump	243	242	230	242	222	235	221
Fuel	93	93	94	92	91	88	87
Inlet Air	99	101	100	102	101	102	101
Airbox	203	197	171	180	162	165	152
Wet Bulb	66.8	66.9	67.0	68.0	67.4	67.8	68.0
Dry Bulb	74.0	74.0	74.9	75.5	76.5	73.0	74.0
PRESSURES, PSIG							
Oil Gallery	51.5	44.0	51.0	46.0	50.5	42.0	44.0
Air After Blower	5.0	4.0	3.8	3.0	2.8	2.0	1.8
Fuel Transfer	70.0	67.0	70.2	66.0	67.5	62.5	64.5
LOW PRESSURES							
Intake Vac., in.water		14.0		13.1	13.5	8.9	4.2
Exh. Comm., in.Water	27.5	24.0	19.5	19.0	14.0	13.5	10.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	28.81	28.80	28.80	28.85	28.83	28.78	28.78

DETROIT DIESEL 6V–53N LOG SHEET

TEST NO. 9 FUEL TF34128J88 DATE 3-31-88 PAGE 53

Operator	Greg						
Time	1:50	2:00	2:15	2:25			
Test Hour	10 min	10 min	15 min	10 min			
Speed, RPM	1400	1400	1400	1400			
Load, lb–ft	151.2	96.4	375.6	98.1			
Fuel Flow, lb/hr	22.6	20.4	64.2	16.7			
Exh. Opacity, %	0	0	76.0	1.0			
TEMPERATURES, DEG. F							
Exhaust Cyl. L1	400	350	608	350			
Exhaust Cyl. L2	400	350	660	330			
Exhaust Cyl. L3	440	360	760	350			
Exhaust Cyl. R1	350	270	610	250			
Exhaust Cyl. R2	360	280	740	250			
Exhaust Cyl. R3	370	290	700	270			
Exhaust Common	340	295	560	295			
Water In	162	162	153	159			
Water Out	170	170	169	168			
Oil Sump	212	207	222	206			
Fuel	88	89	88	90			
Inlet Air	102	101	102	100			
Airbox	147	146	157	147			
Wet Bulb	68.2	68.1	68.0	68.5			
Dry Bulb	74.0	73.6	73.4	73.0			
PRESSURES, PSIG							
Oil Gallery	46.0	47.0	32.5	36.5			
Air After Blower	1.7	1.8	1.5	1.3			
Fuel Transfer	66.2	67.5	63.0	66.0			
LOW PRESSURES							
Intake Vac., in.water	9.3	9.2	9.4	5.5			
Exh. Comm., in.Water	9.0	8.0	8.0	5.0			
Blowby, in.water	0	0	0	0			
Barometer, in.Hg	28.77	28.77	28.75	28.75			

880331.122129 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	79.779	.376	26.544	.209
Wet Bulb Temperature, F	68.699	.059	20.388	.033
P11-Baro (Vent), "Hg ABS	28.806	.000	97.549	.001
P3 C3 Fuel Pressure,psig	69.208	.466	477.17	3.215
P4 C3 Oil Pressure, psig	51.461	.035	354.81	.244
P5 C3 Airbox Pres., psig	4.837	.017	33.351	.119
P10 C3 Exh Comm, inH2Og	28.153	.195	7.806	.049
P11 C3 Intake Vac,inH2Ov	22.891	.148	5.696	.037
P12 C3 Blowby, inH2Og	.028	.003	.007	.001
C3 Speed, RPM	2800.7	3.209	2800.7	3.209
C3 Fuel Flow, lb/hr	106.39	1.908	48.258	.866
C3 Smoke, %	8.706	.232	8.706	.232
Cell 3 Load, lb-ft	384.74	.739	521.64	1.002
K1 C3 Exhaust 1, F	822.77	6.368	439.31	3.538
K2 C3 Exhaust 2, F	874.73	5.311	468.18	2.950
K3 C3 Exhaust 3, F	979.22	5.411	526.23	3.006
K4 C3 Exhaust 4, F	893.60	6.949	478.67	3.860
K5 C3 Exhaust 5, F	996.87	.707	536.04	.393
K6 C3 Exhaust 6, F	1004.2	.806	540.11	.448
K7-C3 Exhaust Comm, F	801.09	.808	427.27	.449
J1 C3 Water In, F	154.57	.115	68.092	.064
J2 C3 Water Out, F	168.63	.148	75.907	.082
J3 C3 Oil Sump, F	243.30	.363	117.39	.202
J4 C3 Fuel In, F	92.596	.074	33.664	.041
J5 C3 Inlet Air, F	99.156	.079	37.309	.044
J6 C3 Airbox, F	201.14	.349	93.968	.194
Horsepower	205.17	.414	152.97	.308
Corrected Horsepower	217.33	.438	162.03	.327
BSFC, lb/hp-hr	.519	.009	.315	.006
Corrected BSFC	.490	.009	.298	.005
Relative Humidity	57.340	.988	57.340	.988
Reference Pressure, inHg	36.971		125.20	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1676

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	36.97 in-Hg
Speed :	2801 RPM
Load :	384.7 lb-ft
Fuel Flow :	106.4 lb/hr
Brake Power :	205.17 bhp
BSFC :	.519 lb/bhp-hr
Indicated Power :	27.29 kW/cyl
Peak Pressure :	9.566 MPa
Peak Rate of Pressure Rise:	618.2 kPa/deg
Peak Heat Release Rate :	58.8 Joules/deg
Cumulative Heat Release :	1133.46 Joules
Apparent Combustion Efficiency :	57.3 %
Indicated Thermal Efficiency :	29.6 %
Brake Thermal Efficiency :	27.6 %
Ignition Delay :	8.0 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	11.30 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.27714

880331.123244 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	79.551	.159	26.417	.088
Wet Bulb Temperature, F	68.648	.027	20.360	.015
P11-Baro (Vent), "Hg ABS	28.802	.000	97.535	.001
P3 C3 Fuel Pressure,psig	68.786	.148	474.27	1.020
P4 C3 Oil Pressure, psig	49.042	.015	338.13	.100
P5 C3 Airbox Pres., psig	3.752	.016	25.868	.113
P10 C3 Exh Comm, inH2Og	23.803	.187	5.923	.047
P11 C3 Intake Vac,inH2Ov	19.295	.114	4.801	.028
P12 C3 Blowby, inH2Og	.021	.002	.005	.000
C3 Speed, RPM	2500.2	3.128	2500.2	3.128
C3 Fuel Flow, lb/hr	101.19	.320	45.899	.145
C3 Smoke, %	9.051	.834	9.051	.834
Cell 3 Load, lb-ft	415.55	.980	563.40	1.328
K1 C3 Exhaust 1, F	844.66	.831	451.48	.462
K2 C3 Exhaust 2, F	914.86	.422	490.48	.234
K3 C3 Exhaust 3, F	1028.0	1.666	553.33	.926
K4 C3 Exhaust 4, F	885.29	.781	474.05	.434
K5 C3 Exhaust 5, F	1031.4	1.613	555.23	.896
K6 C3 Exhaust 6, F	1036.0	.790	557.76	.439
K7-C3 Exhaust Comm, F	816.67	.552	435.93	.306
J1 C3 Water In, F	154.44	.071	68.025	.040
J2 C3 Water Out, F	169.05	.079	76.138	.044
J3 C3 Oil Sump, F	243.24	.130	117.35	.072
J4 C3 Fuel In, F	93.203	.038	34.002	.021
J5 C3 Inlet Air, F	100.24	.400	37.910	.222
J6 C3 Airbox, F	197.07	.224	91.705	.124
Horsepower	197.82	.614	147.49	.458
Corrected Horsepower	209.78	.652	156.40	.486
BSFC, lb/hp-hr	.512	.002	.311	.001
Corrected BSFC	.482	.002	.293	.001
Relative Humidity	57.833	.419	57.833	.419
Reference Pressure, inHg	35.022		118.60	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1678

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	35.02 in-Hg
Speed :	2500 RPM
Load :	415.6 lb-ft
Fuel Flow :	101.2 lb/hr
Brake Power :	197.83 bhp
BSFC :	.512 lb/bhp-hr
Indicated Power :	25.04 kW/cyl
Peak Pressure :	9.790 MPa
Peak Rate of Pressure Rise:	727.1 kPa/deg
Peak Heat Release Rate :	75.7 Joules/deg
Cumulative Heat Release :	1171.80 Joules
Apparent Combustion Efficiency :	55.6 %
Indicated Thermal Efficiency :	28.5 %
Brake Thermal Efficiency :	28.0 %
Ignition Delay :	7.8 degrees
Centroid Phasing :	198.4 degrees
Centroid Magnitude :	13.11 J/degree
Sensitivity :	28.6 degrees
Premixed/Diffusion Ratio :	.27257

880331.124510 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	75.889	.385	24.383	.214
Wet Bulb Temperature, F	67.716	.051	19.842	.028
P11-Baro (Vent), "Hg ABS	28.799	.000	97.523	.001
P3 C3 Fuel Pressure,psig	69.776	.249	481.09	1.718
P4 C3 Oil Pressure, psig	51.796	.016	357.12	.113
P5 C3 Airbox Pres., psig	3.461	.018	23.866	.126
P10 C3 Exh Comm, inH2Og	19.149	.134	4.765	.033
P11 C3 Intake Vac,inH2Ov	19.618	.123	4.882	.031
P12 C3 Blowby, inH2Og	.007	.002	.002	.000
C3 Speed, RPM	2499.5	2.871	2499.5	2.871
C3 Fuel Flow, lb/hr	65.880	.129	29.883	.058
C3 Smoke, %	1.214	.066	1.214	.066
Cell 3 Load, lb-ft	284.34	1.183	385.51	1.604
K1 C3 Exhaust 1, F	608.71	.271	320.40	.151
K2 C3 Exhaust 2, F	634.55	.738	334.75	.410
K3 C3 Exhaust 3, F	716.42	.958	380.23	.532
K4 C3 Exhaust 4, F	635.93	.489	335.52	.272
K5 C3 Exhaust 5, F	704.79	.676	373.77	.376
K6 C3 Exhaust 6, F	714.02	.324	378.90	.180
K7-C3 Exhaust Comm, F	556.89	1.535	291.60	.853
J1 C3 Water In, F	158.36	.037	70.202	.021
J2 C3 Water Out, F	169.84	.232	76.577	.129
J3 C3 Oil Sump, F	231.09	.143	110.61	.080
J4 C3 Fuel In, F	93.710	.118	34.283	.065
J5 C3 Inlet Air, F	100.12	.059	37.844	.033
J6 C3 Airbox, F	171.36	.260	77.424	.144
Horsepower	135.32	.635	100.89	.473
Corrected Horsepower	143.54	.673	107.02	.502
BSFC, lb/hp-hr	.487	.002	.296	.001
Corrected BSFC	.459	.002	.279	.001
Relative Humidity	66.074	1.197	66.074	1.197
Reference Pressure, inHg	34.403		116.50	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1680

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	34.40 in-Hg
Speed :	2500 RPM
Load :	284.3 lb-ft
Fuel Flow :	65.9 lb/hr
Brake Power :	135.33 bhp
BSFC :	.487 lb/bhp-hr
Indicated Power :	17.88 kW/cyl
Peak Pressure :	8.572 MPa
Peak Rate of Pressure Rise:	820.6 kPa/deg
Peak Heat Release Rate :	93.2 Joules/deg
Cumulative Heat Release :	799.997 Joules
Apparent Combustion Efficiency :	58.3 %
Indicated Thermal Efficiency :	31.3 %
Brake Thermal Efficiency :	29.4 %
Ignition Delay :	11.4 degrees
Centroid Phasing :	195.9 degrees
Centroid Magnitude :	17.71 J/degree
Sensitivity :	22.5 degrees
Premixed/Diffusion Ratio :	.50833

880331.125539 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	78.956	.323	26.086	.179
Wet Bulb Temperature, F	68.902	.040	20.501	.022
P11-Baro (Vent), "Hg ABS	28.795	.000	97.512	.001
P3 C3 Fuel Pressure,psig	65.842	.254	453.97	1.754
P4 C3 Oil Pressure, psig	46.400	.016	319.92	.111
P5 C3 Airbox Pres., psig	2.636	.010	18.174	.068
P10 C3 Exh Comm, inH2Og	18.811	.172	4.681	.043
P11 C3 Intake Vac,inH2Ov	16.475	.136	4.100	.034
P12 C3 Blowby, inH2Og	-.004	.001	-.001	.000
C3 Speed, RPM	2200.7	1.858	2200.7	1.858
C3 Fuel Flow, lb/hr	91.603	.265	41.551	.120
C3 Smoke, %	16.117	.339	16.117	.339
Cell 3 Load, lb-ft	429.68	.964	582.56	1.307
K1 C3 Exhaust 1, F	795.94	.308	424.41	.171
K2 C3 Exhaust 2, F	887.42	.502	475.23	.279
K3 C3 Exhaust 3, F	1012.6	.857	544.80	.476
K4 C3 Exhaust 4, F	837.88	.299	447.71	.166
K5 C3 Exhaust 5, F	1018.5	.326	548.03	.181
K6 C3 Exhaust 6, F	1024.5	.591	551.38	.328
K7-C3 Exhaust Comm, F	794.50	.513	423.61	.285
J1 C3 Water In, F	153.55	.098	67.528	.054
J2 C3 Water Out, F	168.57	.122	75.874	.068
J3 C3 Oil Sump, F	242.18	.269	116.77	.150
J4 C3 Fuel In, F	91.437	.096	33.020	.053
J5 C3 Inlet Air, F	101.97	.090	38.870	.050
J6 C3 Airbox, F	186.96	.067	86.090	.037
Horsepower	180.04	.455	134.24	.339
Corrected Horsepower	191.37	.483	142.68	.360
BSFC, lb/hp-hr	.509	.001	.310	.001
Corrected BSFC	.479	.001	.291	.001
Relative Humidity	60.515	.887	60.515	.887
Reference Pressure, inHg	32.950		111.58	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1682

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	32.95 in-Hg
Speed :	2201 RPM
Load :	429.7 lb-ft
Fuel Flow :	91.6 lb/hr
Brake Power :	180.08 bhp
BSFC :	.509 lb/bhp-hr
Indicated Power :	22.23 kW/cyl
Peak Pressure :	10.03 MPa
Peak Rate of Pressure Rise:	913.7 kPa/deg
Peak Heat Release Rate :	102.1 Joules/deg
Cumulative Heat Release :	1203.35 Joules
Apparent Combustion Efficiency :	55.6 %
Indicated Thermal Efficiency :	28.0 %
Brake Thermal Efficiency :	28.2 %
Ignition Delay :	8.0 degrees
Centroid Phasing :	197.6 degrees
Centroid Magnitude :	15.89 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.28812

880331.131550 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	80.976	.177	27.209	.098
Wet Bulb Temperature, F	69.693	.024	20.941	.013
P11-Baro (Vent), "Hg ABS	28.785	.000	97.476	.001
P3 C3 Fuel Pressure,psig	67.529	.107	465.59	.737
P4 C3 Oil Pressure, psig	50.601	.017	348.88	.114
P5 C3 Airbox Pres., psig	2.396	.010	16.523	.066
P10 C3 Exh Comm, inH2Og	13.856	.150	3.448	.037
P11 C3 Intake Vac,inH2Ov	16.932	.088	4.213	.022
P12 C3 Blowby, inH2Og	.002	.003	.001	.001
C3 Speed, RPM	2201.9	1.960	2201.9	1.960
C3 Fuel Flow, lb/hr	45.895	.061	20.818	.028
C3 Smoke, %	-2.015	.089	-2.015	.089
Cell 3 Load, lb-ft	223.95	.878	303.64	1.190
K1 C3 Exhaust 1, F	506.61	.375	263.67	.209
K2 C3 Exhaust 2, F	523.02	.367	272.79	.204
K3 C3 Exhaust 3, F	577.95	.476	303.31	.265
K4 C3 Exhaust 4, F	503.83	.219	262.13	.122
K5 C3 Exhaust 5, F	553.63	.653	289.80	.363
K6 C3 Exhaust 6, F	561.98	.563	294.43	.313
K7-C3 Exhaust Comm, F	453.13	.307	233.96	.170
J1 C3 Water In, F	158.47	.099	70.262	.055
J2 C3 Water Out, F	168.67	.114	75.926	.063
J3 C3 Oil Sump, F	222.11	.236	105.62	.131
J4 C3 Fuel In, F	90.503	.037	32.502	.021
J5 C3 Inlet Air, F	101.16	.085	38.422	.047
J6 C3 Airbox, F	161.71	.079	72.064	.044
Horsepower	93.892	.427	70.004	.319
Corrected Horsepower	99.789	.454	74.399	.338
BSFC, lb/hp-hr	.489	.003	.297	.002
Corrected BSFC	.460	.002	.280	.001
Relative Humidity	57.233	.485	57.233	.485
Reference Pressure, inHg	32.419		109.78	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1684

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	32.42 in-Hg
Speed :	2202 RPM
Load :	224.0 lb-ft
Fuel Flow :	45.9 lb/hr
Brake Power :	93.92 bhp
BSFC :	.489 lb/bhp-hr
Indicated Power :	12.62 kW/cyl
Peak Pressure :	8.148 MPa
Peak Rate of Pressure Rise:	1099. kPa/deg
Peak Heat Release Rate :	134.5 Joules/deg
Cumulative Heat Release :	648.755 Joules
Apparent Combustion Efficiency :	59.8 %
Indicated Thermal Efficiency :	31.7 %
Brake Thermal Efficiency :	29.3 %
Ignition Delay :	12.6 degrees
Centroid Phasing :	195.9 degrees
Centroid Magnitude :	29.73 J/degree
Sensitivity :	21.3 degrees
Premixed/Diffusion Ratio :	.59061

880331.132917 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	79.148	.609	26.194	.338
Wet Bulb Temperature, F	69.453	.076	20.807	.042
P11-Baro (Vent), "Hg ABS	28.777	.001	97.450	.002
P3 C3 Fuel Pressure,psig	62.159	.091	428.57	.629
P4 C3 Oil Pressure, psig	42.483	.020	292.91	.141
P5 C3 Airbox Pres., psig	1.725	.008	11.892	.054
P10 C3 Exh Comm, inH2Og	12.969	.176	3.227	.044
P11 C3 Intake Vac,inH2Ov	12.477	.055	3.105	.014
P12 C3 Blowby, inH2Og	-.017	.002	-.004	.000
C3 Speed, RPM	1802.2	1.538	1802.2	1.538
C3 Fuel Flow, lb/hr	80.091	.102	36.329	.046
C3 Smoke, %	39.582	.465	39.582	.465
Cell 3 Load, lb-ft	416.14	.684	564.21	.928
K1 C3 Exhaust 1, F	724.89	.695	384.94	.386
K2 C3 Exhaust 2, F	827.86	.432	442.14	.240
K3 C3 Exhaust 3, F	910.84	.291	488.24	.162
K4 C3 Exhaust 4, F	739.34	.559	392.97	.311
K5 C3 Exhaust 5, F	928.91	.265	498.28	.147
K6 C3 Exhaust 6, F	922.20	.626	494.56	.348
K7-C3 Exhaust Comm, F	707.48	.345	375.27	.192
J1 C3 Water In, F	153.08	.098	67.268	.054
J2 C3 Water Out, F	168.66	.039	75.920	.022
J3 C3 Oil Sump, F	234.66	.386	112.59	.214
J4 C3 Fuel In, F	87.181	.062	30.656	.034
J5 C3 Inlet Air, F	102.45	.173	39.139	.096
J6 C3 Airbox, F	164.98	.142	73.880	.079
Horsepower	142.80	.285	106.47	.212
Corrected Horsepower	152.04	.303	113.36	.226
BSFC, lb/hp-hr	.561	.001	.341	.001
Corrected BSFC	.527	.001	.320	.001
Relative Humidity	61.885	1.690	61.885	1.690
Reference Pressure, inHg	31.371		106.23	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1686

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	31.37 in-Hg
Speed :	1802 RPM
Load :	416.1 lb-ft
Fuel Flow :	80.1 lb/hr
Brake Power :	142.77 bhp
BSFC :	.561 lb/bhp-hr
Indicated Power :	17.61 kW/cyl
Peak Pressure :	10.16 MPa
Peak Rate of Pressure Rise:	1188. kPa/deg
Peak Heat Release Rate :	144.2 Joules/deg
Cumulative Heat Release :	1164.52 Joules
Apparent Combustion Efficiency :	50.3 %
Indicated Thermal Efficiency :	25.3 %
Brake Thermal Efficiency :	25.5 %
Ignition Delay :	8.2 degrees
Centroid Phasing :	196.1 degrees
Centroid Magnitude :	22.73 J/degree
Sensitivity :	25.9 degrees
Premixed/Diffusion Ratio :	.31752

880331.134138 AL-17233-F AL-12920-L 6V53N 9

Dry Bulb Temperature, F	79.677	.468	26.487	.260
Wet Bulb Temperature, F	69.557	.083	20.865	.046
P11-Baro (Vent), "Hg ABS	28.776	.000	97.447	.001
P3 C3 Fuel Pressure,psig	64.096	.111	441.93	.766
P4 C3 Oil Pressure, psig	45.176	.012	311.48	.084
P5 C3 Airbox Pres., psig	1.462	.010	10.079	.068
P10 C3 Exh Comm, inH20g	10.349	.106	2.575	.026
P11 C3 Intake Vac,inH20v	12.786	.065	3.182	.016
P12 C3 Blowby, inH20g	-.011	.001	-.003	.000
C3 Speed, RPM	1801.1	1.330	1801.1	1.330
C3 Fuel Flow, lb/hr	43.733	.057	19.837	.026
C3 Smoke, %	-.690	.095	-.690	.095
Cell 3 Load, lb-ft	273.51	.649	370.83	.879
K1 C3 Exhaust 1, F	507.49	4.417	264.16	2.454
K2 C3 Exhaust 2, F	541.96	.637	283.31	.354
K3 C3 Exhaust 3, F	602.01	4.542	316.67	2.523
K4 C3 Exhaust 4, F	517.21	.150	269.56	.084
K5 C3 Exhaust 5, F	621.35	4.180	327.42	2.322
K6 C3 Exhaust 6, F	602.03	4.208	316.68	2.338
K7-C3 Exhaust Comm, F	478.66	.741	248.15	.412
J1 C3 Water In, F	157.07	.064	69.486	.035
J2 C3 Water Out, F	168.24	.049	75.686	.027
J3 C3 Oil Sump, F	221.10	.296	105.05	.165
J4 C3 Fuel In, F	86.331	.040	30.184	.022
J5 C3 Inlet Air, F	101.87	.177	38.818	.099
J6 C3 Airbox, F	152.49	.240	66.937	.134
Horsepower	93.796	.225	69.932	.168
Corrected Horsepower	99.813	.239	74.417	.178
BSFC, lb/hp-hr	.466	.002	.284	.001
Corrected BSFC	.438	.001	.267	.001
Relative Humidity	60.619	1.171	60.619	1.171
Reference Pressure, inHg	30.812		104.34	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1688

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	30.81 in-Hg
Speed :	1801 RPM
Load :	273.5 lb-ft
Fuel Flow :	43.7 lb/hr
Brake Power :	93.79 bhp
BSFC :	.466 lb/bhp-hr
Indicated Power :	11.34 kW/cyl
Peak Pressure :	8.364 MPa
Peak Rate of Pressure Rise:	1137. kPa/deg
Peak Heat Release Rate :	138.2 Joules/deg
Cumulative Heat Release :	722.312 Joules
Apparent Combustion Efficiency :	57.2 %
Indicated Thermal Efficiency :	29.9 %
Brake Thermal Efficiency :	30.7 %
Ignition Delay :	11.4 degrees
Centroid Phasing :	194.2 degrees
Centroid Magnitude :	28.58 J/degree
Sensitivity :	20.8 degrees
Premixed/Diffusion Ratio :	.54851

980331.135202 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	78.914	.122	26.063	.068
Wet Bulb Temperature, F	69.440	.062	20.800	.035
P11-Baro (Vent), "Hg ABS	28.767	.001	97.417	.002
P3 C3 Fuel Pressure,psig	66.117	.094	455.86	.651
P4 C3 Oil Pressure, psig	46.692	.016	321.93	.109
P5 C3 Airbox Pres., psig	1.471	.004	10.139	.027
P10 C3 Exh Comm, inH20g	8.514	.120	2.119	.030
P11 C3 Intake Vac,inH20v	12.864	.089	3.201	.022
P12 C3 Blowby, inH20g	-.014	.001	-.004	.000
C3 Speed, RPM	1802.2	1.168	1802.2	1.168
C3 Fuel Flow, lb/hr	27.819	.251	12.618	.114
C3 Smoke, %	-1.120	.081	-1.120	.081
Cell 3 Load, lb-ft	149.68	.678	202.94	.919
K1 C3 Exhaust 1, F	405.11	.262	207.28	.145
K2 C3 Exhaust 2, F	412.17	.662	211.21	.368
K3 C3 Exhaust 3, F	450.68	.436	232.60	.242
K4 C3 Exhaust 4, F	360.28	.317	182.38	.176
K5 C3 Exhaust 5, F	380.21	.677	193.45	.376
K6 C3 Exhaust 6, F	384.23	.488	195.68	.271
K7-C3 Exhaust Comm, F	355.81	1.351	179.89	.751
J1 C3 Water In, F	160.19	.069	71.219	.039
J2 C3 Water Out, F	169.33	.088	76.297	.049
J3 C3 Oil Sump, F	212.80	.225	100.44	.125
J4 C3 Fuel In, F	87.684	.017	30.935	.009
J5 C3 Inlet Air, F	101.74	.060	38.744	.033
J6 C3 Airbox, F	147.86	.112	64.368	.062
Horsepower	51.362	.249	38.294	.185
Corrected Horsepower	54.676	.265	40.764	.197
BSFC, lb/hp-hr	.542	.004	.330	.002
Corrected BSFC	.509	.004	.310	.002
Relative Humidity	62.554	.204	62.554	.204
Reference Pressure, inHg	30.815		104.35	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1690

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	30.82 in-Hg
Speed :	1802 RPM
Load :	149.7 lb-ft
Fuel Flow :	27.8 lb/hr
Brake Power :	51.36 bhp
BSFC :	.541 lb/bhp-hr
Indicated Power :	7.77 kW/cyl
Peak Pressure :	7.620 MPa
Peak Rate of Pressure Rise:	1157. kPa/deg
Peak Heat Release Rate :	144.2 Joules/deg
Cumulative Heat Release :	482.016 Joules
Apparent Combustion Efficiency :	60.0 %
Indicated Thermal Efficiency :	32.2 %
Brake Thermal Efficiency :	26.5 %
Ignition Delay :	13.2 degrees
Centroid Phasing :	192.9 degrees
Centroid Magnitude :	37.81 J/degree
Sensitivity :	17.8 degrees
Premixed/Diffusion Ratio :	.74183

980331.140149 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	80.791	.130	27.106	.072
Wet Bulb Temperature, F	70.331	.026	21.295	.014
P11-Baro (Vent), "Hg ABS	28.763	.000	97.402	.001
P3 C3 Fuel Pressure,psig	67.190	.131	463.26	.902
P4 C3 Oil Pressure, psig	47.780	.020	329.43	.136
P5 C3 Airbox Pres., psig	1.516	.006	10.453	.043
P10 C3 Exh Comm, inH2Og	7.774	.087	1.935	.022
P11 C3 Intake Vac,inH2Ov	12.939	.069	3.220	.017
P12 C3 Blowby, inH2Og	-.014	.001	-.004	.000
C3 Speed, RPM	1802.0	1.607	1802.0	1.607
C3 Fuel Flow, lb/hr	20.416	.063	9.261	.029
C3 Smoke, %	-.387	.070	-.387	.070
Cell 3 Load, lb-ft	85.745	.649	116.25	.880
K1 C3 Exhaust 1, F	356.70	.445	180.39	.247
K2 C3 Exhaust 2, F	353.80	.345	178.78	.192
K3 C3 Exhaust 3, F	382.79	.240	194.88	.134
K4 C3 Exhaust 4, F	285.11	.164	140.62	.091
K5 C3 Exhaust 5, F	289.17	.408	142.87	.227
K6 C3 Exhaust 6, F	294.20	.622	145.67	.346
K7-C3 Exhaust Comm, F	297.08	.743	147.27	.413
J1 C3 Water In, F	161.58	.114	71.990	.064
J2 C3 Water Out, F	169.60	.055	76.443	.030
J3 C3 Oil Sump, F	207.38	.084	97.435	.047
J4 C3 Fuel In, F	88.937	.036	31.631	.020
J5 C3 Inlet Air, F	101.31	.182	38.504	.101
J6 C3 Airbox, F	145.44	.065	63.021	.036
Horsepower	29.420	.239	21.935	.178
Corrected Horsepower	31.324	.254	23.354	.189
BSFC, lb/hp-hr	.694	.007	.422	.004
Corrected BSFC	.652	.007	.397	.004
Relative Humidity	59.935	.334	59.935	.334
Reference Pressure, inHg	30.898		104.63	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1692

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	30.90 in-Hg
Speed :	1802 RPM
Load :	85.7 lb-ft
Fuel Flow :	20.4 lb/hr
Brake Power :	29.40 bhp
BSFC :	.694 lb/bhp-hr
Indicated Power :	6.04 kW/cyl
Peak Pressure :	7.148 MPa
Peak Rate of Pressure Rise:	1018. kPa/deg
Peak Heat Release Rate :	127.4 Joules/deg
Cumulative Heat Release :	369.479 Joules
Apparent Combustion Efficiency :	62.7 %
Indicated Thermal Efficiency :	34.1 %
Brake Thermal Efficiency :	20.7 %
Ignition Delay :	13.9 degrees
Centroid Phasing :	193.0 degrees
Centroid Magnitude :	38.83 J/degree
Sensitivity :	17.2 degrees
Premixed/Diffusion Ratio :	.80675

880331.141340 AL-17233-F AL-12920-L 6V53N				9
Dry Bulb Temperature, F	80.312	.078	26.840	.044
Wet Bulb Temperature, F	70.348	.016	21.304	.009
P11-Baro (Vent), "Hg ABS	28.752	.000	97.365	.001
P3 C3 Fuel Pressure,psig	62.667	.042	432.08	.292
P4 C3 Oil Pressure, psig	32.523	.025	224.24	.172
P5 C3 Airbox Pres., psig	1.112	.007	7.669	.046
P10 C3 Exh Comm, inH2Og	8.437	.120	2.099	.030
P11 C3 Intake Vac,inH2Ov	9.418	.062	2.343	.015
P12 C3 Blowby, inH2Og	-.015	.001	-.004	.000
C3 Speed, RPM	1401.5	1.108	1401.5	1.108
C3 Fuel Flow, lb/hr	66.746	.055	30.275	.025
C3 Smoke, %	75.789	1.335	75.789	1.335
Cell 3 Load, lb-ft	374.75	.999	508.09	1.354
K1 C3 Exhaust 1, F	613.51	4.014	323.06	2.230
K2 C3 Exhaust 2, F	693.41	.699	367.45	.388
K3 C3 Exhaust 3, F	788.04	4.587	420.02	2.548
K4 C3 Exhaust 4, F	635.27	1.244	335.15	.691
K5 C3 Exhaust 5, F	762.87	.682	406.04	.379
K6 C3 Exhaust 6, F	728.93	.719	387.18	.399
K7-C3 Exhaust Comm, F	592.12	.750	311.18	.417
J1 C3 Water In, F	152.88	.073	67.157	.040
J2 C3 Water Out, F	169.22	.058	76.231	.032
J3 C3 Oil Sump, F	232.42	.210	111.34	.117
J4 C3 Fuel In, F	87.944	.020	31.080	.011
J5 C3 Inlet Air, F	101.47	.096	38.594	.053
J6 C3 Airbox, F	156.41	.180	69.116	.100
Horsepower	99.999	.302	74.557	.225
Corrected Horsepower	106.55	.322	79.440	.240
BSFC, lb/hp-hr	.667	.002	.406	.001
Corrected BSFC	.626	.002	.381	.001
Relative Humidity	61.436	.227	61.436	.227
Reference Pressure, inHg	30.324		102.69	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1694

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	30.32 in-Hg
Speed :	1402 RPM
Load :	374.8 lb-ft
Fuel Flow :	66.7 lb/hr
Brake Power :	100.05 bhp
BSFC :	.667 lb/bhp-hr
Indicated Power :	13.56 kW/cyl
Peak Pressure :	10.58 MPa
Peak Rate of Pressure Rise:	1349. kPa/deg
Peak Heat Release Rate :	168.7 Joules/deg
Cumulative Heat Release :	1138.92 Joules
Apparent Combustion Efficiency :	46.0 %
Indicated Thermal Efficiency :	23.4 %
Brake Thermal Efficiency :	21.5 %
Ignition Delay :	7.8 degrees
Centroid Phasing :	193.4 degrees
Centroid Magnitude :	29.18 J/degree
Sensitivity :	23.6 degrees
Premixed/Diffusion Ratio :	.32894

880331.142513 AL-17233-F	AL-12920-L	6V53N			9
Dry Bulb Temperature, F	80.731	.450	27.073	.250
Wet Bulb Temperature, F	70.643	.096	21.468	.053
P11-Baro (Vent), "Hg ABS	28.745	.000	97.342	.002
P3 C3 Fuel Pressure,psig	65.663	.110	452.73	.756
P4 C3 Oil Pressure, psig	37.909	.051	261.37	.352
P5 C3 Airbox Pres., psig	1.071	.008	7.384	.054
P10 C3 Exh Comm, inH2Og	5.146	.047	1.281	.012
P11 C3 Intake Vac,inH2Ov	9.628	.050	2.396	.012
P12 C3 Blowby, inH2Og	-.017	.002	-.004	.000
C3 Speed, RPM	1401.3	1.073	1401.3	1.073
C3 Fuel Flow, lb/hr	17.111	.093	7.761	.042
C3 Smoke, %	1.357	.100	1.357	.100
Cell 3 Load, lb-ft	96.860	.518	131.32	.702
K1 C3 Exhaust 1, F	346.86	.188	174.92	.105
K2 C3 Exhaust 2, F	335.11	.512	168.39	.284
K3 C3 Exhaust 3, F	371.53	.297	188.63	.165
K4 C3 Exhaust 4, F	266.12	.129	130.07	.071
K5 C3 Exhaust 5, F	269.11	.340	131.73	.189
K6 C3 Exhaust 6, F	283.89	.323	139.94	.180
K7-C3 Exhaust Comm, F	293.82	1.953	145.46	1.085
J1 C3 Water In, F	158.21	.075	70.114	.041
J2 C3 Water Out, F	166.80	.058	74.888	.032
J3 C3 Oil Sump, F	204.94	.264	96.077	.147
J4 C3 Fuel In, F	93.854	13.483	34.363	7.490
J5 C3 Inlet Air, F	101.42	.056	38.569	.031
J6 C3 Airbox, F	145.74	.363	63.188	.201
Horsepower	25.844	.153	19.268	.114
Corrected Horsepower	27.548	.163	20.539	.122
BSFC, lb/hp-hr	.662	.006	.403	.004
Corrected BSFC	.621	.006	.378	.003
Relative Humidity	61.199	1.045	61.199	1.045
Reference Pressure, inHg	30.218		102.33	

NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N FILE : DN1696

Bore :	98.4 mm
Stroke :	114.3 mm
Displacement :	5217.9 cc
Compression Ratio :	21.0 to 1
Injection Timing :	18 BTDC
Crankangle Offset :	179.0 degrees
Reference Pressure :	30.22 in-Hg
Speed :	1401 RPM
Load :	96.9 lb-ft
Fuel Flow :	17.1 lb/hr
Brake Power :	25.85 bhp
BSFC :	.662 lb/bhp-hr
Indicated Power :	4.82 kW/cyl
Peak Pressure :	7.214 MPa
Peak Rate of Pressure Rise:	1182. kPa/deg
Peak Heat Release Rate :	147.5 Joules/deg
Cumulative Heat Release :	378.240 Joules
Apparent Combustion Efficiency :	59.5 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	21.7 %
Ignition Delay :	13.0 degrees
Centroid Phasing :	190.6 degrees
Centroid Magnitude :	47.23 J/degree
Sensitivity :	15.6 degrees
Premixed/Diffusion Ratio :	.83065

APPENDIX G
Cummins NG-220G Data Sheets

APPENDIX G1
CUMMINS NH-220G DATA SHEETS
FUEL BLEND BF02

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Test Procedure Checklist

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 AL-15299-F Date: 5-27-87
BF02V13L86

Step	Initials	Test Procedure
1.	G.L.P.	Flush Fuel System with BF-2
2.	G.L.P.	Engine Warmup
3.	G.L.P.	Clean Smokemeter Lenses
4.	G.L.P.	Full Rack Power Check with BF-2
5.	G.L.P.	Compute Corrected Power Levels
6.	G.L.P.	Compare to 95% Confidence Bands of BF-2 Performance
7.	G.L.P.	Determine Action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush Fuel System with BF-2 Blend
9.	G.L.P.	Engine Warmup
10.	G.L.P.	Clean Smokemeter Lenses
11.	G.L.P.	Complete Performance Testing Load-Speed Matrix
12.	G.L.P.	Flush Fuel System with BF-2
13.	G.L.P.	Engine Warmup
14.	G.L.P.	Clean Smokemeter Lenses
15.	G.L.P.	Full Rack Power Check on BF-2
16.	G.L.P.	Compute Corrected Power Levels
17.	G.L.P.	Compare to 95% Confidence Bands of BF-2 Performance
18.	G.L.P.	Determine Action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush Fuel System with BF-2 Blend
20.	G.L.P.	Engine Warmup
21.	G.L.P.	Clean Smokemeter Lenses
22.	G.L.P.	Complete Performance Testing Load-Speed Matrix

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 AL-15299-F Date: 5-27-87

BF02V13486

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	17	CN1139	CN1140
1800	18	CN1141	CN1142
1500	19	CN1143	CN1144
1300	20	CN1145	CN1146
1100	21	CN1147	CN1148

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: BF-2 AL-15299-F

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	22	CN1149	CN1150
1800	Full-Rack	23	CN1151	CN1152
1800	133	24	CN1153	CN1154
1800	98	25	CN1155	CN1156
1800	48	26	CN1157	CN1158
1800	13	27	CN1159	CN1160
1500	Full-Rack	28	CN1161	CN1162
1300	Full-Rack	29	CN1163	CN1164
1100	Full-Rack	30	CN1165	CN1166

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 AL-15299-F Date: 5-29-87
BF02V13L86

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	31	CN1167	CN1168
1800	32	CN1169	CN1170
1500	33	CN1171	CN1172
1300	34	CN1173	CN1174
1100	35	CN1175	CN1176

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: BF-2 AL-15299-F

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	36	CN1177	CN1178
1800	Full-Rack	37	CN1179	CN1180
1800	133	38	CN1181	CN1182
1800	98	39	CN1183	CN1184
1800	48	40	CN1185	CN1186
1800	13	41	CN1187	CN1188
1500	Full-Rack	42	CN1189	CN1190
1300	Full-Rack	43	CN1191	CN1192
1100	Full-Rack	44	CN1193	CN1194

CUMMINS NH220 LOG SHEET

TEST NO. 1 FUEL BF-2 AL-15299F DATE 5-27-87 PAGE 4

Operator GREG							
Time	2:30	2:45	3:00	3:15	3:30		
Test Hour							
Speed, RPM	2100	1800	1500	1300	1100		
Load, lb–ft	468.7	514.0	542.8	554.2	536.0		
Fuel Flow, lb/hr	77.9	73.3	66.5	58.8	52.3		
Exh. Opacity, %	24.0	15.0	15.0	16.0	14.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1171	1168	1137	1070	988		
Exhaust Cyl. 2	1264	1252	1208	1148	1050		
Exhaust Cyl. 3	1214	1219	1204	1148	1056		
Exhaust Cyl. 4	1183	1193	1167	1106	1003		
Exhaust Cyl. 5	1200	1234	1217	1165	1071		
Exhaust Cyl. 6	1114	1130	1110	1068	997		
Exhaust Common	1236	1270	1279	1230	1121		
Water In	168	168	167	167	167		
Water Out	174	174	175	175	175		
Oil Sump	233	230	224	217	212		
Fuel	94	95	95	94	94		
Inlet Air	105	105	105	105	105		
Wet Bulb	76.5	75.5	76.0	76.0	75.8		
Dry Bulb	85.0	83.5	84.5	85.0	84.8		
PRESSURES, PSIG							
Fuel Pump	127	115	100.0	81.0	67		
Oil Gallery	56.0	54.9	53.8	51.0	45.6		
LOW PRESSURES							
Intake Vac, in.water	3.3	2.4	1.8	1.4	1.1		
Exh. Comm., in.Water	22.5	20.5	17.5	16.0	13.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	28.9	28.9	28.89	28.89	28.88		

370527.142914 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1171.8	1.139	633.21	.633
K2-Exhaust 2, F	1265.0	1.116	684.98	.620
K3-Exhaust 3, F	1213.3	.493	656.26	.274
K4-Exhaust 4, F	1183.9	.512	639.92	.285
K5-Exhaust 5, F	1202.4	.334	650.20	.185
K6-Exhaust 6, F	1114.3	1.061	601.26	.590
K7-Exhaust Common, F	1236.4	.588	669.12	.327
Dry Bulb Temperature, F	84.042	.233	28.912	.130
Wet Bulb Temperature, F	75.579	.053	24.211	.030
J1-Water In, F	163.00	.067	72.780	.037
J2-Water Out, F	169.44	.061	76.358	.034
J3-Oil Sump, F	228.22	.166	109.01	.092
J4-Fuel Inlet, F	90.300	.070	32.389	.039
J5-Air After Filter, F	101.77	.114	38.762	.063
J6-Intake Manifold, F	102.76	.092	39.311	.051
J7-Fuel Return, F	93.842	.132	34.357	.073
P1-Fuel, PSIG	124.80	1.002	860.43	6.907
P2-Oil Gallery, PSIG	55.267	.036	381.05	.250
P6-Ex Common, "H2OG	24.157	.239	6.011	.059
P7-Air Aft Filt, "H2OV	7.925	.248	1.972	.062
P8-Blowby, "H2OG	.055	.038	.014	.009
P11-Baro (Vent), "Hg ABS	28.895	.002	97.851	.008
Speed, RPM	2099.6	2.781	2099.6	2.781
Load, Lb-Ft	467.10	3.410	633.30	4.624
Smoke, %	23.703	.332	23.703	.332
Fuel Flow, Lb/Hr	79.334	1.848	35.985	.838
Horsepower	186.73	1.342	139.22	1.001
Corrected Horsepower	199.14	1.431	148.47	1.067
BSFC, lb/hp-hr	.425	.011	.258	.007
Corrected BSFC	.398	.010	.242	.006
Relative Humidity	68.004	.594	68.004	.594
Reference Pressure, inHg	28.313		95.877	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1140

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.31 in-Hg
Speed :	2100 RPM
Load :	467.1 lb-ft
Fuel Flow :	79.3 lb/hr
Brake Power :	186.77 bhp
BSFC :	.425 lb/bhp-hr
Indicated Power :	28.56 kW/cyl
Peak Pressure :	7.182 MPa
Peak Rate of Pressure Rise:	547.9 kPa/deg
Peak Heat Release Rate :	196.1 Joules/deg
Cumulative Heat Release :	3318.38 Joules
Apparent Combustion Efficiency :	81.3 %
Indicated Thermal Efficiency :	40.0 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	3.8 degrees
Centroid Phasing :	196.4 degrees
Centroid Magnitude :	36.88 J/degree
Sensitivity :	31.5 degrees
Premixed/Diffusion Ratio :	.12194

870527.144407 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1167.6	.538	630.86	.299
K2-Exhaust 2, F	1251.2	.548	677.31	.304
K3-Exhaust 3, F	1218.3	.637	659.08	.354
K4-Exhaust 4, F	1188.9	1.002	642.71	.557
K5-Exhaust 5, F	1233.6	.499	667.57	.277
K6-Exhaust 6, F	1129.0	.728	609.42	.404
K7-Exhaust Common, F	1267.5	1.091	686.40	.606
Dry Bulb Temperature, F	83.474	.188	28.597	.105
Wet Bulb Temperature, F	75.414	.051	24.119	.028
J1-Water In, F	162.98	.077	72.764	.043
J2-Water Out, F	170.34	.076	76.856	.042
J3-Oil Sump, F	226.27	.084	107.93	.046
J4-Fuel Inlet, F	91.683	.128	33.157	.071
J5-Air After Filter, F	102.24	.145	39.021	.081
J6-Intake Manifold, F	103.09	.085	39.495	.047
J7-Fuel Return, F	95.223	.028	35.124	.016
P1-Fuel, PSIG	113.35	.681	781.55	4.695
P2-Oil Gallery, PSIG	54.409	.035	375.14	.244
P6-Ex Common, "H2OG	17.132	.630	4.263	.157
P7-Air Aft Filt, "H2OV	7.150	.580	1.779	.144
P8-Blowby, "H2OG	.047	.059	.012	.015
P11-Baro (Vent), "Hg ABS	28.898	.004	97.861	.014
Speed, RPM	1800.5	3.230	1800.5	3.230
Load, Lb-Ft	514.14	6.931	697.07	9.397
Smoke, %	15.653	.301	15.653	.301
Fuel Flow, Lb/Hr	74.305	.710	33.704	.322
Horsepower	176.26	2.571	131.42	1.917
Corrected Horsepower	188.03	2.742	140.19	2.045
BSFC, lb/hp-hr	.422	.007	.257	.004
Corrected BSFC	.395	.006	.240	.004
Relative Humidity	69.211	.532	69.211	.532
Reference Pressure, inHg	28.372		96.080	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1142

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.37 in-Hg
Speed :	1801 RPM
Load :	514.1 lb-ft
Fuel Flow :	74.3 lb/hr
Brake Power :	176.29 bhp
BSFC :	.421 lb/bhp-hr
Indicated Power :	25.91 kW/cyl
Peak Pressure :	7.654 MPa
Peak Rate of Pressure Rise:	593.9 kPa/deg
Peak Heat Release Rate :	220.3 Joules/deg
Cumulative Heat Release :	3423.80 Joules
Apparent Combustion Efficiency :	76.8 %
Indicated Thermal Efficiency :	38.7 %
Brake Thermal Efficiency :	32.7 %
Ignition Delay :	3.2 degrees
Centroid Phasing :	193.7 degrees
Centroid Magnitude :	40.20 J/degree
Sensitivity :	29.5 degrees
Premixed/Diffusion Ratio :	.11007

870527.150116 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1137.3	.946	614.06	.525
K2-Exhaust 2, F	1207.2	.739	652.87	.411
K3-Exhaust 3, F	1204.4	.798	651.35	.443
K4-Exhaust 4, F	1168.7	.623	631.49	.346
K5-Exhaust 5, F	1219.1	.429	659.52	.239
K6-Exhaust 6, F	1109.9	.787	598.85	.437
K7-Exhaust Common, F	1280.9	.584	693.82	.325
Dry Bulb Temperature, F	84.254	.263	29.030	.146
Wet Bulb Temperature, F	76.202	.041	24.557	.023
J1-Water In, F	162.89	.130	72.718	.072
J2-Water Out, F	171.38	.082	77.431	.046
J3-Oil Sump, F	219.20	.080	104.00	.044
J4-Fuel Inlet, F	90.748	.076	32.638	.042
J5-Air After Filter, F	100.97	.176	38.316	.098
J6-Intake Manifold, F	102.48	.075	39.153	.042
J7-Fuel Return, F	93.348	.034	34.082	.019
P1-Fuel, PSIG	98.536	.926	679.38	6.386
P2-Oil Gallery, PSIG	53.128	.026	366.31	.182
P6-Ex Common, "H2OG	13.305	.772	3.311	.192
P7-Air Aft Filt, "H2OV	6.476	.226	1.612	.056
P8-Blowby, "H2OG	.092	.012	.023	.003
P11-Baro (Vent), "Hg ABS	28.891	.002	97.837	.007
Speed, RPM	1500.7	1.709	1500.7	1.709
Load, Lb-Ft	548.85	2.843	744.13	3.855
Smoke, %	15.171	.296	15.171	.296
Fuel Flow, Lb/Hr	66.791	1.459	30.296	.662
Horsepower	156.83	.693	116.93	.517
Corrected Horsepower	167.29	.740	124.72	.552
BSFC, lb/hp-hr	.426	.009	.259	.006
Corrected BSFC	.399	.009	.243	.005
Relative Humidity	69.494	.694	69.494	.694
Reference Pressure, inHg	28.415		96.224	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1144

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.42 in-Hg
Speed :	1501 RPM
Load :	548.9 lb-ft
Fuel Flow :	66.8 lb/hr
Brake Power :	156.87 bhp
BSFC :	.426 lb/bhp-hr
Indicated Power :	21.82 kW/cyl
Peak Pressure :	8.191 MPa
Peak Rate of Pressure Rise:	754.7 kPa/deg
Peak Heat Release Rate :	305.8 Joules/deg
Cumulative Heat Release :	3424.34 Joules
Apparent Combustion Efficiency :	71.2 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	32.4 %
Ignition Delay :	.9 degrees
Centroid Phasing :	191.1 degrees
Centroid Magnitude :	46.64 J/degree
Sensitivity :	29.2 degrees
Premixed/Diffusion Ratio :	.03071

870527.151723 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1070.9	.503	577.19	.280
K2-Exhaust 2, F	1149.5	.571	620.84	.317
K3-Exhaust 3, F	1147.8	.851	619.91	.473
K4-Exhaust 4, F	1105.9	.533	596.60	.296
K5-Exhaust 5, F	1166.4	.601	630.22	.334
K6-Exhaust 6, F	1067.5	.759	575.29	.422
K7-Exhaust Common, F	1230.5	.508	665.81	.282
Dry Bulb Temperature, F	84.375	.114	29.097	.063
Wet Bulb Temperature, F	76.375	.025	24.653	.014
J1-Water In, F	162.30	.080	72.387	.044
J2-Water Out, F	171.47	.101	77.485	.056
J3-Oil Sump, F	213.68	.185	100.93	.103
J4-Fuel Inlet, F	90.025	.127	32.236	.070
J5-Air After Filter, F	100.82	.187	38.236	.104
J6-Intake Manifold, F	101.70	.092	38.721	.051
J7-Fuel Return, F	92.384	.084	33.547	.047
P1-Fuel, PSIG	84.568	.400	583.08	2.760
P2-Oil Gallery, PSIG	50.666	.050	349.33	.345
P6-Ex Common, "H2OG	12.284	.492	3.057	.123
P7-Air Aft Filt, "H2OV	5.962	.238	1.484	.059
P8-Blowby, "H2OG	.035	.057	.009	.014
P11-Baro (Vent), "Hg ABS	28.892	.002	97.840	.006
Speed, RPM	1299.5	2.051	1299.5	2.051
Load, Lb-Ft	553.89	1.650	750.98	2.237
Smoke, %	15.745	.754	15.745	.754
Fuel Flow, Lb/Hr	59.429	.997	26.957	.452
Horsepower	137.04	.508	102.18	.379
Corrected Horsepower	146.19	.542	109.00	.404
BSFC, lb/hp-hr	.434	.008	.264	.005
Corrected BSFC	.407	.007	.247	.005
Relative Humidity	69.710	.321	69.710	.321
Reference Pressure, inHg	28.454		96.355	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1146

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.45 in-Hg
Speed :	1300 RPM
Load :	553.9 lb-ft
Fuel Flow :	59.3 lb/hr
Brake Power :	137.10 bhp
BSFC :	.433 lb/bhp-hr
Indicated Power :	19.22 kW/cyl
Peak Pressure :	8.433 MPa
Peak Rate of Pressure Rise:	741.6 kPa/deg
Peak Heat Release Rate :	305.7 Joules/deg
Cumulative Heat Release :	3453.35 Joules
Apparent Combustion Efficiency :	70.1 %
Indicated Thermal Efficiency :	36.0 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	1.3 degrees
Centroid Phasing :	189.6 degrees
Centroid Magnitude :	48.88 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.04724

870527.152844 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	988.33	.564	531.30	.314
K2-Exhaust 2, F	1052.2	.549	566.79	.305
K3-Exhaust 3, F	1054.3	.735	567.96	.408
K4-Exhaust 4, F	1002.9	.657	539.41	.365
K5-Exhaust 5, F	1071.6	.629	577.55	.350
K6-Exhaust 6, F	996.35	.871	535.75	.484
K7-Exhaust Common, F	1119.6	.371	604.20	.206
Dry Bulb Temperature, F	84.834	.303	29.352	.168
Wet Bulb Temperature, F	76.370	.116	24.650	.064
J1-Water In, F	162.30	.147	72.387	.082
J2-Water Out, F	171.39	.061	77.440	.034
J3-Oil Sump, F	208.21	.178	97.892	.099
J4-Fuel Inlet, F	89.752	.139	32.084	.077
J5-Air After Filter, F	101.19	.192	38.438	.106
J6-Intake Manifold, F	101.97	.061	38.870	.034
J7-Fuel Return, F	91.652	.076	33.140	.042
P1-Fuel, PSIG	65.154	.411	449.22	2.831
P2-Oil Gallery, PSIG	45.465	.066	313.47	.452
P6-Ex Common, "H2OG	8.915	.364	2.218	.091
P7-Air Aft Filt, "H2OV	5.861	.271	1.458	.068
P8-Blowby, "H2OG	.108	.093	.027	.023
P11-Baro (Vent), "Hg ABS	28.881	.003	97.803	.009
Speed, RPM	1100.6	2.598	1100.6	2.598
Load, Lb-Ft	536.73	2.184	727.71	2.961
Smoke, %	14.709	.324	14.709	.324
Fuel Flow, Lb/Hr	50.568	4.327	22.937	1.963
Horsepower	112.48	.507	83.862	.378
Corrected Horsepower	120.05	.541	89.506	.403
BSFC, lb/hp-hr	.450	.039	.274	.024
Corrected BSFC	.421	.037	.256	.022
Relative Humidity	68.267	.583	68.267	.583
Reference Pressure, inHg	28.450		96.343	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1148

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.45 in-Hg
Speed :	1101 RPM
Load :	536.7 lb-ft
Fuel Flow :	50.6 lb/hr
Brake Power :	112.51 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	15.33 kW/cyl
Peak Pressure :	8.381 MPa
Peak Rate of Pressure Rise:	710.7 kPa/deg
Peak Heat Release Rate :	292.3 Joules/deg
Cumulative Heat Release :	3263.86 Joules
Apparent Combustion Efficiency :	65.7 %
Indicated Thermal Efficiency :	33.6 %
Brake Thermal Efficiency :	30.7 %
Ignition Delay :	1.2 degrees
Centroid Phasing :	189.0 degrees
Centroid Magnitude :	47.20 J/degree
Sensitivity :	26.8 degrees
Premixed/Diffusion Ratio :	.04433

CUMMINS NH220 LOG SHEET

TEST NO. 1 FUEL RF-2 AL-18299-F DATE 5-28-87 PAGE 5

Operator GREG							
Time	1:30	1:50	2:00	2:15	2:25	2:35	2:50
Test Hour							
Speed, RPM	2100	1800	1800	1800	1800	1800	1300
Load, lb–ft	470.9	515.3	364.8	268.0	131.1	39.9	347.5
Fuel Flow, lb/hr	79.7	75.6	48.9	38.1	23.1	14.5	65.4
Exh. Opacity, %	20.0	16.0	2.0	1.0	1.0	.5	18.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1169	1160	860	707	515	373	1124
Exhaust Cyl. 2	1260	1250	953	773	544	378	1200
Exhaust Cyl. 3	1207	1214	892	729	533	396	1187
Exhaust Cyl. 4	1178	1192	874	713	505	389	1154
Exhaust Cyl. 5	1196	1234	854	700	498	375	1213
Exhaust Cyl. 6	1116	1133	818	654	449	319	1108
Exhaust Common	1230	1268	885	713	494	368	1271
Water In	166	166	166	170	173	174	167
Water Out	173	174	173	173	174	175	175
Oil Sump	234	230	225	217	211	209	214
Fuel	94	94	94	93	93	93	94
Inlet Air	104	105	104	103	102	102	104
Wet Bulb	75.9	76.0	76.0	76.5	76.0	76.8	72.3
Dry Bulb	84.5	85.0	85.0	84.8	84.8	85.0	86.0
PRESSURES, PSIG							
Fuel Pump	127	116	57.0	40.0	23.0	14.0	100.0
Oil Gallery	55.4	54.8	53.8	57.1	58.3	58.8	56.7
LOW PRESSURES							
Intake Vac, in.water	3.3	2.4	2.6	2.8	2.8	2.9	1.8
Exh. Comm., in.Water	22.5	21.0	17.0	15.8	13.0	11.0	16.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	28.93	28.92	28.92	28.92	28.91	28.91	28.91

CUMMINS NH220 LOG SHEET

TEST NO. 1 FUEL BF-2 AL-15299-F DATE 5-28-87 PAGE 6

Operator GREG							
Time	3:00	3:10					
Test Hour							
Speed, RPM	1300	1100					
Load, lb–ft	554.8	536.1					
Fuel Flow, lb/hr	60.8	54.4					
Exh. Opacity, %	240	230					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1064	985					
Exhaust Cyl. 2	1141	1047					
Exhaust Cyl. 3	1137	1046					
Exhaust Cyl. 4	1098	999					
Exhaust Cyl. 5	1160	1067					
Exhaust Cyl. 6	1069	996					
Exhaust Common	1223	1112					
Water In	166	165					
Water Out	175	174					
Oil Sump	214	210					
Fuel	94	94					
Inlet Air	104	105					
Wet Bulb	76.8	77.0					
Dry Bulb	86.0	85.5					
PRESSURES, PSIG							
Fuel Pump	87.0	67.0					
Oil Gallery	53.1	46.8					
LOW PRESSURES							
Intake Vac, in.water	1.4	1.1					
Exh. Comm., in.Water	16.0	13.0					
Blowby, in.water	0	0					
Barometer, in.Hg	28.9	28.9					

870528.133650 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1170.2	1.076	632.33	.598
K2-Exhaust 2, F	1259.9	.426	682.14	.237
K3-Exhaust 3, F	1206.7	1.224	652.62	.680
K4-Exhaust 4, F	1179.0	.240	637.24	.133
K5-Exhaust 5, F	1197.1	.689	647.29	.383
K6-Exhaust 6, F	1115.4	.608	601.89	.338
K7-Exhaust Common, F	1230.1	.361	665.61	.200
Dry Bulb Temperature, F	83.928	.063	28.849	.035
Wet Bulb Temperature, F	77.495	.098	25.275	.054
J1-Water In, F	162.44	.092	72.468	.051
J2-Water Out, F	169.12	.041	76.177	.023
J3-Oil Sump, F	230.73	.094	110.41	.052
J4-Fuel Inlet, F	89.881	.112	32.156	.062
J5-Air After Filter, F	98.980	.170	37.211	.094
J6-Intake Manifold, F	99.734	.126	37.630	.070
J7-Fuel Return, F	93.990	.186	34.439	.103
P1-Fuel, PSIG	124.19	1.723	856.24	11.879
P2-Oil Gallery, PSIG	54.742	.032	377.44	.220
P6-Ex Common, "H2OG	24.795	.350	6.170	.087
P7-Air Aft Filt, "H2OV	7.673	.364	1.909	.091
P8-Blowby, "H2OG	.036	.025	.009	.006
P11-Baro (Vent), "Hg ABS	28.923	.002	97.945	.006
Speed, RPM	2100.9	2.313	2100.9	2.313
Load, Lb-Ft	468.71	3.651	635.48	4.949
Smoke, %	20.036	.413	20.036	.413
Fuel Flow, Lb/Hr	80.517	2.595	36.522	1.177
Horsepower	187.50	1.451	139.79	1.082
Corrected Horsepower	199.83	1.546	148.99	1.153
BSFC, lb/hp-hr	.429	.013	.261	.008
Corrected BSFC	.403	.012	.245	.007
Relative Humidity	75.114	.449	75.114	.449
Reference Pressure, inHg	28.359		96.034	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1150

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.36 in-Hg
Speed :	2101 RPM
Load :	468.7 lb-ft
Fuel Flow :	80.5 lb/hr
Brake Power :	187.50 bhp
BSFC :	.429 lb/bhp-hr
Indicated Power :	28.14 kW/cyl
Peak Pressure :	7.227 MPa
Peak Rate of Pressure Rise:	566.9 kPa/deg
Peak Heat Release Rate :	203.1 Joules/deg
Cumulative Heat Release :	3303.75 Joules
Apparent Combustion Efficiency :	79.8 %
Indicated Thermal Efficiency :	38.8 %
Brake Thermal Efficiency :	32.1 %
Ignition Delay :	3.6 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	40.18 J/degree
Sensitivity :	32.0 degrees
Premixed/Diffusion Ratio :	.11358

870528.134935 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1162.6	1.531	628.10	.851
K2-Exhaust 2, F	1251.1	.502	677.27	.279
K3-Exhaust 3, F	1214.7	.351	657.08	.195
K4-Exhaust 4, F	1192.7	.871	644.84	.484
K5-Exhaust 5, F	1234.8	.802	668.23	.445
K6-Exhaust 6, F	1131.1	.651	610.60	.362
K7-Exhaust Common, F	1269.5	.812	687.51	.451
Dry Bulb Temperature, F	84.189	.026	28.994	.014
Wet Bulb Temperature, F	77.433	.023	25.241	.013
J1-Water In, F	162.37	.100	72.429	.056
J2-Water Out, F	169.87	.048	76.596	.027
J3-Oil Sump, F	226.96	.064	108.31	.035
J4-Fuel Inlet, F	89.220	.094	31.789	.052
J5-Air After Filter, F	100.01	.183	37.785	.102
J6-Intake Manifold, F	101.02	.064	38.347	.036
J7-Fuel Return, F	92.271	.084	33.484	.047
P1-Fuel, PSIG	113.52	1.642	782.72	11.321
P2-Oil Gallery, PSIG	54.286	.020	374.29	.136
P6-Ex Common, "H2OG	17.422	.791	4.335	.197
P7-Air Aft Filt, "H2OV	6.992	.548	1.740	.136
P8-Blowby, "H2OG	.058	.031	.015	.008
P11-Baro (Vent), "Hg ABS	28.920	.004	97.936	.014
Speed, RPM	1801.4	3.175	1801.4	3.175
Load, Lb-Ft	515.60	5.072	699.05	6.877
Smoke, %	16.643	.494	16.643	.494
Fuel Flow, Lb/Hr	75.223	1.528	34.120	.693
Horsepower	176.85	1.984	131.85	1.479
Corrected Horsepower	188.63	2.116	140.64	1.578
BSFC, lb/hp-hr	.425	.012	.259	.007
Corrected BSFC	.399	.011	.243	.007
Relative Humidity	74.026	.082	74.026	.082
Reference Pressure, inHg	28.406		96.194	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1152

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.41 in-Hg
Speed :	1801 RPM
Load :	515.6 lb-ft
Fuel Flow :	75.2 lb/hr
Brake Power :	176.81 bhp
BSFC :	.425 lb/bhp-hr
Indicated Power :	25.79 kW/cyl
Peak Pressure :	7.682 MPa
Peak Rate of Pressure Rise:	636.3 kPa/deg
Peak Heat Release Rate :	237.6 Joules/deg
Cumulative Heat Release :	3433.92 Joules
Apparent Combustion Efficiency :	76.1 %
Indicated Thermal Efficiency :	38.1 %
Brake Thermal Efficiency :	32.4 %
Ignition Delay :	3.3 degrees
Centroid Phasing :	194.1 degrees
Centroid Magnitude :	42.13 J/degree
Sensitivity :	29.8 degrees
Premixed/Diffusion Ratio :	.10908

870528.135953 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	864.21	.767	462.34	.426
K2-Exhaust 2, F	960.19	1.886	515.66	1.048
K3-Exhaust 3, F	897.93	1.828	481.07	1.015
K4-Exhaust 4, F	882.37	1.904	472.43	1.058
K5-Exhaust 5, F	862.98	1.839	461.66	1.022
K6-Exhaust 6, F	822.82	1.800	439.34	1.000
K7-Exhaust Common, F	894.94	1.947	479.41	1.081
Dry Bulb Temperature, F	84.245	.055	29.025	.030
Wet Bulb Temperature, F	77.226	.005	25.125	.003
J1-Water In, F	164.78	.071	73.769	.039
J2-Water Out, F	169.39	.043	76.327	.024
J3-Oil Sump, F	221.04	.246	105.02	.136
J4-Fuel Inlet, F	88.829	.058	31.572	.032
J5-Air After Filter, F	98.477	.118	36.931	.066
J6-Intake Manifold, F	99.282	.129	37.379	.072
J7-Fuel Return, F	90.906	.113	32.725	.063
P1-Fuel, PSIG	55.866	.471	385.18	3.248
P2-Oil Gallery, PSIG	55.341	.033	381.57	.230
P6-Ex Common, "H2OG	13.831	.529	3.442	.132
P7-Air Aft Filt, "H2OV	7.016	.520	1.746	.129
P8-Blowby, "H2OG	.065	.048	.016	.012
P11-Baro (Vent), "Hg ABS	28.920	.003	97.933	.010
Speed, RPM	1799.5	2.959	1799.5	2.959
Load, Lb-Ft	365.08	6.626	494.97	8.984
Smoke, %	1.551	.175	1.551	.175
Fuel Flow, Lb/Hr	49.801	4.383	22.589	1.988
Horsepower	125.08	2.392	93.260	1.783
Corrected Horsepower	133.20	2.547	99.309	1.899
BSFC, lb/hp-hr	.398	.034	.242	.020
Corrected BSFC	.374	.032	.227	.019
Relative Humidity	73.103	.189	73.103	.189
Reference Pressure, inHg	28.404		96.186	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1154

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.40 in-Hg
Speed :	1800 RPM
Load :	365.1 lb-ft
Fuel Flow :	49.8 lb/hr
Brake Power :	125.13 bhp
BSFC :	.398 lb/bhp-hr
Indicated Power :	18.96 kW/cyl
Peak Pressure :	6.448 MPa
Peak Rate of Pressure Rise:	480.3 kPa/deg
Peak Heat Release Rate :	170.5 Joules/deg
Cumulative Heat Release :	2453.34 Joules
Apparent Combustion Efficiency :	82.1 %
Indicated Thermal Efficiency :	42.3 %
Brake Thermal Efficiency :	34.7 %
Ignition Delay :	7.3 degrees
Centroid Phasing :	192.5 degrees
Centroid Magnitude :	31.75 J/degree
Sensitivity :	24.3 degrees
Premixed/Diffusion Ratio :	.29927

870528.141152 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	707.95	.401	375.53	.223
K2-Exhaust 2, F	775.05	.585	412.81	.325
K3-Exhaust 3, F	729.30	.411	387.39	.228
K4-Exhaust 4, F	712.83	.533	378.24	.296
K5-Exhaust 5, F	698.65	.292	370.36	.162
K6-Exhaust 6, F	653.97	.423	345.54	.235
K7-Exhaust Common, F	714.00	.459	378.89	.255
Dry Bulb Temperature, F	84.817	.122	29.343	.068
Wet Bulb Temperature, F	77.340	.035	25.189	.020
J1-Water In, F	165.99	.084	74.437	.047
J2-Water Out, F	168.95	.031	76.082	.017
J3-Oil Sump, F	213.87	.146	101.04	.081
J4-Fuel Inlet, F	88.391	.017	31.328	.009
J5-Air After Filter, F	98.223	.225	36.791	.125
J6-Intake Manifold, F	99.009	.065	37.227	.036
J7-Fuel Return, F	89.833	.029	32.129	.016
P1-Fuel, PSIG	37.526	.472	258.73	3.258
P2-Oil Gallery, PSIG	56.791	.147	391.56	1.011
P6-Ex Common, "H2OG	12.738	.684	3.170	.170
P7-Air Aft Filt, "H2OV	6.923	.469	1.723	.117
P8-Blowby, "H2OG	.078	.037	.019	.009
P11-Baro (Vent), "Hg ABS	28.917	.003	97.923	.011
Speed, RPM	1800.0	2.692	1800.0	2.692
Load, Lb-Ft	267.45	4.820	362.60	6.534
Smoke, %	-.298	.101	-.298	.101
Fuel Flow, Lb/Hr	37.443	1.160	16.984	.526
Horsepower	91.662	1.742	68.341	1.299
Corrected Horsepower	97.591	1.855	72.761	1.383
BSFC, lb/hp-hr	.409	.018	.249	.011
Corrected BSFC	.384	.017	.234	.010
Relative Humidity	71.657	.349	71.657	.349
Reference Pressure, inHg	28.407		96.198	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1156

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.41 in-Hg
Speed :	1800 RPM
Load :	267.5 lb-ft
Fuel Flow :	37.4 lb/hr
Brake Power :	91.68 bhp
BSFC :	.408 lb/bhp-hr
Indicated Power :	14.89 kW/cyl
Peak Pressure :	5.755 MPa
Peak Rate of Pressure Rise:	384.9 kPa/deg
Peak Heat Release Rate :	133.9 Joules/deg
Cumulative Heat Release :	1907.27 Joules
Apparent Combustion Efficiency :	84.9 %
Indicated Thermal Efficiency :	44.2 %
Brake Thermal Efficiency :	33.8 %
Ignition Delay :	9.0 degrees
Centroid Phasing :	191.1 degrees
Centroid Magnitude :	26.67 J/degree
Sensitivity :	21.0 degrees
Premixed/Diffusion Ratio :	.42882

870528.142601 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	509.08	1.542	265.05	.857
K2-Exhaust 2, F	536.03	2.415	280.02	1.342
K3-Exhaust 3, F	526.76	1.390	274.87	.772
K4-Exhaust 4, F	501.31	1.532	260.73	.851
K5-Exhaust 5, F	492.35	1.749	255.75	.972
K6-Exhaust 6, F	444.16	1.865	228.98	1.036
K7-Exhaust Common, F	490.70	1.378	254.83	.766
Dry Bulb Temperature, F	84.998	.171	29.443	.095
Wet Bulb Temperature, F	77.420	.032	25.233	.018
J1-Water In, F	168.90	.117	76.057	.065
J2-Water Out, F	170.34	.092	76.856	.051
J3-Oil Sump, F	207.49	.131	97.496	.073
J4-Fuel Inlet, F	87.684	.037	30.936	.021
J5-Air After Filter, F	97.450	.259	36.361	.144
J6-Intake Manifold, F	98.525	.059	36.958	.033
J7-Fuel Return, F	87.954	.033	31.085	.018
P1-Fuel, PSIG	19.712	.336	135.91	2.318
P2-Oil Gallery, PSIG	57.938	.035	399.47	.243
P6-Ex Common, "H2OG	9.010	.543	2.242	.135
P7-Air Aft Filt, "H2OV	7.161	.504	1.782	.125
P8-Blowby, "H2OG	.052	.070	.013	.017
P11-Baro (Vent), "Hg ABS	28.911	.004	97.905	.014
Speed, RPM	1798.5	3.385	1798.5	3.385
Load, Lb-Ft	132.79	6.586	180.03	8.930
Smoke, %	.924	.100	.924	.100
Fuel Flow, Lb/Hr	22.261	.759	10.098	.344
Horsepower	45.473	2.282	33.904	1.702
Corrected Horsepower	48.393	2.429	36.080	1.811
BSFC, lb/hp-hr	.490	.026	.298	.016
Corrected BSFC	.461	.025	.280	.015
Relative Humidity	71.360	.545	71.360	.545
Reference Pressure, inHg	28.385		96.121	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1158

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.39 in-Hg
Speed :	1799 RPM
Load :	132.8 lb-ft
Fuel Flow :	22.3 lb/hr
Brake Power :	45.49 bhp
BSFC :	.490 lb/bhp-hr
Indicated Power :	8.98 kW/cyl
Peak Pressure :	5.030 MPa
Peak Rate of Pressure Rise:	223.8 kPa/deg
Peak Heat Release Rate :	71.2 Joules/deg
Cumulative Heat Release :	1183.69 Joules
Apparent Combustion Efficiency :	88.4 %
Indicated Thermal Efficiency :	44.7 %
Brake Thermal Efficiency :	28.2 %
Ignition Delay :	10.6 degrees
Centroid Phasing :	189.5 degrees
Centroid Magnitude :	19.22 J/degree
Sensitivity :	17.9 degrees
Premixed/Diffusion Ratio :	.59039

870528.143455 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	373.35	.739	189.64	.411
K2-Exhaust 2, F	378.71	.392	192.62	.218
K3-Exhaust 3, F	395.28	1.235	201.82	.686
K4-Exhaust 4, F	389.56	.849	198.65	.472
K5-Exhaust 5, F	374.86	.352	190.48	.196
K6-Exhaust 6, F	319.86	.480	159.92	.267
K7-Exhaust Common, F	369.43	.519	187.46	.288
Dry Bulb Temperature, F	86.172	.092	30.095	.051
Wet Bulb Temperature, F	78.464	.043	25.813	.024
J1-Water In, F	170.62	.112	77.010	.062
J2-Water Out, F	171.21	.071	77.340	.040
J3-Oil Sump, F	205.16	.047	96.200	.026
J4-Fuel Inlet, F	87.387	.083	30.770	.046
J5-Air After Filter, F	97.502	.105	36.390	.058
J6-Intake Manifold, F	99.506	.124	37.503	.069
J7-Fuel Return, F	87.504	.047	30.836	.026
P1-Fuel, PSIG	11.111	.065	76.608	.449
P2-Oil Gallery, PSIG	58.302	.029	401.98	.199
P6-Ex Common, "H2OG	6.898	.281	1.717	.070
P7-Air Aft Filt, "H2OV	7.230	.525	1.799	.131
P8-Blowby, "H2OG	.104	.042	.026	.010
P11-Baro (Vent), "Hg ABS	28.908	.004	97.893	.015
Speed, RPM	1799.5	3.618	1799.5	3.618
Load, Lb-Ft	40.351	3.101	54.708	4.205
Smoke, %	.416	.060	.416	.060
Fuel Flow, Lb/Hr	13.757	.389	6.240	.177
Horsepower	13.826	1.067	10.308	.795
Corrected Horsepower	14.733	1.137	10.984	.848
BSFC, lb/hp-hr	1.000	.070	.608	.042
Corrected BSFC	.938	.065	.571	.040
Relative Humidity	71.254	.349	71.254	.349
Reference Pressure, inHg	28.376		96.092	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1160

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.38 in-Hg
Speed :	1800 RPM
Load :	40.3 lb-ft
Fuel Flow :	13.8 lb/hr
Brake Power :	13.83 bhp
BSFC :	.998 lb/bhp-hr
Indicated Power :	4.31 kW/cyl
Peak Pressure :	4.608 MPa
Peak Rate of Pressure Rise:	136.7 kPa/deg
Peak Heat Release Rate :	46.8 Joules/deg
Cumulative Heat Release :	631.183 Joules
Apparent Combustion Efficiency :	76.2 %
Indicated Thermal Efficiency :	34.7 %
Brake Thermal Efficiency :	13.8 %
Ignition Delay :	12.0 degrees
Centroid Phasing :	189.4 degrees
Centroid Magnitude :	13.05 J/degree
Sensitivity :	16.4 degrees
Premixed/Diffusion Ratio :	.73107

970528.144805 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1124.1	.657	606.72	.365
K2-Exhaust 2, F	1202.3	1.219	650.18	.677
K3-Exhaust 3, F	1185.6	1.062	640.90	.590
K4-Exhaust 4, F	1152.5	1.449	622.53	.805
K5-Exhaust 5, F	1212.7	.809	655.95	.449
K6-Exhaust 6, F	1103.7	1.115	595.40	.619
K7-Exhaust Common, F	1268.7	1.239	687.06	.688
Dry Bulb Temperature, F	86.674	.120	30.375	.067
Wet Bulb Temperature, F	78.860	.073	26.033	.041
J1-Water In, F	162.68	.061	72.601	.034
J2-Water Out, F	170.60	.047	76.999	.026
J3-Oil Sump, F	209.64	.218	98.689	.121
J4-Fuel Inlet, F	89.882	.065	32.157	.036
J5-Air After Filter, F	99.667	.284	37.593	.158
J6-Intake Manifold, F	100.94	.093	38.302	.052
J7-Fuel Return, F	92.255	.044	33.475	.025
P1-Fuel, PSIG	98.897	1.277	681.87	8.803
P2-Oil Gallery, PSIG	55.990	.029	386.04	.201
P6-Ex Common, "H2OG	13.320	.774	3.315	.193
P7-Air Aft Filt, "H2OV	6.262	.217	1.558	.054
P8-Blowby, "H2OG	.091	.017	.023	.004
P11-Baro (Vent), "Hg ABS	28.901	.002	97.871	.008
Speed, RPM	1500.1	2.111	1500.1	2.111
Load, Lb-Ft	546.41	2.523	740.82	3.420
Smoke, %	17.963	.573	17.963	.573
Fuel Flow, Lb/Hr	68.321	1.641	30.990	.744
Horsepower	156.06	.600	116.36	.447
Corrected Horsepower	166.73	.641	124.31	.478
BSFC, lb/hp-hr	.438	.010	.266	.006
Corrected BSFC	.410	.010	.249	.006
Relative Humidity	71.038	.211	71.038	.211
Reference Pressure, inHg	28.441		96.311	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1162

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.44 in-Hg
Speed :	1500 RPM
Load :	546.4 lb-ft
Fuel Flow :	68.3 lb/hr
Brake Power :	156.05 bhp
BSFC :	.438 lb/bhp-hr
Indicated Power :	21.62 kW/cyl
Peak Pressure :	8.171 MPa
Peak Rate of Pressure Rise:	771.1 kPa/deg
Peak Heat Release Rate :	312.7 Joules/deg
Cumulative Heat Release :	3423.15 Joules
Apparent Combustion Efficiency :	69.6 %
Indicated Thermal Efficiency :	35.1 %
Brake Thermal Efficiency :	31.5 %
Ignition Delay :	.6 degrees
Centroid Phasing :	191.5 degrees
Centroid Magnitude :	46.63 J/degree
Sensitivity :	29.9 degrees
Premixed/Diffusion Ratio :	.02101

870528.145742 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1064.0	.465	573.32	.258
K2-Exhaust 2, F	1142.5	.769	616.94	.427
K3-Exhaust 3, F	1136.2	.570	613.44	.317
K4-Exhaust 4, F	1096.0	1.135	591.11	.631
K5-Exhaust 5, F	1161.3	.582	627.41	.323
K6-Exhaust 6, F	1068.4	.557	575.79	.309
K7-Exhaust Common, F	1220.8	1.484	660.43	.824
Dry Bulb Temperature, F	85.639	.064	29.800	.035
Wet Bulb Temperature, F	77.843	.069	25.468	.039
J1-Water In, F	162.00	.153	72.221	.085
J2-Water Out, F	170.97	.110	77.204	.061
J3-Oil Sump, F	209.41	.047	98.560	.026
J4-Fuel Inlet, F	89.395	.080	31.886	.044
J5-Air After Filter, F	99.030	.189	37.239	.105
J6-Intake Manifold, F	100.65	.117	38.140	.065
J7-Fuel Return, F	91.741	.086	33.190	.048
P1-Fuel, PSIG	85.167	.615	587.21	4.239
P2-Oil Gallery, PSIG	52.674	.025	363.18	.176
P6-Ex Common, "H2OG	12.649	.459	3.148	.114
P7-Air Aft Filt, "H2OV	6.077	.182	1.512	.045
P8-Blowby, "H2OG	.101	.048	.025	.012
P11-Baro (Vent), "Hg ABS	28.894	.001	97.845	.004
Speed, RPM	1300.6	2.703	1300.6	2.703
Load, Lb-Ft	554.90	2.264	752.34	3.070
Smoke, %	25.223	.727	25.223	.727
Fuel Flow, Lb/Hr	60.587	.716	27.482	.325
Horsepower	137.41	.691	102.45	.515
Corrected Horsepower	146.59	.737	109.29	.550
BSFC, lb/hp-hr	.441	.005	.268	.003
Corrected BSFC	.413	.005	.251	.003
Relative Humidity	70.797	.325	70.797	.325
Reference Pressure, inHg	28.447		96.331	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1164

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.45 in-Hg
Speed :	1301 RPM
Load :	554.9 lb-ft
Fuel Flow :	60.6 lb/hr
Brake Power :	137.46 bhp
BSFC :	.441 lb/bhp-hr
Indicated Power :	19.07 kW/cyl
Peak Pressure :	8.409 MPa
Peak Rate of Pressure Rise:	741.8 kPa/deg
Peak Heat Release Rate :	303.8 Joules/deg
Cumulative Heat Release :	3453.25 Joules
Apparent Combustion Efficiency :	68.6 %
Indicated Thermal Efficiency :	34.9 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	.9 degrees
Centroid Phasing :	190.1 degrees
Centroid Magnitude :	47.65 J/degree
Sensitivity :	28.2 degrees
Premixed/Diffusion Ratio :	.03110

970528.150819 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	985.99	.683	530.00	.380
K2-Exhaust 2, F	1049.8	.979	565.46	.544
K3-Exhaust 3, F	1048.7	.465	564.86	.258
K4-Exhaust 4, F	999.29	.645	537.38	.358
K5-Exhaust 5, F	1068.1	.618	575.63	.343
K6-Exhaust 6, F	994.51	.667	534.73	.371
K7-Exhaust Common, F	1115.2	.470	601.78	.261
Dry Bulb Temperature, F	86.154	.137	30.086	.076
Wet Bulb Temperature, F	78.347	.068	25.748	.038
J1-Water In, F	160.72	.103	71.512	.057
J2-Water Out, F	170.04	.085	76.690	.047
J3-Oil Sump, F	206.25	.154	96.806	.086
J4-Fuel Inlet, F	89.271	.047	31.817	.026
J5-Air After Filter, F	99.936	.107	37.742	.060
J6-Intake Manifold, F	100.94	.153	38.302	.085
J7-Fuel Return, F	90.846	.048	32.692	.027
P1-Fuel, PSIG	65.109	.456	448.91	3.141
P2-Oil Gallery, PSIG	46.409	.066	319.98	.454
P6-Ex Common, "H2OG	9.038	.412	2.249	.103
P7-Air Aft Filt, "H2OV	5.577	.219	1.388	.055
P8-Blowby, "H2OG	.030	.106	.008	.026
P11-Baro (Vent), "Hg ABS	28.895	.002	97.850	.008
Speed, RPM	1100.7	3.018	1100.7	3.018
Load, Lb-Ft	537.81	1.167	729.17	1.582
Smoke, %	23.048	.438	23.048	.438
Fuel Flow, Lb/Hr	50.737	2.258	23.014	1.024
Horsepower	112.71	.329	84.035	.245
Corrected Horsepower	120.40	.351	89.768	.262
BSFC, lb/hp-hr	.450	.020	.274	.012
Corrected BSFC	.421	.019	.256	.011
Relative Humidity	70.912	.421	70.912	.421
Reference Pressure, inHg	28.485		96.461	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1166

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.49 in-Hg
Speed :	1101 RPM
Load :	537.8 lb-ft
Fuel Flow :	50.7 lb/hr
Brake Power :	112.74 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	15.19 kW/cyl
Peak Pressure :	8.408 MPa
Peak Rate of Pressure Rise:	718.1 kPa/deg
Peak Heat Release Rate :	302.8 Joules/deg
Cumulative Heat Release :	3248.60 Joules
Apparent Combustion Efficiency :	65.3 %
Indicated Thermal Efficiency :	33.3 %
Brake Thermal Efficiency :	30.7 %
Ignition Delay :	1.1 degrees
Centroid Phasing :	189.1 degrees
Centroid Magnitude :	48.53 J/degree
Sensitivity :	27.0 degrees
Premixed/Diffusion Ratio :	.04052

CUMMINS NH220 LOG SHEET

TEST NO. 1 FUEL BF-2 AF-1599-F DATE 5-27-87 PAGE 7

Operator GRG							
Time	10:35	10:55	11:05	11:25	11:45		
Test Hour							
Speed, RPM	2100	1800	1500	1300	1100		
Load, lb–ft	468.2	512.7	550.3	557.2	537.5		
Fuel Flow, lb/hr	84.6	74.1	65.4	61.1	50.2		
Exh. Opacity, %	19.5	13.0	12.0	14.0	14.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1171	1164	1135	1085	987		
Exhaust Cyl. 2	1264	1247	1210	1147	1060		
Exhaust Cyl. 3	1220	1222	1205	1150	1051		
Exhaust Cyl. 4	1197	1199	1178	1115	1010		
Exhaust Cyl. 5	1205	1232	1221	1166	1072		
Exhaust Cyl. 6	1125	1193	1121	1078	997		
Exhaust Common	1240	1266	1279	1224	1118		
Water In	167	168	168	166	167		
Water Out	174	174	175	175	175		
Oil Sump	234	230	225	216	213		
Fuel	93	94	94	94	95		
Inlet Air	105	106	105	103	105		
Wet Bulb	68.8	69.2	69.0	69.0	71.0		
Dry Bulb	75.8	75.8	76.2	77.0	77.0		
PRESSURES, PSIG							
Fuel Pump	126.0	113	101	82	67		
Oil Gallery	55.8	54.8	52.9	51.1	49.1		
LOW PRESSURES							
Intake Vac, in.water	3.3	2.4	1.8	1.4	1.1		
Exh. Comm., in.Water	27.5	20.5	16.5	16.0	12.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	28.97	29.02	29.07	29.01	29.0		

870529.103620 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1170.3	1.153	632.41	.641
K2-Exhaust 2, F	1264.3	.715	684.59	.397
K3-Exhaust 3, F	1219.7	.586	659.85	.325
K4-Exhaust 4, F	1197.2	.894	647.31	.497
K5-Exhaust 5, F	1206.2	.851	652.33	.473
K6-Exhaust 6, F	1124.0	.548	606.68	.304
K7-Exhaust Common, F	1239.8	.490	671.00	.272
Dry Bulb Temperature, F	72.056	.104	22.253	.058
Wet Bulb Temperature, F	67.609	.027	19.783	.015
J1-Water In, F	162.97	.072	72.763	.040
J2-Water Out, F	169.26	.056	76.253	.031
J3-Oil Sump, F	229.75	.153	109.86	.085
J4-Fuel Inlet, F	87.007	.079	30.559	.044
J5-Air After Filter, F	101.78	.172	38.767	.096
J6-Intake Manifold, F	105.64	.157	40.912	.087
J7-Fuel Return, F	90.685	.097	32.603	.054
P1-Fuel, PSIG	125.76	1.692	867.05	11.669
P2-Oil Gallery, PSIG	55.224	.029	380.76	.203
P6-Ex Common, "H2OG	24.708	.422	6.148	.105
P7-Air Aft Filt, "H2OV	7.011	.257	1.745	.064
P8-Blowby, "H2OG	.214	.040	.053	.010
P11-Baro (Vent), "Hg ABS	28.966	.003	98.091	.010
Speed, RPM	2102.1	1.634	2102.1	1.634
Load, Lb-Ft	466.77	5.212	632.86	7.066
Smoke, %	19.647	.458	19.647	.458
Fuel Flow, Lb/Hr	82.774	1.760	37.546	.798
Horsepower	186.83	2.043	139.29	1.523
Corrected Horsepower	197.56	2.160	147.29	1.611
BSFC, lb/hp-hr	.443	.011	.270	.007
Corrected BSFC	.419	.010	.255	.006
Relative Humidity	79.837	.369	79.837	.369
Reference Pressure, inHg	28.451		96.345	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1168

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.45 in-Hg
Speed :	2102 RPM
Load :	466.8 lb-ft
Fuel Flow :	82.8 lb/hr
Brake Power :	186.83 bhp
BSFC :	.443 lb/bhp-hr
Indicated Power :	28.19 kW/cyl
Peak Pressure :	7.198 MPa
Peak Rate of Pressure Rise:	545.6 kPa/deg
Peak Heat Release Rate :	194.6 Joules/deg
Cumulative Heat Release :	3304.23 Joules
Apparent Combustion Efficiency :	77.6 %
Indicated Thermal Efficiency :	37.8 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	3.5 degrees
Centroid Phasing :	196.8 degrees
Centroid Magnitude :	37.00 J/degree
Sensitivity :	32.2 degrees
Premixed/Diffusion Ratio :	.11007

870529.105541 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1164.1	.668	628.94	.371
K2-Exhaust 2, F	1247.4	.737	675.21	.410
K3-Exhaust 3, F	1221.4	.511	660.77	.284
K4-Exhaust 4, F	1196.6	.444	647.02	.247
K5-Exhaust 5, F	1230.1	.643	665.59	.357
K6-Exhaust 6, F	1131.4	.800	610.78	.445
K7-Exhaust Common, F	1263.8	.482	684.31	.268
Dry Bulb Temperature, F	71.811	.302	22.117	.168
Wet Bulb Temperature, F	67.563	.118	19.757	.065
J1-Water In, F	162.87	.110	72.704	.061
J2-Water Out, F	170.21	.067	76.781	.037
J3-Oil Sump, F	227.21	.065	108.45	.036
J4-Fuel Inlet, F	89.361	.023	31.867	.013
J5-Air After Filter, F	103.17	.172	39.541	.095
J6-Intake Manifold, F	106.29	.162	41.274	.090
J7-Fuel Return, F	92.636	.044	33.686	.025
P1-Fuel, PSIG	110.87	1.781	764.41	12.282
P2-Oil Gallery, PSIG	54.306	.017	374.43	.118
P6-Ex Common, "H2OG	18.282	.623	4.549	.155
P7-Air Aft Filt, "H2OV	5.749	.513	1.431	.128
P8-Blowby, "H2OG	.152	.046	.038	.011
P11-Baro (Vent), "Hg ABS	29.015	.004	98.256	.015
Speed, RPM	1801.3	1.497	1801.3	1.497
Load, Lb-Ft	514.97	5.401	698.21	7.322
Smoke, %	13.271	.478	13.271	.478
Fuel Flow, Lb/Hr	74.911	2.116	33.979	.960
Horsepower	176.63	1.893	131.69	1.411
Corrected Horsepower	186.69	2.001	139.19	1.492
BSFC, lb/hp-hr	.424	.012	.258	.007
Corrected BSFC	.401	.011	.244	.007
Relative Humidity	80.635	1.037	80.635	1.037
Reference Pressure, inHg	28.592		96.824	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1170

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.59 in-Hg
Speed :	1801 RPM
Load :	515.0 lb-ft
Fuel Flow :	74.9 lb/hr
Brake Power :	176.60 bhp
BSFC :	.424 lb/bhp-hr
Indicated Power :	25.16 kW/cyl
Peak Pressure :	7.666 MPa
Peak Rate of Pressure Rise:	618.5 kPa/deg
Peak Heat Release Rate :	228.4 Joules/deg
Cumulative Heat Release :	3350.38 Joules
Apparent Combustion Efficiency :	74.5 %
Indicated Thermal Efficiency :	37.3 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	3.3 degrees
Centroid Phasing :	193.8 degrees
Centroid Magnitude :	39.51 J/degree
Sensitivity :	29.5 degrees
Premixed/Diffusion Ratio :	.11190

870529.110715 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1135.3	.500	612.93	.278
K2-Exhaust 2, F	1210.1	.607	654.51	.337
K3-Exhaust 3, F	1204.2	.473	651.20	.263
K4-Exhaust 4, F	1177.1	.626	636.19	.348
K5-Exhaust 5, F	1222.3	.662	661.29	.368
K6-Exhaust 6, F	1119.1	.540	603.94	.300
K7-Exhaust Common, F	1279.4	.398	692.98	.221
Dry Bulb Temperature, F	70.985	.293	21.658	.163
Wet Bulb Temperature, F	67.320	.086	19.622	.048
J1-Water In, F	163.05	.083	72.806	.046
J2-Water Out, F	171.63	.082	77.571	.046
J3-Oil Sump, F	221.47	.322	105.26	.179
J4-Fuel Inlet, F	90.254	.516	32.363	.287
J5-Air After Filter, F	103.16	.264	39.534	.147
J6-Intake Manifold, F	103.24	.059	39.578	.033
J7-Fuel Return, F	92.223	.033	33.457	.018
P1-Fuel, PSIG	98.517	1.850	679.25	12.757
P2-Oil Gallery, PSIG	52.613	.068	362.76	.468
P6-Ex Common, "H2OG	15.608	.650	3.884	.162
P7-Air Aft Filt, "H2OV	4.033	.295	1.004	.073
P8-Blowby, "H2OG	.162	.037	.040	.009
P11-Baro (Vent), "Hg ABS	29.056	.003	98.393	.010
Speed, RPM	1500.6	2.074	1500.6	2.074
Load, Lb-Ft	551.05	2.915	747.12	3.953
Smoke, %	12.625	.579	12.625	.579
Fuel Flow, Lb/Hr	68.877	1.667	31.242	.756
Horsepower	157.44	.676	117.39	.504
Corrected Horsepower	166.18	.713	123.90	.532
BSFC, lb/hp-hr	.437	.011	.266	.007
Corrected BSFC	.414	.010	.252	.006
Relative Humidity	83.002	.895	83.002	.895
Reference Pressure, inHg	28.759		97.389	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1172

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.76 in-Hg
Speed :	1501 RPM
Load :	551.1 lb-ft
Fuel Flow :	68.9 lb/hr
Brake Power :	157.50 bhp
BSFC :	.437 lb/bhp-hr
Indicated Power :	21.75 kW/cyl
Peak Pressure :	8.237 MPa
Peak Rate of Pressure Rise:	726.5 kPa/deg
Peak Heat Release Rate :	294.3 Joules/deg
Cumulative Heat Release :	3433.70 Joules
Apparent Combustion Efficiency :	69.2 %
Indicated Thermal Efficiency :	35.1 %
Brake Thermal Efficiency :	31.5 %
Ignition Delay :	.7 degrees
Centroid Phasing :	191.2 degrees
Centroid Magnitude :	45.50 J/degree
Sensitivity :	29.5 degrees
Premixed/Diffusion Ratio :	.02371

870529.112757 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1064.2	1.152	573.43	.640
K2-Exhaust 2, F	1146.9	1.389	619.37	.772
K3-Exhaust 3, F	1150.1	.649	621.18	.360
K4-Exhaust 4, F	1113.8	.732	601.02	.407
K5-Exhaust 5, F	1164.7	.528	629.27	.293
K6-Exhaust 6, F	1077.1	1.012	580.64	.562
K7-Exhaust Common, F	1221.6	.670	660.87	.372
Dry Bulb Temperature, F	73.062	.093	22.812	.051
Wet Bulb Temperature, F	67.957	.005	19.976	.003
J1-Water In, F	161.75	.134	72.084	.075
J2-Water Out, F	170.68	.116	77.046	.065
J3-Oil Sump, F	213.50	.085	100.83	.047
J4-Fuel Inlet, F	90.082	.061	32.268	.034
J5-Air After Filter, F	97.930	.130	36.628	.072
J6-Intake Manifold, F	101.57	.052	38.649	.029
J7-Fuel Return, F	92.603	.089	33.668	.049
P1-Fuel, PSIG	85.718	.534	591.01	3.683
P2-Oil Gallery, PSIG	50.927	.051	351.13	.352
P6-Ex Common, "H2OG	13.837	.406	3.443	.101
P7-Air Aft Filt, "H2OV	4.214	.223	1.049	.055
P8-Blowby, "H2OG	.007	.052	.002	.013
P11-Baro (Vent), "Hg ABS	29.019	.002	98.270	.007
Speed, RPM	1300.3	2.848	1300.3	2.848
Load, Lb-Ft	558.35	2.058	757.02	2.791
Smoke, %	14.025	.574	14.025	.574
Fuel Flow, Lb/Hr	60.641	.975	27.506	.442
Horsepower	138.24	.458	103.07	.341
Corrected Horsepower	145.41	.482	108.41	.359
BSFC, lb/hp-hr	.439	.006	.267	.004
Corrected BSFC	.417	.006	.254	.004
Relative Humidity	77.294	.356	77.294	.356
Reference Pressure, inHg	28.709		97.221	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1174

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.71 in-Hg
Speed :	1300 RPM
Load :	558.4 lb-ft
Fuel Flow :	60.6 lb/hr
Brake Power :	138.22 bhp
BSFC :	.438 lb/bhp-hr
Indicated Power :	18.74 kW/cyl
Peak Pressure :	8.439 MPa
Peak Rate of Pressure Rise:	775.9 kPa/deg
Peak Heat Release Rate :	325.1 Joules/deg
Cumulative Heat Release :	3354.49 Joules
Apparent Combustion Efficiency :	66.6 %
Indicated Thermal Efficiency :	34.3 %
Brake Thermal Efficiency :	31.5 %
Ignition Delay :	.9 degrees
Centroid Phasing :	189.5 degrees
Centroid Magnitude :	48.98 J/degree
Sensitivity :	27.5 degrees
Premixed/Diffusion Ratio :	.03436

870529.114504 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	986.75	.391	530.41	.217
K2-Exhaust 2, F	1060.6	.469	571.47	.261
K3-Exhaust 3, F	1052.9	.965	567.16	.536
K4-Exhaust 4, F	1011.5	.570	544.14	.317
K5-Exhaust 5, F	1072.6	.537	578.09	.298
K6-Exhaust 6, F	997.50	.530	536.39	.294
K7-Exhaust Common, F	1118.0	.360	603.32	.200
Dry Bulb Temperature, F	73.843	.153	23.246	.085
Wet Bulb Temperature, F	68.696	.048	20.387	.026
J1-Water In, F	161.62	.091	72.011	.051
J2-Water Out, F	171.01	.126	77.229	.070
J3-Oil Sump, F	209.90	.097	98.833	.054
J4-Fuel Inlet, F	92.793	.028	33.774	.016
J5-Air After Filter, F	102.24	.088	39.022	.049
J6-Intake Manifold, F	104.35	.049	40.197	.027
J7-Fuel Return, F	94.253	.069	34.585	.038
P1-Fuel, PSIG	64.822	.383	446.93	2.640
P2-Oil Gallery, PSIG	45.515	.017	313.82	.116
P6-Ex Common, "H2OG	10.979	.398	2.732	.099
P7-Air Aft Filt, "H2OV	3.657	.276	.910	.069
P8-Blowby, "H2OG	.081	.108	.020	.027
P11-Baro (Vent), "Hg ABS	29.028	.001	98.301	.005
Speed, RPM	1101.5	3.254	1101.5	3.254
Load, Lb-Ft	536.97	1.641	728.03	2.225
Smoke, %	14.468	.597	14.468	.597
Fuel Flow, Lb/Hr	49.777	1.529	22.578	.694
Horsepower	112.62	.551	83.968	.411
Corrected Horsepower	118.96	.582	88.690	.434
BSFC, lb/hp-hr	.442	.014	.269	.009
Corrected BSFC	.418	.014	.255	.008
Relative Humidity	77.339	.452	77.339	.452
Reference Pressure, inHg	28.759		97.390	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1176

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.76 in-Hg
Speed :	1102 RPM
Load :	537.0 lb-ft
Fuel Flow :	49.8 lb/hr
Brake Power :	112.68 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	17.59 kW/cyl
Peak Pressure :	8.360 MPa
Peak Rate of Pressure Rise:	524.2 kPa/deg
Peak Heat Release Rate :	190.8 Joules/deg
Cumulative Heat Release :	3413.46 Joules
Apparent Combustion Efficiency :	69.9 %
Indicated Thermal Efficiency :	39.2 %
Brake Thermal Efficiency :	31.2 %
Ignition Delay :	1.2 degrees
Centroid Phasing :	183.1 degrees
Centroid Magnitude :	47.96 J/degree
Sensitivity :	20.8 degrees
Premixed/Diffusion Ratio :	.05957

CUMMINS NH220 LOG SHEET

TEST NO. 1 FUEL BF-2 AL-15299-F DATE 6-487 PAGE 8

Operator GREG							
Time	9:00	9:30	9:45	10:00	10:10	10:20	10:40
Test Hour							
Speed, RPM	2100	1800	1800	1800	1800	1800	1500
Load, lb–ft	470.4	514.6	368.7	270.2	132.2	42.8	549.6
Fuel Flow, lb/hr	81.3	75.4	53.0	36.6	21.7	14.2	68.8
Exh. Opacity, %	20.5	13.5	2.0	1.0	1.0	.5	17.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1160	1165	863	715	515	377	1126
Exhaust Cyl. 2	1253	1247	957	782	543	379	1212
Exhaust Cyl. 3	1216	1223	896	739	536	404	1201
Exhaust Cyl. 4	1189	1148	882	728	524	400	1176
Exhaust Cyl. 5	1194	1231	860	705	500	373	1216
Exhaust Cyl. 6	1113	1131	820	660	440	325	1109
Exhaust Common	1228	1254	890	721	501	372	1274
Water In	168	167	170	170	174	174	167
Water Out	174	175	174	174	175	175	175
Oil Sump	230	233	226	224	220	216	223
Fuel	93	94	94	94	94	93	95
Inlet Air	104	105	105	105	104	104	101
Wet Bulb	70.5	70.2	70.4	70.9	72.0	71.0	71.0
Dry Bulb	75.0	74.5	74.2	75.0	76.0	75.5	75.1
PRESSURES, PSIG							
Fuel Pump	126	114	57	40.0	21	14.0	102
Oil Gallery	56.2	54.3	53.7	57.0	56.9	57.8	54.2
LOW PRESSURES							
Intake Vac, in.water	3.4	2.4	2.6	2.7	2.8	2.8	1.8
Exh. Comm., in.Water	27.0	20.5	17.0	15.5	12.5	10.5	16.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.12	29.13	29.14	29.14	29.14	29.15	29.14

CUMMINS NH220 LOG SHEET

TEST NO. 1 FUEL BF-2 DATE 6-4-87 PAGE 9

Operator GREG							
Time	10:50	11:05					
Test Hour							
Speed, RPM	1300	1100					
Load, lb–ft	558.3	541.6					
Fuel Flow, lb/hr	61.5	50.3					
Exh. Opacity, %	16.0	13.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1064	948					
Exhaust Cyl. 2	1155	1056					
Exhaust Cyl. 3	1157	1061					
Exhaust Cyl. 4	1124	1024					
Exhaust Cyl. 5	1173	1084					
Exhaust Cyl. 6	1078	1007					
Exhaust Common	1242	1134					
Water In	166	167					
Water Out	175	175					
Oil Sump	221	219					
Fuel	94	94					
Inlet Air	105	105					
Wet Bulb	71.5	71.5					
Dry Bulb	75.5	75.0					
PRESSURES, PSIG							
Fuel Pump	88.0	68.0					
Oil Gallery	49.5	43.2					
LOW PRESSURES							
Intake Vac, in.water	1.4	1.1					
Exh. Comm., in.Water	16.0	13.0					
Blowby, in.water	0	0					
Barometer, in.Hg	29.15	29.15					

970604.085853 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1158.6	.648	625.91	.360
K2-Exhaust 2, F	1250.3	.371	676.84	.206
K3-Exhaust 3, F	1213.5	1.097	656.41	.609
K4-Exhaust 4, F	1187.6	.569	641.99	.316
K5-Exhaust 5, F	1195.1	.300	646.19	.166
K6-Exhaust 6, F	1111.4	.485	599.65	.269
K7-Exhaust Common, F	1227.1	.286	663.95	.159
Dry Bulb Temperature, F	74.751	.067	23.750	.037
Wet Bulb Temperature, F	72.302	.041	22.390	.023
J1-Water In, F	163.10	.055	72.834	.031
J2-Water Out, F	169.35	.032	76.304	.018
J3-Oil Sump, F	227.18	.203	108.44	.113
J4-Fuel Inlet, F	87.336	.054	30.742	.030
J5-Air After Filter, F	98.213	.205	36.785	.114
J6-Intake Manifold, F	103.93	.089	39.962	.050
J7-Fuel Return, F	91.073	.053	32.818	.029
P1-Fuel, PSIG	123.54	1.199	851.76	8.265
P2-Oil Gallery, PSIG	55.855	.060	385.11	.415
P6-Ex Common, "H2OG	27.001	.324	6.719	.081
P7-Air Aft Filt, "H2OV	4.971	.294	1.237	.073
P8-Blowby, "H2OG	.169	.026	.042	.006
P11-Baro (Vent), "Hg ABS	29.117	.002	98.600	.006
Speed, RPM	2101.2	2.454	2101.2	2.454
Load, Lb-Ft	466.06	2.149	631.90	2.914
Smoke, %	20.694	.401	20.694	.401
Fuel Flow, Lb/Hr	80.866	.943	36.680	.428
Horsepower	186.46	.900	139.02	.671
Corrected Horsepower	196.48	.948	146.49	.707
BSFC, lb/hp-hr	.434	.005	.264	.003
Corrected BSFC	.412	.005	.250	.003
Relative Humidity	89.018	.169	89.018	.169
Reference Pressure, inHg	28.751		97.362	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1178

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.75 in-Hg
Speed :	2101 RPM
Load :	466.1 lb-ft
Fuel Flow :	80.9 lb/hr
Brake Power :	186.46 bhp
BSFC :	.434 lb/bhp-hr
Indicated Power :	27.93 kW/cyl
Peak Pressure :	7.187 MPa
Peak Rate of Pressure Rise:	529.3 kPa/deg
Peak Heat Release Rate :	187.5 Joules/deg
Cumulative Heat Release :	3298.21 Joules
Apparent Combustion Efficiency :	79.3 %
Indicated Thermal Efficiency :	38.3 %
Brake Thermal Efficiency :	31.8 %
Ignition Delay :	4.3 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	38.76 J/degree
Sensitivity :	32.3 degrees
Premixed/Diffusion Ratio :	.13210

870604.092803 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1165.2	.651	629.54	.362
K2-Exhaust 2, F	1249.1	.724	676.19	.402
K3-Exhaust 3, F	1222.4	.425	661.32	.236
K4-Exhaust 4, F	1198.6	.284	648.11	.158
K5-Exhaust 5, F	1229.7	.640	665.37	.355
K6-Exhaust 6, F	1130.1	1.117	610.06	.620
K7-Exhaust Common, F	1263.0	.351	683.88	.195
Dry Bulb Temperature, F	74.343	.115	23.524	.064
Wet Bulb Temperature, F	72.203	.045	22.335	.025
J1-Water In, F	162.83	.085	72.681	.047
J2-Water Out, F	170.31	.072	76.840	.040
J3-Oil Sump, F	229.57	.085	109.76	.047
J4-Fuel Inlet, F	90.921	.036	32.734	.020
J5-Air After Filter, F	102.48	.430	39.158	.239
J6-Intake Manifold, F	108.70	.178	42.608	.099
J7-Fuel Return, F	94.767	.033	34.870	.019
P1-Fuel, PSIG	113.35	1.335	781.52	9.204
P2-Oil Gallery, PSIG	53.962	.027	372.05	.184
P6-Ex Common, "H2OG	19.723	.587	4.908	.146
P7-Air Aft Filt, "H2OV	3.958	.685	.985	.170
P8-Blowby, "H2OG	.078	.021	.019	.005
P11-Baro (Vent), "Hg ABS	29.130	.004	98.644	.013
Speed, RPM	1797.8	1.840	1797.8	1.840
Load, Lb-Ft	508.31	2.759	689.17	3.740
Smoke, %	14.241	.393	14.241	.393
Fuel Flow, Lb/Hr	74.474	.702	33.781	.318
Horsepower	174.00	.913	129.73	.681
Corrected Horsepower	183.96	.965	137.16	.720
BSFC, lb/hp-hr	.428	.004	.260	.003
Corrected BSFC	.405	.004	.246	.002
Relative Humidity	90.323	.336	90.323	.336
Reference Pressure, inHg	28.839		97.658	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1180

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	1798 RPM
Load :	508.3 lb-ft
Fuel Flow :	74.5 lb/hr
Brake Power :	174.01 bhp
BSFC :	.428 lb/bhp-hr
Indicated Power :	24.67 kW/cyl
Peak Pressure :	7.628 MPa
Peak Rate of Pressure Rise:	599.8 kPa/deg
Peak Heat Release Rate :	221.9 Joules/deg
Cumulative Heat Release :	3331.17 Joules
Apparent Combustion Efficiency :	74.4 %
Indicated Thermal Efficiency :	36.8 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	4.2 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	37.05 J/degree
Sensitivity :	29.5 degrees
Premixed/Diffusion Ratio :	.14361

970604.094835 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	862.69	.461	461.49	.256
K2-Exhaust 2, F	958.13	.533	514.52	.296
K3-Exhaust 3, F	895.47	.464	479.70	.258
K4-Exhaust 4, F	882.04	.482	472.25	.268
K5-Exhaust 5, F	860.50	.357	460.28	.198
K6-Exhaust 6, F	821.10	.356	438.39	.198
K7-Exhaust Common, F	890.55	.305	476.97	.170
Dry Bulb Temperature, F	74.559	.247	23.644	.137
Wet Bulb Temperature, F	72.383	.081	22.435	.045
J1-Water In, F	165.64	.052	74.242	.029
J2-Water Out, F	169.80	.035	76.556	.020
J3-Oil Sump, F	222.59	.154	105.88	.085
J4-Fuel Inlet, F	89.370	.075	31.872	.042
J5-Air After Filter, F	100.97	.157	38.315	.087
J6-Intake Manifold, F	108.00	.033	42.222	.018
J7-Fuel Return, F	91.440	.136	33.022	.076
P1-Fuel, PSIG	55.809	.507	384.79	3.494
P2-Oil Gallery, PSIG	55.380	.030	381.83	.205
P6-Ex Common, "H2OG	16.040	.704	3.991	.175
P7-Air Aft Filt, "H2OV	4.122	.320	1.026	.080
P8-Blowby, "H2OG	.001	.061	.000	.015
P11-Baro (Vent), "Hg ABS	29.139	.003	98.675	.008
Speed, RPM	1801.5	2.286	1801.5	2.286
Load, Lb-Ft	366.89	8.762	497.43	11.879
Smoke, %	2.117	.186	2.117	.186
Fuel Flow, Lb/Hr	49.677	1.415	22.533	.642
Horsepower	125.85	3.088	93.831	2.303
Corrected Horsepower	132.86	3.260	99.053	2.431
BSFC, lb/hp-hr	.395	.013	.240	.008
Corrected BSFC	.374	.012	.228	.007
Relative Humidity	90.193	.759	90.193	.759
Reference Pressure, inHg	28.836		97.649	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1182

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	1802 RPM
Load :	366.9 lb-ft
Fuel Flow :	49.7 lb/hr
Brake Power :	125.89 bhp
BSFC :	.395 lb/bhp-hr
Indicated Power :	18.43 kW/cyl
Peak Pressure :	6.492 MPa
Peak Rate of Pressure Rise:	471.4 kPa/deg
Peak Heat Release Rate :	165.1 Joules/deg
Cumulative Heat Release :	2423.80 Joules
Apparent Combustion Efficiency :	81.3 %
Indicated Thermal Efficiency :	41.2 %
Brake Thermal Efficiency :	35.0 %
Ignition Delay :	7.2 degrees
Centroid Phasing :	193.4 degrees
Centroid Magnitude :	31.30 J/degree
Sensitivity :	25.2 degrees
Premixed/Diffusion Ratio :	.28576

870604.095942 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	715.91	.580	379.95	.322
K2-Exhaust 2, F	784.07	.586	417.82	.325
K3-Exhaust 3, F	738.28	.554	392.38	.308
K4-Exhaust 4, F	729.32	.704	387.40	.391
K5-Exhaust 5, F	706.49	.609	374.72	.339
K6-Exhaust 6, F	659.05	1.131	348.36	.628
K7-Exhaust Common, F	723.34	.771	384.08	.428
Dry Bulb Temperature, F	75.163	.133	23.979	.074
Wet Bulb Temperature, F	72.770	.038	22.650	.021
J1-Water In, F	168.79	.051	75.995	.028
J2-Water Out, F	171.39	.072	77.439	.040
J3-Oil Sump, F	219.80	.114	104.34	.063
J4-Fuel Inlet, F	90.106	.020	32.281	.011
J5-Air After Filter, F	100.55	.232	38.082	.129
J6-Intake Manifold, F	107.38	.131	41.880	.073
J7-Fuel Return, F	91.308	.017	32.949	.009
P1-Fuel, PSIG	37.816	.379	260.73	2.615
P2-Oil Gallery, PSIG	55.886	.034	385.32	.234
P6-Ex Common, "H2OG	15.023	.497	3.738	.124
P7-Air Aft Filt, "H2OV	3.961	.294	.986	.073
P8-Blowby, "H2OG	.033	.049	.008	.012
P11-Baro (Vent), "Hg ABS	29.140	.003	98.678	.010
Speed, RPM	1803.1	3.559	1803.1	3.559
Load, Lb-Ft	271.30	6.901	367.83	9.357
Smoke, %	.932	.109	.932	.109
Fuel Flow, Lb/Hr	38.066	1.072	17.266	.486
Horsepower	93.143	2.464	69.445	1.837
Corrected Horsepower	98.316	2.601	73.301	1.939
BSFC, lb/hp-hr	.409	.014	.249	.008
Corrected BSFC	.387	.013	.236	.008
Relative Humidity	89.316	.424	89.316	.424
Reference Pressure, inHg	28.848		97.691	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1184

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.85 in-Hg
Speed :	1803 RPM
Load :	271.3 lb-ft
Fuel Flow :	38.1 lb/hr
Brake Power :	93.14 bhp
BSFC :	.409 lb/bhp-hr
Indicated Power :	14.93 kW/cyl
Peak Pressure :	5.828 MPa
Peak Rate of Pressure Rise:	366.8 kPa/deg
Peak Heat Release Rate :	124.2 Joules/deg
Cumulative Heat Release :	1916.79 Joules
Apparent Combustion Efficiency :	83.9 %
Indicated Thermal Efficiency :	43.5 %
Brake Thermal Efficiency :	33.7 %
Ignition Delay :	8.6 degrees
Centroid Phasing :	190.8 degrees
Centroid Magnitude :	26.11 J/degree
Sensitivity :	21.1 degrees
Premixed/Diffusion Ratio :	.40861

970604.101129 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	515.39	.310	268.55	.172
K2-Exhaust 2, F	542.59	.937	283.66	.520
K3-Exhaust 3, F	534.80	.861	279.33	.478
K4-Exhaust 4, F	522.69	.826	272.60	.459
K5-Exhaust 5, F	499.25	.403	259.58	.224
K6-Exhaust 6, F	440.15	.548	226.75	.304
K7-Exhaust Common, F	501.62	.811	260.90	.451
Dry Bulb Temperature, F	75.728	.307	24.293	.171
Wet Bulb Temperature, F	73.000	.057	22.778	.032
J1-Water In, F	171.04	.186	77.243	.103
J2-Water Out, F	172.24	.123	77.909	.068
J3-Oil Sump, F	215.34	.136	101.86	.076
J4-Fuel Inlet, F	89.032	.091	31.684	.050
J5-Air After Filter, F	99.440	.091	37.467	.050
J6-Intake Manifold, F	106.18	.043	41.211	.024
J7-Fuel Return, F	88.150	.116	31.195	.065
P1-Fuel, PSIG	19.308	.143	133.12	.988
P2-Oil Gallery, PSIG	56.558	.064	389.95	.440
P6-Ex Common, "H2OG	11.510	.760	2.864	.189
P7-Air Aft Filt, "H2OV	4.137	.445	1.029	.111
P8-Blowby, "H2OG	-.001	.042	-.000	.010
P11-Baro (Vent), "Hg ABS	29.145	.003	98.697	.012
Speed, RPM	1801.5	3.601	1801.5	3.601
Load, Lb-Ft	130.45	6.078	176.87	8.240
Smoke, %	1.352	.085	1.352	.085
Fuel Flow, Lb/Hr	21.708	.368	9.847	.167
Horsepower	44.747	2.129	33.362	1.587
Corrected Horsepower	47.181	2.245	35.177	1.674
BSFC, lb/hp-hr	.486	.029	.296	.018
Corrected BSFC	.461	.028	.281	.017
Relative Humidity	87.948	1.069	87.948	1.069
Reference Pressure, inHg	28.841		97.666	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1186

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	1802 RPM
Load :	130.5 lb-ft
Fuel Flow :	21.7 lb/hr
Brake Power :	44.78 bhp
BSFC :	.485 lb/bhp-hr
Indicated Power :	8.24 kW/cyl
Peak Pressure :	4.978 MPa
Peak Rate of Pressure Rise:	217.2 kPa/deg
Peak Heat Release Rate :	62.1 Joules/deg
Cumulative Heat Release :	1088.28 Joules
Apparent Combustion Efficiency :	83.6 %
Indicated Thermal Efficiency :	42.1 %
Brake Thermal Efficiency :	28.5 %
Ignition Delay :	10.1 degrees
Centroid Phasing :	189.5 degrees
Centroid Magnitude :	16.99 J/degree
Sensitivity :	18.3 degrees
Premixed/Diffusion Ratio :	.55312

870604.101936 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	378.24	.818	192.36	.455
K2-Exhaust 2, F	381.23	.497	194.02	.276
K3-Exhaust 3, F	406.17	.316	207.87	.175
K4-Exhaust 4, F	402.19	.863	205.66	.479
K5-Exhaust 5, F	374.52	.616	190.29	.342
K6-Exhaust 6, F	327.69	.801	164.27	.445
K7-Exhaust Common, F	376.09	1.048	191.16	.582
Dry Bulb Temperature, F	75.152	.114	23.974	.063
Wet Bulb Temperature, F	72.734	.023	22.630	.013
J1-Water In, F	170.86	.127	77.145	.070
J2-Water Out, F	171.38	.119	77.433	.066
J3-Oil Sump, F	212.45	.175	100.25	.097
J4-Fuel Inlet, F	86.712	.051	30.396	.028
J5-Air After Filter, F	98.625	.197	37.014	.110
J6-Intake Manifold, F	105.63	.054	40.904	.030
J7-Fuel Return, F	85.490	.075	29.717	.042
P1-Fuel, PSIG	11.048	.059	76.172	.409
P2-Oil Gallery, PSIG	57.358	.017	395.47	.118
P6-Ex Common, "H2OG	9.550	.538	2.377	.134
P7-Air Aft Filt, "H2OV	3.656	.295	.910	.074
P8-Blowby, "H2OG	-.009	.041	-.002	.010
P11-Baro (Vent), "Hg ABS	29.146	.004	98.699	.013
Speed, RPM	1802.1	2.655	1802.1	2.655
Load, Lb-Ft	42.872	3.331	58.126	4.516
Smoke, %	.778	.040	.778	.040
Fuel Flow, Lb/Hr	13.703	.188	6.216	.085
Horsepower	14.711	1.143	10.968	.852
Corrected Horsepower	15.497	1.204	11.554	.898
BSFC, lb/hp-hr	.937	.072	.570	.044
Corrected BSFC	.889	.069	.541	.042
Relative Humidity	89.203	.421	89.203	.421
Reference Pressure, inHg	28.877		97.788	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1138

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.88 in-Hg
Speed :	1802 RPM
Load :	42.9 lb-ft
Fuel Flow :	13.7 lb/hr
Brake Power :	14.71 bhp
BSFC :	.931 lb/bhp-hr
Indicated Power :	4.19 kW/cyl
Peak Pressure :	4.597 MPa
Peak Rate of Pressure Rise:	140.5 kPa/deg
Peak Heat Release Rate :	43.8 Joules/deg
Cumulative Heat Release :	615.827 Joules
Apparent Combustion Efficiency :	75.0 %
Indicated Thermal Efficiency :	33.9 %
Brake Thermal Efficiency :	14.8 %
Ignition Delay :	11.6 degrees
Centroid Phasing :	189.2 degrees
Centroid Magnitude :	12.36 J/degree
Sensitivity :	16.6 degrees
Premixed/Diffusion Ratio :	.69535

870604.104039 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1126.1	1.870	607.84	1.039
K2-Exhaust 2, F	1211.7	.398	655.41	.221
K3-Exhaust 3, F	1200.7	.951	649.28	.528
K4-Exhaust 4, F	1176.1	.680	635.60	.378
K5-Exhaust 5, F	1217.9	1.448	658.84	.804
K6-Exhaust 6, F	1109.8	1.133	598.76	.630
K7-Exhaust Common, F	1273.9	1.062	689.97	.590
Dry Bulb Temperature, F	74.999	.167	23.888	.093
Wet Bulb Temperature, F	73.034	.048	22.797	.027
J1-Water In, F	162.42	.039	72.456	.022
J2-Water Out, F	170.87	.032	77.151	.018
J3-Oil Sump, F	218.91	.107	103.84	.059
J4-Fuel Inlet, F	91.700	.022	33.167	.012
J5-Air After Filter, F	96.664	.177	35.924	.098
J6-Intake Manifold, F	103.52	.056	39.735	.031
J7-Fuel Return, F	94.433	.033	34.685	.018
P1-Fuel, PSIG	100.16	1.581	690.57	10.899
P2-Oil Gallery, PSIG	53.706	.026	370.29	.179
P6-Ex Common, "H2OG	16.304	.674	4.057	.168
P7-Air Aft Filt, "H2OV	2.608	.236	.649	.059
P8-Blowby, "H2OG	.096	.019	.024	.005
P11-Baro (Vent), "Hg ABS	29.148	.003	98.705	.009
Speed, RPM	1498.4	2.155	1498.4	2.155
Load, Lb-Ft	554.70	3.628	752.07	4.918
Smoke, %	16.268	.643	16.268	.643
Fuel Flow, Lb/Hr	68.332	.818	30.995	.371
Horsepower	158.26	.919	117.99	.685
Corrected Horsepower	166.49	.967	124.13	.721
BSFC, lb/hp-hr	.432	.006	.263	.003
Corrected BSFC	.410	.005	.250	.003
Relative Humidity	91.170	.520	91.170	.520
Reference Pressure, inHg	28.956		98.056	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1190

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.96 in-Hg
Speed :	1498 RPM
Load :	554.7 lb-ft
Fuel Flow :	68.3 lb/hr
Brake Power :	158.21 bhp
BSFC :	.432 lb/bhp-hr
Indicated Power :	21.68 kW/cyl
Peak Pressure :	8.282 MPa
Peak Rate of Pressure Rise:	728.2 kPa/deg
Peak Heat Release Rate :	294.3 Joules/deg
Cumulative Heat Release :	3450.68 Joules
Apparent Combustion Efficiency :	70.0 %
Indicated Thermal Efficiency :	35.2 %
Brake Thermal Efficiency :	32.0 %
Ignition Delay :	1.0 degrees
Centroid Phasing :	191.3 degrees
Centroid Magnitude :	44.80 J/degree
Sensitivity :	29.3 degrees
Premixed/Diffusion Ratio :	.03248

870604.105352 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	1067.5	1.253	575.26	.696
K2-Exhaust 2, F	1157.7	1.238	625.38	.688
K3-Exhaust 3, F	1157.4	.485	625.22	.269
K4-Exhaust 4, F	1124.3	.506	606.85	.281
K5-Exhaust 5, F	1177.0	.553	636.09	.307
K6-Exhaust 6, F	1080.4	.841	582.43	.467
K7-Exhaust Common, F	1243.9	.660	673.28	.367
Dry Bulb Temperature, F	74.849	.068	23.805	.038
Wet Bulb Temperature, F	72.952	.041	22.751	.023
J1-Water In, F	162.02	.119	72.232	.066
J2-Water Out, F	171.41	.087	77.450	.048
J3-Oil Sump, F	218.33	.097	103.51	.054
J4-Fuel Inlet, F	90.386	.155	32.437	.086
J5-Air After Filter, F	99.408	.394	37.449	.219
J6-Intake Manifold, F	105.31	.073	40.728	.040
J7-Fuel Return, F	92.137	.062	33.410	.034
P1-Fuel, PSIG	87.263	.663	601.65	4.569
P2-Oil Gallery, PSIG	49.293	.025	339.86	.175
P6-Ex Common, "H2OG	15.684	.378	3.903	.094
P7-Air Aft Filt, "H2OV	2.384	.185	.593	.046
P8-Blowby, "H2OG	.060	.061	.015	.015
P11-Baro (Vent), "Hg ABS	29.151	.002	98.718	.007
Speed, RPM	1299.4	2.962	1299.4	2.962
Load, Lb-Ft	559.30	2.458	758.31	3.333
Smoke, %	16.970	.455	16.970	.455
Fuel Flow, Lb/Hr	61.430	.747	27.864	.339
Horsepower	138.38	.583	103.17	.435
Corrected Horsepower	145.91	.615	108.78	.459
BSFC, lb/hp-hr	.444	.007	.270	.004
Corrected BSFC	.421	.006	.256	.004
Relative Humidity	91.453	.307	91.453	.307
Reference Pressure, inHg	28.976		98.124	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1192

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.98 in-Hg
Speed :	1299 RPM
Load :	559.3 lb-ft
Fuel Flow :	61.4 lb/hr
Brake Power :	138.33 bhp
BSFC :	.444 lb/bhp-hr
Indicated Power :	18.55 kW/cyl
Peak Pressure :	8.519 MPa
Peak Rate of Pressure Rise:	773.2 kPa/deg
Peak Heat Release Rate :	320.4 Joules/deg
Cumulative Heat Release :	3397.48 Joules
Apparent Combustion Efficiency :	66.5 %
Indicated Thermal Efficiency :	33.5 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	.8 degrees
Centroid Phasing :	190.4 degrees
Centroid Magnitude :	48.14 J/degree
Sensitivity :	28.6 degrees
Premixed/Diffusion Ratio :	.02689

870604.110711 AL-15299-F AL-12920-L NH220				1
K1-Exhaust 1, F	987.26	.713	530.70	.396
K2-Exhaust 2, F	1057.1	.821	569.52	.456
K3-Exhaust 3, F	1061.6	.599	571.99	.333
K4-Exhaust 4, F	1023.5	.457	550.81	.254
K5-Exhaust 5, F	1083.8	.322	584.36	.179
K6-Exhaust 6, F	1007.2	.384	541.76	.213
K7-Exhaust Common, F	1133.8	.500	612.09	.278
Dry Bulb Temperature, F	75.544	.335	24.191	.186
Wet Bulb Temperature, F	73.385	.068	22.991	.038
J1-Water In, F	161.30	.145	71.832	.081
J2-Water Out, F	170.90	.100	77.166	.056
J3-Oil Sump, F	214.60	.114	101.44	.063
J4-Fuel Inlet, F	91.354	.069	32.974	.038
J5-Air After Filter, F	102.31	.628	39.061	.349
J6-Intake Manifold, F	106.31	.258	41.285	.143
J7-Fuel Return, F	93.435	.199	34.131	.110
P1-Fuel, PSIG	66.538	.411	458.76	2.831
P2-Oil Gallery, PSIG	43.399	.052	299.23	.357
P6-Ex Common, "H2OG	12.323	.462	3.066	.115
P7-Air Aft Filt, "H2OV	2.088	.200	.520	.050
P8-Blowby, "H2OG	.103	.066	.026	.016
P11-Baro (Vent), "Hg ABS	29.150	.002	98.713	.006
Speed, RPM	1102.0	2.792	1102.0	2.792
Load, Lb-Ft	541.66	1.988	734.39	2.695
Smoke, %	13.721	.413	13.721	.413
Fuel Flow, Lb/Hr	50.782	.935	23.034	.424
Horsepower	113.65	.536	84.738	.400
Corrected Horsepower	120.19	.567	89.613	.423
BSFC, lb/hp-hr	.447	.008	.272	.005
Corrected BSFC	.423	.008	.257	.005
Relative Humidity	90.385	1.151	90.385	1.151
Reference Pressure, inHg	28.996		98.193	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1194

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.00 in-Hg
Speed :	1102 RPM
Load :	541.7 lb-ft
Fuel Flow :	50.8 lb/hr
Brake Power :	113.66 bhp
BSFC :	.447 lb/bhp-hr
Indicated Power :	14.92 kW/cyl
Peak Pressure :	8.417 MPa
Peak Rate of Pressure Rise:	706.2 kPa/deg
Peak Heat Release Rate :	299.9 Joules/deg
Cumulative Heat Release :	3226.12 Joules
Apparent Combustion Efficiency :	64.8 %
Indicated Thermal Efficiency :	32.6 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	.7 degrees
Centroid Phasing :	189.9 degrees
Centroid Magnitude :	46.40 J/degree
Sensitivity :	28.1 degrees
Premixed/Diffusion Ratio :	.02655

APPENDIX G2
CUMMINS NH-220G DATA SHEETS
FUEL BLEND TF26

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Test Procedure Checklist

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: JP-5 TF26P22Y87 Date: 7-14-87

Step	Initials	Test Procedure
1.	G.L.P.	Flush Fuel System with BF-2
2.	G.L.P.	Engine Warmup
3.	G.L.P.	Clean Smokemeter Lenses
4.	G.L.P.	Full Rack Power Check with BF-2
5.	G.L.P.	Compute Corrected Power Levels
6.	G.L.P.	Compare to 95% Confidence Bands of BF-2 Performance
7.	G.L.P.	Determine Action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush Fuel System with JP-5(HO-14) TF26P22Y87 Blend
9.	G.L.P.	Engine Warmup
10.	G.L.P.	Clean Smokemeter Lenses
11.	G.L.P.	Complete Performance Testing Load-Speed Matrix
12.	G.L.P.	Flush Fuel System with BF-2
13.	G.L.P.	Engine Warmup
14.	G.L.P.	Clean Smokemeter Lenses
15.	G.L.P.	Full Rack Power Check on BF-2
16.	G.L.P.	Compute Corrected Power Levels
17.	G.L.P.	Compare to 95% Confidence Bands of BF-2 Performance
18.	G.L.P.	Determine Action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush Fuel System with JP-5(HO-14) TF26P22Y87 Blend
20.	G.L.P.	Engine Warmup
21.	G.L.P.	Clean Smokemeter Lenses
22.	G.L.P.	Complete Performance Testing Load-Speed Matrix

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 Date: 7-14-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	45	CN1195	CN1196
1800	46	CN1197	CN1198
1500	47	CN1199	CN1200
1300	48	CN1201	CN1202
1100	49	CN1203	CN1204

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: JP-5 (HD-14)
TF26P22Y87

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	50	CN1205	CN1206
1800	Full-Rack	51	CN1207	CN1208
1800	133	52	CN1209	CN1210
1800	98	53	CN1211	CN1212
1800	48	54	CN1213	CN1214
1800	13	55	CN1215	CN1216
1500	Full-Rack	56	CN1217	CN1218
1300	Full-Rack	57	CN1219	CN1220
1100	Full-Rack	58	CN1221	CN1222

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: BF-2 Date: 7-15-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	59	CN1223	CN1224
1800	60	CN1225	CN1226
1500	61	CN1227	CN1228
1300	62	CN1229	CN1230
1100	63	CN1231	CN1232

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: JP-5 (HD-14)
TF26P22Y87

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	64	CN1233	CN1234
1800	Full-Rack	65	CN1235	CN1236
1800	133	66	CN1237	CN1238
1800	98	67	CN1239	CN1240
1800	48	68	CN1241	CN1242
1800	13	69	CN1243	CN1244
1500	Full-Rack	70	CN1245	CN1246
1300	Full-Rack	71	CN1247	CN1248
1100	Full-Rack	72	CN1249	CN1250

CUMMINS NH220 LOG SHEET

TEST NO. 2 FUEL BF02S14L87 AK-15894-F BF-2 DATE 7-14-87 PAGE 10

Operator brig							
Time							
Test Hour							
Speed, RPM	2100	1799	1499	1300	1100		
Load, lb–ft	470.2	512.0	551.2	558.1	540.2		
Fuel Flow, lb/hr	82.2	73.1	68.5	60.8	49.3		
Exh. Opacity, %	36.0	21.5	20.5	22.5	20.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1187	1179	1150	1090	1013		
Exhaust Cyl. 2	1255	1238	1209	1155	1050		
Exhaust Cyl. 3	1218	1219	1205	1154	1063		
Exhaust Cyl. 4	1192	1196	1183	1133	1031		
Exhaust Cyl. 5	1204	1223	1228	1185	1087		
Exhaust Cyl. 6	1128	1127	1122	1088	1017		
Exhaust Common	1236	1257	1290	1262	1140		
Water In	162	162	161	161	161		
Water Out	169	170	170	170	173		
Oil Sump	232	227	219	213	208		
Fuel	90	91	88	88	88		
Inlet Air	98	100	101	102	100		
Wet Bulb	76.0	77.6	77.2	77.9	78.0		
Dry Bulb	83.3	85.1	86.0	86.2	87.0		
PRESSURES, PSIG							
Fuel Pump	127.0	112.0	103.0	89.0	69.0		
Oil Gallery	55.0	54.8	53.7	50.9	45.8		
LOW PRESSURES							
Intake Vac, in.water	3.2	2.4	1.7	1.3	1.0		
Exh. Comm., in.Water	27.0	20.5	17.0	16.0	13.5		
Blowby, in.water	0	0.1	0.3	0.2	0.1		
Barometer, in.Hg	29.12	29.13	29.12	29.12	29.12		

870714.104238 AL-15299-F AL-12920-L NH220				2
K1-Exhaust 1, F	1183.5	.708	639.74	.393
K2-Exhaust 2, F	1256.9	.448	680.53	.249
K3-Exhaust 3, F	1216.6	.873	658.10	.485
K4-Exhaust 4, F	1189.7	.471	643.16	.262
K5-Exhaust 5, F	1204.2	.473	651.25	.263
K6-Exhaust 6, F	1122.3	.970	605.74	.539
K7-Exhaust Common, F	1234.9	.646	668.27	.359
Dry Bulb Temperature, F	84.407	.263	29.115	.146
Wet Bulb Temperature, F	76.729	.080	24.849	.044
J1-Water In, F	162.91	.073	72.729	.040
J2-Water Out, F	169.55	.039	76.419	.022
J3-Oil Sump, F	233.77	.057	112.10	.032
J4-Fuel Inlet, F	90.441	.211	32.467	.117
J5-Air After Filter, F	99.060	.093	37.256	.052
J6-Intake Manifold, F	101.75	.134	38.749	.074
J7-Fuel Return, F	93.569	.303	34.205	.168
P1-Fuel, PSIG	126.81	1.343	874.31	9.258
P2-Oil Gallery, PSIG	54.553	.027	376.13	.188
P6-Ex Common, "H2OG	27.100	.371	6.744	.092
P7-Air Aft Filt, "H2OV	4.694	.215	1.168	.053
P8-Blowby, "H2OG	.066	.018	.016	.005
P11-Baro (Vent), "Hg ABS	29.124	.002	98.624	.006
Speed, RPM	2102.4	3.086	2102.4	3.086
Load, Lb-Ft	471.59	3.756	639.39	5.092
Smoke, %	34.776	.744	34.776	.744
Fuel Flow, Lb/Hr	81.490	1.451	36.963	.658
Horsepower	188.78	1.362	140.75	1.016
Corrected Horsepower	199.52	1.440	148.75	1.073
BSFC, lb/hp-hr	.432	.009	.263	.005
Corrected BSFC	.408	.008	.248	.005
Relative Humidity	70.783	.602	70.783	.602
Reference Pressure, inHg	28.779		97.455	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1196

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.78 in-Hg
Speed :	2102 RPM
Load :	471.6 lb-ft
Fuel Flow :	81.5 lb/hr
Brake Power :	188.75 bhp
BSFC :	.432 lb/bhp-hr
Indicated Power :	26.92 kW/cyl
Peak Pressure :	7.097 MPa
Peak Rate of Pressure Rise:	557.3 kPa/deg
Peak Heat Release Rate :	195.8 Joules/deg
Cumulative Heat Release :	3206.50 Joules
Apparent Combustion Efficiency :	76.5 %
Indicated Thermal Efficiency :	36.7 %
Brake Thermal Efficiency :	32.0 %
Ignition Delay :	5.6 degrees
Centroid Phasing :	199.6 degrees
Centroid Magnitude :	32.06 J/degree
Sensitivity :	33.1 degrees
Premixed/Diffusion Ratio :	.16778

870714.105856 AL-15299-F AL-12920-L NH220				2
K1-Exhaust 1, F	1178.1	.909	636.70	.505
K2-Exhaust 2, F	1239.1	.483	670.62	.268
K3-Exhaust 3, F	1218.7	.450	659.27	.250
K4-Exhaust 4, F	1198.2	1.080	647.92	.600
K5-Exhaust 5, F	1225.3	1.242	662.93	.690
K6-Exhaust 6, F	1126.9	.736	608.27	.409
K7-Exhaust Common, F	1260.1	1.118	682.28	.621
Dry Bulb Temperature, F	85.958	.272	29.977	.151
Wet Bulb Temperature, F	77.772	.065	25.429	.036
J1-Water In, F	162.83	.106	72.684	.059
J2-Water Out, F	170.37	.049	76.871	.027
J3-Oil Sump, F	228.30	.070	109.06	.039
J4-Fuel Inlet, F	90.026	.183	32.236	.102
J5-Air After Filter, F	99.800	.138	37.666	.076
J6-Intake Manifold, F	102.99	.113	39.436	.063
J7-Fuel Return, F	93.506	.213	34.170	.118
P1-Fuel, PSIG	112.65	.789	776.73	5.438
P2-Oil Gallery, PSIG	54.324	.022	374.55	.150
P6-Ex Common, "H2OG	19.775	.646	4.921	.161
P7-Air Aft Filt, "H2OV	3.822	.631	.951	.157
P8-Blowby, "H2OG	.046	.022	.011	.005
P11-Baro (Vent), "Hg ABS	29.123	.005	98.621	.016
Speed, RPM	1800.5	2.827	1800.5	2.827
Load, Lb-Ft	514.30	4.712	697.29	6.388
Smoke, %	21.861	.302	21.861	.302
Fuel Flow, Lb/Hr	74.177	.529	33.646	.240
Horsepower	176.31	1.868	131.45	1.393
Corrected Horsepower	186.65	1.977	139.16	1.474
BSFC, lb/hp-hr	.421	.005	.256	.003
Corrected BSFC	.397	.005	.242	.003
Relative Humidity	69.511	.796	69.511	.796
Reference Pressure, inHg	28.842		97.669	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1198

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	1801 RPM
Load :	514.3 lb-ft
Fuel Flow :	74.2 lb/hr
Brake Power :	176.36 bhp
BSFC :	.421 lb/bhp-hr
Indicated Power :	24.16 kW/cyl
Peak Pressure :	7.553 MPa
Peak Rate of Pressure Rise:	621.4 kPa/deg
Peak Heat Release Rate :	229.9 Joules/deg
Cumulative Heat Release :	3317.33 Joules
Apparent Combustion Efficiency :	74.5 %
Indicated Thermal Efficiency :	36.2 %
Brake Thermal Efficiency :	32.8 %
Ignition Delay :	3.7 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	34.30 J/degree
Sensitivity :	32.8 degrees
Premixed/Diffusion Ratio :	.11277

870714.111351 AL-15299-F AL-12920-L NH220				2
K1-Exhaust 1, F	1150.4	.486	621.32	.270
K2-Exhaust 2, F	1211.2	.803	655.10	.446
K3-Exhaust 3, F	1206.5	.870	652.50	.483
K4-Exhaust 4, F	1183.1	.554	639.50	.308
K5-Exhaust 5, F	1228.2	.685	664.55	.381
K6-Exhaust 6, F	1118.0	1.134	603.31	.630
K7-Exhaust Common, F	1285.3	.893	696.30	.496
Dry Bulb Temperature, F	85.821	.206	29.900	.114
Wet Bulb Temperature, F	77.328	.087	25.182	.048
J1-Water In, F	162.13	.143	72.296	.079
J2-Water Out, F	170.93	.076	77.186	.042
J3-Oil Sump, F	220.47	.081	104.70	.045
J4-Fuel Inlet, F	89.566	.241	31.981	.134
J5-Air After Filter, F	100.62	.159	38.120	.088
J6-Intake Manifold, F	103.35	.090	39.641	.050
J7-Fuel Return, F	91.117	.278	32.843	.154
P1-Fuel, PSIG	100.28	1.284	691.39	8.853
P2-Oil Gallery, PSIG	53.122	.068	366.26	.470
P6-Ex Common, "H2OG	16.459	.720	4.096	.179
P7-Air Aft Filt, "H2OV	2.921	.232	.727	.058
P8-Blowby, "H2OG	.208	.047	.052	.012
P11-Baro (Vent), "Hg ABS	29.127	.002	98.635	.007
Speed, RPM	1501.5	2.214	1501.5	2.214
Load, Lb-Ft	553.67	2.540	750.68	3.444
Smoke, %	20.583	.750	20.583	.750
Fuel Flow, Lb/Hr	68.493	.752	31.068	.341
Horsepower	158.29	.735	118.01	.548
Corrected Horsepower	167.56	.778	124.92	.580
BSFC, lb/hp-hr	.433	.005	.263	.003
Corrected BSFC	.409	.005	.249	.003
Relative Humidity	68.423	.343	68.423	.343
Reference Pressure, inHg	28.912		97.907	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1200

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.91 in-Hg
Speed :	1502 RPM
Load :	553.7 lb-ft
Fuel Flow :	68.5 lb/hr
Brake Power :	158.35 bhp
BSFC :	.433 lb/bhp-hr
Indicated Power :	21.23 kW/cyl
Peak Pressure :	8.205 MPa
Peak Rate of Pressure Rise:	711.9 kPa/deg
Peak Heat Release Rate :	286.3 Joules/deg
Cumulative Heat Release :	3406.66 Joules
Apparent Combustion Efficiency :	69.1 %
Indicated Thermal Efficiency :	34.4 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	1.5 degrees
Centroid Phasing :	193.7 degrees
Centroid Magnitude :	39.99 J/degree
Sensitivity :	31.2 degrees
Premixed/Diffusion Ratio :	.04773

870714.112723 AL-15299-F AL-12920-L NH220				2
K1-Exhaust 1, F	1088.8	.472	587.13	.262
K2-Exhaust 2, F	1157.2	.507	625.13	.282
K3-Exhaust 3, F	1158.1	.518	625.61	.288
K4-Exhaust 4, F	1133.3	.680	611.83	.378
K5-Exhaust 5, F	1183.1	.402	639.50	.224
K6-Exhaust 6, F	1087.3	.599	586.26	.333
K7-Exhaust Common, F	1258.3	.429	681.26	.238
Dry Bulb Temperature, F	85.688	.034	29.827	.019
Wet Bulb Temperature, F	77.271	.022	25.150	.012
J1-Water In, F	162.12	.144	72.287	.080
J2-Water Out, F	171.67	.082	77.593	.045
J3-Oil Sump, F	214.77	.107	101.54	.060
J4-Fuel Inlet, F	88.905	.218	31.614	.121
J5-Air After Filter, F	101.30	.253	38.500	.141
J6-Intake Manifold, F	103.76	.043	39.866	.024
J7-Fuel Return, F	90.146	.173	32.303	.096
P1-Fuel, PSIG	87.426	.263	602.78	1.817
P2-Oil Gallery, PSIG	50.564	.041	348.63	.284
P6-Ex Common, "H2OG	15.764	.312	3.923	.078
P7-Air Aft Filt, "H2OV	2.924	.125	.728	.031
P8-Blowby, "H2OG	.118	.042	.029	.010
P11-Baro (Vent), "Hg ABS	29.131	.001	98.648	.003
Speed, RPM	1301.4	1.646	1301.4	1.646
Load, Lb-Ft	559.05	1.982	757.96	2.688
Smoke, %	22.288	.627	22.288	.627
Fuel Flow, Lb/Hr	62.111	1.238	28.173	.562
Horsepower	138.52	.507	103.28	.378
Corrected Horsepower	146.70	.537	109.38	.400
BSFC, lb/hp-hr	.448	.009	.273	.006
Corrected BSFC	.423	.009	.258	.005
Relative Humidity	68.635	.164	68.635	.164
Reference Pressure, inHg	28.916		97.919	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1202

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.92 in-Hg
Speed :	1301 RPM
Load :	559.1 lb-ft
Fuel Flow :	62.1 lb/hr
Brake Power :	138.50 bhp
BSFC :	.448 lb/bhp-hr
Indicated Power :	18.03 kW/cyl
Peak Pressure :	8.486 MPa
Peak Rate of Pressure Rise:	721.8 kPa/deg
Peak Heat Release Rate :	298.7 Joules/deg
Cumulative Heat Release :	3242.03 Joules
Apparent Combustion Efficiency :	62.9 %
Indicated Thermal Efficiency :	32.2 %
Brake Thermal Efficiency :	30.8 %
Ignition Delay :	1.0 degrees
Centroid Phasing :	189.8 degrees
Centroid Magnitude :	44.41 J/degree
Sensitivity :	27.8 degrees
Premixed/Diffusion Ratio :	.03502

870714.113920 AL-15299-F AL-12920-L NH220				2
K1-Exhaust 1, F	1012.7	.645	544.81	.358
K2-Exhaust 2, F	1051.2	.804	566.21	.447
K3-Exhaust 3, F	1063.3	1.019	572.95	.566
K4-Exhaust 4, F	1030.1	.530	554.50	.295
K5-Exhaust 5, F	1087.3	.483	586.30	.268
K6-Exhaust 6, F	1016.9	.575	547.18	.319
K7-Exhaust Common, F	1141.0	.460	616.14	.256
Dry Bulb Temperature, F	86.750	.161	30.417	.089
Wet Bulb Temperature, F	78.107	.082	25.615	.045
J1-Water In, F	161.36	.123	71.867	.068
J2-Water Out, F	171.20	.050	77.332	.028
J3-Oil Sump, F	208.66	.223	98.143	.124
J4-Fuel Inlet, F	89.331	.219	31.850	.122
J5-Air After Filter, F	99.858	.229	37.699	.127
J6-Intake Manifold, F	101.39	.053	38.549	.030
J7-Fuel Return, F	90.333	.280	32.407	.156
P1-Fuel, PSIG	67.124	.389	462.80	2.682
P2-Oil Gallery, PSIG	45.770	.050	315.57	.348
P6-Ex Common, "H2OG	12.742	.355	3.171	.088
P7-Air Aft Filt, "H2OV	2.307	.264	.574	.066
P8-Blowby, "H2OG	.109	.138	.027	.034
P11-Baro (Vent), "Hg ABS	29.129	.003	98.641	.009
Speed, RPM	1102.7	2.657	1102.7	2.657
Load, Lb-Ft	541.92	2.398	734.74	3.251
Smoke, %	20.944	.523	20.944	.523
Fuel Flow, Lb/Hr	50.059	.873	22.706	.396
Horsepower	113.78	.630	84.830	.470
Corrected Horsepower	120.45	.667	89.805	.497
BSFC, lb/hp-hr	.440	.008	.268	.005
Corrected BSFC	.416	.008	.253	.005
Relative Humidity	68.216	.228	68.216	.228
Reference Pressure, inHg	28.959		98.067	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1204

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.96 in-Hg
Speed :	1103 RPM
Load :	541.9 lb-ft
Fuel Flow :	50.1 lb/hr
Brake Power :	113.81 bhp
BSFC :	.440 lb/bhp-hr
Indicated Power :	14.91 kW/cyl
Peak Pressure :	8.424 MPa
Peak Rate of Pressure Rise:	691.6 kPa/deg
Peak Heat Release Rate :	290.7 Joules/deg
Cumulative Heat Release :	3245.31 Joules
Apparent Combustion Efficiency :	66.1 %
Indicated Thermal Efficiency :	33.0 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	.8 degrees
Centroid Phasing :	191.8 degrees
Centroid Magnitude :	41.69 J/degree
Sensitivity :	29.9 degrees
Premixed/Diffusion Ratio :	.02781

CUMMINS NH220 LOG SHEET

TF26P22Y87

TEST NO. 2 FUEL JP5 DATE 7-1487 PAGE 11

AL-16086-F

Operator GRG							
Time							
Test Hour							
Speed, RPM	2100	1799	1799	1800	1799	1800	1501
Load, lb–ft	460.7	504.1	365.9	270.5	131.5	44.0	339.6
Fuel Flow, lb/hr	74.1	69.6	46.0	37.3	22.5	14.1	62.6
Exh. Opacity, %	35.0	22.0	7.0	5.0	2.5	1.5	25.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1134	1128	875	732	550	423	1076
Exhaust Cyl. 2	1207	1186	915	759	544	390	1132
Exhaust Cyl. 3	1158	1156	870	724	523	341	1118
Exhaust Cyl. 4	1154	1155	862	718	525	400	1107
Exhaust Cyl. 5	1175	1190	857	706	505	388	1149
Exhaust Cyl. 6	1083	1085	803	651	446	331	1058
Exhaust Common	1194	1209	870	709	501	373	1170
Water In	162	162	165	167	170	170	156
Water Out	168	169	169	171	171	171	167
Oil Sump	220	221	217	213	209	206	208
Fuel	92	90	90	90	88	88	91
Inlet Air	103	103	100	102	100	100	101
Wet Bulb	78.0	78.8	78.5	78.3	78.3	78.0	78.5
Dry Bulb	86.0	86.8	89.0	88.5	88.5	88.5	89.5
PRESSURES, PSIG							
Fuel Pump	124.0	111.0	58.0	40.0	23.0	15.0	94.0
Oil Gallery	58.2	55.4	56.5	57.2	58.1	58.5	56.8
LOW PRESSURES							
Intake Vac, in.water	3.2	2.4	2.5	2.5	2.6	2.6	1.7
Exh. Comm., in.Water	27.0	19.5	17.5	15.5	12.5	11.0	15.5
Blowby, in.water	0	0.1	0	0	0	0	0
Barometer, in.Hg	29.03	29.03	29.10	29.10	29.10	29.09	29.09

CUMMINS NH220 LOG SHEET

TF26P22Y87

TEST NO. 2 FUEL JP-5 DATE 7-14-87 PAGE 12

A2-16086-F

Operator Gray							
Time							
Test Hour							
Speed, RPM	1301	1100					
Load, lb–ft	555.6	540.7					
Fuel Flow, lb/hr	56.2	43.6					
Exh. Opacity, %	27.0	16.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1029	974					
Exhaust Cyl. 2	1085	1008					
Exhaust Cyl. 3	1073	991					
Exhaust Cyl. 4	1062	974					
Exhaust Cyl. 5	1097	1018					
Exhaust Cyl. 6	1032	962					
Exhaust Common	1137	1044					
Water In	159	159					
Water Out	168	169					
Oil Sump	205	198					
Fuel	89	89					
Inlet Air	99	101					
Wet Bulb	79.0	79.8					
Dry Bulb	89.0	91.0					
PRESSURES, PSIG							
Fuel Pump	81.0	64.0					
Oil Gallery	53.8	48.8					
LOW PRESSURES							
Intake Vac, in.water	1.4	1.0					
Exh. Comm., in.Water	14.0	12.5					
Blowby, in.water	0	0					
Barometer, in.Hg	29.07	29.07					

870714.125424 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	1133.6	.520	612.01	.289
K2-Exhaust 2, F	1206.1	.773	652.26	.429
K3-Exhaust 3, F	1157.9	.705	625.50	.391
K4-Exhaust 4, F	1154.2	.759	623.44	.422
K5-Exhaust 5, F	1174.9	.343	634.96	.191
K6-Exhaust 6, F	1083.7	.428	584.30	.238
K7-Exhaust Common, F	1194.2	.662	645.68	.368
Dry Bulb Temperature, F	85.038	.335	29.466	.186
Wet Bulb Temperature, F	78.834	.109	26.019	.061
J1-Water In, F	162.46	.076	72.478	.042
J2-Water Out, F	168.26	.042	75.703	.024
J3-Oil Sump, F	219.85	.370	104.36	.205
J4-Fuel Inlet, F	91.847	.108	33.249	.060
J5-Air After Filter, F	102.63	.186	39.236	.103
J6-Intake Manifold, F	104.12	.118	40.065	.066
J7-Fuel Return, F	95.381	.221	35.212	.123
P1-Fuel, PSIG	122.88	1.620	847.24	11.169
P2-Oil Gallery, PSIG	57.042	.094	393.29	.651
P6-Ex Common, "H2OG	25.126	.375	6.252	.093
P7-Air Aft Filt, "H2OV	6.014	.308	1.496	.077
P8-Blowby, "H2OG	.113	.023	.028	.006
P11-Baro (Vent), "Hg ABS	29.027	.002	98.296	.007
Speed, RPM	2102.2	2.715	2102.2	2.715
Load, Lb-Ft	458.65	5.559	621.84	7.537
Smoke, %	33.918	.323	33.918	.323
Fuel Flow, Lb/Hr	73.797	.428	33.474	.194
Horsepower	183.58	2.267	136.87	1.690
Corrected Horsepower	195.88	2.419	146.04	1.803
BSFC, lb/hp-hr	.402	.006	.245	.003
Corrected BSFC	.377	.005	.229	.003
Relative Humidity	76.196	.748	76.196	.748
Reference Pressure, inHg	28.584		96.798	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1206

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.42 in-Hg
Speed :	2102 RPM
Load :	458.7 lb-ft
Fuel Flow :	73.8 lb/hr
Brake Power :	183.58 bhp
BSFC :	.402 lb/bhp-hr
Indicated Power :	26.42 kW/cyl
Peak Pressure :	7.061 MPa
Peak Rate of Pressure Rise:	675.0 kPa/deg
Peak Heat Release Rate :	249.6 Joules/deg
Cumulative Heat Release :	3166.77 Joules
Apparent Combustion Efficiency :	83.1 %
Indicated Thermal Efficiency :	39.6 %
Brake Thermal Efficiency :	34.2 %
Ignition Delay :	7.8 degrees
Centroid Phasing :	200.7 degrees
Centroid Magnitude :	43.34 J/degree
Sensitivity :	31.9 degrees
Premixed/Diffusion Ratio :	.24590

970714.131226 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	1129.3	.972	609.60	.540
K2-Exhaust 2, F	1188.4	.737	642.43	.409
K3-Exhaust 3, F	1157.2	.569	625.10	.316
K4-Exhaust 4, F	1158.0	.429	625.54	.238
K5-Exhaust 5, F	1189.8	.770	643.22	.428
K6-Exhaust 6, F	1085.1	.655	585.07	.364
K7-Exhaust Common, F	1209.1	.516	653.93	.286
Dry Bulb Temperature, F	85.184	.148	29.546	.082
Wet Bulb Temperature, F	79.046	.045	26.136	.025
J1-Water In, F	162.25	.091	72.363	.051
J2-Water Out, F	169.28	.073	76.268	.041
J3-Oil Sump, F	219.91	.244	104.39	.136
J4-Fuel Inlet, F	91.487	.133	33.048	.074
J5-Air After Filter, F	103.02	.456	39.457	.253
J6-Intake Manifold, F	104.83	.180	40.463	.100
J7-Fuel Return, F	94.110	.275	34.505	.153
P1-Fuel, PSIG	110.09	.538	759.01	3.711
P2-Oil Gallery, PSIG	55.351	.048	381.63	.331
P6-Ex Common, "H2OG	17.423	.568	4.336	.141
P7-Air Aft Filt, "H2OV	4.942	.425	1.230	.106
P8-Blowby, "H2OG	.116	.049	.029	.012
P11-Baro (Vent), "Hg ABS	29.027	.007	98.295	.022
Speed, RPM	1802.0	2.062	1802.0	2.062
Load, Lb-Ft	509.48	6.055	690.76	8.210
Smoke, %	22.993	.746	22.993	.746
Fuel Flow, Lb/Hr	69.579	.322	31.560	.146
Horsepower	174.81	2.183	130.33	1.627
Corrected Horsepower	186.64	2.330	139.16	1.737
BSFC, lb/hp-hr	.398	.006	.242	.003
Corrected BSFC	.373	.005	.227	.003
Relative Humidity	76.466	.396	76.466	.396
Reference Pressure, inHg	28.663		97.064	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1208

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.66 in-Hg
Speed :	1802 RPM
Load :	509.5 lb-ft
Fuel Flow :	69.6 lb/hr
Brake Power :	174.81 bhp
BSFC :	.398 lb/bhp-hr
Indicated Power :	23.58 kW/cyl
Peak Pressure :	7.504 MPa
Peak Rate of Pressure Rise:	818.2 kPa/deg
Peak Heat Release Rate :	314.5 Joules/deg
Cumulative Heat Release :	3223.51 Joules
Apparent Combustion Efficiency :	76.9 %
Indicated Thermal Efficiency :	37.5 %
Brake Thermal Efficiency :	34.5 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	197.7 degrees
Centroid Magnitude :	46.68 J/degree
Sensitivity :	30.1 degrees
Premixed/Diffusion Ratio :	.21830

870714.132644 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	876.46	.748	469.15	.415
K2-Exhaust 2, F	917.32	.581	491.85	.323
K3-Exhaust 3, F	871.91	.463	466.62	.257
K4-Exhaust 4, F	863.28	.643	461.82	.357
K5-Exhaust 5, F	857.63	.647	458.68	.360
K6-Exhaust 6, F	801.54	.664	427.52	.369
K7-Exhaust Common, F	871.39	.289	466.33	.161
Dry Bulb Temperature, F	88.195	.263	31.219	.146
Wet Bulb Temperature, F	78.363	.052	25.757	.029
J1-Water In, F	164.70	.093	73.723	.051
J2-Water Out, F	168.81	.045	76.008	.025
J3-Oil Sump, F	218.54	.127	103.63	.071
J4-Fuel Inlet, F	89.114	.178	31.730	.099
J5-Air After Filter, F	99.115	.153	37.286	.085
J6-Intake Manifold, F	100.71	.100	38.170	.056
J7-Fuel Return, F	91.256	.173	32.920	.096
P1-Fuel, PSIG	56.036	.389	386.35	2.682
P2-Oil Gallery, PSIG	56.111	.136	386.87	.938
P6-Ex Common, "H2OG	16.616	.368	4.135	.092
P7-Air Aft Filt, "H2OV	3.902	.380	.971	.094
P8-Blowby, "H2OG	.063	.055	.016	.014
P11-Baro (Vent), "Hg ABS	29.104	.005	98.556	.016
Speed, RPM	1801.0	3.299	1801.0	3.299
Load, Lb-Ft	365.77	2.443	495.91	3.313
Smoke, %	7.614	.158	7.614	.158
Fuel Flow, Lb/Hr	45.388	.472	20.587	.214
Horsepower	125.43	.984	93.514	.733
Corrected Horsepower	132.79	1.042	99.003	.777
BSFC, lb/hp-hr	.362	.004	.220	.002
Corrected BSFC	.342	.003	.208	.002
Relative Humidity	64.811	.603	64.811	.603
Reference Pressure, inHg	28.817		97.584	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1210

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.82 in-Hg
Speed :	1801 RPM
Load :	365.8 lb-ft
Fuel Flow :	45.4 lb/hr
Brake Power :	125.44 bhp
BSFC :	.362 lb/bhp-hr
Indicated Power :	18.68 kW/cyl
Peak Pressure :	6.437 MPa
Peak Rate of Pressure Rise:	589.7 kPa/deg
Peak Heat Release Rate :	219.4 Joules/deg
Cumulative Heat Release :	2514.13 Joules
Apparent Combustion Efficiency :	91.9 %
Indicated Thermal Efficiency :	45.5 %
Brake Thermal Efficiency :	38.0 %
Ignition Delay :	9.5 degrees
Centroid Phasing :	197.5 degrees
Centroid Magnitude :	34.38 J/degree
Sensitivity :	27.0 degrees
Premixed/Diffusion Ratio :	.35167

870714.133957 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	732.42	.556	389.12	.309
K2-Exhaust 2, F	759.95	.400	404.41	.222
K3-Exhaust 3, F	723.45	.525	384.14	.292
K4-Exhaust 4, F	717.95	.481	381.08	.267
K5-Exhaust 5, F	705.34	.387	374.08	.215
K6-Exhaust 6, F	650.60	.673	343.67	.374
K7-Exhaust Common, F	710.16	.443	376.75	.246
Dry Bulb Temperature, F	90.014	.299	32.230	.166
Wet Bulb Temperature, F	79.502	.219	26.390	.122
J1-Water In, F	168.01	.079	75.560	.044
J2-Water Out, F	170.78	.062	77.098	.034
J3-Oil Sump, F	214.13	.083	101.18	.046
J4-Fuel Inlet, F	88.103	.185	31.168	.103
J5-Air After Filter, F	101.53	.213	38.630	.118
J6-Intake Manifold, F	103.61	.061	39.784	.034
J7-Fuel Return, F	89.735	.200	32.075	.111
P1-Fuel, PSIG	37.528	.662	258.74	4.563
P2-Oil Gallery, PSIG	56.849	.144	391.96	.994
P6-Ex Common, "H2OG	14.461	.468	3.599	.117
P7-Air Aft Filt, "H2OV	4.263	.491	1.061	.122
P8-Blowby, "H2OG	.066	.046	.016	.011
P11-Baro (Vent), "Hg ABS	29.101	.004	98.546	.014
Speed, RPM	1801.8	2.869	1801.8	2.869
Load, Lb-Ft	270.31	4.081	366.49	5.533
Smoke, %	5.664	.116	5.664	.116
Fuel Flow, Lb/Hr	36.866	.287	16.722	.130
Horsepower	92.738	1.521	69.143	1.134
Corrected Horsepower	98.509	1.616	73.445	1.205
BSFC, lb/hp-hr	.398	.008	.242	.005
Corrected BSFC	.374	.007	.228	.004
Relative Humidity	63.296	.242	63.296	.242
Reference Pressure, inHg	28.787		97.484	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1212

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.79 in-Hg
Speed :	1802 RPM
Load :	270.3 lb-ft
Fuel Flow :	36.9 lb/hr
Brake Power :	92.74 bhp
BSFC :	.398 lb/bhp-hr
Indicated Power :	14.37 kW/cyl
Peak Pressure :	5.768 MPa
Peak Rate of Pressure Rise:	468.7 kPa/deg
Peak Heat Release Rate :	174.2 Joules/deg
Cumulative Heat Release :	1919.06 Joules
Apparent Combustion Efficiency :	86.3 %
Indicated Thermal Efficiency :	43.0 %
Brake Thermal Efficiency :	34.5 %
Ignition Delay :	10.7 degrees
Centroid Phasing :	197.6 degrees
Centroid Magnitude :	27.55 J/degree
Sensitivity :	26.0 degrees
Premixed/Diffusion Ratio :	.41060

870714.135400 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	549.01	1.780	287.23	.989
K2-Exhaust 2, F	541.86	2.459	283.26	1.366
K3-Exhaust 3, F	518.20	4.398	270.11	2.443
K4-Exhaust 4, F	524.79	.594	273.77	.330
K5-Exhaust 5, F	503.24	1.871	261.80	1.040
K6-Exhaust 6, F	441.49	2.248	227.50	1.249
K7-Exhaust Common, F	499.14	1.623	259.52	.902
Dry Bulb Temperature, F	89.349	.245	31.860	.136
Wet Bulb Temperature, F	78.728	.119	25.960	.066
J1-Water In, F	170.42	.107	76.900	.059
J2-Water Out, F	171.62	.083	77.568	.046
J3-Oil Sump, F	209.52	.313	98.625	.174
J4-Fuel Inlet, F	87.441	.163	30.801	.091
J5-Air After Filter, F	99.760	.154	37.645	.086
J6-Intake Manifold, F	102.53	.146	39.183	.081
J7-Fuel Return, F	87.808	.171	31.004	.095
P1-Fuel, PSIG	20.054	.185	138.26	1.276
P2-Oil Gallery, PSIG	57.802	.017	398.53	.121
P6-Ex Common, "H2OG	11.095	.476	2.761	.118
P7-Air Aft Filt, "H2OV	4.597	.669	1.144	.166
P8-Blowby, "H2OG	.053	.060	.013	.015
P11-Baro (Vent), "Hg ABS	29.092	.005	98.517	.016
Speed, RPM	1802.0	4.019	1802.0	4.019
Load, Lb-Ft	134.86	3.792	182.84	5.142
Smoke, %	3.209	.067	3.209	.067
Fuel Flow, Lb/Hr	22.191	.328	10.066	.149
Horsepower	46.272	1.305	34.499	.973
Corrected Horsepower	49.042	1.383	36.564	1.031
BSFC, lb/hp-hr	.480	.012	.292	.007
Corrected BSFC	.453	.011	.275	.007
Relative Humidity	62.725	.379	62.725	.379
Reference Pressure, inHg	28.754		97.372	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1214

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.75 in-Hg
Speed :	1802 RPM
Load :	134.9 lb-ft
Fuel Flow :	22.2 lb/hr
Brake Power :	46.29 bhp
BSFC :	.480 lb/bhp-hr
Indicated Power :	8.84 kW/cyl
Peak Pressure :	5.026 MPa
Peak Rate of Pressure Rise:	247.7 kPa/deg
Peak Heat Release Rate :	88.8 Joules/deg
Cumulative Heat Release :	1211.06 Joules
Apparent Combustion Efficiency :	90.6 %
Indicated Thermal Efficiency :	44.0 %
Brake Thermal Efficiency :	28.6 %
Ignition Delay :	12.5 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	17.39 J/degree
Sensitivity :	25.5 degrees
Premixed/Diffusion Ratio :	.49020

870714.140438 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	422.51	.572	216.95	.318
K2-Exhaust 2, F	389.48	.516	198.60	.287
K3-Exhaust 3, F	339.58	1.319	170.88	.733
K4-Exhaust 4, F	401.55	.423	205.30	.235
K5-Exhaust 5, F	386.99	.292	197.21	.162
K6-Exhaust 6, F	329.64	.562	165.35	.312
K7-Exhaust Common, F	374.82	.229	190.45	.127
Dry Bulb Temperature, F	89.544	.284	31.969	.158
Wet Bulb Temperature, F	78.828	.124	26.016	.069
J1-Water In, F	170.61	.178	77.007	.099
J2-Water Out, F	171.25	.134	77.358	.075
J3-Oil Sump, F	206.95	.151	97.195	.084
J4-Fuel Inlet, F	87.722	.142	30.957	.079
J5-Air After Filter, F	99.868	.106	37.704	.059
J6-Intake Manifold, F	102.50	.052	39.167	.029
J7-Fuel Return, F	87.432	.093	30.795	.051
P1-Fuel, PSIG	11.955	.129	82.428	.891
P2-Oil Gallery, PSIG	58.017	.021	400.01	.144
P6-Ex Common, "H2OG	9.733	.281	2.422	.070
P7-Air Aft Filt, "H2OV	4.379	.540	1.090	.134
P8-Blowby, "H2OG	.050	.053	.012	.013
P11-Baro (Vent), "Hg ABS	29.086	.003	98.497	.012
Speed, RPM	1801.3	3.797	1801.3	3.797
Load, Lb-Ft	43.717	1.563	59.272	2.119
Smoke, %	1.753	.087	1.753	.087
Fuel Flow, Lb/Hr	13.840	.208	6.278	.094
Horsepower	14.993	.534	11.179	.398
Corrected Horsepower	15.897	.566	11.853	.422
BSFC, lb/hp-hr	.924	.028	.562	.017
Corrected BSFC	.871	.026	.530	.016
Relative Humidity	62.499	.471	62.499	.471
Reference Pressure, inHg	28.764		97.406	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1216

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.76 in-Hg
Speed :	1801 RPM
Load :	43.7 lb-ft
Fuel Flow :	13.8 lb/hr
Brake Power :	14.99 bhp
BSFC :	.921 lb/bhp-hr
Indicated Power :	5.18 kW/cyl
Peak Pressure :	4.647 MPa
Peak Rate of Pressure Rise:	134.4 kPa/deg
Peak Heat Release Rate :	48.2 Joules/deg
Cumulative Heat Release :	723.884 Joules
Apparent Combustion Efficiency :	87.0 %
Indicated Thermal Efficiency :	41.5 %
Brake Thermal Efficiency :	14.9 %
Ignition Delay :	13.9 degrees
Centroid Phasing :	198.9 degrees
Centroid Magnitude :	12.82 J/degree
Sensitivity :	24.0 degrees
Premixed/Diffusion Ratio :	.57872

870714.142309 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	1075.8	.837	579.91	.465
K2-Exhaust 2, F	1134.3	.988	612.37	.549
K3-Exhaust 3, F	1117.2	.390	602.90	.217
K4-Exhaust 4, F	1105.2	.595	596.24	.330
K5-Exhaust 5, F	1148.4	.911	620.24	.506
K6-Exhaust 6, F	1054.6	.726	568.08	.404
K7-Exhaust Common, F	1168.8	.931	631.58	.517
Dry Bulb Temperature, F	89.948	.228	32.193	.126
Wet Bulb Temperature, F	79.009	.127	26.116	.070
J1-Water In, F	159.52	5.613	70.845	3.119
J2-Water Out, F	168.38	3.832	75.767	2.129
J3-Oil Sump, F	207.22	.337	97.346	.187
J4-Fuel Inlet, F	89.415	.173	31.897	.096
J5-Air After Filter, F	102.07	.126	38.925	.070
J6-Intake Manifold, F	104.73	.119	40.407	.066
J7-Fuel Return, F	91.264	.252	32.924	.140
P1-Fuel, PSIG	92.701	1.328	639.15	9.156
P2-Oil Gallery, PSIG	56.086	.037	386.70	.253
P6-Ex Common, "H2OG	14.561	.701	3.623	.174
P7-Air Aft Filt, "H2OV	3.609	.263	.898	.066
P8-Blowby, "H2OG	.097	.034	.024	.008
P11-Baro (Vent), "Hg ABS	29.078	.002	98.470	.006
Speed, RPM	1502.9	2.049	1502.9	2.049
Load, Lb-Ft	536.14	3.214	726.91	4.358
Smoke, %	24.832	1.142	24.832	1.142
Fuel Flow, Lb/Hr	59.487	.478	26.983	.217
Horsepower	153.42	.785	114.39	.585
Corrected Horsepower	163.06	.835	121.57	.622
BSFC, lb/hp-hr	.388	.003	.236	.002
Corrected BSFC	.365	.002	.222	.001
Relative Humidity	61.959	.259	61.959	.259
Reference Pressure, inHg	28.813		97.571	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1218

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.81 in-Hg
Speed :	1503 RPM
Load :	536.1 lb-ft
Fuel Flow :	59.5 lb/hr
Brake Power :	153.42 bhp
BSFC :	.388 lb/bhp-hr
Indicated Power :	20.62 kW/cyl
Peak Pressure :	8.109 MPa
Peak Rate of Pressure Rise:	982.1 kPa/deg
Peak Heat Release Rate :	399.8 Joules/deg
Cumulative Heat Release :	3315.02 Joules
Apparent Combustion Efficiency :	77.1 %
Indicated Thermal Efficiency :	38.3 %
Brake Thermal Efficiency :	35.4 %
Ignition Delay :	4.3 degrees
Centroid Phasing :	194.1 degrees
Centroid Magnitude :	56.47 J/degree
Sensitivity :	28.8 degrees
Premixed/Diffusion Ratio :	.15027

970714.144015 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	1025.1	.534	551.75	.296
K2-Exhaust 2, F	1087.5	.722	586.41	.401
K3-Exhaust 3, F	1073.1	.449	578.39	.250
K4-Exhaust 4, F	1059.3	.280	570.70	.155
K5-Exhaust 5, F	1097.1	.794	591.75	.441
K6-Exhaust 6, F	1031.1	.930	555.08	.517
K7-Exhaust Common, F	1123.9	.593	606.59	.329
Dry Bulb Temperature, F	90.104	.160	32.280	.089
Wet Bulb Temperature, F	78.939	.101	26.077	.056
J1-Water In, F	158.69	.050	70.381	.028
J2-Water Out, F	167.61	.089	75.337	.049
J3-Oil Sump, F	205.63	.235	96.458	.131
J4-Fuel Inlet, F	88.858	.137	31.588	.076
J5-Air After Filter, F	99.738	.147	37.632	.082
J6-Intake Manifold, F	102.42	.058	39.121	.032
J7-Fuel Return, F	89.905	.079	32.169	.044
P1-Fuel, PSIG	80.076	.595	552.11	4.102
P2-Oil Gallery, PSIG	53.366	.030	367.94	.210
P6-Ex Common, "H2OG	13.388	.355	3.331	.088
P7-Air Aft Filt, "H2OV	3.410	.253	.849	.063
P8-Blowby, "H2OG	.089	.047	.022	.012
P11-Baro (Vent), "Hg ABS	29.073	.002	98.452	.005
Speed, RPM	1300.8	3.288	1300.8	3.288
Load, Lb-Ft	550.61	2.297	746.53	3.115
Smoke, %	27.013	1.276	27.013	1.276
Fuel Flow, Lb/Hr	55.139	.734	25.011	.333
Horsepower	136.37	.764	101.68	.569
Corrected Horsepower	144.64	.810	107.84	.604
BSFC, lb/hp-hr	.404	.006	.246	.004
Corrected BSFC	.381	.006	.232	.003
Relative Humidity	61.323	.180	61.323	.180
Reference Pressure, inHg	28.822		97.603	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1220

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.82 in-Hg
Speed :	1301 RPM
Load :	550.6 lb-ft
Fuel Flow :	55.1 lb/hr
Brake Power :	136.39 bhp
BSFC :	.404 lb/bhp-hr
Indicated Power :	18.12 kW/cyl
Peak Pressure :	8.384 MPa
Peak Rate of Pressure Rise:	1006. kPa/deg
Peak Heat Release Rate :	421.2 Joules/deg
Cumulative Heat Release :	3338.45 Joules
Apparent Combustion Efficiency :	72.6 %
Indicated Thermal Efficiency :	36.4 %
Brake Thermal Efficiency :	34.0 %
Ignition Delay :	3.7 degrees
Centroid Phasing :	192.4 degrees
Centroid Magnitude :	62.49 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.13304

870714.145842 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	974.96	.608	523.87	.338
K2-Exhaust 2, F	1009.3	.473	542.93	.263
K3-Exhaust 3, F	990.46	.688	532.48	.382
K4-Exhaust 4, F	972.39	.548	522.44	.304
K5-Exhaust 5, F	1016.0	.906	546.67	.504
K6-Exhaust 6, F	961.25	.730	516.25	.406
K7-Exhaust Common, F	1042.4	.276	561.34	.153
Dry Bulb Temperature, F	90.181	.149	32.323	.083
Wet Bulb Temperature, F	78.802	.024	26.001	.013
J1-Water In, F	158.78	.083	70.436	.046
J2-Water Out, F	168.71	.104	75.950	.058
J3-Oil Sump, F	199.77	.146	93.207	.081
J4-Fuel Inlet, F	89.208	.225	31.782	.125
J5-Air After Filter, F	99.928	.234	37.738	.130
J6-Intake Manifold, F	101.66	.106	38.698	.059
J7-Fuel Return, F	89.954	.247	32.197	.137
P1-Fuel, PSIG	61.710	.286	425.47	1.971
P2-Oil Gallery, PSIG	48.402	.057	333.72	.390
P6-Ex Common, "H2OG	11.362	.539	2.827	.134
P7-Air Aft Filt, "H2OV	3.090	.208	.769	.052
P8-Blowby, "H2OG	.036	.081	.009	.020
P11-Baro (Vent), "Hg ABS	29.064	.002	98.422	.007
Speed, RPM	1100.4	2.343	1100.4	2.343
Load, Lb-Ft	540.56	2.911	732.90	3.946
Smoke, %	17.416	.769	17.416	.769
Fuel Flow, Lb/Hr	46.644	3.418	21.158	1.550
Horsepower	113.26	.691	84.445	.515
Corrected Horsepower	120.16	.733	89.585	.546
BSFC, lb/hp-hr	.412	.031	.251	.019
Corrected BSFC	.388	.030	.236	.018
Relative Humidity	60.703	.438	60.703	.438
Reference Pressure, inHg	28.837		97.653	

HAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1222

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	1100 RPM
Load :	540.6 lb-ft
Fuel Flow :	46.6 lb/hr
Brake Power :	113.23 bhp
BSFC :	.412 lb/bhp-hr
Indicated Power :	15.02 kW/cyl
Peak Pressure :	8.489 MPa
Peak Rate of Pressure Rise:	934.0 kPa/deg
Peak Heat Release Rate :	396.6 Joules/deg
Cumulative Heat Release :	3274.46 Joules
Apparent Combustion Efficiency :	71.2 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	33.4 %
Ignition Delay :	2.8 degrees
Centroid Phasing :	191.4 degrees
Centroid Magnitude :	60.98 J/degree
Sensitivity :	27.5 degrees
Premixed/Diffusion Ratio :	.10216

CUMMINS NH220 LOG SHEET

TEST NO. 2 FUEL BF02515287 BF-2 AL-15299-F DATE 2-15-87 PAGE 13

Operator GREY							
Time							
Test Hour							
Speed, RPM	2100	1900	1500	1300	1100		
Load, lb–ft	473.6	513.7	551.7	557.5	542.5		
Fuel Flow, lb/hr	81.8	71.5	68.1	60.5	48.6		
Exh. Opacity, %	24.0	16.0	16.0	15.5	14.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1172	1172	1146	1083	999		
Exhaust Cyl. 2	1246	1229	1195	1136	1043		
Exhaust Cyl. 3	1216	1210	1198	1146	1047		
Exhaust Cyl. 4	1196	1195	1176	1116	1009		
Exhaust Cyl. 5	1207	1219	1218	1170	1070		
Exhaust Cyl. 6	1114	1113	1101	1061	990		
Exhaust Common	1236	1253	1278	1237	1114		
Water In	162	160	161	161	161		
Water Out	168	168	169	169	170		
Oil Sump	228	226	222	216	211		
Fuel	93	91	92	91	90		
Inlet Air	100	101	102	102	97		
Wet Bulb	76.0	75.9	75.8	76.1	76.5		
Dry Bulb	79.5	79.0	80.0	80.2	81.0		
PRESSURES, PSIG							
Fuel Pump	119.0	114.0	102.0	87.0	68.0		
Oil Gallery	56.5	54.8	52.9	59.8	44.1		
LOW PRESSURES							
Intake Vac, in.water	3.2	2.3	1.7	1.4	1.0		
Exh. Comm., in.Water	27.0	20.0	17.0	16.0	13.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.05	29.06	29.07	29.07	29.07		

870715.085529 AL-15299-F AL-12920-L NH220				2
K1-Exhaust 1, F	1170.9	1.035	632.75	.575
K2-Exhaust 2, F	1249.0	.611	676.13	.339
K3-Exhaust 3, F	1217.8	.659	658.78	.366
K4-Exhaust 4, F	1196.0	.579	646.69	.322
K5-Exhaust 5, F	1208.5	.683	653.61	.379
K6-Exhaust 6, F	1113.5	.958	600.85	.532
K7-Exhaust Common, F	1237.2	.446	669.53	.248
Dry Bulb Temperature, F	78.395	.090	25.775	.050
Wet Bulb Temperature, F	75.577	.038	24.209	.021
J1-Water In, F	162.22	.058	72.342	.032
J2-Water Out, F	168.40	.042	75.775	.024
J3-Oil Sump, F	226.62	.339	108.12	.188
J4-Fuel Inlet, F	92.279	.072	33.488	.040
J5-Air After Filter, F	98.045	.138	36.691	.077
J6-Intake Manifold, F	100.54	.178	38.076	.099
J7-Fuel Return, F	96.311	.065	35.729	.036
P1-Fuel, PSIG	127.50	1.595	879.06	11.000
P2-Oil Gallery, PSIG	55.857	.045	385.12	.307
P6-Ex Common, "H2OG	26.068	.267	6.487	.066
P7-Air Aft Filt, "H2OV	5.537	.291	1.378	.072
P8-Blowby, "H2OG	.056	.027	.014	.007
P11-Baro (Vent), "Hg ABS	29.053	.001	98.383	.004
Speed, RPM	2103.0	3.153	2103.0	3.153
Load, Lb-Ft	471.65	5.065	639.47	6.867
Smoke, %	24.769	.570	24.769	.570
Fuel Flow, Lb/Hr	81.479	.761	36.958	.345
Horsepower	188.86	1.892	140.81	1.411
Corrected Horsepower	200.05	2.004	149.15	1.494
BSFC, lb/hp-hr	.431	.007	.263	.004
Corrected BSFC	.407	.007	.248	.004
Relative Humidity	87.948	.212	87.948	.212
Reference Pressure, inHg	28.645		97.004	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1224

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.65 in-Hg
Speed :	2103 RPM
Load :	471.7 lb-ft
Fuel Flow :	81.5 lb/hr
Brake Power :	188.88 bhp
BSFC :	.431 lb/bhp-hr
Indicated Power :	26.83 kW/cyl
Peak Pressure :	7.010 MPa
Peak Rate of Pressure Rise:	514.3 kPa/deg
Peak Heat Release Rate :	177.8 Joules/deg
Cumulative Heat Release :	3194.39 Joules
Apparent Combustion Efficiency :	76.3 %
Indicated Thermal Efficiency :	36.5 %
Brake Thermal Efficiency :	32.0 %
Ignition Delay :	6.0 degrees
Centroid Phasing :	199.9 degrees
Centroid Magnitude :	30.70 J/degree
Sensitivity :	32.9 degrees
Premixed/Diffusion Ratio :	.18226

870715.091048 AL-15299-F AL-12920-L NH220 2

K1-Exhaust 1, F	1170.4	.689	632.46	.383
K2-Exhaust 2, F	1229.8	.881	665.45	.490
K3-Exhaust 3, F	1210.4	.368	654.69	.204
K4-Exhaust 4, F	1193.0	.417	644.98	.231
K5-Exhaust 5, F	1219.6	.375	659.80	.208
K6-Exhaust 6, F	1113.6	.384	600.87	.213
K7-Exhaust Common, F	1251.8	.509	677.69	.283
Dry Bulb Temperature, F	78.886	.095	26.048	.053
Wet Bulb Temperature, F	76.052	.031	24.473	.017
J1-Water In, F	162.19	.084	72.328	.047
J2-Water Out, F	169.39	.048	76.328	.027
J3-Oil Sump, F	228.17	.151	108.98	.084
J4-Fuel Inlet, F	91.159	.178	32.866	.099
J5-Air After Filter, F	100.83	.324	38.240	.180
J6-Intake Manifold, F	103.08	.078	39.490	.043
J7-Fuel Return, F	94.983	.182	34.991	.101
P1-Fuel, PSIG	113.92	1.504	785.48	10.368
P2-Oil Gallery, PSIG	54.296	.027	374.36	.189
P6-Ex Common, "H2OG	18.288	.582	4.551	.145
P7-Air Aft Filt, "H2OV	4.826	.690	1.201	.172
P8-Blowby, "H2OG	.091	.029	.023	.007
P11-Baro (Vent), "Hg ABS	29.054	.005	98.388	.018
Speed, RPM	1803.3	3.730	1803.3	3.730
Load, Lb-Ft	514.09	4.501	697.01	6.103
Smoke, %	16.497	.384	16.497	.384
Fuel Flow, Lb/Hr	73.295	1.160	33.246	.526
Horsepower	176.51	1.763	131.60	1.314
Corrected Horsepower	187.53	1.873	139.81	1.396
BSFC, lb/hp-hr	.415	.009	.253	.005
Corrected BSFC	.391	.008	.238	.005

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1226

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.59 in-Hg
Speed :	1803 RPM
Load :	514.1 lb-ft
Fuel Flow :	73.3 lb/hr
Brake Power :	176.49 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	23.97 kW/cyl
Peak Pressure :	7.494 MPa
Peak Rate of Pressure Rise:	594.3 kPa/deg
Peak Heat Release Rate :	218.6 Joules/deg
Cumulative Heat Release :	3242.18 Joules
Apparent Combustion Efficiency :	73.8 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	33.2 %
Ignition Delay :	4.4 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	34.23 J/degree
Sensitivity :	31.2 degrees
Premixed/Diffusion Ratio :	.14118

870715.092906 AL-15299-F AL-12920-L NH220				2
K1-Exhaust 1, F	1145.3	1.035	618.49	.575
K2-Exhaust 2, F	1197.6	1.148	647.55	.638
K3-Exhaust 3, F	1199.1	1.275	648.41	.708
K4-Exhaust 4, F	1175.0	.763	635.03	.424
K5-Exhaust 5, F	1217.6	1.136	658.68	.631
K6-Exhaust 6, F	1099.3	.917	592.94	.509
K7-Exhaust Common, F	1275.2	1.122	690.67	.623
Dry Bulb Temperature, F	80.813	.031	27.119	.017
Wet Bulb Temperature, F	76.461	.023	24.701	.013
J1-Water In, F	162.11	.120	72.281	.067
J2-Water Out, F	170.57	.044	76.981	.025
J3-Oil Sump, F	222.54	.097	105.85	.054
J4-Fuel Inlet, F	92.094	.065	33.386	.036
J5-Air After Filter, F	102.58	.183	39.210	.102
J6-Intake Manifold, F	104.15	.104	40.081	.058
J7-Fuel Return, F	94.724	.054	34.846	.030
P1-Fuel, PSIG	100.29	1.168	691.45	8.052
P2-Oil Gallery, PSIG	52.374	.016	361.11	.109
P6-Ex Common, "H2OG	15.372	.612	3.825	.152
P7-Air Aft Filt, "H2OV	3.672	.247	.914	.061
P8-Blowby, "H2OG	.026	.021	.007	.005
P11-Baro (Vent), "Hg ABS	29.074	.002	98.454	.006
Speed, RPM	1502.0	2.450	1502.0	2.450
Load, Lb-Ft	551.92	4.107	748.30	5.568
Smoke, %	16.548	.664	16.548	.664
Fuel Flow, Lb/Hr	68.300	.723	30.980	.328
Horsepower	157.84	1.084	117.68	.808
Corrected Horsepower	167.81	1.152	125.11	.859
BSFC, lb/hp-hr	.433	.006	.263	.004
Corrected BSFC	.407	.006	.248	.004
Relative Humidity	82.178	.096	82.178	.096
Reference Pressure, inHg	28.803		97.539	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1228

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.80 in-Hg
Speed :	1502 RPM
Load :	551.9 lb-ft
Fuel Flow :	68.3 lb/hr
Brake Power :	157.84 bhp
BSFC :	.433 lb/bhp-hr
Indicated Power :	20.85 kW/cyl
Peak Pressure :	8.154 MPa
Peak Rate of Pressure Rise:	697.6 kPa/deg
Peak Heat Release Rate :	274.0 Joules/deg
Cumulative Heat Release :	3322.31 Joules
Apparent Combustion Efficiency :	67.6 %
Indicated Thermal Efficiency :	33.9 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	1.7 degrees
Centroid Phasing :	193.1 degrees
Centroid Magnitude :	39.99 J/degree
Sensitivity :	30.4 degrees
Premixed/Diffusion Ratio :	.05502

870715.094553 AL-15299-F AL-12920-L NH220				2
K1-Exhaust 1, F	1082.5	.628	583.61	.349
K2-Exhaust 2, F	1137.3	.795	614.03	.442
K3-Exhaust 3, F	1147.6	1.010	619.76	.561
K4-Exhaust 4, F	1116.9	.566	602.70	.314
K5-Exhaust 5, F	1170.8	.411	632.67	.228
K6-Exhaust 6, F	1060.8	.882	571.54	.490
K7-Exhaust Common, F	1235.6	.530	668.68	.295
Dry Bulb Temperature, F	79.879	.285	26.600	.159
Wet Bulb Temperature, F	76.160	.146	24.534	.081
J1-Water In, F	161.63	.067	72.018	.037
J2-Water Out, F	170.82	.067	77.124	.037
J3-Oil Sump, F	217.32	.147	102.96	.082
J4-Fuel Inlet, F	91.403	.127	33.002	.071
J5-Air After Filter, F	101.78	.099	38.769	.055
J6-Intake Manifold, F	104.19	.110	40.108	.061
J7-Fuel Return, F	93.571	.088	34.206	.049
P1-Fuel, PSIG	86.763	.745	598.21	5.137
P2-Oil Gallery, PSIG	49.437	.024	340.86	.167
P6-Ex Common, "H2OG	14.319	.467	3.563	.116
P7-Air Aft Filt, "H2OV	3.420	.238	.851	.059
P8-Blowby, "H2OG	.065	.045	.016	.011
P11-Baro (Vent), "Hg ABS	29.069	.001	98.439	.004
Speed, RPM	1299.4	3.113	1299.4	3.113
Load, Lb-Ft	558.29	1.735	756.94	2.352
Smoke, %	16.267	.309	16.267	.309
Fuel Flow, Lb/Hr	60.613	1.012	27.493	.459
Horsepower	138.12	.669	102.98	.499
Corrected Horsepower	146.75	.711	109.41	.530
BSFC, lb/hp-hr	.439	.008	.267	.005
Corrected BSFC	.413	.007	.251	.004
Relative Humidity	84.511	.526	84.511	.526
Reference Pressure, inHg	28.818		97.588	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1230

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.82 in-Hg
Speed :	1299 RPM
Load :	558.3 lb-ft
Fuel Flow :	60.6 lb/hr
Brake Power :	138.09 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	18.04 kW/cyl
Peak Pressure :	8.413 MPa
Peak Rate of Pressure Rise:	720.7 kPa/deg
Peak Heat Release Rate :	296.0 Joules/deg
Cumulative Heat Release :	3331.57 Joules
Apparent Combustion Efficiency :	66.1 %
Indicated Thermal Efficiency :	33.1 %
Brake Thermal Efficiency :	31.4 %
Ignition Delay :	1.1 degrees
Centroid Phasing :	192.0 degrees
Centroid Magnitude :	43.00 J/degree
Sensitivity :	29.9 degrees
Premixed/Diffusion Ratio :	.03605

870715.100003 AL-15299-F AL-12920-L NH220				2
K1-Exhaust 1, F	1000.2	.715	537.89	.397
K2-Exhaust 2, F	1044.2	.856	562.33	.476
K3-Exhaust 3, F	1049.6	.512	565.34	.285
K4-Exhaust 4, F	1010.3	.610	543.48	.339
K5-Exhaust 5, F	1070.0	.374	576.65	.208
K6-Exhaust 6, F	992.09	.562	533.38	.312
K7-Exhaust Common, F	1117.7	1.104	603.19	.613
Dry Bulb Temperature, F	80.471	.290	26.928	.161
Wet Bulb Temperature, F	76.469	.150	24.705	.083
J1-Water In, F	161.77	1.294	72.096	.719
J2-Water Out, F	171.12	.816	77.291	.453
J3-Oil Sump, F	213.00	.054	100.56	.030
J4-Fuel Inlet, F	89.364	.141	31.869	.078
J5-Air After Filter, F	97.064	.292	35.591	.162
J6-Intake Manifold, F	98.097	.203	36.720	.113
J7-Fuel Return, F	91.053	.124	32.807	.069
P1-Fuel, PSIG	65.819	.576	453.81	3.974
P2-Oil Gallery, PSIG	43.916	.065	302.79	.451
P6-Ex Common, "H2OG	11.147	.565	2.774	.141
P7-Air Aft Filt, "H2OV	3.004	.239	.747	.059
P8-Blowby, "H2OG	-.001	.097	-.000	.024
P11-Baro (Vent), "Hg ABS	29.069	.002	98.438	.007
Speed, RPM	1100.2	3.848	1100.2	3.848
Load, Lb-Ft	543.04	2.837	736.25	3.846
Smoke, %	14.182	.444	14.182	.444
Fuel Flow, Lb/Hr	49.548	.754	22.475	.342
Horsepower	113.76	.804	84.814	.599
Corrected Horsepower	120.27	.850	89.672	.634
BSFC, lb/hp-hr	.436	.007	.265	.004
Corrected BSFC	.412	.007	.251	.004
Relative Humidity	83.493	.559	83.493	.559
Reference Pressure, inHg	28.848		97.690	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1232

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.85 in-Hg
Speed :	1100 RPM
Load :	543.0 lb-ft
Fuel Flow :	49.6 lb/hr
Brake Power :	113.73 bhp
BSFC :	.436 lb/bhp-hr
Indicated Power :	15.20 kW/cyl
Peak Pressure :	8.351 MPa
Peak Rate of Pressure Rise:	680.6 kPa/deg
Peak Heat Release Rate :	277.9 Joules/deg
Cumulative Heat Release :	3291.34 Joules
Apparent Combustion Efficiency :	67.5 %
Indicated Thermal Efficiency :	34.0 %
Brake Thermal Efficiency :	31.6 %
Ignition Delay :	1.6 degrees
Centroid Phasing :	191.2 degrees
Centroid Magnitude :	41.87 J/degree
Sensitivity :	28.6 degrees
Premixed/Diffusion Ratio :	.05519

CUMMINS NH220 LOG SHEET

TEST NO. 2 FUEL JP5 TF26P22Y87 AL-1608-F DATE 7-15-87 PAGE 14

Operator Grey							
Time							
Test Hour							
Speed, RPM	2100	1800	1801	1800	1800	1803	1500
Load, lb-ft	462.3	502.9	366	269.0	132.0	39.6	538.6
Fuel Flow, lb/hr	73.0	67.3	45.2	36.6	21.3	13.0	60.3
Exh. Opacity, %	20.0	15.0	5.0	2.5	1.0	.5	20.5
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1131	1121	880	737	573	422	1084
Exhaust Cyl. 2	1200	1174	917	765	354	389	1135
Exhaust Cyl. 3	1145	1134	870	729	457	320	1114
Exhaust Cyl. 4	1145	1136	860	718	533	400	1102
Exhaust Cyl. 5	1162	1164	849	706	509	384	1140
Exhaust Cyl. 6	1076	1071	807	653	433	312	1056
Exhaust Common	1176	89	870	715	500	368	1172
Water In	161	161	163	167	167	170	161
Water Out	167	168	167	170	169	171	168
Oil Sump	226	222	214	211	206	204	205
Fuel	89	1177	88	89	88	87	89
Inlet Air	101	103	103	101	101	101	103
Wet Bulb	75.5	75.8	76.0	77.3	77.5	78.0	78.5
Dry Bulb	83.9	84.3	84.9	85.0	86.0	85.0	86.0
PRESSURES, PSIG							
Fuel Pump	124.0	107.0	58.0	40.0	23.0	15.0	94.0
Oil Gallery	56.8	55.5	56.5	57.8	58.3	58.8	57.5
LOW PRESSURES							
Intake Vac, in.water	3.2	2.4	2.5	2.5	2.7	2.7	1.7
Exh. Comm., in.Water	22.0	19.0	16.5	16.0	12.5	10.0	15.0
Blowby, in.water	0	0.1	0	0	0	0	0
Barometer, in.Hg	29.07	29.07	29.06	29.07	29.07	29.07	29.07

CUMMINS NH220 LOG SHEET

TEST NO. 2 FUEL JP5 TF26P22Y87 AL-16086-F DATE 7-15-87 PAGE 15

Operator Greg							
Time							
Test Hour							
Speed, RPM	1390	1100					
Load, lb–ft	547.9	536.1					
Fuel Flow, lb/hr	53.2	51.4					
Exh. Opacity, %	24.0	15.5					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1032	973					
Exhaust Cyl. 2	1084	998					
Exhaust Cyl. 3	1069	981					
Exhaust Cyl. 4	1056	964					
Exhaust Cyl. 5	1092	1002					
Exhaust Cyl. 6	1022	953					
Exhaust Common	1123	1034					
Water In	161	154					
Water Out	169	168					
Oil Sump	202	201					
Fuel	90	90					
Inlet Air	99	99					
Wet Bulb	78.8	78.9					
Dry Bulb	86.8	86.8					
PRESSURES, PSIG							
Fuel Pump	81.0	62.0					
Oil Gallery	53.0	47.9					
LOW PRESSURES							
Intake Vac, in.water	1.4	1.0					
Exh. Comm., in.Water	14.0	12.5					
Blowby, in.water	0.1	0					
Barometer, in.Hg	29.06	29.06					

870715.111853 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	1128.5	1.400	609.19	.778
K2-Exhaust 2, F	1201.5	.612	649.72	.340
K3-Exhaust 3, F	1144.7	.660	618.16	.366
K4-Exhaust 4, F	1144.5	.375	618.05	.208
K5-Exhaust 5, F	1161.9	.438	627.74	.244
K6-Exhaust 6, F	1073.1	.735	578.42	.408
K7-Exhaust Common, F	1176.1	.225	635.62	.125
Dry Bulb Temperature, F	83.957	.184	28.865	.102
Wet Bulb Temperature, F	75.069	.093	23.927	.052
J1-Water In, F	162.52	.061	72.513	.034
J2-Water Out, F	168.54	.028	75.855	.016
J3-Oil Sump, F	225.58	.313	107.54	.174
J4-Fuel Inlet, F	89.705	.216	32.058	.120
J5-Air After Filter, F	100.46	.203	38.034	.113
J6-Intake Manifold, F	102.32	.138	39.066	.077
J7-Fuel Return, F	92.867	.191	33.371	.106
P1-Fuel, PSIG	121.20	1.750	835.65	12.066
P2-Oil Gallery, PSIG	56.029	.033	386.31	.229
P6-Ex Common, "H2OG	25.681	.296	6.390	.074
P7-Air Aft Filt, "H2OV	5.495	.232	1.367	.058
P8-Blowby, "H2OG	.112	.029	.028	.007
P11-Baro (Vent), "Hg ABS	29.066	.002	98.430	.007
Speed, RPM	2102.6	3.225	2102.6	3.225
Load, Lb-Ft	462.08	4.969	626.49	6.737
Smoke, %	20.335	.522	20.335	.522
Fuel Flow, Lb/Hr	73.155	.766	33.182	.348
Horsepower	184.99	1.812	137.93	1.351
Corrected Horsepower	195.72	1.917	145.92	1.429
BSFC, lb/hp-hr	.395	.006	.241	.004
Corrected BSFC	.374	.006	.227	.003
Relative Humidity	66.466	.254	66.466	.254
Reference Pressure, inHg	28.662		97.061	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1234

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.66 in-Hg
Speed :	2103 RPM
Load :	462.1 lb-ft
Fuel Flow :	73.2 lb/hr
Brake Power :	185.03 bhp
BSFC :	.396 lb/bhp-hr
Indicated Power :	25.92 kW/cyl
Peak Pressure :	6.932 MPa
Peak Rate of Pressure Rise:	632.3 kPa/deg
Peak Heat Release Rate :	231.6 Joules/deg
Cumulative Heat Release :	3077.46 Joules
Apparent Combustion Efficiency :	81.4 %
Indicated Thermal Efficiency :	39.1 %
Brake Thermal Efficiency :	34.7 %
Ignition Delay :	8.1 degrees
Centroid Phasing :	200.0 degrees
Centroid Magnitude :	40.44 J/degree
Sensitivity :	30.8 degrees
Premixed/Diffusion Ratio :	.26404

870715.113459 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	1118.1	1.382	603.36	.768
K2-Exhaust 2, F	1174.9	.484	634.97	.269
K3-Exhaust 3, F	1133.3	.427	611.83	.237
K4-Exhaust 4, F	1135.4	.300	613.00	.167
K5-Exhaust 5, F	1162.8	.700	628.21	.389
K6-Exhaust 6, F	1067.3	.548	575.16	.304
K7-Exhaust Common, F	1176.1	.339	635.63	.188
Dry Bulb Temperature, F	84.255	.233	29.031	.129
Wet Bulb Temperature, F	75.880	.096	24.378	.053
J1-Water In, F	162.48	.105	72.488	.058
J2-Water Out, F	169.30	.040	76.280	.022
J3-Oil Sump, F	223.28	.389	106.27	.216
J4-Fuel Inlet, F	89.361	.069	31.867	.038
J5-Air After Filter, F	102.57	.384	39.204	.213
J6-Intake Manifold, F	104.69	.073	40.383	.040
J7-Fuel Return, F	91.330	.065	32.961	.036
P1-Fuel, PSIG	105.97	1.180	730.65	8.138
P2-Oil Gallery, PSIG	55.062	.025	379.64	.170
P6-Ex Common, "H2OG	17.816	.641	4.433	.160
P7-Air Aft Filt, "H2OV	4.583	.627	1.140	.156
P8-Blowby, "H2OG	.137	.037	.034	.009
P11-Baro (Vent), "Hg ABS	29.066	.005	98.428	.016
Speed, RPM	1802.9	2.757	1802.9	2.757
Load, Lb-Ft	503.03	3.699	682.01	5.015
Smoke, %	15.388	.506	15.388	.506
Fuel Flow, Lb/Hr	67.622	.710	30.673	.322
Horsepower	172.68	1.499	128.75	1.118
Corrected Horsepower	183.23	1.590	136.61	1.186
BSFC, lb/hp-hr	.392	.006	.238	.004
Corrected BSFC	.369	.006	.225	.004
Relative Humidity	68.331	.453	68.331	.453
Reference Pressure, inHg	28.729		97.287	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1236

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.73 in-Hg
Speed :	1803 RPM
Load :	503.0 lb-ft
Fuel Flow :	67.6 lb/hr
Brake Power :	172.68 bhp
BSFC :	.391 lb/bhp-hr
Indicated Power :	23.29 kW/cyl
Peak Pressure :	7.397 MPa
Peak Rate of Pressure Rise:	766.9 kPa/deg
Peak Heat Release Rate :	291.2 Joules/deg
Cumulative Heat Release :	3157.23 Joules
Apparent Combustion Efficiency :	77.6 %
Indicated Thermal Efficiency :	38.1 %
Brake Thermal Efficiency :	35.1 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	197.0 degrees
Centroid Magnitude :	44.97 J/degree
Sensitivity :	29.3 degrees
Premixed/Diffusion Ratio :	.22736

870715.114947 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	880.94	.845	471.63	.470
K2-Exhaust 2, F	918.89	.776	492.72	.431
K3-Exhaust 3, F	871.28	.654	466.27	.364
K4-Exhaust 4, F	862.16	.405	461.20	.225
K5-Exhaust 5, F	851.09	.244	455.05	.136
K6-Exhaust 6, F	806.00	.841	430.00	.467
K7-Exhaust Common, F	870.82	.391	466.01	.217
Dry Bulb Temperature, F	84.691	.155	29.273	.086
Wet Bulb Temperature, F	76.240	.040	24.578	.022
J1-Water In, F	163.85	.047	73.251	.026
J2-Water Out, F	168.02	.040	75.564	.022
J3-Oil Sump, F	216.56	.400	102.53	.222
J4-Fuel Inlet, F	87.747	.084	30.971	.047
J5-Air After Filter, F	102.17	.240	38.984	.133
J6-Intake Manifold, F	104.56	.033	40.313	.018
J7-Fuel Return, F	89.760	.126	32.089	.070
P1-Fuel, PSIG	56.219	.427	387.62	2.944
P2-Oil Gallery, PSIG	56.242	.121	387.77	.834
P6-Ex Common, "H2OG	15.291	.493	3.805	.123
P7-Air Aft Filt, "H2OV	4.661	.485	1.160	.121
P8-Blowby, "H2OG	.076	.049	.019	.012
P11-Baro (Vent), "Hg ABS	29.063	.005	98.420	.016
Speed, RPM	1802.9	4.818	1802.9	4.818
Load, Lb-Ft	365.47	3.351	495.51	4.544
Smoke, %	5.716	.219	5.716	.219
Fuel Flow, Lb/Hr	46.424	.848	21.057	.385
Horsepower	125.46	1.440	93.538	1.073
Corrected Horsepower	133.13	1.528	99.260	1.139
BSFC, lb/hp-hr	.370	.008	.225	.005
Corrected BSFC	.349	.007	.212	.004
Relative Humidity	68.211	.488	68.211	.488
Reference Pressure, inHg	28.721		97.259	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1238

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.72 in-Hg
Speed :	1803 RPM
Load :	365.5 lb-ft
Fuel Flow :	46.4 lb/hr
Brake Power :	125.48 bhp
BSFC :	.370 lb/bhp-hr
Indicated Power :	18.23 kW/cyl
Peak Pressure :	6.310 MPa
Peak Rate of Pressure Rise:	548.5 kPa/deg
Peak Heat Release Rate :	201.5 Joules/deg
Cumulative Heat Release :	2441.65 Joules
Apparent Combustion Efficiency :	87.4 %
Indicated Thermal Efficiency :	43.4 %
Brake Thermal Efficiency :	37.2 %
Ignition Delay :	9.5 degrees
Centroid Phasing :	197.7 degrees
Centroid Magnitude :	33.12 J/degree
Sensitivity :	27.1 degrees
Premixed/Diffusion Ratio :	.35210

970715.120534 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	734.67	1.213	390.37	.674
K2-Exhaust 2, F	760.84	1.731	404.91	.962
K3-Exhaust 3, F	724.03	1.448	384.46	.804
K4-Exhaust 4, F	714.77	1.251	379.32	.695
K5-Exhaust 5, F	701.48	1.307	371.93	.726
K6-Exhaust 6, F	646.13	2.873	341.18	1.596
K7-Exhaust Common, F	711.10	1.386	377.28	.770
Dry Bulb Temperature, F	85.123	.123	29.513	.068
Wet Bulb Temperature, F	77.372	.068	25.207	.038
J1-Water In, F	166.78	.126	74.880	.070
J2-Water Out, F	169.56	.079	76.422	.044
J3-Oil Sump, F	211.55	.405	99.753	.225
J4-Fuel Inlet, F	89.417	.037	31.898	.021
J5-Air After Filter, F	100.61	.092	38.117	.051
J6-Intake Manifold, F	102.63	.064	39.241	.035
J7-Fuel Return, F	91.151	.033	32.862	.018
P1-Fuel, PSIG	38.080	.730	262.56	5.033
P2-Oil Gallery, PSIG	56.988	.145	392.92	.997
P6-Ex Common, "H2OG	14.253	.323	3.547	.080
P7-Air Aft Filt, "H2OV	4.747	.428	1.181	.107
P8-Blowby, "H2OG	.041	.071	.010	.018
P11-Baro (Vent), "Hg ABS	29.070	.003	98.443	.009
Speed, RPM	1803.0	3.830	1803.0	3.830
Load, Lb-Ft	269.77	5.758	365.76	7.807
Smoke, %	3.509	.186	3.509	.186
Fuel Flow, Lb/Hr	35.858	.450	16.265	.204
Horsepower	92.615	2.135	69.052	1.592
Corrected Horsepower	98.270	2.265	73.267	1.689
BSFC, lb/hp-hr	.387	.011	.236	.007
Corrected BSFC	.365	.010	.222	.006
Relative Humidity	70.759	.159	70.759	.159
Reference Pressure, inHg	28.721		97.261	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1240

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.72 in-Hg
Speed :	1803 RPM
Load :	269.8 lb-ft
Fuel Flow :	35.9 lb/hr
Brake Power :	92.62 bhp
BSFC :	.388 lb/bhp-hr
Indicated Power :	14.13 kW/cyl
Peak Pressure :	5.635 MPa
Peak Rate of Pressure Rise:	427.3 kPa/deg
Peak Heat Release Rate :	156.6 Joules/deg
Cumulative Heat Release :	1902.40 Joules
Apparent Combustion Efficiency :	88.0 %
Indicated Thermal Efficiency :	43.5 %
Brake Thermal Efficiency :	35.4 %
Ignition Delay :	10.8 degrees
Centroid Phasing :	198.4 degrees
Centroid Magnitude :	25.44 J/degree
Sensitivity :	26.6 degrees
Premixed/Diffusion Ratio :	.40362

870715.122135 AL-16086-F AL-12920-L NH220 2

K1-Exhaust 1, F	573.32	.552	300.73	.307
K2-Exhaust 2, F	555.52	.692	290.85	.384
K3-Exhaust 3, F	460.35	2.520	237.97	1.400
K4-Exhaust 4, F	534.98	.383	279.43	.213
K5-Exhaust 5, F	509.00	.472	265.00	.262
K6-Exhaust 6, F	435.22	.749	224.01	.416
K7-Exhaust Common, F	500.50	.311	260.28	.173
Dry Bulb Temperature, F	85.805	.135	29.891	.075
Wet Bulb Temperature, F	77.664	.045	25.369	.025
J1-Water In, F	168.65	.138	75.917	.077
J2-Water Out, F	170.00	.084	76.666	.047
J3-Oil Sump, F	207.08	.190	97.265	.105
J4-Fuel Inlet, F	87.791	.108	30.995	.060
J5-Air After Filter, F	100.58	.276	38.100	.153
J6-Intake Manifold, F	102.41	.156	39.115	.087
J7-Fuel Return, F	88.441	.077	31.356	.043
P1-Fuel, PSIG	20.763	.378	143.16	2.608
P2-Oil Gallery, PSIG	57.939	.030	399.47	.209
P6-Ex Common, "H2OG	10.922	.262	2.718	.065
P7-Air Aft Filt, "H2OV	4.737	.577	1.179	.144
P8-Blowby, "H2OG	.055	.065	.014	.016
P11-Baro (Vent), "Hg ABS	29.066	.005	98.430	.016
Speed, RPM	1802.3	5.774	1802.3	5.774
Load, Lb-Ft	131.44	4.628	178.21	6.274
Smoke, %	1.313	.144	1.313	.144
Fuel Flow, Lb/Hr	21.272	.134	9.649	.061
Horsepower	45.106	1.601	33.630	1.193
Corrected Horsepower	47.874	1.699	35.693	1.267
BSFC, lb/hp-hr	.472	.017	.287	.010
Corrected BSFC	.445	.016	.271	.010
Relative Humidity	69.630	.433	69.630	.433
Reference Pressure, inHg	28.718		97.250	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1242

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.72 in-Hg
Speed :	1802 RPM
Load :	131.4 lb-ft
Fuel Flow :	21.3 lb/hr
Brake Power :	45.08 bhp
BSFC :	.472 lb/bhp-hr
Indicated Power :	9.31 kW/cyl
Peak Pressure :	5.002 MPa
Peak Rate of Pressure Rise:	249.4 kPa/deg
Peak Heat Release Rate :	87.2 Joules/deg
Cumulative Heat Release :	1259.41 Joules
Apparent Combustion Efficiency :	98.2 %
Indicated Thermal Efficiency :	48.3 %
Brake Thermal Efficiency :	29.1 %
Ignition Delay :	12.5 degrees
Centroid Phasing :	198.6 degrees
Centroid Magnitude :	17.75 J/degree
Sensitivity :	25.0 degrees
Premixed/Diffusion Ratio :	.50072

870715.123332 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	423.83	.594	217.69	.330
K2-Exhaust 2, F	390.88	1.217	199.38	.676
K3-Exhaust 3, F	323.06	1.290	161.70	.717
K4-Exhaust 4, F	401.48	1.123	205.27	.624
K5-Exhaust 5, F	383.47	.654	195.26	.363
K6-Exhaust 6, F	313.26	1.181	156.26	.656
K7-Exhaust Common, F	371.27	.933	188.48	.518
Dry Bulb Temperature, F	85.684	.146	29.825	.081
Wet Bulb Temperature, F	77.428	.072	25.238	.040
J1-Water In, F	170.74	.131	77.079	.073
J2-Water Out, F	171.35	.099	77.418	.055
J3-Oil Sump, F	205.05	.231	96.139	.128
J4-Fuel Inlet, F	87.442	.027	30.801	.015
J5-Air After Filter, F	99.865	.199	37.703	.111
J6-Intake Manifold, F	102.01	.086	38.895	.048
J7-Fuel Return, F	87.387	.029	30.771	.016
P1-Fuel, PSIG	11.589	.076	79.906	.522
P2-Oil Gallery, PSIG	58.248	.034	401.61	.236
P6-Ex Common, "H2OG	8.957	.448	2.229	.111
P7-Air Aft Filt, "H2OV	5.289	.652	1.316	.162
P8-Blowby, "H2OG	.032	.030	.008	.008
P11-Baro (Vent), "Hg ABS	29.067	.003	98.432	.011
Speed, RPM	1803.4	4.789	1803.4	4.789
Load, Lb-Ft	37.804	1.839	51.255	2.493
Smoke, %	.572	.154	.572	.154
Fuel Flow, Lb/Hr	12.983	.091	5.889	.041
Horsepower	12.980	.612	9.678	.456
Corrected Horsepower	13.763	.649	10.261	.484
BSFC, lb/hp-hr	1.002	.051	.610	.031
Corrected BSFC	.945	.048	.575	.029
Relative Humidity	69.199	.266	69.199	.266
Reference Pressure, inHg	28.678		97.115	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1244

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.68 in-Hg
Speed :	1803 RPM
Load :	37.8 lb-ft
Fuel Flow :	13.8 lb/hr
Brake Power :	12.98 bhp
BSFC :	1.063 lb/bhp-hr
Indicated Power :	4.99 kW/cyl
Peak Pressure :	4.562 MPa
Peak Rate of Pressure Rise:	127.4 kPa/deg
Peak Heat Release Rate :	50.8 Joules/deg
Cumulative Heat Release :	708.651 Joules
Apparent Combustion Efficiency :	85.3 %
Indicated Thermal Efficiency :	39.9 %
Brake Thermal Efficiency :	12.9 %
Ignition Delay :	14.0 degrees
Centroid Phasing :	199.7 degrees
Centroid Magnitude :	12.54 J/degree
Sensitivity :	24.7 degrees
Premixed/Diffusion Ratio :	.56847

870715.125349 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	1083.6	.691	584.22	.384
K2-Exhaust 2, F	1134.5	.602	612.47	.335
K3-Exhaust 3, F	1113.8	.477	601.02	.265
K4-Exhaust 4, F	1099.5	.736	593.04	.409
K5-Exhaust 5, F	1139.2	.804	615.13	.447
K6-Exhaust 6, F	1053.6	.925	567.54	.514
K7-Exhaust Common, F	1170.4	.576	632.43	.320
Dry Bulb Temperature, F	86.535	.115	30.297	.064
Wet Bulb Temperature, F	79.032	.049	26.129	.027
J1-Water In, F	160.96	.105	71.644	.058
J2-Water Out, F	168.60	.064	75.889	.036
J3-Oil Sump, F	205.41	.147	96.337	.082
J4-Fuel Inlet, F	89.906	.194	32.170	.108
J5-Air After Filter, F	102.93	.232	39.406	.129
J6-Intake Manifold, F	104.75	.339	40.418	.189
J7-Fuel Return, F	91.167	.237	32.870	.132
P1-Fuel, PSIG	91.786	.762	632.84	5.254
P2-Oil Gallery, PSIG	55.933	.041	385.64	.283
P6-Ex Common, "H2OG	14.020	.709	3.489	.176
P7-Air Aft Filt, "H2OV	3.788	.196	.943	.049
P8-Blowby, "H2OG	.048	.021	.012	.005
P11-Baro (Vent), "Hg ABS	29.068	.002	98.437	.008
Speed, RPM	1499.4	2.393	1499.4	2.393
Load, Lb-Ft	537.95	3.229	729.36	4.378
Smoke, %	20.232	1.028	20.232	1.028
Fuel Flow, Lb/Hr	60.312	.198	27.357	.090
Horsepower	153.58	.860	114.51	.641
Corrected Horsepower	163.63	.916	122.00	.683
BSFC, lb/hp-hr	.393	.003	.239	.002
Corrected BSFC	.369	.003	.224	.002
Relative Humidity	72.024	.228	72.024	.228
Reference Pressure, inHg	28.790		97.493	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1246

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.79 in-Hg
Speed :	1499 RPM
Load :	538.0 lb-ft
Fuel Flow :	60.3 lb/hr
Brake Power :	153.55 bhp
BSFC :	.393 lb/bhp-hr
Indicated Power :	20.16 kW/cyl
Peak Pressure :	7.861 MPa
Peak Rate of Pressure Rise:	890.1 kPa/deg
Peak Heat Release Rate :	357.7 Joules/deg
Cumulative Heat Release :	3240.28 Joules
Apparent Combustion Efficiency :	74.2 %
Indicated Thermal Efficiency :	37.0 %
Brake Thermal Efficiency :	35.0 %
Ignition Delay :	4.8 degrees
Centroid Phasing :	194.1 degrees
Centroid Magnitude :	51.11 J/degree
Sensitivity :	28.3 degrees
Premixed/Diffusion Ratio :	.16852

870715.130421 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	1035.1	2.779	557.30	1.544
K2-Exhaust 2, F	1085.1	.637	585.07	.354
K3-Exhaust 3, F	1068.0	.785	575.54	.436
K4-Exhaust 4, F	1055.4	.770	568.53	.428
K5-Exhaust 5, F	1090.6	.812	588.09	.451
K6-Exhaust 6, F	1022.7	.683	550.38	.380
K7-Exhaust Common, F	1120.8	.993	604.89	.552
Dry Bulb Temperature, F	87.059	.169	30.588	.094
Wet Bulb Temperature, F	79.534	.099	26.408	.055
J1-Water In, F	161.11	.106	71.730	.059
J2-Water Out, F	169.70	.080	76.500	.045
J3-Oil Sump, F	203.04	.341	95.024	.189
J4-Fuel Inlet, F	89.606	.175	32.003	.097
J5-Air After Filter, F	98.755	.058	37.086	.032
J6-Intake Manifold, F	100.89	.139	38.270	.077
J7-Fuel Return, F	91.392	.210	32.996	.117
P1-Fuel, PSIG	79.507	.556	548.18	3.836
P2-Oil Gallery, PSIG	52.565	.028	362.42	.196
P6-Ex Common, "H2OG	12.702	.341	3.161	.085
P7-Air Aft Filt, "H2OV	3.682	.215	.916	.054
P8-Blowby, "H2OG	.156	.061	.039	.015
P11-Baro (Vent), "Hg ABS	29.061	.001	98.411	.003
Speed, RPM	1302.3	2.153	1302.3	2.153
Load, Lb-Ft	549.44	2.875	744.93	3.898
Smoke, %	25.241	1.193	25.241	1.193
Fuel Flow, Lb/Hr	53.086	.661	24.079	.300
Horsepower	136.24	.629	101.58	.469
Corrected Horsepower	144.74	.669	107.92	.498
BSFC, lb/hp-hr	.390	.004	.237	.002
Corrected BSFC	.367	.004	.223	.002
Relative Humidity	72.096	.206	72.096	.206
Reference Pressure, inHg	28.790		97.494	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1248

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.79 in-Hg
Speed :	1302 RPM
Load :	549.4 lb-ft
Fuel Flow :	53.1 lb/hr
Brake Power :	136.20 bhp
BSFC :	.390 lb/bhp-hr
Indicated Power :	17.53 kW/cyl
Peak Pressure :	8.123 MPa
Peak Rate of Pressure Rise:	930.9 kPa/deg
Peak Heat Release Rate :	387.1 Joules/deg
Cumulative Heat Release :	3222.90 Joules
Apparent Combustion Efficiency :	72.8 %
Indicated Thermal Efficiency :	36.5 %
Brake Thermal Efficiency :	35.2 %
Ignition Delay :	4.0 degrees
Centroid Phasing :	192.3 degrees
Centroid Magnitude :	58.48 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.14436

870715.131952 AL-16086-F AL-12920-L NH220				2
K1-Exhaust 1, F	972.26	.384	522.37	.213
K2-Exhaust 2, F	999.56	.513	537.53	.285
K3-Exhaust 3, F	982.31	1.163	527.95	.646
K4-Exhaust 4, F	966.76	.787	519.31	.437
K5-Exhaust 5, F	1004.2	.934	540.13	.519
K6-Exhaust 6, F	955.73	.826	513.18	.459
K7-Exhaust Common, F	1037.2	.601	558.47	.334
Dry Bulb Temperature, F	86.847	.045	30.471	.025
Wet Bulb Temperature, F	78.899	.031	26.055	.017
J1-Water In, F	160.21	.322	71.230	.179
J2-Water Out, F	169.09	.251	76.163	.139
J3-Oil Sump, F	200.50	.324	93.608	.180
J4-Fuel Inlet, F	89.941	.090	32.189	.050
J5-Air After Filter, F	98.710	.088	37.061	.049
J6-Intake Manifold, F	100.35	.061	37.970	.034
J7-Fuel Return, F	91.434	.080	33.019	.045
P1-Fuel, PSIG	60.668	.359	418.29	2.472
P2-Oil Gallery, PSIG	47.527	.032	327.69	.222
P6-Ex Common, "H2OG	10.919	.501	2.717	.125
P7-Air Aft Filt, "H2OV	3.198	.267	.796	.067
P8-Blowby, "H2OG	-.003	.127	-.001	.032
P11-Baro (Vent), "Hg ABS	29.059	.002	98.405	.008
Speed, RPM	1102.1	2.828	1102.1	2.828
Load, Lb-Ft	538.40	1.884	729.96	2.554
Smoke, %	16.827	.655	16.827	.655
Fuel Flow, Lb/Hr	45.274	2.242	20.536	1.017
Horsepower	112.98	.629	84.233	.469
Corrected Horsepower	119.92	.667	89.408	.498
BSFC, lb/hp-hr	.401	.019	.244	.011
Corrected BSFC	.378	.018	.230	.011
Relative Humidity	70.597	.130	70.597	.130
Reference Pressure, inHg	28.824		97.608	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1250

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	180.0 degrees
Reference Pressure :	28.82 in-Hg
Speed :	1102 RPM
Load :	538.4 lb-ft
Fuel Flow :	45.3 lb/hr
Brake Power :	112.97 bhp
BSFC :	.401 lb/bhp-hr
Indicated Power :	14.29 kW/cyl
Peak Pressure :	8.184 MPa
Peak Rate of Pressure Rise:	858.6 kPa/deg
Peak Heat Release Rate :	361.2 Joules/deg
Cumulative Heat Release :	3100.11 Joules
Apparent Combustion Efficiency :	69.5 %
Indicated Thermal Efficiency :	34.9 %
Brake Thermal Efficiency :	34.3 %
Ignition Delay :	2.9 degrees
Centroid Phasing :	191.2 degrees
Centroid Magnitude :	56.17 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.10494

APPENDIX G3
CUMMINS NH-220G DATA SHEETS
TEST FUEL TF10

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: Cummins NH220G Engine Tester: _____
Test Fuel: TF1ØN18X87 Date: 10/23/87

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressure:
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF1ØN18X87 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressure
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF1ØN18X87 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF10N18Y87 Date: 10/23/87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	88	CN1279	CN1280
1800	89	CN1281	CN1282
1500	90	CN1283	CN1284
1300	91	CN1285	CN1286
1100	92	CN1287	CN1288

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF10N18Y87

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	94	CN1289	CN1290
1800	Full-Rack	95	CN1291	CN1292
1800	133	96	CN1293	CN1294
1800	98	97	CN1295	CN1296
1800	48	98	CN1297	CN1298
1800	13	99	CN1299	CN1300
1500	Full-Rack	100	CN1301	CN1302
1300	Full-Rack	101	CN1303	CN1304
1100	Full-Rack	102	CN1305	CN1306

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TFØ1N18Y87 Date: 10/26/87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	103	CN1307	CN1308
1800	104	CN1309	CN1310
1500	105	CN1311	CN1312
1300	106	CN1313	CN1314
1100	107	CN1315	CN1316

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TFØ1N18Y87

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	108	CN1317	CN1318
1800	Full-Rack	109	CN1319	CN1320
1800	133	110	CN1321	CN1322
1800	98	111	CN1323	CN1324
1800	48	112	CN1325	CN1326
1800	13	113	CN1327	CN1328
1500	Full-Rack	114	CN1329	CN1330
1300	Full-Rack	115	CN1331	CN1332
1100	Full-Rack	116	CN1333	CN1334

CUMMINS NH220 LOG SHEET

TEST NO. 3 FUEL RF-2 DATE 10/23/87 PAGE 19
BFO2V13286

Operator Greg							
Time	9:35	9:50	10:05	10:25	10:40		
Test Hour	30 min	15 min	15 min	20 min	15 min		
Speed, RPM	2100	1800	1499	1299	1099		
Load, lb–ft	472.6	516.5	554.3	561.0	539.2		
Fuel Flow, lb/hr	82.3	75.9	67.2	61.6	540		
Exh. Opacity, %	18.0	12.0	10.5	11.0	14.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1167	1163	1126	1084	1008		
Exhaust Cyl. 2	1254	1238	1202	1159	1076		
Exhaust Cyl. 3	1240	1229	1198	1158	1072		
Exhaust Cyl. 4	1205	1207	1166	1131	1043		
Exhaust Cyl. 5	1220	1244	1212	1195	1117		
Exhaust Cyl. 6	1149	1143	1113	1095	1032		
Exhaust Common	1239	1256	1240	1236	1155		
Water In	161	161	161	160	160		
Water Out	168	169	170	169	169		
Oil Sump	232	226	219	211	205		
Fuel	89	89	89	89	89		
Inlet Air	99	101	101	102	104		
Wet Bulb	68.6	69.0	69.1	69.2	69.2		
Dry Bulb	76.7	77.8	78.0	78.0	78.1		
PRESSURES, PSIG							
Fuel Pump	124.0	160	99.0	87.0	70.0		
Oil Gallery	55.2	54.3	53.1	51.1	46.5		
LOW PRESSURES							
Intake Vac, in.water	3.1	2.3	1.7	1.4	1.0		
Exh. Comm., in.Water	22.0	20.0	16.5	16.0	13.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.10	29.11	29.12	29.13	29.13		

871023.093133 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1169.5	1.298	631.96	.721
K2-Exhaust 2, F	1251.6	.425	677.53	.236
K3-Exhaust 3, F	1238.7	.583	670.37	.324
K4-Exhaust 4, F	1204.7	.552	651.52	.307
K5-Exhaust 5, F	1220.0	.944	659.97	.524
K6-Exhaust 6, F	1150.1	.615	621.18	.342
K7-Exhaust Common, F	1239.6	.586	670.92	.326
Dry Bulb Temperature, F	71.516	.055	21.953	.031
Wet Bulb Temperature, F	66.881	.024	19.378	.014
J1-Water In, F	161.49	.078	71.937	.043
J2-Water Out, F	168.21	.057	75.671	.032
J3-Oil Sump, F	232.17	.066	111.20	.037
J4-Fuel Inlet, F	88.925	.028	31.625	.016
J5-Air After Filter, F	99.175	.106	37.319	.059
J6-Intake Manifold, F	105.06	.053	40.589	.030
J7-Fuel Return, F	92.438	.075	33.577	.041
P1-Fuel, PSIG	128.34	2.054	884.84	14.165
P2-Oil Gallery, PSIG	54.718	.022	377.27	.150
P6-Ex Common, "H2OG	26.922	.238	6.699	.059
P7-Air Aft Filt, "H2OV	4.880	.367	1.214	.091
P8-Blowby, "H2OG	.068	.026	.017	.006
P11-Baro (Vent), "Hg ABS	29.105	.002	98.560	.008
Speed, RPM	2100.3	3.133	2100.3	3.133
Load, Lb-Ft	473.61	2.998	642.13	4.064
Smoke, %	18.539	.310	18.539	.310
Fuel Flow, Lb/Hr	83.049	.719	37.670	.326
Horsepower	189.40	1.079	141.21	.805
Corrected Horsepower	198.71	1.132	148.15	.844
BSFC, lb/hp-hr	.438	.003	.267	.002
Corrected BSFC	.418	.002	.254	.001
Relative Humidity	78.848	.186	78.848	.186
Reference Pressure, inHg	28.746		97.345	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1290

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.75 in-Hg
Speed :	2100 RPM
Load :	473.6 lb-ft
Fuel Flow :	83.0 lb/hr
Brake Power :	189.37 bhp
BSFC :	.438 lb/bhp-hr
Indicated Power :	28.70 kW/cyl
Peak Pressure :	7.060 MPa
Peak Rate of Pressure Rise:	522.7 kPa/deg
Peak Heat Release Rate :	185.6 Joules/deg
Cumulative Heat Release :	3299.85 Joules
Apparent Combustion Efficiency :	77.3 %
Indicated Thermal Efficiency :	38.4 %
Brake Thermal Efficiency :	31.5 %
Ignition Delay :	5.5 degrees
Centroid Phasing :	196.4 degrees
Centroid Magnitude :	35.54 J/degree
Sensitivity :	29.9 degrees
Premixed/Diffusion Ratio :	.18403

871023.094852 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1163.6	.752	628.66	.418
K2-Exhaust 2, F	1237.0	.483	669.47	.268
K3-Exhaust 3, F	1229.0	.604	665.00	.335
K4-Exhaust 4, F	1207.4	.308	653.01	.171
K5-Exhaust 5, F	1243.3	.463	672.93	.257
K6-Exhaust 6, F	1146.0	.842	618.89	.468
K7-Exhaust Common, F	1254.6	.330	679.23	.183
Dry Bulb Temperature, F	72.492	.055	22.495	.031
Wet Bulb Temperature, F	67.480	.024	19.711	.013
J1-Water In, F	161.35	.133	71.861	.074
J2-Water Out, F	168.91	.085	76.058	.047
J3-Oil Sump, F	227.57	.166	108.65	.092
J4-Fuel Inlet, F	89.823	.069	32.124	.038
J5-Air After Filter, F	100.73	.132	38.185	.073
J6-Intake Manifold, F	106.97	.028	41.651	.016
J7-Fuel Return, F	92.383	.097	33.546	.054
P1-Fuel, PSIG	114.50	1.062	789.42	7.321
P2-Oil Gallery, PSIG	54.253	.021	374.06	.144
P6-Ex Common, "H2OG	19.340	.592	4.813	.147
P7-Air Aft Filt, "H2OV	4.123	.798	1.026	.199
P8-Blowby, "H2OG	.066	.039	.016	.010
P11-Baro (Vent), "Hg ABS	29.113	.007	98.588	.023
Speed, RPM	1800.8	2.751	1800.8	2.751
Load, Lb-Ft	518.06	1.600	702.39	2.169
Smoke, %	12.884	.243	12.884	.243
Fuel Flow, Lb/Hr	76.055	.291	34.498	.132
Horsepower	177.63	.695	132.44	.518
Corrected Horsepower	186.63	.730	139.14	.544
BSFC, lb/hp-hr	.428	.003	.260	.002
Corrected BSFC	.408	.002	.248	.001
Relative Humidity	77.501	.151	77.501	.151
Reference Pressure, inHg	28.810		97.562	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1282

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.81 in-Hg
Speed :	1801 RPM
Load :	518.1 lb-ft
Fuel Flow :	76.1 lb/hr
Brake Power :	177.67 bhp
BSFC :	.428 lb/bhp-hr
Indicated Power :	25.64 kW/cyl
Peak Pressure :	7.556 MPa
Peak Rate of Pressure Rise:	601.5 kPa/deg
Peak Heat Release Rate :	224.4 Joules/deg
Cumulative Heat Release :	3378.71 Joules
Apparent Combustion Efficiency :	74.0 %
Indicated Thermal Efficiency :	37.4 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	2.8 degrees
Centroid Phasing :	193.8 degrees
Centroid Magnitude :	37.23 J/degree
Sensitivity :	30.0 degrees
Premixed/Diffusion Ratio :	.09279

871023.100244 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1128.4	1.079	609.13	.599
K2-Exhaust 2, F	1204.1	.343	651.19	.191
K3-Exhaust 3, F	1200.1	.364	648.95	.202
K4-Exhaust 4, F	1166.0	.437	629.98	.243
K5-Exhaust 5, F	1213.2	.664	656.25	.369
K6-Exhaust 6, F	1113.1	.984	600.60	.547
K7-Exhaust Common, F	1238.7	.802	670.40	.445
Dry Bulb Temperature, F	72.917	.128	22.732	.071
Wet Bulb Temperature, F	67.617	.051	19.787	.028
J1-Water In, F	161.30	.157	71.835	.087
J2-Water Out, F	169.85	.096	76.585	.053
J3-Oil Sump, F	220.30	.170	104.61	.094
J4-Fuel Inlet, F	88.700	.023	31.500	.013
J5-Air After Filter, F	101.26	.099	38.480	.055
J6-Intake Manifold, F	106.80	.042	41.558	.023
J7-Fuel Return, F	90.736	.132	32.631	.073
P1-Fuel, PSIG	97.128	1.393	669.67	9.604
P2-Oil Gallery, PSIG	53.103	.082	366.13	.566
P6-Ex Common, "H2OG	15.349	.691	3.819	.172
P7-Air Aft Filt, "H2OV	3.228	.184	.803	.046
P8-Blowby, "H2OG	.062	.007	.015	.002
P11-Baro (Vent), "Hg ABS	29.126	.002	98.630	.008
Speed, RPM	1499.1	2.533	1499.1	2.533
Load, Lb-Ft	554.09	1.582	751.24	2.145
Smoke, %	11.165	.401	11.165	.401
Fuel Flow, Lb/Hr	67.450	.369	30.595	.167
Horsepower	158.15	.378	117.91	.282
Corrected Horsepower	166.17	.397	123.89	.296
BSFC, lb/hp-hr	.426	.002	.259	.001
Corrected BSFC	.406	.002	.247	.001
Relative Humidity	76.401	.304	76.401	.304
Reference Pressure, inHg	28.888		97.826	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1284

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.89 in-Hg
Speed :	1499 RPM
Load :	554.1 lb-ft
Fuel Flow :	67.5 lb/hr
Brake Power :	158.15 bhp
BSFC :	.427 lb/bhp-hr
Indicated Power :	22.21 kW/cyl
Peak Pressure :	8.196 MPa
Peak Rate of Pressure Rise:	732.3 kPa/deg
Peak Heat Release Rate :	295.2 Joules/deg
Cumulative Heat Release :	3408.95 Joules
Apparent Combustion Efficiency :	70.1 %
Indicated Thermal Efficiency :	36.5 %
Brake Thermal Efficiency :	32.3 %
Ignition Delay :	1.2 degrees
Centroid Phasing :	189.4 degrees
Centroid Magnitude :	44.62 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.04247

871023.102129 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1083.3	.869	584.04	.483
K2-Exhaust 2, F	1161.1	.283	627.30	.157
K3-Exhaust 3, F	1157.0	.896	624.98	.498
K4-Exhaust 4, F	1130.1	.929	610.07	.516
K5-Exhaust 5, F	1195.7	.642	646.47	.357
K6-Exhaust 6, F	1091.7	.856	588.71	.475
K7-Exhaust Common, F	1236.0	1.199	668.90	.666
Dry Bulb Temperature, F	73.167	.082	22.871	.045
Wet Bulb Temperature, F	67.949	.023	19.971	.013
J1-Water In, F	160.30	.141	71.277	.078
J2-Water Out, F	169.83	.053	76.571	.029
J3-Oil Sump, F	212.73	.127	100.41	.071
J4-Fuel Inlet, F	89.133	.101	31.741	.056
J5-Air After Filter, F	101.64	.114	38.691	.063
J6-Intake Manifold, F	107.29	.089	41.827	.049
J7-Fuel Return, F	90.205	.075	32.336	.042
P1-Fuel, PSIG	86.189	1.109	594.26	7.648
P2-Oil Gallery, PSIG	51.196	.058	352.98	.403
P6-Ex Common, "H2OG	15.441	.368	3.842	.091
P7-Air Aft Filt, "H2OV	2.727	.330	.679	.082
P8-Blowby, "H2OG	.064	.037	.016	.009
P11-Baro (Vent), "Hg ABS	29.126	.002	98.633	.006
Speed, RPM	1299.0	2.130	1299.0	2.130
Load, Lb-Ft	561.60	1.532	761.43	2.077
Smoke, %	11.967	.462	11.967	.462
Fuel Flow, Lb/Hr	61.907	.598	28.080	.271
Horsepower	138.90	.532	103.56	.397
Corrected Horsepower	146.03	.559	108.88	.417
BSFC, lb/hp-hr	.446	.005	.271	.003
Corrected BSFC	.424	.005	.258	.003
Relative Humidity	76.818	.245	76.818	.245
Reference Pressure, inHg	28.926		97.954	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1286

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.93 in-Hg
Speed :	1299 RPM
Load :	561.6 lb-ft
Fuel Flow :	61.9 lb/hr
Brake Power :	138.90 bhp
BSFC :	.446 lb/bhp-hr
Indicated Power :	19.01 kW/cyl
Peak Pressure :	8.578 MPa
Peak Rate of Pressure Rise:	782.2 kPa/deg
Peak Heat Release Rate :	328.1 Joules/deg
Cumulative Heat Release :	3393.08 Joules
Apparent Combustion Efficiency :	65.9 %
Indicated Thermal Efficiency :	34.1 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	1.0 degrees
Centroid Phasing :	188.3 degrees
Centroid Magnitude :	49.61 J/degree
Sensitivity :	26.2 degrees
Premixed/Diffusion Ratio :	.03940

971023.103909 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1009.1	.534	542.86	.297
K2-Exhaust 2, F	1078.2	.594	581.19	.330
K3-Exhaust 3, F	1073.8	.647	578.78	.360
K4-Exhaust 4, F	1043.9	.463	562.16	.257
K5-Exhaust 5, F	1117.0	.514	602.78	.286
K6-Exhaust 6, F	1032.2	.177	555.67	.098
K7-Exhaust Common, F	1154.7	.478	623.73	.266
Dry Bulb Temperature, F	73.007	.055	22.782	.030
Wet Bulb Temperature, F	67.922	.023	19.957	.013
J1-Water In, F	160.54	.125	71.414	.070
J2-Water Out, F	170.07	.100	76.707	.056
J3-Oil Sump, F	205.62	.215	96.455	.119
J4-Fuel Inlet, F	89.017	.057	31.676	.032
J5-Air After Filter, F	103.56	.145	39.753	.081
J6-Intake Manifold, F	107.65	.032	42.030	.018
J7-Fuel Return, F	90.282	.145	32.379	.080
P1-Fuel, PSIG	68.037	.552	469.10	3.805
P2-Oil Gallery, PSIG	46.631	.040	321.51	.279
P6-Ex Common, "H2OG	12.615	.504	3.139	.125
P7-Air Aft Filt, "H2OV	2.009	.091	.500	.023
P8-Blowby, "H2OG	.069	.037	.017	.009
P11-Baro (Vent), "Hg ABS	29.129	.001	98.642	.005
Speed, RPM	1099.8	2.448	1099.8	2.448
Load, Lb-Ft	539.80	2.318	731.87	3.143
Smoke, %	15.144	.437	15.144	.437
Fuel Flow, Lb/Hr	52.296	1.148	23.721	.521
Horsepower	113.04	.629	84.278	.469
Corrected Horsepower	119.04	.662	88.749	.494
BSFC, lb/hp-hr	.463	.010	.281	.006
Corrected BSFC	.439	.009	.267	.006
Relative Humidity	77.333	.200	77.333	.200
Reference Pressure, inHg	28.981		98.141	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1288

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.98 in-Hg
Speed :	1100 RPM
Load :	539.8 lb-ft
Fuel Flow :	52.3 lb/hr
Brake Power :	113.06 bhp
BSFC :	.463 lb/bhp-hr
Indicated Power :	15.50 kW/cyl
Peak Pressure :	8.607 MPa
Peak Rate of Pressure Rise:	726.9 kPa/deg
Peak Heat Release Rate :	311.0 Joules/deg
Cumulative Heat Release :	3220.15 Joules
Apparent Combustion Efficiency :	62.7 %
Indicated Thermal Efficiency :	32.9 %
Brake Thermal Efficiency :	29.8 %
Ignition Delay :	.7 degrees
Centroid Phasing :	186.8 degrees
Centroid Magnitude :	49.03 J/degree
Sensitivity :	25.1 degrees
Premixed/Diffusion Ratio :	.02956

CUMMINS NH220 LOG SHEET

TEST NO. 3 FUEL TF10N18Y87 DATE 10/23/87 PAGE 20

Operator Greg							
Time	1:00	1:15	1:30	1:40	1:50	2:05	2:25
Test Hour	30 min	15 min	15 min	10 min	10 min	15 min	20 min
Speed, RPM	2099	1800	1800	1800	1800	1800	1500
Load, lb–ft	495.3	539.1	368.5	272.9	135.4	42.3	582.2
Fuel Flow, lb/hr	81.1	80.0	54.9	40.1	24.6	15.6	70.6
Exh. Opacity, %	24.0	23.0	3.0	3.0	20	1.0	30.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1155	1150	857	706	532	395	1092
Exhaust Cyl. 2	1253	1232	914	770	560	385	1176
Exhaust Cyl. 3	1239	1225	898	760	558	399	1174
Exhaust Cyl. 4	1203	1197	871	729	526	388	1146
Exhaust Cyl. 5	1225	1227	863	717	522	376	1175
Exhaust Cyl. 6	1151	1151	822	661	469	337	1094
Exhaust Common	1252	1262	879	723	518	374	1219
Water In	160	160	163	166	168	168	160
Water Out	168	169	168	164	170	168	170
Oil Sump	232	229	219	215	211	205	213
Fuel	89	89	88	87	88	88	88
Inlet Air	100	100	100	99	98	98	101
Wet Bulb	69.8	70.0	70.8	71.0	71.0	69.0	68.5
Dry Bulb	76.0	77.2	78.0	77.9	78.0	74.0	73.0
PRESSURES, PSIG							
Fuel Pump	133.0	120.0	61.0	43.0	25.0	15.0	102.0
Oil Gallery	55.1	53.9	53.9	56.9	57.9	58.3	55.2
LOW PRESSURES							
Intake Vac, in.water	3.1	2.3	2.1	2.5	2.5	2.6	1.7
Exh. Comm., in.Water	27.5	20.0	17.0	15.5	12.5	10.0	16.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.10	29.11	29.1	29.1	29.09	29.09	29.08

CUMMINS NH220 LOG SHEET

TEST NO. 3 FUEL TF10N8X87 DATE 10/23/87 PAGE 21

Operator GREY							
Time	2:40	2:50					
Test Hour	15 MIN	10 MIN					
Speed, RPM	1300 ~~1500~~	1100					
Load, lb–ft	560.7	543.1					
Fuel Flow, lb/hr	64.7	53.8					
Exh. Opacity, %	38.0	32.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1032	979					
Exhaust Cyl. 2	1125	1057					
Exhaust Cyl. 3	1115	1040					
Exhaust Cyl. 4	1086	1008					
Exhaust Cyl. 5	1122	1059					
Exhaust Cyl. 6	1068	1022					
Exhaust Common	1160	1084					
Water In	161	161					
Water Out	171	171					
Oil Sump	212	209					
Fuel	90	90					
Inlet Air	100	102					
Wet Bulb	68.5	68.9					
Dry Bulb	73.0	74.0					
PRESSURES, PSIG							
Fuel Pump	90.0	71.0					
Oil Gallery	51.0	45.0					
LOW PRESSURES							
Intake Vac, in.water	1.4	1.0					
Exh. Comm., in.Water	14.5	13.0					
Blowby, in.water	0	0					
Barometer, in.Hg	29.07	29.07					

871023.125927 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	1157.7	1.817	625.39	1.009
K2-Exhaust 2, F	1253.9	.984	678.82	.547
K3-Exhaust 3, F	1238.2	.610	670.13	.339
K4-Exhaust 4, F	1204.3	.405	651.28	.225
K5-Exhaust 5, F	1222.7	1.361	661.50	.756
K6-Exhaust 6, F	1151.7	1.268	622.04	.704
K7-Exhaust Common, F	1251.9	.384	677.70	.213
Dry Bulb Temperature, F	72.144	.084	22.302	.047
Wet Bulb Temperature, F	68.650	.027	20.361	.015
J1-Water In, F	161.24	.113	71.797	.063
J2-Water Out, F	168.35	.062	75.751	.034
J3-Oil Sump, F	231.18	.283	110.65	.157
J4-Fuel Inlet, F	88.043	.217	31.135	.121
J5-Air After Filter, F	99.244	.114	37.358	.063
J6-Intake Manifold, F	103.04	.083	39.464	.046
J7-Fuel Return, F	92.249	.217	33.471	.120
P1-Fuel, PSIG	132.88	1.429	916.18	9.852
P2-Oil Gallery, PSIG	54.833	.030	378.06	.204
P6-Ex Common, "H2OG	27.324	.182	6.799	.045
P7-Air Aft Filt, "H2OV	4.854	.234	1.208	.058
P8-Blowby, "H2OG	.079	.018	.020	.005
P11-Baro (Vent), "Hg ABS	29.103	.002	98.554	.005
Speed, RPM	2099.1	3.782	2099.1	3.782
Load, Lb-Ft	496.32	2.704	672.92	3.667
Smoke, %	24.433	.644	24.433	.644
Fuel Flow, Lb/Hr	82.921	1.101	37.612	.499
Horsepower	198.37	.808	147.90	.603
Corrected Horsepower	208.54	.850	155.48	.634
BSFC, lb/hp-hr	.418	.006	.254	.004
Corrected BSFC	.398	.006	.242	.004
Relative Humidity	83.994	.243	83.994	.243
Reference Pressure, inHg	28.746		97.345	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1290

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.75 in-Hg
Speed :	2099 RPM
Load :	496.3 lb-ft
Fuel Flow :	82.9 lb/hr
Brake Power :	198.35 bhp
BSFC :	.418 lb/bhp-hr
Indicated Power :	29.71 kW/cyl
Peak Pressure :	7.321 MPa
Peak Rate of Pressure Rise:	853.9 kPa/deg
Peak Heat Release Rate :	335.6 Joules/deg
Cumulative Heat Release :	3376.57 Joules
Apparent Combustion Efficiency :	80.8 %
Indicated Thermal Efficiency :	40.7 %
Brake Thermal Efficiency :	33.7 %
Ignition Delay :	10.0 degrees
Centroid Phasing :	196.3 degrees
Centroid Magnitude :	67.23 J/degree
Sensitivity :	25.3 degrees
Premixed/Diffusion Ratio :	.39746

871023.131124 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	1148.8	1.774	620.42	.986
K2-Exhaust 2, F	1233.6	.725	667.54	.403
K3-Exhaust 3, F	1225.4	.903	662.99	.502
K4-Exhaust 4, F	1197.1	.687	647.28	.382
K5-Exhaust 5, F	1228.1	1.109	664.52	.616
K6-Exhaust 6, F	1157.0	1.547	625.00	.859
K7-Exhaust Common, F	1263.0	.615	683.90	.342
Dry Bulb Temperature, F	72.329	.095	22.405	.053
Wet Bulb Temperature, F	68.692	.056	20.384	.031
J1-Water In, F	161.05	.121	71.694	.067
J2-Water Out, F	169.23	.050	76.236	.028
J3-Oil Sump, F	229.68	.158	109.82	.088
J4-Fuel Inlet, F	90.161	.029	32.311	.016
J5-Air After Filter, F	100.77	.142	38.208	.079
J6-Intake Manifold, F	105.38	.020	40.765	.011
J7-Fuel Return, F	92.665	.047	33.703	.026
P1-Fuel, PSIG	119.08	.556	821.04	3.833
P2-Oil Gallery, PSIG	53.829	.023	371.14	.159
P6-Ex Common, "H2OG	19.352	.557	4.816	.139
P7-Air Aft Filt, "H2OV	4.272	.891	1.063	.222
P8-Blowby, "H2OG	.077	.034	.019	.008
P11-Baro (Vent), "Hg ABS	29.104	.006	98.558	.021
Speed, RPM	1800.8	2.626	1800.8	2.626
Load, Lb-Ft	539.11	1.930	730.93	2.617
Smoke, %	22.774	.670	22.774	.670
Fuel Flow, Lb/Hr	80.342	1.224	36.442	.555
Horsepower	184.85	.628	137.82	.468
Corrected Horsepower	194.58	.661	145.07	.493
BSFC, lb/hp-hr	.435	.007	.264	.004
Corrected BSFC	.413	.007	.251	.004
Relative Humidity	83.406	.168	83.406	.168
Reference Pressure, inHg	28.790		97.495	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1292

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.79 in-Hg
Speed :	1801 RPM
Load :	539.1 lb-ft
Fuel Flow :	80.3 lb/hr
Brake Power :	184.87 bhp
BSFC :	.434 lb/bhp-hr
Indicated Power :	26.69 kW/cyl
Peak Pressure :	7.852 MPa
Peak Rate of Pressure Rise:	1036. kPa/deg
Peak Heat Release Rate :	409.6 Joules/deg
Cumulative Heat Release :	3446.10 Joules
Apparent Combustion Efficiency :	73.1 %
Indicated Thermal Efficiency :	37.7 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	7.5 degrees
Centroid Phasing :	193.0 degrees
Centroid Magnitude :	69.04 J/degree
Sensitivity :	24.5 degrees
Premixed/Diffusion Ratio :	.30495

871023.132629 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	837.52	.750	447.51	.416
K2-Exhaust 2, F	915.60	.477	490.89	.265
K3-Exhaust 3, F	898.79	.702	481.55	.390
K4-Exhaust 4, F	872.58	.733	466.99	.407
K5-Exhaust 5, F	865.26	.541	462.92	.301
K6-Exhaust 6, F	822.12	.573	438.96	.319
K7-Exhaust Common, F	880.22	.506	471.23	.281
Dry Bulb Temperature, F	72.997	.081	22.776	.045
Wet Bulb Temperature, F	69.221	.028	20.679	.015
J1-Water In, F	163.33	.079	72.962	.044
J2-Water Out, F	167.79	.039	75.439	.022
J3-Oil Sump, F	220.88	.148	104.93	.082
J4-Fuel Inlet, F	88.815	.041	31.564	.023
J5-Air After Filter, F	100.00	.148	37.779	.082
J6-Intake Manifold, F	103.60	.172	39.778	.096
J7-Fuel Return, F	89.994	.063	32.219	.035
P1-Fuel, PSIG	57.976	.386	399.73	2.663
P2-Oil Gallery, PSIG	55.501	.026	382.67	.182
P6-Ex Common, "H2OG	16.111	.515	4.009	.128
P7-Air Aft Filt, "H2OV	4.065	.647	1.012	.161
P8-Blowby, "H2OG	.071	.037	.018	.009
P11-Baro (Vent), "Hg ABS	29.102	.005	98.550	.017
Speed, RPM	1803.9	3.295	1803.9	3.295
Load, Lb-Ft	368.13	2.140	499.11	2.902
Smoke, %	3.349	.148	3.349	.148
Fuel Flow, Lb/Hr	50.583	.569	22.944	.258
Horsepower	126.44	.878	94.270	.655
Corrected Horsepower	133.07	.924	99.213	.689
BSFC, lb/hp-hr	.400	.005	.243	.003
Corrected BSFC	.380	.005	.231	.003
Relative Humidity	82.943	.315	82.943	.315
Reference Pressure, inHg	28.803		97.537	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1294

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.80 in-Hg
Speed :	1804 RPM
Load :	368.1 lb-ft
Fuel Flow :	50.6 lb/hr
Brake Power :	126.44 bhp
BSFC :	.400 lb/bhp-hr
Indicated Power :	19.05 kW/cyl
Peak Pressure :	6.376 MPa
Peak Rate of Pressure Rise:	636.6 kPa/deg
Peak Heat Release Rate :	256.2 Joules/deg
Cumulative Heat Release :	2428.74 Joules
Apparent Combustion Efficiency :	81.9 %
Indicated Thermal Efficiency :	42.7 %
Brake Thermal Efficiency :	35.2 %
Ignition Delay :	12.5 degrees
Centroid Phasing :	193.4 degrees
Centroid Magnitude :	46.54 J/degree
Sensitivity :	19.9 degrees
Premixed/Diffusion Ratio :	.62803

871023.133842 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	707.29	.515	375.16	.286
K2-Exhaust 2, F	773.76	.714	412.09	.396
K3-Exhaust 3, F	763.16	1.093	406.20	.607
K4-Exhaust 4, F	733.56	.932	389.76	.518
K5-Exhaust 5, F	720.96	.856	382.75	.476
K6-Exhaust 6, F	664.68	.740	351.49	.411
K7-Exhaust Common, F	726.39	.972	385.77	.540
Dry Bulb Temperature, F	72.939	.042	22.744	.024
Wet Bulb Temperature, F	69.101	.025	20.611	.014
J1-Water In, F	166.12	.096	74.509	.053
J2-Water Out, F	169.02	.049	76.122	.027
J3-Oil Sump, F	215.34	.267	101.86	.149
J4-Fuel Inlet, F	87.459	.032	30.811	.018
J5-Air After Filter, F	99.661	.104	37.590	.058
J6-Intake Manifold, F	103.66	.120	39.808	.066
J7-Fuel Return, F	87.674	.033	30.930	.019
P1-Fuel, PSIG	40.769	.349	281.10	2.408
P2-Oil Gallery, PSIG	56.453	.019	389.23	.133
P6-Ex Common, "H2OG	14.697	.255	3.657	.063
P7-Air Aft Filt, "H2OV	4.135	.772	1.029	.192
P8-Blowby, "H2OG	.068	.031	.017	.008
P11-Baro (Vent), "Hg ABS	29.099	.006	98.542	.020
Speed, RPM	1800.8	3.327	1800.8	3.327
Load, Lb-Ft	269.44	2.236	365.31	3.031
Smoke, %	3.267	.145	3.267	.145
Fuel Flow, Lb/Hr	40.142	.686	18.208	.311
Horsepower	92.386	.862	68.881	.643
Corrected Horsepower	97.196	.907	72.466	.676
BSFC, lb/hp-hr	.435	.006	.264	.004
Corrected BSFC	.413	.006	.251	.004
Relative Humidity	82.656	.147	82.656	.147
Reference Pressure, inHg	28.795		97.512	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1296

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.80 in-Hg
Speed :	1801 RPM
Load :	269.4 lb-ft
Fuel Flow :	40.1 lb/hr
Brake Power :	92.38 bhp
BSFC :	.434 lb/bhp-hr
Indicated Power :	14.65 kW/cyl
Peak Pressure :	5.703 MPa
Peak Rate of Pressure Rise:	451.0 kPa/deg
Peak Heat Release Rate :	191.2 Joules/deg
Cumulative Heat Release :	1885.93 Joules
Apparent Combustion Efficiency :	80.1 %
Indicated Thermal Efficiency :	41.5 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	14.5 degrees
Centroid Phasing :	194.2 degrees
Centroid Magnitude :	39.73 J/degree
Sensitivity :	18.7 degrees
Premixed/Diffusion Ratio :	.77458

871023.135033 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	530.97	.760	277.20	.422
K2-Exhaust 2, F	560.25	.680	293.47	.378
K3-Exhaust 3, F	560.20	.740	293.44	.411
K4-Exhaust 4, F	529.67	.999	276.48	.555
K5-Exhaust 5, F	523.31	.481	272.95	.267
K6-Exhaust 6, F	472.67	1.058	244.82	.588
K7-Exhaust Common, F	521.04	.910	271.69	.506
Dry Bulb Temperature, F	73.073	.088	22.819	.049
Wet Bulb Temperature, F	69.239	.040	20.689	.022
J1-Water In, F	168.35	.089	75.748	.050
J2-Water Out, F	169.68	.051	76.489	.028
J3-Oil Sump, F	210.91	.084	99.393	.047
J4-Fuel Inlet, F	87.155	.311	30.642	.173
J5-Air After Filter, F	98.270	.090	36.817	.050
J6-Intake Manifold, F	103.13	.053	39.516	.030
J7-Fuel Return, F	84.846	.040	29.359	.022
P1-Fuel, PSIG	22.124	.141	152.54	.972
P2-Oil Gallery, PSIG	57.462	.049	396.19	.341
P6-Ex Common, "H2OG	11.510	.188	2.864	.047
P7-Air Aft Filt, "H2OV	4.261	.639	1.060	.159
P8-Blowby, "H2OG	.076	.019	.019	.005
P11-Baro (Vent), "Hg ABS	29.100	.006	98.543	.022
Speed, RPM	1801.5	2.298	1801.5	2.298
Load, Lb-Ft	134.49	4.026	182.35	5.459
Smoke, %	1.924	.047	1.924	.047
Fuel Flow, Lb/Hr	23.923	.389	10.851	.176
Horsepower	46.134	1.422	34.396	1.060
Corrected Horsepower	48.481	1.494	36.146	1.114
BSFC, lb/hp-hr	.519	.019	.316	.012
Corrected BSFC	.494	.018	.300	.011
Relative Humidity	82.706	.200	82.706	.200
Reference Pressure, inHg	28.786		97.481	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1298

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.79 in-Hg
Speed :	1802 RPM
Load :	134.5 lb-ft
Fuel Flow :	23.9 lb/hr
Brake Power :	46.15 bhp
BSFC :	.518 lb/bhp-hr
Indicated Power :	9.27 kW/cyl
Peak Pressure :	4.931 MPa
Peak Rate of Pressure Rise:	270.2 kPa/deg
Peak Heat Release Rate :	136.4 Joules/deg
Cumulative Heat Release :	1230.10 Joules
Apparent Combustion Efficiency :	87.7 %
Indicated Thermal Efficiency :	44.0 %
Brake Thermal Efficiency :	27.2 %
Ignition Delay :	16.7 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	33.39 J/degree
Sensitivity :	17.3 degrees
Premixed/Diffusion Ratio :	.96777

871023.140103 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	400.18	1.059	204.54	.588
K2-Exhaust 2, F	395.28	1.898	201.82	1.054
K3-Exhaust 3, F	409.59	2.025	209.77	1.125
K4-Exhaust 4, F	397.39	1.753	202.99	.974
K5-Exhaust 5, F	387.89	1.903	197.71	1.057
K6-Exhaust 6, F	346.99	1.216	174.99	.675
K7-Exhaust Common, F	385.70	1.430	196.50	.795
Dry Bulb Temperature, F	72.536	.034	22.520	.019
Wet Bulb Temperature, F	68.865	.024	20.481	.013
J1-Water In, F	168.47	.135	75.814	.075
J2-Water Out, F	168.96	.149	76.090	.083
J3-Oil Sump, F	206.79	.204	97.106	.113
J4-Fuel Inlet, F	88.485	.076	31.381	.042
J5-Air After Filter, F	97.604	.091	36.447	.051
J6-Intake Manifold, F	102.18	.084	38.988	.047
J7-Fuel Return, F	84.120	.100	28.956	.056
P1-Fuel, PSIG	11.740	.193	80.943	1.333
P2-Oil Gallery, PSIG	58.183	.030	401.15	.206
P6-Ex Common, "H2OG	9.032	.077	2.247	.019
P7-Air Aft Filt, "H2OV	4.281	.665	1.065	.166
P8-Blowby, "H2OG	.078	.015	.019	.004
P11-Baro (Vent), "Hg ABS	29.093	.006	98.519	.021
Speed, RPM	1801.0	3.050	1801.0	3.050
Load, Lb-Ft	43.177	3.521	58.540	4.773
Smoke, %	1.460	.069	1.460	.069
Fuel Flow, Lb/Hr	15.826	.129	7.179	.059
Horsepower	14.805	1.198	11.038	.893
Corrected Horsepower	15.549	1.258	11.593	.938
BSFC, lb/hp-hr	1.075	.084	.654	.051
Corrected BSFC	1.024	.080	.623	.049
Relative Humidity	83.302	.096	83.302	.096
Reference Pressure, inHg	28.778		97.453	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1300

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.78 in-Hg
Speed :	1801 RPM
Load :	43.2 lb-ft
Fuel Flow :	15.8 lb/hr
Brake Power :	14.80 bhp
BSFC :	1.067 lb/bhp-hr
Indicated Power :	5.32 kW/cyl
Peak Pressure :	4.308 MPa
Peak Rate of Pressure Rise:	153.3 kPa/deg
Peak Heat Release Rate :	102.9 Joules/deg
Cumulative Heat Release :	757.787 Joules
Apparent Combustion Efficiency :	81.7 %
Indicated Thermal Efficiency :	38.2 %
Brake Thermal Efficiency :	13.2 %
Ignition Delay :	18.4 degrees
Centroid Phasing :	195.7 degrees
Centroid Magnitude :	26.66 J/degree
Sensitivity :	16.2 degrees
Premixed/Diffusion Ratio :	1.13423

971023.142404 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	1091.0	.427	588.34	.237
K2-Exhaust 2, F	1177.8	1.347	636.53	.748
K3-Exhaust 3, F	1173.9	.918	634.37	.510
K4-Exhaust 4, F	1145.9	.607	618.84	.337
K5-Exhaust 5, F	1175.6	1.182	635.33	.657
K6-Exhaust 6, F	1098.8	.673	592.65	.374
K7-Exhaust Common, F	1218.3	.601	659.07	.334
Dry Bulb Temperature, F	72.317	.122	22.398	.068
Wet Bulb Temperature, F	68.758	.058	20.421	.032
J1-Water In, F	161.18	.155	71.765	.086
J2-Water Out, F	169.93	.127	76.628	.071
J3-Oil Sump, F	212.90	.077	100.50	.043
J4-Fuel Inlet, F	87.872	.080	31.040	.045
J5-Air After Filter, F	101.81	.177	38.781	.098
J6-Intake Manifold, F	104.87	.071	40.483	.039
J7-Fuel Return, F	89.878	.024	32.154	.014
P1-Fuel, PSIG	99.745	.883	687.72	6.090
P2-Oil Gallery, PSIG	54.753	.145	377.51	.998
P6-Ex Common, "H2OG	14.476	.676	3.602	.168
P7-Air Aft Filt, "H2OV	3.706	.226	.922	.056
P8-Blowby, "H2OG	.080	.026	.020	.007
P11-Baro (Vent), "Hg ABS	29.078	.002	98.469	.007
Speed, RPM	1501.4	2.257	1501.4	2.257
Load, Lb-Ft	552.67	1.759	749.32	2.385
Smoke, %	29.867	1.044	29.867	1.044
Fuel Flow, Lb/Hr	70.952	1.752	32.183	.794
Horsepower	157.99	.519	117.80	.387
Corrected Horsepower	166.63	.547	124.24	.408
BSFC, lb/hp-hr	.449	.011	.273	.007
Corrected BSFC	.426	.010	.259	.006
Relative Humidity	83.748	.406	83.748	.406
Reference Pressure, inHg	28.805		97.546	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1302

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.81 in-Hg
Speed :	1501 RPM
Load :	552.7 lb-ft
Fuel Flow :	71.0 lb/hr
Brake Power :	157.96 bhp
BSFC :	.449 lb/bhp-hr
Indicated Power :	22.54 kW/cyl
Peak Pressure :	8.298 MPa
Peak Rate of Pressure Rise:	1213. kPa/deg
Peak Heat Release Rate :	496.3 Joules/deg
Cumulative Heat Release :	3435.53 Joules
Apparent Combustion Efficiency :	68.7 %
Indicated Thermal Efficiency :	36.0 %
Brake Thermal Efficiency :	31.4 %
Ignition Delay :	5.9 degrees
Centroid Phasing :	190.0 degrees
Centroid Magnitude :	78.87 J/degree
Sensitivity :	23.1 degrees
Premixed/Diffusion Ratio :	.25290

971023.144207 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	1032.3	2.073	555.74	1.151
K2-Exhaust 2, F	1125.2	1.172	607.31	.651
K3-Exhaust 3, F	1112.1	1.411	600.06	.784
K4-Exhaust 4, F	1083.8	1.493	584.31	.829
K5-Exhaust 5, F	1121.4	1.284	605.22	.713
K6-Exhaust 6, F	1067.3	1.007	575.16	.559
K7-Exhaust Common, F	1158.9	1.734	626.06	.963
Dry Bulb Temperature, F	72.735	.211	22.631	.117
Wet Bulb Temperature, F	68.935	.081	20.519	.045
J1-Water In, F	161.21	.109	71.781	.060
J2-Water Out, F	170.97	.118	77.204	.066
J3-Oil Sump, F	212.64	.180	100.35	.100
J4-Fuel Inlet, F	90.395	.065	32.442	.036
J5-Air After Filter, F	99.792	.504	37.662	.280
J6-Intake Manifold, F	102.46	.651	39.146	.361
J7-Fuel Return, F	91.694	.106	33.163	.059
P1-Fuel, PSIG	88.760	.338	611.98	2.331
P2-Oil Gallery, PSIG	50.837	.042	350.51	.292
P6-Ex Common, "H2OG	13.492	.448	3.357	.111
P7-Air Aft Filt, "H2OV	3.472	.189	.864	.047
P8-Blowby, "H2OG	.065	.041	.016	.010
P11-Baro (Vent), "Hg ABS	29.073	.001	98.453	.004
Speed, RPM	1299.1	1.484	1299.1	1.484
Load, Lb-Ft	556.52	3.552	754.53	4.816
Smoke, %	38.901	1.516	38.901	1.516
Fuel Flow, Lb/Hr	64.677	1.696	29.337	.769
Horsepower	137.65	.845	102.63	.630
Corrected Horsepower	144.95	.889	108.07	.663
BSFC, lb/hp-hr	.470	.013	.286	.008
Corrected BSFC	.446	.012	.271	.007
Relative Humidity	82.782	.543	82.782	.543
Reference Pressure, inHg	28.818		97.588	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1304

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.82 in-Hg
Speed :	1299 RPM
Load :	556.5 lb-ft
Fuel Flow :	64.7 lb/hr
Brake Power :	137.64 bhp
BSFC :	.470 lb/bhp-hr
Indicated Power :	19.10 kW/cyl
Peak Pressure :	8.622 MPa
Peak Rate of Pressure Rise:	1324. kPa/deg
Peak Heat Release Rate :	552.2 Joules/deg
Cumulative Heat Release :	3353.48 Joules
Apparent Combustion Efficiency :	63.7 %
Indicated Thermal Efficiency :	33.5 %
Brake Thermal Efficiency :	30.0 %
Ignition Delay :	4.4 degrees
Centroid Phasing :	188.1 degrees
Centroid Magnitude :	93.01 J/degree
Sensitivity :	22.6 degrees
Premixed/Diffusion Ratio :	.19615

871023.145044 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	978.10	.694	525.61	.386
K2-Exhaust 2, F	1058.0	.449	570.00	.249
K3-Exhaust 3, F	1040.5	1.376	560.30	.764
K4-Exhaust 4, F	1007.7	.312	542.05	.173
K5-Exhaust 5, F	1055.7	.569	568.74	.316
K6-Exhaust 6, F	1020.9	.833	549.41	.463
K7-Exhaust Common, F	1082.6	.646	583.67	.359
Dry Bulb Temperature, F	73.131	.063	22.851	.035
Wet Bulb Temperature, F	69.011	.024	20.562	.013
J1-Water In, F	161.28	.167	71.825	.093
J2-Water Out, F	171.49	.104	77.495	.058
J3-Oil Sump, F	209.29	.055	98.497	.030
J4-Fuel Inlet, F	90.576	.051	32.542	.028
J5-Air After Filter, F	101.82	.160	38.791	.089
J6-Intake Manifold, F	104.14	.024	40.076	.013
J7-Fuel Return, F	90.977	.142	32.765	.079
P1-Fuel, PSIG	69.366	.457	478.26	3.153
P2-Oil Gallery, PSIG	45.054	.057	310.63	.391
P6-Ex Common, "H2OG	11.223	.537	2.793	.134
P7-Air Aft Filt, "H2OV	3.186	.355	.793	.088
P8-Blowby, "H2OG	.104	.044	.026	.011
P11-Baro (Vent), "Hg ABS	29.068	.001	98.434	.004
Speed, RPM	1100.3	3.271	1100.3	3.271
Load, Lb-Ft	546.31	3.769	740.69	5.110
Smoke, %	33.762	2.244	33.762	2.244
Fuel Flow, Lb/Hr	54.205	.604	24.587	.274
Horsepower	114.45	.946	85.333	.705
Corrected Horsepower	120.76	.998	90.033	.744
BSFC, lb/hp-hr	.474	.006	.288	.004
Corrected BSFC	.449	.006	.273	.003
Relative Humidity	81.490	.221	81.490	.221
Reference Pressure, inHg	28.833		97.641	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1306

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.83 in-Hg
Speed :	1100 RPM
Load :	546.3 lb-ft
Fuel Flow :	54.2 lb/hr
Brake Power :	114.42 bhp
BSFC :	.474 lb/bhp-hr
Indicated Power :	15.31 kW/cyl
Peak Pressure :	8.672 MPa
Peak Rate of Pressure Rise:	1277. kPa/deg
Peak Heat Release Rate :	540.1 Joules/deg
Cumulative Heat Release :	3120.59 Joules
Apparent Combustion Efficiency :	59.9 %
Indicated Thermal Efficiency :	32.1 %
Brake Thermal Efficiency :	29.8 %
Ignition Delay :	3.7 degrees
Centroid Phasing :	185.0 degrees
Centroid Magnitude :	103.9 J/degree
Sensitivity :	20.2 degrees
Premixed/Diffusion Ratio :	.18478

CUMMINS NH220 LOG SHEET

TEST NO. 3 FUEL ___ DATE 10/26/87 PAGE 22

RF92V13L86

Operator Greg							
Time	9:25	9:40	9:53	10:10	10:23		
Test Hour	40min	15min	15min	15min	15min		
Speed, RPM	2099	1800	1501	1300	1100		
Load, lb–ft	488.6	527.1	551.1	565.7	538.3		
Fuel Flow, lb/hr	81.7	75.7	68.9	61.0	50.4		
Exh. Opacity, %	19.5	13.0	10.5	12.0	14.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1150	1153	1124	1074	1001		
Exhaust Cyl. 2	1245	1235	1202	1158	1070		
Exhaust Cyl. 3	1224	1223	1195	1151	1055		
Exhaust Cyl. 4	1195	1203	1172	1126	1030		
Exhaust Cyl. 5	1218	1241	1229	1193	1101		
Exhaust Cyl. 6	1142	1145	1122	1094	1018		
Exhaust Common	1238	1237	1257	1240	1129		
Water In	161	161	160	160	160		
Water Out	168	168	170	170	170		
Oil Sump	220	224	218	214	~~220~~ 207		
Fuel	91	89	89	89	~~87~~ 88		
Inlet Air	98	100	102	98	98		
Wet Bulb	71.2	71.9	72.1	72.5	73		
Dry Bulb	79.5	80.2	81.0	81.0	83		
PRESSURES, PSIG							
Fuel Pump	129.0	117.0	102.0	89.0	69.0		
Oil Gallery	57.8	55.2	53.4	50.2	44.9		
LOW PRESSURES							
Intake Vac, in.water	3.1	2.3	1.7	1.4	1.0		
Exh. Comm., in.Water	27.5	21.0	16.5	16.0	13.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.01	29.0	29.01	29.01	29.01		

871026.102125 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1149.8	1.489	621.00	.827
K2-Exhaust 2, F	1243.1	.551	672.82	.306
K3-Exhaust 3, F	1223.6	.732	662.01	.407
K4-Exhaust 4, F	1193.8	.621	645.46	.345
K5-Exhaust 5, F	1215.4	.441	657.42	.245
K6-Exhaust 6, F	1140.4	.866	615.78	.481
K7-Exhaust Common, F	1236.6	.595	669.21	.330
Dry Bulb Temperature, F	78.010	.058	25.561	.032
Wet Bulb Temperature, F	72.586	.026	22.548	.014
J1-Water In, F	161.35	.081	71.861	.045
J2-Water Out, F	167.65	.049	75.361	.027
J3-Oil Sump, F	218.24	.413	103.47	.229
J4-Fuel Inlet, F	90.426	.055	32.459	.031
J5-Air After Filter, F	98.607	.158	37.004	.088
J6-Intake Manifold, F	100.52	.093	38.067	.052
J7-Fuel Return, F	93.626	.033	34.237	.019
P1-Fuel, PSIG	127.51	1.609	879.12	11.091
P2-Oil Gallery, PSIG	57.480	.129	396.31	.889
P6-Ex Common, "H2OG	26.158	.332	6.509	.083
P7-Air Aft Filt, "H2OV	6.215	.325	1.547	.081
P8-Blowby, "H2OG	.074	.026	.018	.006
P11-Baro (Vent), "Hg ABS	29.010	.002	98.239	.007
Speed, RPM	2101.5	3.147	2101.5	3.147
Load, Lb-Ft	481.25	1.697	652.49	2.301
Smoke, %	19.704	.468	19.704	.468
Fuel Flow, Lb/Hr	82.912	.898	37.608	.407
Horsepower	192.56	.558	143.57	.416
Corrected Horsepower	203.56	.590	151.77	.440
BSFC, lb/hp-hr	.431	.004	.262	.003
Corrected BSFC	.407	.004	.248	.002
Relative Humidity	77.344	.128	77.344	.128
Reference Pressure, inHg	28.553		96.691	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1308

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.55 in-Hg
Speed :	2102 RPM
Load :	481.3 lb-ft
Fuel Flow :	82.9 lb/hr
Brake Power :	192.63 bhp
BSFC :	.430 lb/bhp-hr
Indicated Power :	28.62 kW/cyl
Peak Pressure :	7.064 MPa
Peak Rate of Pressure Rise:	549.6 kPa/deg
Peak Heat Release Rate :	195.6 Joules/deg
Cumulative Heat Release :	3287.36 Joules
Apparent Combustion Efficiency :	77.1 %
Indicated Thermal Efficiency :	38.3 %
Brake Thermal Efficiency :	32.1 %
Ignition Delay :	4.7 degrees
Centroid Phasing :	196.2 degrees
Centroid Magnitude :	37.51 J/degree
Sensitivity :	30.5 degrees
Premixed/Diffusion Ratio :	.15412

871026.094141 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1155.4	.861	624.14	.478
K2-Exhaust 2, F	1235.2	1.752	668.42	.973
K3-Exhaust 3, F	1222.1	.669	661.15	.372
K4-Exhaust 4, F	1201.5	.468	649.73	.260
K5-Exhaust 5, F	1239.7	.532	670.97	.295
K6-Exhaust 6, F	1145.2	.572	618.45	.318
K7-Exhaust Common, F	1255.3	.414	679.62	.230
Dry Bulb Temperature, F	79.390	.074	26.328	.041
Wet Bulb Temperature, F	73.629	.064	23.127	.036
J1-Water In, F	161.04	.112	71.687	.062
J2-Water Out, F	168.77	.095	75.984	.053
J3-Oil Sump, F	223.97	.081	106.65	.045
J4-Fuel Inlet, F	89.619	.024	32.011	.013
J5-Air After Filter, F	100.55	.121	38.082	.067
J6-Intake Manifold, F	102.10	.067	38.944	.037
J7-Fuel Return, F	92.234	.041	33.463	.023
P1-Fuel, PSIG	116.25	1.285	801.54	8.860
P2-Oil Gallery, PSIG	54.830	.027	378.04	.186
P6-Ex Common, "H2OG	18.463	.314	4.594	.078
P7-Air Aft Filt, "H2OV	5.152	.709	1.282	.176
P8-Blowby, "H2OG	.050	.037	.012	.009
P11-Baro (Vent), "Hg ABS	29.004	.004	98.219	.015
Speed, RPM	1801.3	3.724	1801.3	3.724
Load, Lb-Ft	527.04	2.244	714.57	3.042
Smoke, %	13.182	.393	13.182	.393
Fuel Flow, Lb/Hr	75.729	.619	34.350	.281
Horsepower	180.77	.934	134.78	.696
Corrected Horsepower	191.64	.990	142.88	.738
BSFC, lb/hp-hr	.419	.004	.255	.003
Corrected BSFC	.395	.004	.240	.002
Relative Humidity	76.404	.106	76.404	.106
Reference Pressure, inHg	28.625		96.936	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1310

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.63 in-Hg
Speed :	1801 RPM
Load :	527.0 lb-ft
Fuel Flow :	75.7 lb/hr
Brake Power :	180.72 bhp
BSFC :	.419 lb/bhp-hr
Indicated Power :	25.90 kW/cyl
Peak Pressure :	7.645 MPa
Peak Rate of Pressure Rise:	633.3 kPa/deg
Peak Heat Release Rate :	239.9 Joules/deg
Cumulative Heat Release :	3416.89 Joules
Apparent Combustion Efficiency :	75.2 %
Indicated Thermal Efficiency :	38.0 %
Brake Thermal Efficiency :	32.9 %
Ignition Delay :	2.8 degrees
Centroid Phasing :	193.9 degrees
Centroid Magnitude :	39.96 J/degree
Sensitivity :	30.1 degrees
Premixed/Diffusion Ratio :	.09304

871026.095526 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1121.5	.862	605.30	.479
K2-Exhaust 2, F	1204.1	.584	651.19	.325
K3-Exhaust 3, F	1196.4	.461	646.91	.256
K4-Exhaust 4, F	1172.4	.232	633.56	.129
K5-Exhaust 5, F	1228.5	.865	664.71	.480
K6-Exhaust 6, F	1120.1	.725	604.50	.403
K7-Exhaust Common, F	1257.2	.391	680.69	.217
Dry Bulb Temperature, F	80.155	.048	26.753	.027
Wet Bulb Temperature, F	73.827	.023	23.237	.013
J1-Water In, F	160.97	.123	71.652	.068
J2-Water Out, F	169.89	.101	76.606	.056
J3-Oil Sump, F	219.11	.095	103.95	.053
J4-Fuel Inlet, F	89.830	.033	32.128	.019
J5-Air After Filter, F	102.29	.144	39.047	.080
J6-Intake Manifold, F	103.81	.061	39.894	.034
J7-Fuel Return, F	91.371	.023	32.984	.013
P1-Fuel, PSIG	99.725	.986	687.58	6.800
P2-Oil Gallery, PSIG	53.062	.053	365.85	.368
P6-Ex Common, "H2OG	14.531	.591	3.616	.147
P7-Air Aft Filt, "H2OV	4.755	.281	1.183	.070
P8-Blowby, "H2OG	.048	.016	.012	.004
P11-Baro (Vent), "Hg ABS	29.010	.002	98.238	.006
Speed, RPM	1501.7	2.590	1501.7	2.590
Load, Lb-Ft	550.98	2.002	747.02	2.714
Smoke, %	11.465	.503	11.465	.503
Fuel Flow, Lb/Hr	68.239	.475	30.953	.216
Horsepower	157.55	.577	117.46	.430
Corrected Horsepower	167.24	.613	124.69	.457
BSFC, lb/hp-hr	.433	.003	.264	.002
Corrected BSFC	.408	.003	.248	.002
Relative Humidity	74.452	.168	74.452	.168
Reference Pressure, inHg	28.660		97.054	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1312

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.66 in-Hg
Speed :	1502 RPM
Load :	551.0 lb-ft
Fuel Flow :	68.2 lb/hr
Brake Power :	157.58 bhp
BSFC :	.433 lb/bhp-hr
Indicated Power :	22.47 kW/cyl
Peak Pressure :	8.336 MPa
Peak Rate of Pressure Rise:	769.5 kPa/deg
Peak Heat Release Rate :	311.5 Joules/deg
Cumulative Heat Release :	3450.47 Joules
Apparent Combustion Efficiency :	70.3 %
Indicated Thermal Efficiency :	36.6 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	1.3 degrees
Centroid Phasing :	189.3 degrees
Centroid Magnitude :	46.49 J/degree
Sensitivity :	27.0 degrees
Premixed/Diffusion Ratio :	.04830

371026.100901 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1075.3	1.189	579.62	.661
K2-Exhaust 2, F	1158.7	.701	625.94	.390
K3-Exhaust 3, F	1151.0	.518	621.65	.288
K4-Exhaust 4, F	1127.5	.924	608.60	.513
K5-Exhaust 5, F	1193.8	1.004	645.44	.558
K6-Exhaust 6, F	1092.4	.658	589.12	.366
K7-Exhaust Common, F	1240.9	.603	671.61	.335
Dry Bulb Temperature, F	81.227	.062	27.349	.034
Wet Bulb Temperature, F	74.573	.056	23.652	.031
J1-Water In, F	160.17	.105	71.206	.058
J2-Water Out, F	170.13	.146	76.740	.081
J3-Oil Sump, F	214.41	.089	101.34	.049
J4-Fuel Inlet, F	89.451	.088	31.917	.049
J5-Air After Filter, F	98.976	.103	37.209	.057
J6-Intake Manifold, F	98.828	.074	37.127	.041
J7-Fuel Return, F	90.591	.096	32.551	.053
P1-Fuel, PSIG	87.913	.438	606.14	3.021
P2-Oil Gallery, PSIG	50.246	.117	346.43	.806
P6-Ex Common, "H2OG	13.791	.443	3.432	.110
P7-Air Aft Filt, "H2OV	4.355	.282	1.084	.070
P8-Blowby, "H2OG	.064	.030	.016	.007
P11-Baro (Vent), "Hg ABS	29.011	.001	98.241	.004
Speed, RPM	1301.8	2.456	1301.8	2.456
Load, Lb-Ft	564.99	1.863	766.02	2.525
Smoke, %	13.289	.630	13.289	.630
Fuel Flow, Lb/Hr	62.090	.645	28.164	.293
Horsepower	140.04	.598	104.41	.446
Corrected Horsepower	148.31	.633	110.58	.472
BSFC, lb/hp-hr	.443	.006	.270	.003
Corrected BSFC	.419	.005	.255	.003
Relative Humidity	73.545	.387	73.545	.387
Reference Pressure, inHg	28.690		97.157	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1314

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.69 in-Hg
Speed :	1302 RPM
Load :	565.0 lb-ft
Fuel Flow :	62.1 lb/hr
Brake Power :	140.07 bhp
BSFC :	.443 lb/bhp-hr
Indicated Power :	19.52 kW/cyl
Peak Pressure :	8.740 MPa
Peak Rate of Pressure Rise:	809.8 kPa/deg
Peak Heat Release Rate :	334.9 Joules/deg
Cumulative Heat Release :	3435.33 Joules
Apparent Combustion Efficiency :	66.6 %
Indicated Thermal Efficiency :	34.9 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	1.2 degrees
Centroid Phasing :	187.6 degrees
Centroid Magnitude :	52.47 J/degree
Sensitivity :	25.3 degrees
Premixed/Diffusion Ratio :	.04936

871026.102220 AL-15299-F AL-12920-L NH220				3
K1-Exhaust 1, F	1000.3	1.005	537.96	.558
K2-Exhaust 2, F	1070.6	.782	576.97	.434
K3-Exhaust 3, F	1056.1	.344	568.93	.191
K4-Exhaust 4, F	1032.3	.367	555.74	.204
K5-Exhaust 5, F	1102.7	.543	594.83	.301
K6-Exhaust 6, F	1019.2	1.139	548.42	.633
K7-Exhaust Common, F	1129.8	.302	609.88	.168
Dry Bulb Temperature, F	81.034	.098	27.241	.054
Wet Bulb Temperature, F	74.183	.052	23.435	.029
J1-Water In, F	160.58	.122	71.434	.068
J2-Water Out, F	170.28	.084	76.822	.046
J3-Oil Sump, F	208.21	.195	97.896	.109
J4-Fuel Inlet, F	89.268	.083	31.815	.046
J5-Air After Filter, F	98.652	.127	37.029	.070
J6-Intake Manifold, F	98.969	.073	37.205	.040
J7-Fuel Return, F	89.748	.037	32.082	.020
P1-Fuel, PSIG	67.648	.558	466.42	3.850
P2-Oil Gallery, PSIG	45.564	.033	314.15	.231
P6-Ex Common, "H2OG	11.209	.331	2.789	.082
P7-Air Aft Filt, "H2OV	4.038	.320	1.005	.080
P8-Blowby, "H2OG	.084	.033	.021	.008
P11-Baro (Vent), "Hg ABS	29.002	.002	98.213	.008
Speed, RPM	1101.3	2.126	1101.3	2.126
Load, Lb-Ft	539.79	3.958	731.86	5.366
Smoke, %	13.274	.431	13.274	.431
Fuel Flow, Lb/Hr	50.560	.277	22.934	.126
Horsepower	113.19	.967	84.392	.721
Corrected Horsepower	119.82	1.023	89.331	.763
BSFC, lb/hp-hr	.447	.005	.272	.003
Corrected BSFC	.422	.004	.257	.003
Relative Humidity	72.761	.163	72.761	.163
Reference Pressure, inHg	28.705		97.208	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1316

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.71 in-Hg
Speed :	1101 RPM
Load :	539.8 lb-ft
Fuel Flow :	50.6 lb/hr
Brake Power :	113.16 bhp
BSFC :	.447 lb/bhp-hr
Indicated Power :	15.69 kW/cyl
Peak Pressure :	8.747 MPa
Peak Rate of Pressure Rise:	775.6 kPa/deg
Peak Heat Release Rate :	327.0 Joules/deg
Cumulative Heat Release :	3239.08 Joules
Apparent Combustion Efficiency :	65.2 %
Indicated Thermal Efficiency :	34.4 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	.9 degrees
Centroid Phasing :	185.6 degrees
Centroid Magnitude :	53.49 J/degree
Sensitivity :	23.7 degrees
Premixed/Diffusion Ratio :	.04000

CUMMINS NH220 LOG SHEET

TEST NO. 3 FUEL TF/PNJ8X87 DATE 10/26/87 PAGE 23

Operator GREG							
Time	11:40	11:55	12:10	12:25	12:35	12:45	1:05
Test Hour	30 min	15 min	15 min	15 min	10 min	10 min	20 min
Speed, RPM	2100	1801	1800	1800	1800	1800	1500
Load, lb–ft	502.0	537.7	365.7	270.3	132.2	43.3	544.7
Fuel Flow, lb/hr	89.0	79.2	49.3	38.4	24.5	15.7	72.3
Exh. Opacity, %	38.0	27.0	1.5	1.0	.5	0	41.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1157	1136	818	705	528	401	1078
Exhaust Cyl. 2	1256	1216	894	766	553	403	1161
Exhaust Cyl. 3	1248	1217	882	759	555	408	1167
Exhaust Cyl. 4	1219	1188	853	728	526	401	1137
Exhaust Cyl. 5	1240	1216	843	723	518	385	1171
Exhaust Cyl. 6	1156	1149	795	669	466	346	1099
Exhaust Common	1268	1254	858	723	514	383	1218
Water In	161	160	163	166	168	170	160
Water Out	168	169	168	170	170	171	170
Oil Sump	231	228	219	214	210	206	210
Fuel	91	90	87	87	86	86	91
Inlet Air	101	99	98	97	98	98	100
Wet Bulb	74.0	74.9	75.0	75.5	75.0	75.8	75.0
Dry Bulb	85.0	88.0	88.0	87.5	88.0	88.0	90.0
PRESSURES, PSIG							
Fuel Pump	137.0	120.0	59.0	43.0	23.0	15.0	103.0
Oil Gallery	55.3	54.5	55.9	57.2	58.0	58.5	55.6
LOW PRESSURES							
Intake Vac, in.water	3.1	2.4	2.5	2.5	2.6	2.6	1.7
Exh. Comm., in.Water	27.5	20.0	16.5	16.0	12.5	10.5	16.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	28.98	28.98	28.96	28.96	28.96	28.95	28.95

CUMMINS NH220 LOG SHEET

TEST NO. 3 FUEL TF1ØN18X87 DATE 10/26/87 PAGE 24

Operator GREG							
Time	~~11:15~~ 11:30						
Test Hour	10min	15min					
Speed, RPM	1300	1100					
Load, lb–ft	554.1	543.3					
Fuel Flow, lb/hr	64.0	53.0					
Exh. Opacity, %	48.0	34.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1037	995					
Exhaust Cyl. 2	1109	1038					
Exhaust Cyl. 3	1109	1033					
Exhaust Cyl. 4	1076	1002					
Exhaust Cyl. 5	1123	1059					
Exhaust Cyl. 6	1078	1020					
Exhaust Common	1167	1079					
Water In	160	161					
Water Out	171	171					
Oil Sump	211	207					
Fuel	91	91					
Inlet Air	100	99					
Wet Bulb	74.5	74.2					
Dry Bulb	89.0	90.2					
PRESSURES, PSIG							
Fuel Pump	93.0	71.0					
Oil Gallery	51.0	45.0					
LOW PRESSURES							
Intake Vac, in.water	1.4	1.1					
Exh. Comm., in.Water	14.5	12.5					
Blowby, in.water	0	0					
Barometer, in.Hg	28.94	28.94					

871026.113840 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	1153.8	1.537	623.23	.854
K2-Exhaust 2, F	1239.5	11.837	670.85	6.576
K3-Exhaust 3, F	1236.7	.796	669.28	.442
K4-Exhaust 4, F	1215.7	.548	657.62	.304
K5-Exhaust 5, F	1240.0	2.136	671.09	1.186
K6-Exhaust 6, F	1156.4	.650	624.64	.361
K7-Exhaust Common, F	1266.5	1.642	685.85	.912
Dry Bulb Temperature, F	85.616	.111	29.787	.062
Wet Bulb Temperature, F	76.441	.032	24.689	.018
J1-Water In, F	160.81	.070	71.563	.039
J2-Water Out, F	168.17	.036	75.650	.020
J3-Oil Sump, F	231.55	.112	110.86	.062
J4-Fuel Inlet, F	91.053	.041	32.807	.023
J5-Air After Filter, F	100.93	.123	38.296	.068
J6-Intake Manifold, F	100.86	.166	38.256	.092
J7-Fuel Return, F	94.191	.033	34.550	.018
P1-Fuel, PSIG	135.60	.848	934.96	5.847
P2-Oil Gallery, PSIG	54.682	.035	377.02	.241
P6-Ex Common, "H2OG	26.320	.446	6.550	.111
P7-Air Aft Filt, "H2OV	6.809	.227	1.694	.057
P8-Blowby, "H2OG	.075	.021	.019	.005
P11-Baro (Vent), "Hg ABS	28.980	.002	98.136	.007
Speed, RPM	2102.1	3.146	2102.1	3.146
Load, Lb-Ft	501.59	3.042	680.05	4.124
Smoke, %	32.535	1.560	32.535	1.560
Fuel Flow, Lb/Hr	88.026	.712	39.928	.323
Horsepower	200.76	1.016	149.68	.757
Corrected Horsepower	213.43	1.080	159.12	.805
BSFC, lb/hp-hr	.438	.003	.267	.002
Corrected BSFC	.412	.003	.251	.002
Relative Humidity	66.101	.395	66.101	.395
Reference Pressure, inHg	28.479		96.440	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1318

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.48 in-Hg
Speed :	2102 RPM
Load :	501.6 lb-ft
Fuel Flow :	88.0 lb/hr
Brake Power :	200.75 bhp
BSFC :	.438 lb/bhp-hr
Indicated Power :	30.30 kW/cyl
Peak Pressure :	7.499 MPa
Peak Rate of Pressure Rise:	915.8 kPa/deg
Peak Heat Release Rate :	361.6 Joules/deg
Cumulative Heat Release :	3410.66 Joules
Apparent Combustion Efficiency :	77.0 %
Indicated Thermal Efficiency :	39.1 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	9.8 degrees
Centroid Phasing :	195.3 degrees
Centroid Magnitude :	69.85 J/degree
Sensitivity :	24.6 degrees
Premixed/Diffusion Ratio :	.39723

871026.115424 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	1134.3	.911	612.37	.506
K2-Exhaust 2, F	1210.2	4.290	654.57	2.384
K3-Exhaust 3, F	1217.1	.791	658.39	.439
K4-Exhaust 4, F	1188.2	.750	642.35	.417
K5-Exhaust 5, F	1215.5	.403	657.49	.224
K6-Exhaust 6, F	1143.1	.564	617.27	.313
K7-Exhaust Common, F	1251.2	.981	677.36	.545
Dry Bulb Temperature, F	86.125	.030	30.070	.017
Wet Bulb Temperature, F	76.566	.039	24.759	.022
J1-Water In, F	160.64	.104	71.465	.058
J2-Water Out, F	168.96	.042	76.090	.023
J3-Oil Sump, F	228.56	.062	109.20	.035
J4-Fuel Inlet, F	91.119	.206	32.844	.114
J5-Air After Filter, F	98.541	.148	36.967	.082
J6-Intake Manifold, F	98.599	.254	37.000	.141
J7-Fuel Return, F	93.311	.139	34.062	.077
P1-Fuel, PSIG	119.33	1.101	822.74	7.592
P2-Oil Gallery, PSIG	53.980	.018	372.18	.127
P6-Ex Common, "H2OG	18.171	.232	4.522	.058
P7-Air Aft Filt, "H2OV	5.471	.599	1.361	.149
P8-Blowby, "H2OG	.073	.034	.018	.008
P11-Baro (Vent), "Hg ABS	28.973	.007	98.115	.024
Speed, RPM	1804.1	2.836	1804.1	2.836
Load, Lb-Ft	539.25	2.641	731.12	3.581
Smoke, %	24.040	1.569	24.040	1.569
Fuel Flow, Lb/Hr	79.203	.560	35.926	.254
Horsepower	185.23	1.101	138.11	.821
Corrected Horsepower	196.54	1.168	146.54	.871
BSFC, lb/hp-hr	.428	.003	.260	.002
Corrected BSFC	.403	.003	.245	.002
Relative Humidity	65.008	.111	65.008	.111
Reference Pressure, inHg	28.571		96.753	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1320

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.57 in-Hg
Speed :	1804 RPM
Load :	539.3 lb-ft
Fuel Flow :	79.2 lb/hr
Brake Power :	185.24 bhp
BSFC :	.428 lb/bhp-hr
Indicated Power :	27.09 kW/cyl
Peak Pressure :	7.971 MPa
Peak Rate of Pressure Rise:	1098. kPa/deg
Peak Heat Release Rate :	437.3 Joules/deg
Cumulative Heat Release :	3473.75 Joules
Apparent Combustion Efficiency :	74.8 %
Indicated Thermal Efficiency :	38.8 %
Brake Thermal Efficiency :	33.0 %
Ignition Delay :	7.3 degrees
Centroid Phasing :	192.6 degrees
Centroid Magnitude :	74.39 J/degree
Sensitivity :	24.3 degrees
Premixed/Diffusion Ratio :	.30168

871026.120905 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	817.88	.596	436.60	.331
K2-Exhaust 2, F	895.02	.762	479.46	.423
K3-Exhaust 3, F	882.53	.692	472.52	.384
K4-Exhaust 4, F	858.64	.902	459.24	.501
K5-Exhaust 5, F	851.05	.594	455.03	.330
K6-Exhaust 6, F	799.03	.910	426.13	.505
K7-Exhaust Common, F	862.81	.694	461.56	.385
Dry Bulb Temperature, F	86.677	.043	30.376	.024
Wet Bulb Temperature, F	77.096	.025	25.053	.014
J1-Water In, F	164.10	.072	73.391	.040
J2-Water Out, F	168.51	.106	75.841	.059
J3-Oil Sump, F	220.61	.221	104.78	.123
J4-Fuel Inlet, F	88.355	.046	31.308	.025
J5-Air After Filter, F	98.087	.112	36.715	.062
J6-Intake Manifold, F	97.663	.041	36.480	.023
J7-Fuel Return, F	89.959	.108	32.199	.060
P1-Fuel, PSIG	55.997	.287	386.09	1.979
P2-Oil Gallery, PSIG	55.464	.050	382.41	.343
P6-Ex Common, "H2OG	14.254	.381	3.547	.095
P7-Air Aft Filt, "H2OV	6.223	.689	1.549	.171
P8-Blowby, "H2OG	.062	.046	.015	.011
P11-Baro (Vent), "Hg ABS	28.964	.004	98.083	.015
Speed, RPM	1801.4	3.195	1801.4	3.195
Load, Lb-Ft	364.72	2.579	494.50	3.497
Smoke, %	1.973	.167	1.973	.167
Fuel Flow, Lb/Hr	48.202	1.396	21.864	.633
Horsepower	125.10	.994	93.270	.741
Corrected Horsepower	132.80	1.055	99.015	.787
BSFC, lb/hp-hr	.385	.010	.234	.006
Corrected BSFC	.363	.010	.221	.006
Relative Humidity	65.131	.114	65.131	.114
Reference Pressure, inHg	28.506		96.533	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1322

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.51 in-Hg
Speed :	1801 RPM
Load :	364.7 lb-ft
Fuel Flow :	48.2 lb/hr
Brake Power :	125.06 bhp
BSFC :	.385 lb/bhp-hr
Indicated Power :	18.58 kW/cyl
Peak Pressure :	6.340 MPa
Peak Rate of Pressure Rise:	627.1 kPa/deg
Peak Heat Release Rate :	255.1 Joules/deg
Cumulative Heat Release :	2376.25 Joules
Apparent Combustion Efficiency :	84.0 %
Indicated Thermal Efficiency :	43.7 %
Brake Thermal Efficiency :	36.6 %
Ignition Delay :	13.0 degrees
Centroid Phasing :	193.9 degrees
Centroid Magnitude :	47.45 J/degree
Sensitivity :	19.9 degrees
Premixed/Diffusion Ratio :	.65554

971026.122313 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	705.85	.363	374.36	.202
K2-Exhaust 2, F	766.35	.520	407.97	.289
K3-Exhaust 3, F	760.92	.618	404.95	.343
K4-Exhaust 4, F	729.39	.635	387.44	.353
K5-Exhaust 5, F	722.07	.285	383.37	.159
K6-Exhaust 6, F	667.45	.779	353.03	.433
K7-Exhaust Common, F	724.06	.436	384.48	.242
Dry Bulb Temperature, F	85.519	.120	29.733	.066
Wet Bulb Temperature, F	76.184	.064	24.547	.036
J1-Water In, F	166.79	.078	74.883	.043
J2-Water Out, F	169.92	.063	76.621	.035
J3-Oil Sump, F	215.00	.249	101.66	.138
J4-Fuel Inlet, F	87.126	.046	30.626	.026
J5-Air After Filter, F	96.784	.054	35.991	.030
J6-Intake Manifold, F	97.232	.071	36.240	.040
J7-Fuel Return, F	88.756	.051	31.531	.028
P1-Fuel, PSIG	41.272	.440	284.56	3.033
P2-Oil Gallery, PSIG	56.559	.055	389.96	.382
P6-Ex Common, "H2OG	13.267	.354	3.301	.088
P7-Air Aft Filt, "H2OV	5.996	.637	1.492	.158
P8-Blowby, "H2OG	.097	.032	.024	.008
P11-Baro (Vent), "Hg ABS	28.966	.005	98.090	.018
Speed, RPM	1801.8	2.629	1801.8	2.629
Load, Lb-Ft	272.17	2.597	369.01	3.521
Smoke, %	1.355	.097	1.355	.097
Fuel Flow, Lb/Hr	41.293	1.349	18.730	.612
Horsepower	93.371	1.007	69.615	.751
Corrected Horsepower	98.910	1.067	73.745	.796
BSFC, lb/hp-hr	.442	.013	.269	.008
Corrected BSFC	.417	.012	.254	.008
Relative Humidity	65.538	.158	65.538	.158
Reference Pressure, inHg	28.525		96.597	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1324

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.53 in-Hg
Speed :	1802 RPM
Load :	272.2 lb-ft
Fuel Flow :	41.3 lb/hr
Brake Power :	93.39 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	14.77 kW/cyl
Peak Pressure :	5.752 MPa
Peak Rate of Pressure Rise:	477.2 kPa/deg
Peak Heat Release Rate :	202.3 Joules/deg
Cumulative Heat Release :	1896.80 Joules
Apparent Combustion Efficiency :	78.3 %
Indicated Thermal Efficiency :	40.6 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	14.6 degrees
Centroid Phasing :	194.3 degrees
Centroid Magnitude :	40.84 J/degree
Sensitivity :	18.7 degrees
Premixed/Diffusion Ratio :	.78323

871026.123341 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	524.32	.570	273.51	.317
K2-Exhaust 2, F	553.56	.283	289.76	.157
K3-Exhaust 3, F	553.16	.387	289.53	.215
K4-Exhaust 4, F	526.84	.882	274.91	.490
K5-Exhaust 5, F	517.17	.654	269.54	.363
K6-Exhaust 6, F	464.71	.537	240.39	.298
K7-Exhaust Common, F	514.56	.889	268.09	.494
Dry Bulb Temperature, F	85.915	.031	29.953	.017
Wet Bulb Temperature, F	76.326	.020	24.625	.011
J1-Water In, F	168.41	.168	75.784	.093
J2-Water Out, F	169.99	.135	76.663	.075
J3-Oil Sump, F	211.17	.325	99.537	.180
J4-Fuel Inlet, F	86.277	.045	30.154	.025
J5-Air After Filter, F	97.599	.094	36.444	.052
J6-Intake Manifold, F	98.498	.095	36.943	.053
J7-Fuel Return, F	87.996	.079	31.109	.044
P1-Fuel, PSIG	21.895	.240	150.96	1.654
P2-Oil Gallery, PSIG	57.414	.103	395.86	.713
P6-Ex Common, "H2OG	10.206	.291	2.540	.072
P7-Air Aft Filt, "H2OV	6.467	.654	1.609	.163
P8-Blowby, "H2OG	.095	.026	.024	.006
P11-Baro (Vent), "Hg ABS	28.959	.005	98.067	.017
Speed, RPM	1801.9	2.411	1801.9	2.411
Load, Lb-Ft	132.17	2.921	179.20	3.960
Smoke, %	.917	.076	.917	.076
Fuel Flow, Lb/Hr	24.014	.536	10.893	.243
Horsepower	45.346	1.009	33.809	.752
Corrected Horsepower	48.085	1.070	35.851	.798
BSFC, lb/hp-hr	.530	.018	.322	.011
Corrected BSFC	.500	.017	.304	.010
Relative Humidity	64.838	.124	64.838	.124
Reference Pressure, inHg	28.484		96.457	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1326

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.48 in-Hg
Speed :	1802 RPM
Load :	132.2 lb-ft
Fuel Flow :	24.0 lb/hr
Brake Power :	45.36 bhp
BSFC :	.529 lb/bhp-hr
Indicated Power :	9.21 kW/cyl
Peak Pressure :	4.927 MPa
Peak Rate of Pressure Rise:	262.6 kPa/deg
Peak Heat Release Rate :	133.0 Joules/deg
Cumulative Heat Release :	1220.59 Joules
Apparent Combustion Efficiency :	86.7 %
Indicated Thermal Efficiency :	43.6 %
Brake Thermal Efficiency :	26.7 %
Ignition Delay :	16.8 degrees
Centroid Phasing :	195.1 degrees
Centroid Magnitude :	33.31 J/degree
Sensitivity :	17.2 degrees
Premixed/Diffusion Ratio :	.97716

971026.124646 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	401.34	.281	205.19	.156
K2-Exhaust 2, F	404.84	.410	207.13	.228
K3-Exhaust 3, F	410.14	.630	210.08	.350
K4-Exhaust 4, F	401.56	.339	205.31	.188
K5-Exhaust 5, F	385.83	.622	196.57	.346
K6-Exhaust 6, F	346.89	.366	174.94	.203
K7-Exhaust Common, F	384.90	.353	196.06	.196
Dry Bulb Temperature, F	86.262	.096	30.146	.053
Wet Bulb Temperature, F	76.266	.066	24.592	.037
J1-Water In, F	169.78	.224	76.547	.124
J2-Water Out, F	170.45	.199	76.919	.111
J3-Oil Sump, F	206.88	.149	97.157	.083
J4-Fuel Inlet, F	85.996	.034	29.998	.019
J5-Air After Filter, F	97.371	.103	36.317	.057
J6-Intake Manifold, F	97.313	.070	36.285	.039
J7-Fuel Return, F	85.947	.052	29.971	.029
P1-Fuel, PSIG	12.145	.053	83.739	.365
P2-Oil Gallery, PSIG	58.004	.021	399.92	.142
P6-Ex Common, "H2OG	7.764	.207	1.932	.052
P7-Air Aft Filt, "H2OV	6.100	.408	1.518	.102
P8-Blowby, "H2OG	.079	.016	.020	.004
P11-Baro (Vent), "Hg ABS	28.956	.006	98.056	.020
Speed, RPM	1800.2	2.431	1800.2	2.431
Load, Lb-Ft	44.441	.639	60.254	.867
Smoke, %	1.333	.076	1.333	.076
Fuel Flow, Lb/Hr	16.635	.552	7.546	.250
Horsepower	15.233	.207	11.357	.154
Corrected Horsepower	16.148	.220	12.039	.164
BSFC, lb/hp-hr	1.092	.038	.664	.023
Corrected BSFC	1.030	.036	.627	.022
Relative Humidity	63.630	.223	63.630	.223
Reference Pressure, inHg	28.507		96.537	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1328

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.51 in-Hg
Speed :	1800 RPM
Load :	44.4 lb-ft
Fuel Flow :	16.1 lb/hr
Brake Power :	15.23 bhp
BSFC :	1.057 lb/bhp-hr
Indicated Power :	5.50 kW/cyl
Peak Pressure :	4.347 MPa
Peak Rate of Pressure Rise:	148.2 kPa/deg
Peak Heat Release Rate :	100.9 Joules/deg
Cumulative Heat Release :	768.674 Joules
Apparent Combustion Efficiency :	81.3 %
Indicated Thermal Efficiency :	38.7 %
Brake Thermal Efficiency :	13.3 %
Ignition Delay :	18.2 degrees
Centroid Phasing :	195.6 degrees
Centroid Magnitude :	26.25 J/degree
Sensitivity :	16.3 degrees
Premixed/Diffusion Ratio :	1.11698

871026.130443 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	1069.8	5.458	576.56	3.032
K2-Exhaust 2, F	1161.1	1.121	627.26	.623
K3-Exhaust 3, F	1168.7	.671	631.49	.373
K4-Exhaust 4, F	1139.4	1.005	615.20	.559
K5-Exhaust 5, F	1171.1	1.496	632.82	.831
K6-Exhaust 6, F	1097.4	.733	591.90	.407
K7-Exhaust Common, F	1220.0	1.407	660.03	.782
Dry Bulb Temperature, F	86.862	.039	30.479	.022
Wet Bulb Temperature, F	76.287	.019	24.604	.011
J1-Water In, F	160.50	.203	71.387	.113
J2-Water Out, F	169.56	.101	76.422	.056
J3-Oil Sump, F	208.50	.248	98.054	.138
J4-Fuel Inlet, F	90.177	.037	32.321	.021
J5-Air After Filter, F	98.257	.057	36.809	.032
J6-Intake Manifold, F	98.928	.030	37.182	.017
J7-Fuel Return, F	91.504	.036	33.058	.020
P1-Fuel, PSIG	101.64	2.157	700.80	14.873
P2-Oil Gallery, PSIG	54.861	.131	378.26	.901
P6-Ex Common, "H2OG	13.450	.809	3.347	.201
P7-Air Aft Filt, "H2OV	5.544	.193	1.380	.048
P8-Blowby, "H2OG	.086	.018	.021	.004
P11-Baro (Vent), "Hg ABS	28.946	.003	98.022	.011
Speed, RPM	1502.2	2.849	1502.2	2.849
Load, Lb-Ft	545.60	3.235	739.73	4.386
Smoke, %	39.384	1.660	39.384	1.660
Fuel Flow, Lb/Hr	71.822	.258	32.578	.117
Horsepower	156.05	.762	116.35	.568
Corrected Horsepower	165.59	.808	123.46	.603
BSFC, lb/hp-hr	.460	.002	.280	.002
Corrected BSFC	.434	.002	.264	.001
Relative Humidity	61.990	.135	61.990	.135
Reference Pressure, inHg	28.538		96.642	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1330

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.54 in-Hg
Speed :	1502 RPM
Load :	545.6 lb-ft
Fuel Flow :	71.8 lb/hr
Brake Power :	156.03 bhp
BSFC :	.460 lb/bhp-hr
Indicated Power :	21.10 kW/cyl
Peak Pressure :	8.155 MPa
Peak Rate of Pressure Rise:	1229. kPa/deg
Peak Heat Release Rate :	500.7 Joules/deg
Cumulative Heat Release :	3202.99 Joules
Apparent Combustion Efficiency :	63.4 %
Indicated Thermal Efficiency :	33.3 %
Brake Thermal Efficiency :	30.6 %
Ignition Delay :	5.7 degrees
Centroid Phasing :	189.4 degrees
Centroid Magnitude :	81.35 J/degree
Sensitivity :	22.7 degrees
Premixed/Diffusion Ratio :	.25227

871026.131622 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	1040.4	.952	560.22	.529
K2-Exhaust 2, F	1109.4	1.037	598.56	.576
K3-Exhaust 3, F	1108.8	1.133	598.24	.630
K4-Exhaust 4, F	1077.6	1.545	580.91	.858
K5-Exhaust 5, F	1120.3	.773	604.61	.429
K6-Exhaust 6, F	1076.7	.934	580.36	.519
K7-Exhaust Common, F	1166.8	.393	630.46	.218
Dry Bulb Temperature, F	88.026	.204	31.125	.113
Wet Bulb Temperature, F	76.694	.133	24.830	.074
J1-Water In, F	160.51	.158	71.396	.088
J2-Water Out, F	170.84	.126	77.133	.070
J3-Oil Sump, F	212.03	.235	100.02	.131
J4-Fuel Inlet, F	91.102	.071	32.835	.039
J5-Air After Filter, F	99.736	.121	37.631	.067
J6-Intake Manifold, F	99.908	.127	37.727	.071
J7-Fuel Return, F	92.225	.080	33.458	.045
P1-Fuel, PSIG	90.613	.619	624.75	4.268
P2-Oil Gallery, PSIG	50.379	.067	347.35	.462
P6-Ex Common, "H2OG	12.125	.396	3.017	.099
P7-Air Aft Filt, "H2OV	5.271	.231	1.312	.058
P8-Blowby, "H2OG	.074	.025	.018	.006
P11-Baro (Vent), "Hg ABS	28.942	.002	98.009	.007
Speed, RPM	1300.8	2.978	1300.8	2.978
Load, Lb-Ft	555.15	2.596	752.68	3.520
Smoke, %	44.477	2.014	44.477	2.014
Fuel Flow, Lb/Hr	64.415	1.038	29.218	.471
Horsepower	137.50	.888	102.52	.662
Corrected Horsepower	146.13	.944	108.95	.704
BSFC, lb/hp-hr	.468	.008	.285	.005
Corrected BSFC	.441	.007	.268	.004
Relative Humidity	60.058	.210	60.058	.210
Reference Pressure, inHg	28.554		96.696	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1332

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.55 in-Hg
Speed :	1301 RPM
Load :	555.2 lb-ft
Fuel Flow :	64.4 lb/hr
Brake Power :	137.53 bhp
BSFC :	.468 lb/bhp-hr
Indicated Power :	19.41 kW/cyl
Peak Pressure :	8.807 MPa
Peak Rate of Pressure Rise:	1348. kPa/deg
Peak Heat Release Rate :	559.7 Joules/deg
Cumulative Heat Release :	3364.91 Joules
Apparent Combustion Efficiency :	64.3 %
Indicated Thermal Efficiency :	34.2 %
Brake Thermal Efficiency :	30.1 %
Ignition Delay :	4.3 degrees
Centroid Phasing :	186.9 degrees
Centroid Magnitude :	98.03 J/degree
Sensitivity :	21.7 degrees
Premixed/Diffusion Ratio :	.19811

871026.132853 AL-16083-F AL-12920-L NH220				3
K1-Exhaust 1, F	992.10	2.765	533.39	1.536
K2-Exhaust 2, F	1038.3	.716	559.04	.398
K3-Exhaust 3, F	1033.9	1.138	556.62	.632
K4-Exhaust 4, F	1001.8	.860	538.79	.478
K5-Exhaust 5, F	1055.7	1.610	568.73	.895
K6-Exhaust 6, F	1018.9	.450	548.25	.250
K7-Exhaust Common, F	1076.8	.815	580.46	.453
Dry Bulb Temperature, F	87.983	.316	31.101	.175
Wet Bulb Temperature, F	76.058	.154	24.477	.086
J1-Water In, F	160.58	.176	71.431	.098
J2-Water Out, F	171.11	.118	77.283	.065
J3-Oil Sump, F	207.50	.174	97.500	.097
J4-Fuel Inlet, F	90.807	.056	32.671	.031
J5-Air After Filter, F	99.294	.115	37.386	.064
J6-Intake Manifold, F	99.466	.041	37.481	.023
J7-Fuel Return, F	91.940	.048	33.300	.027
P1-Fuel, PSIG	69.864	.781	481.70	5.382
P2-Oil Gallery, PSIG	44.877	.044	309.42	.304
P6-Ex Common, "H2OG	10.061	.584	2.504	.145
P7-Air Aft Filt, "H2OV	4.745	.234	1.181	.058
P8-Blowby, "H2OG	.115	.043	.029	.011
P11-Baro (Vent), "Hg ABS	28.939	.002	98.000	.008
Speed, RPM	1099.4	2.931	1099.4	2.931
Load, Lb-Ft	543.81	1.878	737.30	2.546
Smoke, %	32.870	1.267	32.870	1.267
Fuel Flow, Lb/Hr	52.288	.877	23.717	.398
Horsepower	113.84	.590	84.875	.440
Corrected Horsepower	120.84	.626	90.095	.467
BSFC, lb/hp-hr	.459	.008	.279	.005
Corrected BSFC	.433	.008	.263	.005
Relative Humidity	58.214	.404	58.214	.404
Reference Pressure, inHg	28.590		96.818	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1334

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.59 in-Hg
Speed :	1099 RPM
Load :	543.8 lb-ft
Fuel Flow :	52.3 lb/hr
Brake Power :	113.79 bhp
BSFC :	.460 lb/bhp-hr
Indicated Power :	15.91 kW/cyl
Peak Pressure :	8.833 MPa
Peak Rate of Pressure Rise:	1240. kPa/deg
Peak Heat Release Rate :	518.9 Joules/deg
Cumulative Heat Release :	3236.02 Joules
Apparent Combustion Efficiency :	64.3 %
Indicated Thermal Efficiency :	34.5 %
Brake Thermal Efficiency :	30.7 %
Ignition Delay :	4.1 degrees
Centroid Phasing :	185.2 degrees
Centroid Magnitude :	96.85 J/degree
Sensitivity :	20.2 degrees
Premixed/Diffusion Ratio :	.20172

APPENDIX G4
CUMMINS NH-220G DATA SHEETS
TEST FUEL TF09

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: Cummins NH220G Engine Tester: SwRI
Test Fuel: TF09N14587 Date: 12-2-87

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressure
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF09N14587 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressure
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF09N14587 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF09N14587 Date: ~~11-18-87~~ 12-2-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	~~132~~ 133	CN1338	CN1336
1800	~~133~~ 134	CN1337	CN1338
1500	~~134~~ 135	CN1339	CN1340
1300	136	CN1341	CN1342
1100	137	CN1343	CN1344

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF09N14587

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	138	CN1345	CN1346
1800	Full-Rack	139	CN1347	CN1348
1800	133	140	CN1349	CN1350
1800	98	141	CN1351	CN1352
1800	48	142	CN1353	CN1354
1800	13	143	CN1355	CN1356
1500	Full-Rack	144	CN1357	CN1358
1300	Full-Rack	145	CN1359	CN1360
1100	Full-Rack	146	CN1361	CN1362

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF09N14587 Date: 12-10-87

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	160	CN1363	CN1364
1800	161	CN1365	CN1366
1500	162	CN1367	CN1368
1300	163	CN1369	CN1370
1100	164	CN1371	CN1372

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF09N14587

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	165	CN1373	CN1374
1800	Full-Rack	166	CN1375	CN1376
1800	133	167	CN1377	CN1378
1800	98	168	CN1379	CN1380
1800	48	169	CN1381	CN1382
1800	13	170	CN1383	CN1384
1500	Full-Rack	171	CN1385	CN1386
1300	Full-Rack	172	CN1387	CN1388
1100	Full-Rack	173	CN138	CN1390

CUMMINS NH220 LOG SHEET

TEST NO. 4 FUEL BF-D2U13L86 DATE 12-2-87 PAGE 25

Operator	Greg						
Time	10:30	10:50	11:05	11:25	11:45		
Test Hour	20 min	20 min	15 min	20 min	20 min		
Speed, RPM	2099	1800	1501	1300	1101		
Load, lb–ft	488.7	532.7	553.4	561.2	541.9		
Fuel Flow, lb/hr	85.4	79.1	71.3	63.2	51.8		
Exh. Opacity, %	25.0	13.5	12.5	13.0	14.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1199	1180	1143	1101	1014		
Exhaust Cyl. 2	1283	1261	1215	1167	1067		
Exhaust Cyl. 3	1260	1251	1221	1177	1073		
Exhaust Cyl. 4	1230	1229	1193	1144	1046		
Exhaust Cyl. 5	1254	1272	1260	1213	1121		
Exhaust Cyl. 6	1163	1165	1140	1111	1031		
Exhaust Common	1276	1290	1292	1268	1154		
Water In	161	161	162	161	161		
Water Out	169	170	170	171	171		
Oil Sump	226	226	219	213	203		
Fuel	92	93	91	90	93		
Inlet Air	99	97	99	100	102		
Wet Bulb	~~60.0~~	61.0	62.0	62.2	62.5		
Dry Bulb	74.8	76.0	79.0	79.8	80.0		
PRESSURES, PSIG							
Fuel Pump	130.0	122.0	106	92.0	71.0		
Oil Gallery	56.4	54.8	53.5	50.6	47.8		
LOW PRESSURES							
Intake Vac, in.water	3.1	2.4	1.7	1.4	1.1		
Exh. Comm., in.Water	27.5	21.0	16.5	16.0	13.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.13	29.12	29.12	29.11	29.11		

971202.103510 AL-15299-F AL-12920-L NH220G				4
K1-Exhaust 1, F	1200.3	2.379	649.06	1.322
K2-Exhaust 2, F	1279.2	.770	692.89	.428
K3-Exhaust 3, F	1257.9	.414	681.03	.230
K4-Exhaust 4, F	1225.7	.729	663.15	.405
K5-Exhaust 5, F	1252.2	.412	677.91	.229
K6-Exhaust 6, F	1159.3	1.177	626.31	.654
K7-Exhaust Common, F	1274.7	.597	690.38	.332
Dry Bulb Temperature, F	73.173	.286	22.874	.159
Wet Bulb Temperature, F	59.853	.096	15.474	.053
J1-Water In, F	162.22	.163	72.343	.091
J2-Water Out, F	168.77	.109	75.983	.060
J3-Oil Sump, F	226.26	.163	107.92	.091
J4-Fuel Inlet, F	91.760	.032	33.200	.018
J5-Air After Filter, F	98.526	.402	36.959	.223
J6-Intake Manifold, F	103.33	.095	39.626	.053
J7-Fuel Return, F	94.376	.061	34.654	.034
P1-Fuel, PSIG	134.56	1.240	927.74	8.549
P2-Oil Gallery, PSIG	56.033	.049	386.33	.337
P6-Ex Common, "H2OG	27.318	.201	6.798	.050
P7-Air Aft Filt, "H2OV	4.697	.297	1.169	.074
P8-Blowby, "H2OG	.090	.021	.022	.005
P11-Baro (Vent), "Hg ABS	29.127	.002	98.636	.006
Speed, RPM	2100.3	3.698	2100.3	3.698
Load, Lb-Ft	490.03	3.066	664.38	4.157
Smoke, %	25.693	.551	25.693	.551
Fuel Flow, Lb/Hr	86.653	.618	39.305	.280
Horsepower	195.96	.949	146.11	.708
Corrected Horsepower	203.60	.986	151.80	.735
BSFC, lb/hp-hr	.442	.003	.269	.002
Corrected BSFC	.426	.003	.259	.002
Relative Humidity	45.505	.574	45.505	.574
Reference Pressure, inHg	28.782		97.466	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1336

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.78 in-Hg
Speed :	2100 RPM
Load :	490.0 lb-ft
Fuel Flow :	86.7 lb/hr
Brake Power :	195.93 bhp
BSFC :	.443 lb/bhp-hr
Indicated Power :	28.98 kW/cyl
Peak Pressure :	7.122 MPa
Peak Rate of Pressure Rise:	535.7 kPa/deg
Peak Heat Release Rate :	190.8 Joules/deg
Cumulative Heat Release :	3362.38 Joules
Apparent Combustion Efficiency :	75.4 %
Indicated Thermal Efficiency :	37.1 %
Brake Thermal Efficiency :	31.2 %
Ignition Delay :	4.1 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	35.90 J/degree
Sensitivity :	31.5 degrees
Premixed/Diffusion Ratio :	.13161

871202.105233 AL-15299-F AL-12920-L NH220G				4
K1-Exhaust 1, F	1179.7	1.274	637.63	.708
K2-Exhaust 2, F	1257.4	.700	680.80	.389
K3-Exhaust 3, F	1251.3	.515	677.38	.286
K4-Exhaust 4, F	1230.5	.553	665.82	.307
K5-Exhaust 5, F	1270.3	.803	687.92	.446
K6-Exhaust 6, F	1165.4	.843	629.66	.468
K7-Exhaust Common, F	1291.7	.583	699.83	.324
Dry Bulb Temperature, F	76.516	.500	24.731	.278
Wet Bulb Temperature, F	61.120	.160	16.178	.089
J1-Water In, F	161.76	.099	72.086	.055
J2-Water Out, F	169.55	.057	76.416	.032
J3-Oil Sump, F	226.41	.093	108.01	.052
J4-Fuel Inlet, F	92.418	.029	33.565	.016
J5-Air After Filter, F	97.777	.313	36.543	.174
J6-Intake Manifold, F	101.97	.271	38.872	.151
J7-Fuel Return, F	94.754	.038	34.863	.021
P1-Fuel, PSIG	120.48	.386	830.69	2.660
P2-Oil Gallery, PSIG	54.533	.035	375.99	.243
P6-Ex Common, "H2OG	19.996	.372	4.976	.093
P7-Air Aft Filt, "H2OV	3.862	.928	.961	.231
P8-Blowby, "H2OG	.077	.043	.019	.011
P11-Baro (Vent), "Hg ABS	29.120	.006	98.611	.022
Speed, RPM	1801.5	3.181	1801.5	3.181
Load, Lb-Ft	532.27	2.988	721.66	4.051
Smoke, %	13.793	.221	13.793	.221
Fuel Flow, Lb/Hr	79.368	.914	36.001	.415
Horsepower	182.58	.979	136.13	.730
Corrected Horsepower	189.62	1.016	141.38	.758
BSFC, lb/hp-hr	.435	.007	.264	.004
Corrected BSFC	.419	.007	.255	.004
Relative Humidity	40.846	.835	40.846	.835
Reference Pressure, inHg	28.836		97.649	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1338

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	1802 RPM
Load :	532.3 lb-ft
Fuel Flow :	79.4 lb/hr
Brake Power :	182.64 bhp
BSFC :	.435 lb/bhp-hr
Indicated Power :	25.88 kW/cyl
Peak Pressure :	7.629 MPa
Peak Rate of Pressure Rise:	626.0 kPa/deg
Peak Heat Release Rate :	234.2 Joules/deg
Cumulative Heat Release :	3419.34 Joules
Apparent Combustion Efficiency :	71.8 %
Indicated Thermal Efficiency :	36.2 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	2.5 degrees
Centroid Phasing :	193.7 degrees
Centroid Magnitude :	39.24 J/degree
Sensitivity :	30.1 degrees
Premixed/Diffusion Ratio :	.08431

871202.110925 AL-15299-F AL-12920-L NH220G				4
K1-Exhaust 1, F	1147.4	.750	619.68	.417
K2-Exhaust 2, F	1215.3	.700	657.38	.389
K3-Exhaust 3, F	1219.4	.654	659.66	.364
K4-Exhaust 4, F	1188.4	.635	642.42	.353
K5-Exhaust 5, F	1258.1	.466	681.14	.259
K6-Exhaust 6, F	1138.3	.886	614.62	.492
K7-Exhaust Common, F	1289.4	.715	698.56	.397
Dry Bulb Temperature, F	77.097	.319	25.054	.177
Wet Bulb Temperature, F	61.624	.089	16.458	.049
J1-Water In, F	161.62	.069	72.012	.038
J2-Water Out, F	170.53	.071	76.958	.040
J3-Oil Sump, F	219.65	.168	104.25	.093
J4-Fuel Inlet, F	90.778	.024	32.655	.013
J5-Air After Filter, F	98.298	.127	36.832	.071
J6-Intake Manifold, F	102.85	.130	39.363	.072
J7-Fuel Return, F	93.144	.025	33.969	.014
P1-Fuel, PSIG	103.57	.849	714.07	5.856
P2-Oil Gallery, PSIG	53.214	.086	366.90	.595
P6-Ex Common, "H2OG	16.162	.836	4.022	.208
P7-Air Aft Filt, "H2OV	3.323	.266	.827	.066
P8-Blowby, "H2OG	.073	.017	.018	.004
P11-Baro (Vent), "Hg ABS	29.113	.003	98.586	.009
Speed, RPM	1502.1	2.826	1502.1	2.826
Load, Lb-Ft	555.63	1.516	753.33	2.055
Smoke, %	12.034	.576	12.034	.576
Fuel Flow, Lb/Hr	70.861	.399	32.142	.181
Horsepower	158.91	.434	118.48	.324
Corrected Horsepower	165.21	.451	123.18	.337
BSFC, lb/hp-hr	.446	.003	.271	.002
Corrected BSFC	.429	.003	.261	.002
Relative Humidity	41.013	.665	41.013	.665
Reference Pressure, inHg	28.868		97.759	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1340

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.87 in-Hg
Speed :	1502 RPM
Load :	555.6 lb-ft
Fuel Flow :	70.9 lb/hr
Brake Power :	158.89 bhp
BSFC :	.446 lb/bhp-hr
Indicated Power :	22.38 kW/cyl
Peak Pressure :	8.290 MPa
Peak Rate of Pressure Rise:	743.9 kPa/deg
Peak Heat Release Rate :	303.4 Joules/deg
Cumulative Heat Release :	3440.32 Joules
Apparent Combustion Efficiency :	67.4 %
Indicated Thermal Efficiency :	35.1 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	1.0 degrees
Centroid Phasing :	189.2 degrees
Centroid Magnitude :	45.51 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.03661

871202.112609 AL-15299-F AL-12920-L NH220G				4
K1-Exhaust 1, F	1100.3	.419	593.48	.233
K2-Exhaust 2, F	1167.1	.953	630.61	.530
K3-Exhaust 3, F	1176.3	.347	635.73	.193
K4-Exhaust 4, F	1141.5	.816	616.39	.453
K5-Exhaust 5, F	1217.0	.781	658.34	.434
K6-Exhaust 6, F	1108.8	.892	598.25	.495
K7-Exhaust Common, F	1267.0	.716	686.10	.398
Dry Bulb Temperature, F	75.602	.057	24.223	.032
Wet Bulb Temperature, F	60.883	.021	16.046	.011
J1-Water In, F	161.51	.106	71.949	.059
J2-Water Out, F	171.16	.076	77.313	.042
J3-Oil Sump, F	213.72	.139	100.95	.077
J4-Fuel Inlet, F	90.487	.148	32.493	.082
J5-Air After Filter, F	99.082	.137	37.268	.076
J6-Intake Manifold, F	103.09	.100	39.495	.056
J7-Fuel Return, F	91.006	.065	32.781	.036
P1-Fuel, PSIG	90.184	.606	621.80	4.179
P2-Oil Gallery, PSIG	50.805	.038	350.29	.265
P6-Ex Common, "H2OG	15.258	.275	3.797	.068
P7-Air Aft Filt, "H2OV	2.866	.245	.713	.061
P8-Blowby, "H2OG	.096	.039	.024	.010
P11-Baro (Vent), "Hg ABS	29.115	.001	98.595	.005
Speed, RPM	1299.5	2.636	1299.5	2.636
Load, Lb-Ft	561.96	1.182	761.91	1.602
Smoke, %	13.786	.700	13.786	.700
Fuel Flow, Lb/Hr	63.391	1.051	28.754	.477
Horsepower	139.05	.363	103.67	.270
Corrected Horsepower	144.62	.377	107.82	.281
BSFC, lb/hp-hr	.456	.007	.277	.004
Corrected BSFC	.438	.007	.267	.004
Relative Humidity	42.414	.134	42.414	.134
Reference Pressure, inHg	28.905		97.882	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1342

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.91 in-Hg
Speed :	1300 RPM
Load :	562.0 lb-ft
Fuel Flow :	63.4 lb/hr
Brake Power :	139.11 bhp
BSFC :	.456 lb/bhp-hr
Indicated Power :	19.28 kW/cyl
Peak Pressure :	8.612 MPa
Peak Rate of Pressure Rise:	764.1 kPa/deg
Peak Heat Release Rate :	323.2 Joules/deg
Cumulative Heat Release :	3422.70 Joules
Apparent Combustion Efficiency :	64.9 %
Indicated Thermal Efficiency :	33.8 %
Brake Thermal Efficiency :	30.3 %
Ignition Delay :	.7 degrees
Centroid Phasing :	188.1 degrees
Centroid Magnitude :	48.30 J/degree
Sensitivity :	26.4 degrees
Premixed/Diffusion Ratio :	.02621

971202.115002 AL-15299-F AL-12920-L NH220G				4
K1-Exhaust 1, F	1014.1	.730	545.60	.406
K2-Exhaust 2, F	1068.7	.651	575.94	.362
K3-Exhaust 3, F	1074.4	.813	579.09	.452
K4-Exhaust 4, F	1045.4	.997	563.02	.554
K5-Exhaust 5, F	1123.0	.662	606.13	.368
K6-Exhaust 6, F	1031.1	.567	555.05	.315
K7-Exhaust Common, F	1155.2	.792	623.99	.440
Dry Bulb Temperature, F	76.769	.165	24.872	.092
Wet Bulb Temperature, F	61.600	.034	16.445	.019
J1-Water In, F	160.96	.094	71.642	.052
J2-Water Out, F	170.79	.078	77.106	.043
J3-Oil Sump, F	204.67	.161	95.928	.090
J4-Fuel Inlet, F	92.196	.059	33.442	.033
J5-Air After Filter, F	102.70	.197	39.278	.109
J6-Intake Manifold, F	104.69	.168	40.382	.094
J7-Fuel Return, F	93.142	.062	33.968	.034
P1-Fuel, PSIG	69.685	.435	480.46	3.002
P2-Oil Gallery, PSIG	47.455	.022	327.19	.154
P6-Ex Common, "H2OG	12.287	.621	3.057	.154
P7-Air Aft Filt, "H2OV	2.462	.291	.613	.072
P8-Blowby, "H2OG	.106	.057	.027	.014
P11-Baro (Vent), "Hg ABS	29.106	.002	98.564	.008
Speed, RPM	1100.4	2.394	1100.4	2.394
Load, Lb-Ft	540.33	2.085	732.59	2.826
Smoke, %	13.791	.652	13.791	.652
Fuel Flow, Lb/Hr	52.043	.834	23.606	.378
Horsepower	113.21	.535	84.410	.399
Corrected Horsepower	118.21	.558	88.132	.416
BSFC, lb/hp-hr	.460	.009	.280	.005
Corrected BSFC	.440	.009	.268	.005
Relative Humidity	41.767	.362	41.767	.362
Reference Pressure, inHg	28.925		97.950	

NAVY HIGH SPEED DIESEL - CUMMINS NH220Q FILE : CN1344

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.93 in-Hg
Speed :	1100 RPM
Load :	540.3 lb-ft
Fuel Flow :	52.0 lb/hr
Brake Power :	113.16 bhp
BSFC :	.460 lb/bhp-hr
Indicated Power :	15.41 kW/cyl
Peak Pressure :	8.539 MPa
Peak Rate of Pressure Rise:	718.2 kPa/deg
Peak Heat Release Rate :	304.0 Joules/deg
Cumulative Heat Release :	3237.34 Joules
Apparent Combustion Efficiency :	63.4 %
Indicated Thermal Efficiency :	32.9 %
Brake Thermal Efficiency :	30.0 %
Ignition Delay :	.6 degrees
Centroid Phasing :	187.3 degrees
Centroid Magnitude :	47.31 J/degree
Sensitivity :	25.7 degrees
Premixed/Diffusion Ratio :	.02173

CUMMINS NH220 LOG SHEET

TEST NO. 4 FUEL TF09P14587 DATE 12-2-87 PAGE 26

Operator Greg							
Time	12:50	1:30	1:40	2:00	2:15	2:35	3:10
Test Hour	20 min	40 min	10 min	20 min	15 min	20 min	35 min
Speed, RPM	2101	1799	1800	1799	1800	1798	~~1766~~ 1500
Load, lb–ft	468.1	514.8	371.0	276.4	134.2	248.4	536.6
Fuel Flow, lb/hr	108.9	102.3	62.3	49.3	31.4	18.4	83.6
Exh. Opacity, %	26.5	16.5	3.0	2.0	0	0	15.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1147	1137	864	723	546	406	1111
Exhaust Cyl. 2	1247	1236	944	779	576	409	1205
Exhaust Cyl. 3	1257	1242	938	784	571	424	1211
Exhaust Cyl. 4	1205	1213	903	737	538	403	1176
Exhaust Cyl. 5	1199	1212	879	724	520	380	1193
Exhaust Cyl. 6	1122	1124	843	696	495	357	1104
Exhaust Common	1237	1254	904	735	526	386	1230
Water In	163	161	164	166	168	170	161
Water Out	169	170	169	169	170	171	170
Oil Sump	228	224	214	212	209	204	207
Fuel	92	93	89	87	86	91	92
Inlet Air	99	99	97	98	100	101	103
Wet Bulb	63.8	64.5	64.1	63.5	64.0	63.0	64.5
Dry Bulb	81.8	82.5	82.0	80.5	80.0	78.5	79.5
PRESSURES, PSIG							
Fuel Pump	141.0	129.0	70.0	50.0	27.0	16.0	111.0
Oil Gallery	56.2	55.2	56.0	57.9	58.2	59.1	56.0
LOW PRESSURES							
Intake Vac, in.water	3.2	2.3	2.4	2.5	2.6	2.7	1.8
Exh. Comm., in.Water	27.5	20.0	17.0	16.0	12.5	10.0	16.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.06	29.04	29.04	29.03	29.01	29.01	29.00

CUMMINS NH220 LOG SHEET

TEST NO. 4 FUEL TF09N14587 DATE 12-2-87 PAGE 27

Operator Greg							
Time	3:30	3:40					
Test Hour	20min	10min					
Speed, RPM	1300	1100					
Load, lb–ft	550.2	532.1					
Fuel Flow, lb/hr	73.9	65.2					
Exh. Opacity, %	19.0	22.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1073	1030					
Exhaust Cyl. 2	1158	1085					
Exhaust Cyl. 3	1165	1090					
Exhaust Cyl. 4	1130	1057					
Exhaust Cyl. 5	1162	1094					
Exhaust Cyl. 6	1075	1029					
Exhaust Common	1227	1155					
Water In	161	159					
Water Out	170	170					
Oil Sump	208	205					
Fuel	93	91					
Inlet Air	102	103					
Wet Bulb	63.0	65.0					
Dry Bulb	80.0	80.2					
PRESSURES, PSIG							
Fuel Pump	98.0	79.0					
Oil Gallery	52.4	46.8					
LOW PRESSURES							
Intake Vac, in.water	1.4	1.1					
Exh. Comm., in.Water	15.0	14.0					
Blowby, in.water	0	0					
Barometer, in.Hg	29.9	29.0					

971202.125527 AL-16090-F AL-12920-L NH220G				4
K1-Exhaust 1, F	1147.0	.797	619.45	.443
K2-Exhaust 2, F	1248.1	.651	675.63	.361
K3-Exhaust 3, F	1257.2	.563	680.69	.313
K4-Exhaust 4, F	1202.9	.341	650.52	.189
K5-Exhaust 5, F	1199.2	.742	648.44	.412
K6-Exhaust 6, F	1120.2	.434	604.57	.241
K7-Exhaust Common, F	1237.2	.438	669.53	.243
Dry Bulb Temperature, F	78.440	.297	25.800	.165
Wet Bulb Temperature, F	63.170	.056	17.316	.031
J1-Water In, F	162.70	.091	72.613	.050
J2-Water Out, F	169.09	.051	76.159	.028
J3-Oil Sump, F	226.47	.234	108.04	.130
J4-Fuel Inlet, F	91.934	.054	33.297	.030
J5-Air After Filter, F	97.949	.104	36.638	.058
J6-Intake Manifold, F	101.63	.073	38.681	.040
J7-Fuel Return, F	95.216	.041	35.120	.023
P1-Fuel, PSIG	139.61	1.675	962.60	11.547
P2-Oil Gallery, PSIG	55.781	.049	384.60	.335
P6-Ex Common, "H2OG	26.375	.222	6.563	.055
P7-Air Aft Filt, "H2OV	5.673	.237	1.412	.059
P8-Blowby, "H2OG	.105	.031	.026	.008
P11-Baro (Vent), "Hg ABS	29.061	.003	98.413	.009
Speed, RPM	2103.1	2.663	2103.1	2.663
Load, Lb-Ft	466.46	2.104	632.43	2.853
Smoke, %	28.611	1.032	28.611	1.032
Fuel Flow, Lb/Hr	109.14	1.657	49.503	.752
Horsepower	186.79	.741	139.26	.552
Corrected Horsepower	194.71	.772	145.17	.576
BSFC, lb/hp-hr	.584	.009	.355	.005
Corrected BSFC	.561	.009	.341	.005
Relative Humidity	42.626	.584	42.626	.584
Reference Pressure, inHg	28.644		96.999	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1346

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.64 in-Hg
Speed :	2103 RPM
Load :	466.5 lb-ft
Fuel Flow :	109.1 lb/hr
Brake Power :	186.80 bhp
BSFC :	.584 lb/bhp-hr
Indicated Power :	27.95 kW/cyl
Peak Pressure :	6.751 MPa
Peak Rate of Pressure Rise:	520.5 kPa/deg
Peak Heat Release Rate :	187.7 Joules/deg
Cumulative Heat Release :	3238.50 Joules
Apparent Combustion Efficiency :	58.3 %
Indicated Thermal Efficiency :	28.7 %
Brake Thermal Efficiency :	23.8 %
Ignition Delay :	6.0 degrees
Centroid Phasing :	197.6 degrees
Centroid Magnitude :	32.67 J/degree
Sensitivity :	30.7 degrees
Premixed/Diffusion Ratio :	.19413

871202.133454 AL-16090-F	AL-12920-L	NH220G		4
K1-Exhaust 1, F	1138.7	.396	614.86	.220
K2-Exhaust 2, F	1236.5	.481	669.16	.267
K3-Exhaust 3, F	1247.0	1.135	675.01	.631
K4-Exhaust 4, F	1212.4	.716	655.78	.398
K5-Exhaust 5, F	1210.1	.380	654.53	.211
K6-Exhaust 6, F	1123.8	1.510	606.58	.839
K7-Exhaust Common, F	1254.6	.275	679.23	.153
Dry Bulb Temperature, F	76.443	.094	24.691	.052
Wet Bulb Temperature, F	62.572	.026	16.984	.014
J1-Water In, F	161.87	.097	72.148	.054
J2-Water Out, F	169.50	.059	76.388	.033
J3-Oil Sump, F	224.58	.061	106.99	.034
J4-Fuel Inlet, F	93.287	.240	34.049	.133
J5-Air After Filter, F	98.941	.085	37.189	.047
J6-Intake Manifold, F	102.22	.080	39.013	.045
J7-Fuel Return, F	94.923	.087	34.957	.048
P1-Fuel, PSIG	127.82	.815	881.31	5.619
P2-Oil Gallery, PSIG	54.864	.034	378.28	.232
P6-Ex Common, "H2OG	18.476	.413	4.598	.103
P7-Air Aft Filt, "H2OV	5.098	.591	1.269	.147
P8-Blowby, "H2OG	.086	.029	.021	.007
P11-Baro (Vent), "Hg ABS	29.040	.005	98.339	.015
Speed, RPM	1800.6	1.851	1800.6	1.851
Load, Lb-Ft	514.66	1.399	697.77	1.897
Smoke, %	17.095	.447	17.095	.447
Fuel Flow, Lb/Hr	97.905	2.993	44.409	1.357
Horsepower	176.44	.569	131.55	.424
Corrected Horsepower	184.25	.594	137.37	.443
BSFC, lb/hp-hr	.555	.017	.338	.010
Corrected BSFC	.531	.016	.323	.010
Relative Humidity	45.878	.222	45.878	.222
Reference Pressure, inHg	28.665		97.070	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1348

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.67 in-Hg
Speed :	1801 RPM
Load :	514.7 lb-ft
Fuel Flow :	97.9 lb/hr
Brake Power :	176.50 bhp
BSFC :	.555 lb/bhp-hr
Indicated Power :	25.17 kW/cyl
Peak Pressure :	7.224 MPa
Peak Rate of Pressure Rise:	577.2 kPa/deg
Peak Heat Release Rate :	215.3 Joules/deg
Cumulative Heat Release :	3341.64 Joules
Apparent Combustion Efficiency :	57.4 %
Indicated Thermal Efficiency :	28.8 %
Brake Thermal Efficiency :	25.1 %
Ignition Delay :	4.4 degrees
Centroid Phasing :	195.2 degrees
Centroid Magnitude :	34.95 J/degree
Sensitivity :	29.8 degrees
Premixed/Diffusion Ratio :	.14761

871202.134621 AL-16090-F AL-12920-L NH220G				4
K1-Exhaust 1, F	864.22	.671	462.34	.373
K2-Exhaust 2, F	947.03	.695	508.35	.386
K3-Exhaust 3, F	942.13	.961	505.63	.534
K4-Exhaust 4, F	910.23	1.023	487.91	.569
K5-Exhaust 5, F	884.15	.506	473.42	.281
K6-Exhaust 6, F	844.08	.290	451.15	.161
K7-Exhaust Common, F	908.93	.667	487.18	.370
Dry Bulb Temperature, F	76.933	.355	24.963	.197
Wet Bulb Temperature, F	62.827	.072	17.126	.040
J1-Water In, F	164.29	.139	73.497	.077
J2-Water Out, F	168.87	.055	76.038	.030
J3-Oil Sump, F	220.91	.098	104.95	.055
J4-Fuel Inlet, F	90.294	.064	32.385	.035
J5-Air After Filter, F	97.704	.139	36.502	.077
J6-Intake Manifold, F	101.28	.056	38.488	.031
J7-Fuel Return, F	91.789	.050	33.216	.028
P1-Fuel, PSIG	67.514	.284	465.50	1.961
P2-Oil Gallery, PSIG	55.681	.040	383.91	.274
P6-Ex Common, "H2OG	15.115	.385	3.761	.096
P7-Air Aft Filt, "H2OV	5.152	.684	1.282	.170
P8-Blowby, "H2OG	.081	.023	.020	.006
P11-Baro (Vent), "Hg ABS	29.036	.004	98.327	.014
Speed, RPM	1799.5	1.943	1799.5	1.943
Load, Lb-Ft	373.29	1.871	506.11	2.537
Smoke, %	3.621	.193	3.621	.193
Fuel Flow, Lb/Hr	63.322	.799	28.723	.362
Horsepower	127.90	.688	95.360	.513
Corrected Horsepower	133.44	.718	99.488	.535
BSFC, lb/hp-hr	.495	.007	.301	.005
Corrected BSFC	.475	.007	.289	.004
Relative Humidity	45.427	.780	45.427	.780
Reference Pressure, inHg	28.657		97.044	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1350

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.66 in-Hg
Speed :	1800 RPM
Load :	373.3 lb-ft
Fuel Flow :	63.3 lb/hr
Brake Power :	127.94 bhp
BSFC :	.495 lb/bhp-hr
Indicated Power :	18.70 kW/cyl
Peak Pressure :	6.027 MPa
Peak Rate of Pressure Rise:	409.2 kPa/deg
Peak Heat Release Rate :	142.2 Joules/deg
Cumulative Heat Release :	2458.17 Joules
Apparent Combustion Efficiency :	65.3 %
Indicated Thermal Efficiency :	33.1 %
Brake Thermal Efficiency :	28.1 %
Ignition Delay :	8.6 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	27.50 J/degree
Sensitivity :	25.4 degrees
Premixed/Diffusion Ratio :	.33974

871202.140608 AL-16090-F	AL-12920-L	NH220G		4
K1-Exhaust 1, F	723.04	.503	383.91	.279
K2-Exhaust 2, F	780.63	.370	415.91	.206
K3-Exhaust 3, F	785.25	.781	418.47	.434
K4-Exhaust 4, F	735.92	.358	391.06	.199
K5-Exhaust 5, F	723.37	.492	384.10	.273
K6-Exhaust 6, F	695.20	.540	368.44	.300
K7-Exhaust Common, F	734.84	.300	390.47	.167
Dry Bulb Temperature, F	76.706	.170	24.837	.094
Wet Bulb Temperature, F	63.085	.038	17.269	.021
J1-Water In, F	165.51	.087	74.170	.048
J2-Water Out, F	168.38	.057	75.769	.032
J3-Oil Sump, F	212.59	.096	100.33	.053
J4-Fuel Inlet, F	87.439	.029	30.800	.016
J5-Air After Filter, F	97.334	.204	36.297	.114
J6-Intake Manifold, F	100.39	.090	37.993	.050
J7-Fuel Return, F	88.736	.040	31.520	.022
P1-Fuel, PSIG	46.888	.266	323.28	1.831
P2-Oil Gallery, PSIG	57.442	.069	396.05	.476
P6-Ex Common, "H2OG	13.808	.294	3.436	.073
P7-Air Aft Filt, "H2OV	5.315	.463	1.322	.115
P8-Blowby, "H2OG	.105	.034	.026	.009
P11-Baro (Vent), "Hg ABS	29.028	.005	98.298	.017
Speed, RPM	1801.0	4.515	1801.0	4.515
Load, Lb-Ft	275.84	5.089	373.98	6.899
Smoke, %	2.477	.152	2.477	.152
Fuel Flow, Lb/Hr	49.782	.775	22.580	.352
Horsepower	94.595	1.920	70.527	1.431
Corrected Horsepower	98.724	2.004	73.605	1.494
BSFC, lb/hp-hr	.526	.014	.320	.008
Corrected BSFC	.504	.013	.307	.008
Relative Humidity	46.898	.379	46.898	.379
Reference Pressure, inHg	28.637		96.975	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1352

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.64 in-Hg
Speed :	1801 RPM
Load :	275.8 lb-ft
Fuel Flow :	49.8 lb/hr
Brake Power :	94.58 bhp
BSFC :	.527 lb/bhp-hr
Indicated Power :	14.70 kW/cyl
Peak Pressure :	5.402 MPa
Peak Rate of Pressure Rise:	302.9 kPa/deg
Peak Heat Release Rate :	101.1 Joules/deg
Cumulative Heat Release :	1928.34 Joules
Apparent Combustion Efficiency :	65.1 %
Indicated Thermal Efficiency :	33.1 %
Brake Thermal Efficiency :	26.4 %
Ignition Delay :	10.2 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	23.01 J/degree
Sensitivity :	23.7 degrees
Premixed/Diffusion Ratio :	.43007

871202.141832 AL-16090-F AL-12920-L NH220G				4
K1-Exhaust 1, F	540.39	3.009	282.44	1.672
K2-Exhaust 2, F	570.84	3.669	299.35	2.039
K3-Exhaust 3, F	566.93	3.159	297.18	1.755
K4-Exhaust 4, F	535.40	1.802	279.66	1.001
K5-Exhaust 5, F	515.93	2.659	268.85	1.477
K6-Exhaust 6, F	490.33	2.542	254.63	1.412
K7-Exhaust Common, F	522.13	2.214	272.30	1.230
Dry Bulb Temperature, F	77.258	.537	25.143	.298
Wet Bulb Temperature, F	63.089	.079	17.271	.044
J1-Water In, F	168.55	.218	75.861	.121
J2-Water Out, F	169.75	.160	76.529	.089
J3-Oil Sump, F	209.36	.182	98.536	.101
J4-Fuel Inlet, F	86.246	.108	30.137	.060
J5-Air After Filter, F	99.835	.165	37.686	.092
J6-Intake Manifold, F	103.68	.119	39.821	.066
J7-Fuel Return, F	85.675	.089	29.820	.049
P1-Fuel, PSIG	24.499	.392	168.92	2.701
P2-Oil Gallery, PSIG	58.041	.073	400.18	.506
P6-Ex Common, "H2OG	10.407	.237	2.590	.059
P7-Air Aft Filt, "H2OV	5.703	.661	1.419	.165
P8-Blowby, "H2OG	.108	.017	.027	.004
P11-Baro (Vent), "Hg ABS	29.016	.005	98.258	.015
Speed, RPM	1799.4	2.881	1799.4	2.881
Load, Lb-Ft	137.60	6.434	186.55	8.724
Smoke, %	-.945	.108	-.945	.108
Fuel Flow, Lb/Hr	30.846	.836	13.991	.379
Horsepower	47.143	2.242	35.149	1.672
Corrected Horsepower	49.322	2.346	36.773	1.749
BSFC, lb/hp-hr	.655	.021	.399	.013
Corrected BSFC	.626	.021	.381	.012
Relative Humidity	45.448	1.249	45.448	1.249
Reference Pressure, inHg	28.596		96.837	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1354

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.60 in-Hg
Speed :	1799 RPM
Load :	137.6 lb-ft
Fuel Flow :	30.8 lb/hr
Brake Power :	47.13 bhp
BSFC :	.653 lb/bhp-hr
Indicated Power :	9.29 kW/cyl
Peak Pressure :	4.755 MPa
Peak Rate of Pressure Rise:	189.7 kPa/deg
Peak Heat Release Rate :	69.7 Joules/deg
Cumulative Heat Release :	1252.77 Joules
Apparent Combustion Efficiency :	68.3 %
Indicated Thermal Efficiency :	33.8 %
Brake Thermal Efficiency :	21.3 %
Ignition Delay :	12.1 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	17.27 J/degree
Sensitivity :	21.7 degrees
Premixed/Diffusion Ratio :	.55922

S71202.143814 AL-16090-F	AL-12920-L	NH220G		4
K1-Exhaust 1, F	402.74	.548	205.96	.304
K2-Exhaust 2, F	417.46	.298	214.15	.166
K3-Exhaust 3, F	423.02	.285	217.23	.158
K4-Exhaust 4, F	402.90	.318	206.06	.177
K5-Exhaust 5, F	379.46	.248	193.04	.138
K6-Exhaust 6, F	355.28	.794	179.60	.441
K7-Exhaust Common, F	386.53	.202	196.96	.112
Dry Bulb Temperature, F	77.414	.483	25.230	.269
Wet Bulb Temperature, F	63.201	.123	17.334	.069
J1-Water In, F	170.01	.299	76.674	.166
J2-Water Out, F	170.33	.321	76.851	.178
J3-Oil Sump, F	204.61	.124	95.896	.069
J4-Fuel Inlet, F	86.363	.118	30.202	.066
J5-Air After Filter, F	100.63	.134	38.127	.074
J6-Intake Manifold, F	103.79	.085	39.881	.047
J7-Fuel Return, F	85.179	.080	29.544	.044
P1-Fuel, PSIG	12.637	.059	87.130	.409
P2-Oil Gallery, PSIG	58.674	.017	404.54	.120
P6-Ex Common, "H2OG	7.735	.211	1.925	.052
P7-Air Aft Filt, "H2OV	5.985	.690	1.489	.172
P8-Blowby, "H2OG	.092	.018	.023	.004
P11-Baro (Vent), "Hg ABS	29.007	.005	98.229	.018
Speed, RPM	1798.4	2.364	1798.4	2.364
Load, Lb-Ft	48.169	1.885	65.308	2.556
Smoke, %	-1.757	.125	-1.757	.125
Fuel Flow, Lb/Hr	18.333	.068	8.316	.031
Horsepower	16.493	.631	12.297	.471
Corrected Horsepower	17.274	.661	12.879	.493
BSFC, lb/hp-hr	1.113	.041	.677	.025
Corrected BSFC	1.063	.039	.646	.024
Relative Humidity	45.403	.940	45.403	.940
Reference Pressure, inHg	28.567		96.738	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1356

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.57 in-Hg
Speed :	1798 RPM
Load :	48.2 lb-ft
Fuel Flow :	18.3 lb/hr
Brake Power :	16.49 bhp
BSFC :	1.110 lb/bhp-hr
Indicated Power :	5.31 kW/cyl
Peak Pressure :	4.397 MPa
Peak Rate of Pressure Rise:	146.0 kPa/deg
Peak Heat Release Rate :	54.5 Joules/deg
Cumulative Heat Release :	754.207 Joules
Apparent Combustion Efficiency :	69.2 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	12.5 %
Ignition Delay :	13.6 degrees
Centroid Phasing :	194.5 degrees
Centroid Magnitude :	13.85 J/degree
Sensitivity :	19.8 degrees
Premixed/Diffusion Ratio :	.68757

871202.151312 AL-16090-F AL-12920-L NH220G				4
K1-Exhaust 1, F	1108.0	1.038	597.76	.577
K2-Exhaust 2, F	1203.4	.986	650.78	.548
K3-Exhaust 3, F	1210.0	.472	654.46	.262
K4-Exhaust 4, F	1175.3	.792	635.17	.440
K5-Exhaust 5, F	1193.2	.790	645.10	.439
K6-Exhaust 6, F	1104.4	.742	595.77	.412
K7-Exhaust Common, F	1249.1	.730	676.19	.406
Dry Bulb Temperature, F	80.808	.163	27.116	.091
Wet Bulb Temperature, F	64.465	.057	18.036	.032
J1-Water In, F	161.93	.185	72.183	.103
J2-Water Out, F	170.20	.118	76.777	.066
J3-Oil Sump, F	209.78	.219	98.766	.122
J4-Fuel Inlet, F	91.090	.071	32.828	.040
J5-Air After Filter, F	102.89	.121	39.385	.067
J6-Intake Manifold, F	104.77	.137	40.428	.076
J7-Fuel Return, F	92.230	.068	33.461	.038
P1-Fuel, PSIG	109.91	.782	757.79	5.392
P2-Oil Gallery, PSIG	55.591	.092	383.28	.635
P6-Ex Common, "H2OG	13.332	.839	3.318	.209
P7-Air Aft Filt, "H2OV	5.053	.187	1.257	.047
P8-Blowby, "H2OG	.090	.019	.022	.005
P11-Baro (Vent), "Hg ABS	28.992	.003	98.179	.009
Speed, RPM	1499.3	3.220	1499.3	3.220
Load, Lb-Ft	538.76	2.243	730.46	3.042
Smoke, %	15.667	.306	15.667	.306
Fuel Flow, Lb/Hr	82.144	5.062	37.260	2.296
Horsepower	153.80	.652	114.67	.486
Corrected Horsepower	161.51	.684	120.41	.510
BSFC, lb/hp-hr	.534	.034	.325	.021
Corrected BSFC	.509	.033	.309	.020
Relative Humidity	40.929	.298	40.929	.298
Reference Pressure, inHg	28.621		96.920	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1358

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.62 in-Hg
Speed :	1499 RPM
Load :	538.8 lb-ft
Fuel Flow :	82.1 lb/hr
Brake Power :	153.78 bhp
BSFC :	.534 lb/bhp-hr
Indicated Power :	21.50 kW/cyl
Peak Pressure :	7.772 MPa
Peak Rate of Pressure Rise:	676.0 kPa/deg
Peak Heat Release Rate :	268.2 Joules/deg
Cumulative Heat Release :	3335.56 Joules
Apparent Combustion Efficiency :	56.9 %
Indicated Thermal Efficiency :	29.3 %
Brake Thermal Efficiency :	26.1 %
Ignition Delay :	3.2 degrees
Centroid Phasing :	191.5 degrees
Centroid Magnitude :	40.44 J/degree
Sensitivity :	27.3 degrees
Premixed/Diffusion Ratio :	.11640

871202.153046 AL-16090-F AL-12920-L NH220G				4
K1-Exhaust 1, F	1073.6	1.002	578.66	.556
K2-Exhaust 2, F	1158.7	1.064	625.97	.591
K3-Exhaust 3, F	1165.3	.373	629.61	.207
K4-Exhaust 4, F	1130.6	.300	610.36	.167
K5-Exhaust 5, F	1163.6	.827	628.66	.459
K6-Exhaust 6, F	1075.9	.649	579.94	.360
K7-Exhaust Common, F	1227.1	.456	663.94	.253
Dry Bulb Temperature, F	80.616	.096	27.009	.054
Wet Bulb Temperature, F	64.209	.040	17.894	.022
J1-Water In, F	160.63	.117	71.461	.065
J2-Water Out, F	170.06	.049	76.699	.027
J3-Oil Sump, F	208.07	.116	97.816	.065
J4-Fuel Inlet, F	92.997	.065	33.887	.036
J5-Air After Filter, F	102.55	.182	39.196	.101
J6-Intake Manifold, F	103.98	.101	39.987	.056
J7-Fuel Return, F	93.000	.093	33.889	.051
P1-Fuel, PSIG	96.126	.501	662.76	3.454
P2-Oil Gallery, PSIG	52.352	.028	360.95	.191
P6-Ex Common, "H2OG	13.042	.384	3.245	.096
P7-Air Aft Filt, "H2OV	4.651	.195	1.157	.048
P8-Blowby, "H2OG	.094	.027	.023	.007
P11-Baro (Vent), "Hg ABS	28.994	.002	98.186	.006
Speed, RPM	1298.6	4.377	1298.6	4.377
Load, Lb-Ft	551.16	2.031	747.27	2.754
Smoke, %	19.518	.595	19.518	.595
Fuel Flow, Lb/Hr	74.909	2.105	33.978	.955
Horsepower	136.28	.820	101.61	.611
Corrected Horsepower	143.02	.860	106.63	.642
BSFC, lb/hp-hr	.550	.014	.334	.009
Corrected BSFC	.524	.014	.319	.008
Relative Humidity	40.606	.149	40.606	.149
Reference Pressure, inHg	28.652		97.027	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1360

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.65 in-Hg
Speed :	1299 RPM
Load :	551.2 lb-ft
Fuel Flow :	74.9 lb/hr
Brake Power :	136.33 bhp
BSFC :	.549 lb/bhp-hr
Indicated Power :	18.56 kW/cyl
Peak Pressure :	8.217 MPa
Peak Rate of Pressure Rise:	738.2 kPa/deg
Peak Heat Release Rate :	304.8 Joules/deg
Cumulative Heat Release :	3321.77 Joules
Apparent Combustion Efficiency :	53.8 %
Indicated Thermal Efficiency :	27.8 %
Brake Thermal Efficiency :	25.3 %
Ignition Delay :	2.3 degrees
Centroid Phasing :	190.0 degrees
Centroid Magnitude :	45.55 J/degree
Sensitivity :	26.7 degrees
Premixed/Diffusion Ratio :	.08543

871202.154224 AL-16090-F AL-12920-L NH220G				4
K1-Exhaust 1, F	1030.9	1.095	554.93	.608
K2-Exhaust 2, F	1086.3	.327	585.72	.181
K3-Exhaust 3, F	1090.0	.545	587.77	.303
K4-Exhaust 4, F	1059.7	.477	570.95	.265
K5-Exhaust 5, F	1094.8	.875	590.45	.486
K6-Exhaust 6, F	1031.4	.498	555.23	.277
K7-Exhaust Common, F	1158.5	1.325	625.85	.736
Dry Bulb Temperature, F	81.811	.137	27.673	.076
Wet Bulb Temperature, F	63.985	.089	17.770	.050
J1-Water In, F	159.71	.142	70.951	.079
J2-Water Out, F	169.90	.088	76.613	.049
J3-Oil Sump, F	206.17	.135	96.763	.075
J4-Fuel Inlet, F	91.232	.073	32.907	.041
J5-Air After Filter, F	104.17	.092	40.094	.051
J6-Intake Manifold, F	104.36	.073	40.203	.040
J7-Fuel Return, F	91.498	.055	33.055	.031
P1-Fuel, PSIG	77.675	.545	535.55	3.756
P2-Oil Gallery, PSIG	46.444	.043	320.22	.294
P6-Ex Common, "H2OG	12.412	.911	3.089	.227
P7-Air Aft Filt, "H2OV	3.954	.205	.984	.051
P8-Blowby, "H2OG	.123	.039	.031	.010
P11-Baro (Vent), "Hg ABS	29.006	.002	98.224	.006
Speed, RPM	1100.4	2.793	1100.4	2.793
Load, Lb-Ft	532.47	2.513	721.93	3.406
Smoke, %	23.899	.602	23.899	.602
Fuel Flow, Lb/Hr	65.110	1.279	29.534	.580
Horsepower	111.57	.714	83.180	.532
Corrected Horsepower	117.13	.749	87.327	.559
BSFC, lb/hp-hr	.584	.011	.355	.007
Corrected BSFC	.556	.010	.338	.006
Relative Humidity	37.221	.365	37.221	.365
Reference Pressure, inHg	28.715		97.239	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1362

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.72 in-Hg
Speed :	1100 RPM
Load :	532.5 lb-ft
Fuel Flow :	65.1 lb/hr
Brake Power :	111.53 bhp
BSFC :	.584 lb/bhp-hr
Indicated Power :	15.14 kW/cyl
Peak Pressure :	8.451 MPa
Peak Rate of Pressure Rise:	771.2 kPa/deg
Peak Heat Release Rate :	329.1 Joules/deg
Cumulative Heat Release :	3155.00 Joules
Apparent Combustion Efficiency :	49.8 %
Indicated Thermal Efficiency :	26.0 %
Brake Thermal Efficiency :	23.9 %
Ignition Delay :	1.7 degrees
Centroid Phasing :	186.7 degrees
Centroid Magnitude :	50.65 J/degree
Sensitivity :	24.0 degrees
Premixed/Diffusion Ratio :	.07224

CUMMINS NH220 LOG SHEET

TEST NO. 4 FUEL BF02V13C86 DATE 12-10-97 PAGE 28

Operator CREG							
Time	9:10	9:25	9:40	9:55	10:10		
Test Hour	40min	15min	15min	15min	15min		
Speed, RPM	2100	1799	1300	1300	1100		
Load, lb–ft	488.4	339.9	559.3	565.9	542.2		
Fuel Flow, lb/hr	86.6	78.8	64.2	62.7	49.3		
Exh. Opacity, %	16.0	11.0	10.5	11.0	11.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1195	1176	1139	1082	1008		
Exhaust Cyl. 2	1280	1236	1216	1161	1068		
Exhaust Cyl. 3	1259	1231	1221	1164	1069		
Exhaust Cyl. 4	1225	1225	1189	1134	1039		
Exhaust Cyl. 5	1251	1264	1251	1202	1105		
Exhaust Cyl. 6	1170	1170	1143	1104	1026		
Exhaust Common	1276	1284	1291	1245	1128		
Water In	162	161	162	160	161		
Water Out	169	170	171	170	171		
Oil Sump	231	226	213	212	202		
Fuel	92	92	92	92	92		
Inlet Air	99	99	100	100	102		
Wet Bulb	61.0	61.0	62.1	63.5	62.5		
Dry Bulb	67.5	68.0	68.1	70.0	69.0		
PRESSURES, PSIG							
Fuel Pump	134.0	122.0	103.0	84.0	70.0		
Oil Gallery	55.3	54.6	54.0	51.4	47.6		
LOW PRESSURES							
Intake Vac, in.water	3.1	2.4	1.7	1.4	1.1		
Exh. Comm., in.Water	27.5	20.5	16.5	15.5	14.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.08	29.08	29.08	29.09	29.09		

871210.091226 AL-15299-F AL-12920-L NH220				4
K1-Exhaust 1, F	1192.8	1.399	644.88	.777
K2-Exhaust 2, F	1280.2	.576	693.46	.320
K3-Exhaust 3, F	1258.8	.645	681.55	.358
K4-Exhaust 4, F	1222.7	.738	661.49	.410
K5-Exhaust 5, F	1251.0	.701	677.21	.390
K6-Exhaust 6, F	1167.6	.544	630.86	.302
K7-Exhaust Common, F	1273.3	.497	689.63	.276
Dry Bulb Temperature, F	71.525	.381	21.958	.212
Wet Bulb Temperature, F	63.180	.074	17.322	.041
J1-Water In, F	162.27	.102	72.373	.057
J2-Water Out, F	169.24	.052	76.244	.029
J3-Oil Sump, F	231.63	.103	110.91	.057
J4-Fuel Inlet, F	92.205	.028	33.447	.016
J5-Air After Filter, F	99.486	.121	37.492	.067
J6-Intake Manifold, F	102.31	.032	39.060	.018
J7-Fuel Return, F	96.193	.054	35.663	.030
P1-Fuel, PSIG	133.42	1.148	919.92	7.917
P2-Oil Gallery, PSIG	54.884	.021	378.41	.145
P6-Ex Common, "H2OG	27.378	.569	6.813	.142
P7-Air Aft Filt, "H2OV	5.299	.327	1.319	.081
P8-Blowby, "H2OG	.077	.018	.019	.004
P11-Baro (Vent), "Hg ABS	29.083	.002	98.486	.005
Speed, RPM	2102.5	2.185	2102.5	2.185
Load, Lb-Ft	486.96	2.664	660.23	3.612
Smoke, %	16.842	.346	16.842	.346
Fuel Flow, Lb/Hr	85.828	.587	38.931	.266
Horsepower	194.94	.890	145.34	.664
Corrected Horsepower	203.87	.931	152.00	.694
BSFC, lb/hp-hr	.440	.004	.268	.002
Corrected BSFC	.421	.004	.256	.002
Relative Humidity	63.364	1.136	63.364	1.136
Reference Pressure, inHg	28.693		97.166	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1364

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.69 in-Hg
Speed :	2103 RPM
Load :	487.0 lb-ft
Fuel Flow :	85.8 lb/hr
Brake Power :	195.00 bhp
BSFC :	.440 lb/bhp-hr
Indicated Power :	29.32 kW/cyl
Peak Pressure :	7.168 MPa
Peak Rate of Pressure Rise:	544.4 kPa/deg
Peak Heat Release Rate :	194.5 Joules/deg
Cumulative Heat Release :	3370.15 Joules
Apparent Combustion Efficiency :	76.4 %
Indicated Thermal Efficiency :	37.9 %
Brake Thermal Efficiency :	31.4 %
Ignition Delay :	4.7 degrees
Centroid Phasing :	196.5 degrees
Centroid Magnitude :	37.22 J/degree
Sensitivity :	30.9 degrees
Premixed/Diffusion Ratio :	.15071

971210.092655 AL-15299-F AL-12920-L NH220				4
K1-Exhaust 1, F	1175.8	.811	635.42	.451
K2-Exhaust 2, F	1257.2	.656	680.66	.365
K3-Exhaust 3, F	1252.1	.346	677.86	.192
K4-Exhaust 4, F	1225.7	.722	663.17	.401
K5-Exhaust 5, F	1266.7	.688	685.96	.382
K6-Exhaust 6, F	1168.2	1.133	631.23	.630
K7-Exhaust Common, F	1289.8	.307	698.76	.171
Dry Bulb Temperature, F	72.734	.401	22.630	.223
Wet Bulb Temperature, F	63.713	.111	17.618	.062
J1-Water In, F	162.13	.111	72.295	.062
J2-Water Out, F	170.11	.085	76.727	.047
J3-Oil Sump, F	227.08	.102	108.38	.057
J4-Fuel Inlet, F	92.642	.025	33.690	.014
J5-Air After Filter, F	99.615	.297	37.564	.165
J6-Intake Manifold, F	102.85	.323	39.361	.179
J7-Fuel Return, F	96.367	.030	35.759	.017
P1-Fuel, PSIG	119.51	.810	823.98	5.584
P2-Oil Gallery, PSIG	54.382	.015	374.95	.102
P6-Ex Common, "H2OG	19.109	.439	4.755	.109
P7-Air Aft Filt, "H2OV	4.101	.552	1.020	.137
P8-Blowby, "H2OG	.090	.026	.022	.006
P11-Baro (Vent), "Hg ABS	29.085	.006	98.493	.022
Speed, RPM	1799.9	2.790	1799.9	2.790
Load, Lb-Ft	535.34	3.838	725.82	5.204
Smoke, %	10.978	.405	10.978	.405
Fuel Flow, Lb/Hr	78.618	.466	35.661	.211
Horsepower	183.46	1.521	136.79	1.134
Corrected Horsepower	191.90	1.591	143.08	1.186
BSFC, lb/hp-hr	.429	.004	.261	.002
Corrected BSFC	.410	.004	.249	.002
Relative Humidity	61.278	1.095	61.278	1.095
Reference Pressure, inHg	28.783		97.471	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1366

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.78 in-Hg
Speed :	1800 RPM
Load :	535.3 lb-ft
Fuel Flow :	78.6 lb/hr
Brake Power :	183.46 bhp
BSFC :	.428 lb/bhp-hr
Indicated Power :	26.00 kW/cyl
Peak Pressure :	7.653 MPa
Peak Rate of Pressure Rise:	619.5 kPa/deg
Peak Heat Release Rate :	231.7 Joules/deg
Cumulative Heat Release :	3438.60 Joules
Apparent Combustion Efficiency :	72.9 %
Indicated Thermal Efficiency :	36.7 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	3.3 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	38.75 J/degree
Sensitivity :	29.7 degrees
Premixed/Diffusion Ratio :	.11149

S71210.094342 AL-15299-F AL-12920-L NH220				4
K1-Exhaust 1, F	1139.0	1.159	615.02	.644
K2-Exhaust 2, F	1216.5	.587	658.07	.326
K3-Exhaust 3, F	1222.0	.340	661.09	.189
K4-Exhaust 4, F	1188.5	.372	642.51	.207
K5-Exhaust 5, F	1251.8	.786	677.65	.437
K6-Exhaust 6, F	1142.3	.776	616.81	.431
K7-Exhaust Common, F	1289.2	.641	698.42	.356
Dry Bulb Temperature, F	73.328	.316	22.960	.175
Wet Bulb Temperature, F	64.219	.063	17.899	.035
J1-Water In, F	162.40	.140	72.444	.078
J2-Water Out, F	171.39	.063	77.437	.035
J3-Oil Sump, F	215.54	.208	101.97	.116
J4-Fuel Inlet, F	92.206	.037	33.448	.021
J5-Air After Filter, F	100.65	.172	38.137	.095
J6-Intake Manifold, F	103.61	.040	39.782	.022
J7-Fuel Return, F	95.059	.075	35.033	.042
P1-Fuel, PSIG	102.96	.408	709.89	2.815
P2-Oil Gallery, PSIG	53.505	.105	368.90	.723
P6-Ex Common, "H2OG	15.273	.510	3.800	.127
P7-Air Aft Filt, "H2OV	3.767	.244	.937	.061
P8-Blowby, "H2OG	.091	.024	.023	.006
P11-Baro (Vent), "Hg ABS	29.082	.003	98.483	.010
Speed, RPM	1499.7	2.217	1499.7	2.217
Load, Lb-Ft	559.40	2.286	758.44	3.099
Smoke, %	10.738	.346	10.738	.346
Fuel Flow, Lb/Hr	70.748	.483	32.091	.219
Horsepower	159.73	.643	119.09	.480
Corrected Horsepower	167.30	.674	124.74	.502
BSFC, lb/hp-hr	.443	.004	.269	.002
Corrected BSFC	.423	.004	.257	.002
Relative Humidity	61.225	.948	61.225	.948
Reference Pressure, inHg	28.805		97.545	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1368

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.81 in-Hg
Speed :	1500 RPM
Load :	559.4 lb-ft
Fuel Flow :	70.7 lb/hr
Brake Power :	159.77 bhp
BSFC :	.443 lb/bhp-hr
Indicated Power :	22.64 kW/cyl
Peak Pressure :	8.357 MPa
Peak Rate of Pressure Rise:	739.8 kPa/deg
Peak Heat Release Rate :	300.9 Joules/deg
Cumulative Heat Release :	3520.96 Joules
Apparent Combustion Efficiency :	69.1 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	31.2 %
Ignition Delay :	.9 degrees
Centroid Phasing :	189.9 degrees
Centroid Magnitude :	44.92 J/degree
Sensitivity :	28.1 degrees
Premixed/Diffusion Ratio :	.03165

971210.095705 AL-15299-F AL-12920-L NH220				4
K1-Exhaust 1, F	1081.6	.560	583.10	.311
K2-Exhaust 2, F	1162.0	1.068	627.77	.594
K3-Exhaust 3, F	1163.6	.562	628.68	.312
K4-Exhaust 4, F	1131.2	.636	610.68	.353
K5-Exhaust 5, F	1199.6	.872	648.67	.484
K6-Exhaust 6, F	1102.3	.634	594.60	.352
K7-Exhaust Common, F	1242.5	.566	672.50	.315
Dry Bulb Temperature, F	74.179	.284	23.433	.158
Wet Bulb Temperature, F	64.908	.089	18.282	.050
J1-Water In, F	160.68	.077	71.487	.043
J2-Water Out, F	170.19	.069	76.775	.038
J3-Oil Sump, F	211.77	.088	99.871	.049
J4-Fuel Inlet, F	92.410	.064	33.561	.036
J5-Air After Filter, F	100.64	.041	38.134	.023
J6-Intake Manifold, F	103.65	.057	39.807	.032
J7-Fuel Return, F	94.574	.083	34.763	.046
P1-Fuel, PSIG	87.900	.595	606.05	4.100
P2-Oil Gallery, PSIG	51.221	.036	353.16	.251
P6-Ex Common, "H2OG	14.680	.334	3.653	.083
P7-Air Aft Filt, "H2OV	3.256	.285	.810	.071
P8-Blowby, "H2OG	.076	.039	.019	.010
P11-Baro (Vent), "Hg ABS	29.089	.002	98.506	.005
Speed, RPM	1299.4	2.338	1299.4	2.338
Load, Lb-Ft	566.48	2.027	768.04	2.748
Smoke, %	10.871	.471	10.871	.471
Fuel Flow, Lb/Hr	62.625	.294	28.406	.134
Horsepower	140.15	.596	104.49	.444
Corrected Horsepower	146.82	.624	109.47	.466
BSFC, lb/hp-hr	.447	.002	.272	.002
Corrected BSFC	.427	.002	.259	.001
Relative Humidity	61.018	.767	61.018	.767
Reference Pressure, inHg	28.850		97.695	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1370

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.85 in-Hg
Speed :	1299 RPM
Load :	566.5 lb-ft
Fuel Flow :	62.6 lb/hr
Brake Power :	140.11 bhp
BSFC :	.447 lb/bhp-hr
Indicated Power :	19.28 kW/cyl
Peak Pressure :	8.642 MPa
Peak Rate of Pressure Rise:	762.5 kPa/deg
Peak Heat Release Rate :	313.5 Joules/deg
Cumulative Heat Release :	3423.85 Joules
Apparent Combustion Efficiency :	65.7 %
Indicated Thermal Efficiency :	34.2 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	.8 degrees
Centroid Phasing :	188.1 degrees
Centroid Magnitude :	48.54 J/degree
Sensitivity :	26.3 degrees
Premixed/Diffusion Ratio :	.03161

871210.101332 AL-15299-F AL-12920-L NH220				4
K1-Exhaust 1, F	1013.0	5.335	544.98	2.964
K2-Exhaust 2, F	1066.8	.670	574.87	.372
K3-Exhaust 3, F	1068.0	.524	575.58	.291
K4-Exhaust 4, F	1037.4	.685	558.53	.381
K5-Exhaust 5, F	1106.5	.290	596.93	.161
K6-Exhaust 6, F	1024.0	.888	551.08	.493
K7-Exhaust Common, F	1128.0	.941	608.86	.523
Dry Bulb Temperature, F	75.987	.231	24.437	.128
Wet Bulb Temperature, F	65.897	.076	18.831	.042
J1-Water In, F	161.47	.207	71.930	.115
J2-Water Out, F	171.15	.156	77.308	.086
J3-Oil Sump, F	202.58	.315	94.766	.175
J4-Fuel Inlet, F	92.183	.067	33.435	.037
J5-Air After Filter, F	102.68	.138	39.266	.077
J6-Intake Manifold, F	103.71	.063	39.839	.035
J7-Fuel Return, F	94.178	.045	34.543	.025
P1-Fuel, PSIG	67.629	.307	466.29	2.114
P2-Oil Gallery, PSIG	47.385	.051	326.71	.352
P6-Ex Common, "H2OG	12.853	1.104	3.198	.275
P7-Air Aft Filt, "H2OV	2.913	.246	.725	.061
P8-Blowby, "H2OG	.102	.048	.025	.012
P11-Baro (Vent), "Hg ABS	29.088	.002	98.504	.007
Speed, RPM	1101.4	1.413	1101.4	1.413
Load, Lb-Ft	545.20	1.566	739.18	2.123
Smoke, %	11.430	.593	11.430	.593
Fuel Flow, Lb/Hr	52.105	1.092	23.634	.495
Horsepower	114.33	.410	85.243	.305
Corrected Horsepower	120.05	.430	89.505	.321
BSFC, lb/hp-hr	.456	.010	.277	.006
Corrected BSFC	.434	.010	.264	.006
Relative Humidity	58.851	.550	58.851	.550
Reference Pressure, inHg	28.874		97.779	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1372

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.87 in-Hg
Speed :	1101 RPM
Load :	545.2 lb-ft
Fuel Flow :	52.1 lb/hr
Brake Power :	114.29 bhp
BSFC :	.456 lb/bhp-hr
Indicated Power :	15.23 kW/cyl
Peak Pressure :	8.521 MPa
Peak Rate of Pressure Rise:	703.2 kPa/deg
Peak Heat Release Rate :	295.4 Joules/deg
Cumulative Heat Release :	3150.37 Joules
Apparent Combustion Efficiency :	61.6 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	30.3 %
Ignition Delay :	.3 degrees
Centroid Phasing :	186.0 degrees
Centroid Magnitude :	46.60 J/degree
Sensitivity :	24.7 degrees
Premixed/Diffusion Ratio :	.01059

CUMMINS NH220 LOG SHEET

TEST NO. 4 FUEL ___ DATE 12-10-87 PAGE 24

TF09NH4587

Operator Grey							
Time	11:20	11:40	11:50	12:00	12:10	12:20	12:35
Test Hour	20 min	20 min	10 min	10 min	10 min	10 min	15 min
Speed, RPM	2099	1800	1800	1800	1800	1799	1500
Load, lb–ft	477.8	528.8	370.7	276.4	133.8	50.1	558.2
Fuel Flow, lb/hr	107.5	85.5	62.1	48.1	28.1	19.2	77.8
Exh. Opacity, %	18.0	13.0	2.0	0	0	0	14.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1142	1127	838	712	520	396	1096
Exhaust Cyl. 2	1231	1231	920	770	548	416	1192
Exhaust Cyl. 3	1256	1238	918	776	549	423	1199
Exhaust Cyl. 4	1203	1206	896	731	525	410	1165
Exhaust Cyl. 5	1206	1207	860	717	500	382	1181
Exhaust Cyl. 6	1136	1122	825	692	480	355	1096
Exhaust Common	1245	1253	883	728	509	389	1237
Water In	162	161	163	166	168	171	161
Water Out	169	170	169	170	170	171	170
Oil Sump	215	221	218	213	210	205	206
Fuel	93	93	91	91	89	89	93
Inlet Air	98	99	98	100	100	99	100
Wet Bulb	63.8	63.5	63.7	63.8	63.7	63.5	64.0
Dry Bulb	73.0	73.0	73.1	73.3	73.3	73.0	73.0
PRESSURES, PSIG							
Fuel Pump	139.0	127.0	63.0	48.0	25.0	17.0	110.0
Oil Gallery	58.9	55.9	56.1	57.3	58.1	58.4	56.2
LOW PRESSURES							
Intake Vac, in.water	3.2	2.4	2.5	2.6	2.7	2.7	18
Exh. Comm., in.Water	27.5	20.0	16.5	16.0	12.5	12.5	16.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.06	29.05	29.03	29.04	29.05	29.04	29.03

CUMMINS NH220 LOG SHEET

TEST NO. 4 FUEL TF09P114587 DATE 12-10-87 PAGE 30

Operator	Brad						
Time	12:45	12:55					
Test Hour	10 min	10 min					
Speed, RPM	1298	1100					
Load, lb–ft	530.7	530.5					
Fuel Flow, lb/hr	71.4	62.9					
Exh. Opacity, %	17.0	20.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1062	1018					
Exhaust Cyl. 2	1150	1076					
Exhaust Cyl. 3	1159	1082					
Exhaust Cyl. 4	1127	1052					
Exhaust Cyl. 5	1157	1091					
Exhaust Cyl. 6	1073	1027					
Exhaust Common	1215	1140					
Water In	161	159					
Water Out	170	170					
Oil Sump	206	202					
Fuel	93	93					
Inlet Air	100	102					
Wet Bulb	63.8	64.0					
Dry Bulb	73.7	74.6					
PRESSURES, PSIG							
Fuel Pump	98.0	79.0					
Oil Gallery	53.1	47.8					
LOW PRESSURES							
Intake Vac, in.water	1.4	1.1					
Exh. Comm., in.Water	15.0	14.5					
Blowby, in.water	0	0					
Barometer, in.Hg	29.03	29.02					

S71210.112419 AL-16090-F AL-12920-L NH220				4
K1-Exhaust 1, F	1143.6	.656	617.57	.365
K2-Exhaust 2, F	1252.5	.666	678.06	.370
K3-Exhaust 3, F	1256.7	.558	680.42	.310
K4-Exhaust 4, F	1201.2	.674	649.57	.374
K5-Exhaust 5, F	1206.7	.509	652.60	.283
K6-Exhaust 6, F	1130.5	1.151	610.30	.639
K7-Exhaust Common, F	1245.4	.388	674.12	.215
Dry Bulb Temperature, F	77.273	.124	25.151	.069
Wet Bulb Temperature, F	66.524	.046	19.180	.025
J1-Water In, F	163.09	.066	72.826	.037
J2-Water Out, F	169.28	.022	76.265	.012
J3-Oil Sump, F	212.23	.799	100.13	.444
J4-Fuel Inlet, F	93.417	.048	34.121	.027
J5-Air After Filter, F	98.051	.122	36.695	.068
J6-Intake Manifold, F	100.64	.178	38.133	.099
J7-Fuel Return, F	97.107	.082	36.170	.046
P1-Fuel, PSIG	138.21	1.317	952.90	9.079
P2-Oil Gallery, PSIG	58.558	.150	403.74	1.033
P6-Ex Common, "H2OG	26.962	.318	6.709	.079
P7-Air Aft Filt, "H2OV	5.742	.274	1.429	.068
P8-Blowby, "H2OG	.107	.019	.027	.005
P11-Baro (Vent), "Hg ABS	29.061	.002	98.412	.007
Speed, RPM	2099.5	3.143	2099.5	3.143
Load, Lb-Ft	479.49	3.189	650.09	4.324
Smoke, %	19.340	.444	19.340	.444
Fuel Flow, Lb/Hr	107.96	1.596	48.969	.724
Horsepower	191.67	1.421	142.91	1.060
Corrected Horsepower	200.67	1.488	149.62	1.110
BSFC, lb/hp-hr	.563	.011	.343	.007
Corrected BSFC	.538	.010	.327	.006
Relative Humidity	57.136	.324	57.136	.324
Reference Pressure, inHg	28.639		96.981	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1374

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.64 in-Hg
Speed :	2100 RPM
Load :	479.5 lb-ft
Fuel Flow :	108.0 lb/hr
Brake Power :	191.73 bhp
BSFC :	.563 lb/bhp-hr
Indicated Power :	28.43 kW/cyl
Peak Pressure :	6.905 MPa
Peak Rate of Pressure Rise:	541.6 kPa/deg
Peak Heat Release Rate :	193.9 Joules/deg
Cumulative Heat Release :	3288.64 Joules
Apparent Combustion Efficiency :	59.7 %
Indicated Thermal Efficiency :	29.5 %
Brake Thermal Efficiency :	24.7 %
Ignition Delay :	5.6 degrees
Centroid Phasing :	197.3 degrees
Centroid Magnitude :	35.09 J/degree
Sensitivity :	30.7 degrees
Premixed/Diffusion Ratio :	.18388

871210.114235 AL-16090-F AL-12920-L NH220				4
K1-Exhaust 1, F	1129.8	.671	609.89	.373
K2-Exhaust 2, F	1232.2	.960	666.80	.533
K3-Exhaust 3, F	1241.9	.684	672.14	.380
K4-Exhaust 4, F	1206.6	.438	652.53	.243
K5-Exhaust 5, F	1208.6	.446	653.67	.248
K6-Exhaust 6, F	1122.8	.832	606.01	.462
K7-Exhaust Common, F	1252.6	.507	678.11	.282
Dry Bulb Temperature, F	78.782	.210	25.990	.117
Wet Bulb Temperature, F	66.413	.040	19.118	.022
J1-Water In, F	162.61	.091	72.562	.050
J2-Water Out, F	170.21	.050	76.783	.028
J3-Oil Sump, F	220.95	.093	104.97	.052
J4-Fuel Inlet, F	92.076	.048	33.375	.027
J5-Air After Filter, F	99.488	.079	37.493	.044
J6-Intake Manifold, F	102.28	.089	39.042	.049
J7-Fuel Return, F	95.429	.117	35.239	.065
P1-Fuel, PSIG	125.74	.874	866.97	6.023
P2-Oil Gallery, PSIG	55.237	.032	380.85	.220
P6-Ex Common, "H2OG	18.494	.458	4.602	.114
P7-Air Aft Filt, "H2OV	5.182	.792	1.290	.197
P8-Blowby, "H2OG	.107	.025	.027	.006
P11-Baro (Vent), "Hg ABS	29.052	.006	98.383	.019
Speed, RPM	1800.4	4.020	1800.4	4.020
Load, Lb-Ft	528.28	3.715	716.24	5.037
Smoke, %	13.470	.204	13.470	.204
Fuel Flow, Lb/Hr	95.563	4.446	43.346	2.017
Horsepower	181.10	1.490	135.02	1.111
Corrected Horsepower	189.77	1.561	141.49	1.164
BSFC, lb/hp-hr	.528	.025	.321	.015
Corrected BSFC	.504	.024	.306	.014
Relative Humidity	52.341	.567	52.341	.567
Reference Pressure, inHg	28.671		97.092	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1376

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.67 in-Hg
Speed :	1800 RPM
Load :	528.3 lb-ft
Fuel Flow :	95.6 lb/hr
Brake Power :	181.06 bhp
BSFC :	.528 lb/bhp-hr
Indicated Power :	25.59 kW/cyl
Peak Pressure :	7.379 MPa
Peak Rate of Pressure Rise:	589.2 kPa/deg
Peak Heat Release Rate :	218.9 Joules/deg
Cumulative Heat Release :	3379.47 Joules
Apparent Combustion Efficiency :	59.4 %
Indicated Thermal Efficiency :	30.0 %
Brake Thermal Efficiency :	26.4 %
Ignition Delay :	4.9 degrees
Centroid Phasing :	195.1 degrees
Centroid Magnitude :	36.14 J/degree
Sensitivity :	29.2 degrees
Premixed/Diffusion Ratio :	.16782

871210.115347 AL-16090-F AL-12920-L NH220				4
K1-Exhaust 1, F	837.67	.379	447.59	.211
K2-Exhaust 2, F	921.40	1.779	494.11	.988
K3-Exhaust 3, F	919.67	.367	493.15	.204
K4-Exhaust 4, F	888.59	1.450	475.89	.806
K5-Exhaust 5, F	862.83	.776	461.57	.431
K6-Exhaust 6, F	821.60	.816	438.67	.453
K7-Exhaust Common, F	886.84	1.040	474.91	.578
Dry Bulb Temperature, F	78.556	.139	25.864	.077
Wet Bulb Temperature, F	66.297	.049	19.054	.027
J1-Water In, F	164.33	.093	73.519	.051
J2-Water Out, F	168.75	.064	75.975	.035
J3-Oil Sump, F	218.97	.330	103.87	.183
J4-Fuel Inlet, F	91.506	.045	33.059	.025
J5-Air After Filter, F	98.555	.111	36.975	.062
J6-Intake Manifold, F	101.09	.056	38.382	.031
J7-Fuel Return, F	93.563	.029	34.202	.016
P1-Fuel, PSIG	63.382	.238	437.00	1.642
P2-Oil Gallery, PSIG	55.884	.055	385.31	.380
P6-Ex Common, "H2OG	15.048	.188	3.744	.047
P7-Air Aft Filt, "H2OV	5.102	.577	1.269	.144
P8-Blowby, "H2OG	.105	.028	.026	.007
P11-Baro (Vent), "Hg ABS	29.052	.006	98.381	.020
Speed, RPM	1800.7	2.869	1800.7	2.869
Load, Lb-Ft	371.55	5.984	503.75	8.113
Smoke, %	2.580	.119	2.580	.119
Fuel Flow, Lb/Hr	60.748	4.137	27.555	1.876
Horsepower	127.39	2.170	94.982	1.618
Corrected Horsepower	133.38	2.272	99.442	1.694
BSFC, lb/hp-hr	.477	.035	.290	.021
Corrected BSFC	.456	.034	.277	.020
Relative Humidity	52.589	.468	52.589	.468
Reference Pressure, inHg	28.677		97.111	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1378

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.68 in-Hg
Speed :	1801 RPM
Load :	371.6 lb-ft
Fuel Flow :	60.7 lb/hr
Brake Power :	127.43 bhp
BSFC :	.476 lb/bhp-hr
Indicated Power :	18.26 kW/cyl
Peak Pressure :	6.059 MPa
Peak Rate of Pressure Rise:	407.0 kPa/deg
Peak Heat Release Rate :	140.8 Joules/deg
Cumulative Heat Release :	2361.33 Joules
Apparent Combustion Efficiency :	65.4 %
Indicated Thermal Efficiency :	33.7 %
Brake Thermal Efficiency :	29.2 %
Ignition Delay :	8.8 degrees
Centroid Phasing :	193.9 degrees
Centroid Magnitude :	27.59 J/degree
Sensitivity :	24.2 degrees
Premixed/Diffusion Ratio :	.36292

871210.120417 AL-16090-F AL-12920-L NH220				4
K1-Exhaust 1, F	714.29	.632	379.05	.351
K2-Exhaust 2, F	774.19	.242	412.33	.135
K3-Exhaust 3, F	779.24	.953	415.13	.530
K4-Exhaust 4, F	734.31	.822	390.17	.457
K5-Exhaust 5, F	717.47	.672	380.82	.373
K6-Exhaust 6, F	692.52	.487	366.96	.271
K7-Exhaust Common, F	732.13	.775	388.96	.430
Dry Bulb Temperature, F	78.646	.250	25.914	.139
Wet Bulb Temperature, F	66.193	.045	18.996	.025
J1-Water In, F	166.64	.097	74.802	.054
J2-Water Out, F	169.61	.028	76.453	.016
J3-Oil Sump, F	214.17	.057	101.20	.032
J4-Fuel Inlet, F	89.940	.036	32.189	.020
J5-Air After Filter, F	100.45	.219	38.026	.122
J6-Intake Manifold, F	103.41	.201	39.673	.112
J7-Fuel Return, F	90.869	.118	32.705	.066
P1-Fuel, PSIG	45.205	.384	311.67	2.647
P2-Oil Gallery, PSIG	56.800	.129	391.63	.890
P6-Ex Common, "H2OG	13.839	.265	3.444	.066
P7-Air Aft Filt, "H2OV	5.076	.441	1.263	.110
P8-Blowby, "H2OG	.085	.039	.021	.010
P11-Baro (Vent), "Hg ABS	29.046	.005	98.359	.016
Speed, RPM	1800.6	3.298	1800.6	3.298
Load, Lb-Ft	273.25	5.353	370.47	7.258
Smoke, %	.826	.102	.826	.102
Fuel Flow, Lb/Hr	47.408	.725	21.504	.329
Horsepower	93.679	1.869	69.845	1.394
Corrected Horsepower	98.251	1.960	73.253	1.462
BSFC, lb/hp-hr	.506	.013	.308	.008
Corrected BSFC	.483	.012	.294	.008
Relative Humidity	51.989	.596	51.989	.596
Reference Pressure, inHg	28.672		97.095	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1380

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.67 in-Hg
Speed :	1801 RPM
Load :	273.3 lb-ft
Fuel Flow :	47.4 lb/hr
Brake Power :	93.72 bhp
BSFC :	.506 lb/bhp-hr
Indicated Power :	14.40 kW/cyl
Peak Pressure :	5.449 MPa
Peak Rate of Pressure Rise:	292.2 kPa/deg
Peak Heat Release Rate :	95.8 Joules/deg
Cumulative Heat Release :	1869.17 Joules
Apparent Combustion Efficiency :	66.3 %
Indicated Thermal Efficiency :	34.0 %
Brake Thermal Efficiency :	27.5 %
Ignition Delay :	10.1 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	22.63 J/degree
Sensitivity :	22.9 degrees
Premixed/Diffusion Ratio :	.44143

971210.121311 AL-16090-F AL-12920-L NH220				4
K1-Exhaust 1, F	521.62	.668	272.01	.371
K2-Exhaust 2, F	551.34	1.400	288.52	.778
K3-Exhaust 3, F	553.18	1.272	289.54	.707
K4-Exhaust 4, F	531.58	2.784	277.55	1.547
K5-Exhaust 5, F	502.58	1.509	261.43	.838
K6-Exhaust 6, F	481.85	.852	249.92	.473
K7-Exhaust Common, F	515.53	2.405	268.63	1.336
Dry Bulb Temperature, F	78.538	.230	25.855	.128
Wet Bulb Temperature, F	66.221	.078	19.012	.043
J1-Water In, F	168.51	.209	75.836	.116
J2-Water Out, F	169.82	.208	76.568	.116
J3-Oil Sump, F	210.29	.458	99.048	.254
J4-Fuel Inlet, F	89.456	.055	31.920	.031
J5-Air After Filter, F	99.415	.168	37.453	.093
J6-Intake Manifold, F	102.21	.034	39.003	.019
J7-Fuel Return, F	89.387	.105	31.882	.058
P1-Fuel, PSIG	22.301	.120	153.76	.827
P2-Oil Gallery, PSIG	57.766	.047	398.28	.322
P6-Ex Common, "H2OG	10.531	.298	2.621	.074
P7-Air Aft Filt, "H2OV	5.116	.473	1.273	.118
P8-Blowby, "H2OG	.078	.021	.019	.005
P11-Baro (Vent), "Hg ABS	29.038	.005	98.335	.016
Speed, RPM	1800.3	2.838	1800.3	2.838
Load, Lb-Ft	136.80	5.659	185.48	7.672
Smoke, %	.034	.082	.034	.082
Fuel Flow, Lb/Hr	28.128	.310	12.759	.141
Horsepower	46.892	1.926	34.962	1.436
Corrected Horsepower	49.152	2.019	36.646	1.505
BSFC, lb/hp-hr	.601	.023	.365	.014
Corrected BSFC	.573	.022	.349	.013
Relative Humidity	52.389	.502	52.389	.502
Reference Pressure, inHg	28.662		97.061	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1382

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.66 in-Hg
Speed :	1800 RPM
Load :	136.8 lb-ft
Fuel Flow :	28.1 lb/hr
Brake Power :	46.88 bhp
BSFC :	.599 lb/bhp-hr
Indicated Power :	8.57 kW/cyl
Peak Pressure :	4.759 MPa
Peak Rate of Pressure Rise:	192.2 kPa/deg
Peak Heat Release Rate :	69.3 Joules/deg
Cumulative Heat Release :	1150.09 Joules
Apparent Combustion Efficiency :	68.8 %
Indicated Thermal Efficiency :	34.2 %
Brake Thermal Efficiency :	23.2 %
Ignition Delay :	12.6 degrees
Centroid Phasing :	194.1 degrees
Centroid Magnitude :	17.53 J/degree
Sensitivity :	20.5 degrees
Premixed/Diffusion Ratio :	.61582

871210.122245 AL-16090-F AL-12920-L NH220				4
K1-Exhaust 1, F	395.88	.495	202.15	.275
K2-Exhaust 2, F	418.23	.415	214.57	.230
K3-Exhaust 3, F	424.74	.667	218.19	.371
K4-Exhaust 4, F	409.47	1.031	209.71	.573
K5-Exhaust 5, F	381.29	.870	194.05	.483
K6-Exhaust 6, F	356.60	1.017	180.33	.565
K7-Exhaust Common, F	390.93	1.117	199.40	.621
Dry Bulb Temperature, F	77.817	.165	25.454	.092
Wet Bulb Temperature, F	65.713	.026	18.730	.015
J1-Water In, F	170.31	.120	76.841	.067
J2-Water Out, F	170.89	.150	77.160	.083
J3-Oil Sump, F	205.91	.226	96.619	.126
J4-Fuel Inlet, F	88.757	.028	31.532	.016
J5-Air After Filter, F	98.440	.107	36.911	.059
J6-Intake Manifold, F	101.73	.119	38.739	.066
J7-Fuel Return, F	87.543	.037	30.857	.021
P1-Fuel, PSIG	12.475	.057	86.015	.391
P2-Oil Gallery, PSIG	58.260	.032	401.69	.218
P6-Ex Common, "H2OG	8.355	.215	2.079	.054
P7-Air Aft Filt, "H2OV	5.265	.680	1.310	.169
P8-Blowby, "H2OG	.100	.017	.025	.004
P11-Baro (Vent), "Hg ABS	29.037	.004	98.329	.014
Speed, RPM	1800.2	2.529	1800.2	2.529
Load, Lb-Ft	50.973	2.874	69.110	3.896
Smoke, %	.110	.082	.110	.082
Fuel Flow, Lb/Hr	18.798	.494	8.527	.224
Horsepower	17.473	.996	13.027	.743
Corrected Horsepower	18.294	1.043	13.639	.777
BSFC, lb/hp-hr	1.079	.059	.656	.036
Corrected BSFC	1.030	.057	.627	.035
Relative Humidity	52.713	.501	52.713	.501
Reference Pressure, inHg	28.649		97.018	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1384

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.65 in-Hg
Speed :	1800 RPM
Load :	51.0 lb-ft
Fuel Flow :	18.8 lb/hr
Brake Power :	17.47 bhp
BSFC :	1.076 lb/bhp-hr
Indicated Power :	5.16 kW/cyl
Peak Pressure :	4.446 MPa
Peak Rate of Pressure Rise:	153.3 kPa/deg
Peak Heat Release Rate :	61.8 Joules/deg
Cumulative Heat Release :	734.030 Joules
Apparent Combustion Efficiency :	65.6 %
Indicated Thermal Efficiency :	30.7 %
Brake Thermal Efficiency :	12.9 %
Ignition Delay :	14.1 degrees
Centroid Phasing :	194.2 degrees
Centroid Magnitude :	15.16 J/degree
Sensitivity :	19.1 degrees
Premixed/Diffusion Ratio :	.74130

871210.123523 AL-16090-F AL-12920-L NH220				4
K1-Exhaust 1, F	1097.3	.629	591.83	.349
K2-Exhaust 2, F	1191.1	.458	643.96	.254
K3-Exhaust 3, F	1196.4	.660	646.90	.367
K4-Exhaust 4, F	1160.4	1.218	626.87	.677
K5-Exhaust 5, F	1179.2	.745	637.34	.414
K6-Exhaust 6, F	1094.2	1.844	590.08	1.025
K7-Exhaust Common, F	1234.1	.651	667.81	.362
Dry Bulb Temperature, F	78.177	.501	25.654	.278
Wet Bulb Temperature, F	65.715	.157	18.731	.087
J1-Water In, F	161.57	.099	71.981	.055
J2-Water Out, F	169.69	.105	76.497	.059
J3-Oil Sump, F	206.59	.323	96.996	.179
J4-Fuel Inlet, F	92.954	.109	33.863	.061
J5-Air After Filter, F	99.844	.144	37.691	.080
J6-Intake Manifold, F	101.70	.086	38.723	.048
J7-Fuel Return, F	95.706	.061	35.392	.034
P1-Fuel, PSIG	108.50	.820	748.10	5.653
P2-Oil Gallery, PSIG	55.985	.091	386.00	.624
P6-Ex Common, "H2OG	13.305	.440	3.311	.110
P7-Air Aft Filt, "H2OV	4.350	.300	1.082	.075
P8-Blowby, "H2OG	.073	.019	.018	.005
P11-Baro (Vent), "Hg ABS	29.031	.002	98.310	.008
Speed, RPM	1499.9	2.677	1499.9	2.677
Load, Lb-Ft	539.93	2.885	732.05	3.912
Smoke, %	14.768	.760	14.768	.760
Fuel Flow, Lb/Hr	81.042	4.183	36.760	1.897
Horsepower	154.20	.889	114.97	.663
Corrected Horsepower	161.66	.932	120.53	.695
BSFC, lb/hp-hr	.526	.026	.320	.016
Corrected BSFC	.501	.025	.305	.015
Relative Humidity	51.707	.910	51.707	.910
Reference Pressure, inHg	28.711		97.226	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1386

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.71 in-Hg
Speed :	1500 RPM
Load :	539.9 lb-ft
Fuel Flow :	81.0 lb/hr
Brake Power :	154.20 bhp
BSFC :	.525 lb/bhp-hr
Indicated Power :	22.01 kW/cyl
Peak Pressure :	7.980 MPa
Peak Rate of Pressure Rise:	689.2 kPa/deg
Peak Heat Release Rate :	271.5 Joules/deg
Cumulative Heat Release :	3410.30 Joules
Apparent Combustion Efficiency :	59.0 %
Indicated Thermal Efficiency :	30.4 %
Brake Thermal Efficiency :	26.5 %
Ignition Delay :	2.9 degrees
Centroid Phasing :	191.4 degrees
Centroid Magnitude :	41.88 J/degree
Sensitivity :	27.5 degrees
Premixed/Diffusion Ratio :	.10705

871210.124643 AL-16090-F AL-12920-L NH220				4
K1-Exhaust 1, F	1062.2	.398	572.32	.221
K2-Exhaust 2, F	1150.2	.764	621.20	.425
K3-Exhaust 3, F	1160.4	.349	626.87	.194
K4-Exhaust 4, F	1127.1	1.219	608.39	.677
K5-Exhaust 5, F	1158.1	.687	625.59	.381
K6-Exhaust 6, F	1069.3	1.180	576.28	.656
K7-Exhaust Common, F	1215.8	.656	657.64	.364
Dry Bulb Temperature, F	79.072	.268	26.151	.149
Wet Bulb Temperature, F	66.288	.112	19.049	.062
J1-Water In, F	160.51	.128	71.394	.071
J2-Water Out, F	169.94	.039	76.634	.022
J3-Oil Sump, F	205.73	.127	96.518	.070
J4-Fuel Inlet, F	93.143	.068	33.968	.038
J5-Air After Filter, F	100.76	.138	38.201	.077
J6-Intake Manifold, F	101.96	.070	38.868	.039
J7-Fuel Return, F	94.498	.065	34.721	.036
P1-Fuel, PSIG	95.474	.625	658.27	4.306
P2-Oil Gallery, PSIG	52.984	.025	365.31	.172
P6-Ex Common, "H2OG	13.579	.339	3.379	.084
P7-Air Aft Filt, "H2OV	4.193	.281	1.043	.070
P8-Blowby, "H2OG	.084	.033	.021	.008
P11-Baro (Vent), "Hg ABS	29.024	.001	98.286	.005
Speed, RPM	1299.5	2.446	1299.5	2.446
Load, Lb-Ft	550.79	2.592	746.76	3.515
Smoke, %	17.349	.576	17.349	.576
Fuel Flow, Lb/Hr	75.808	3.433	34.386	1.557
Horsepower	136.28	.701	101.61	.522
Corrected Horsepower	143.08	.736	106.68	.548
BSFC, lb/hp-hr	.556	.025	.338	.015
Corrected BSFC	.530	.023	.322	.014
Relative Humidity	51.129	.573	51.129	.573
Reference Pressure, inHg	28.716		97.242	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1388

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.72 in-Hg
Speed :	1300 RPM
Load :	550.8 lb-ft
Fuel Flow :	75.8 lb/hr
Brake Power :	136.34 bhp
BSFC :	.556 lb/bhp-hr
Indicated Power :	19.13 kW/cyl
Peak Pressure :	8.463 MPa
Peak Rate of Pressure Rise:	786.8 kPa/deg
Peak Heat Release Rate :	320.4 Joules/deg
Cumulative Heat Release :	3394.98 Joules
Apparent Combustion Efficiency :	54.4 %
Indicated Thermal Efficiency :	28.3 %
Brake Thermal Efficiency :	25.0 %
Ignition Delay :	2.1 degrees
Centroid Phasing :	188.9 degrees
Centroid Magnitude :	49.01 J/degree
Sensitivity :	25.7 degrees
Premixed/Diffusion Ratio :	.08339

871210.125836 AL-16090-F AL-12920-L NH220				4
K1-Exhaust 1, F	1019.5	.494	548.60	.275
K2-Exhaust 2, F	1076.5	1.234	580.26	.685
K3-Exhaust 3, F	1081.3	.704	582.97	.391
K4-Exhaust 4, F	1051.4	.637	566.35	.354
K5-Exhaust 5, F	1092.3	.876	589.06	.487
K6-Exhaust 6, F	1027.2	.555	552.87	.308
K7-Exhaust Common, F	1143.0	1.753	617.24	.974
Dry Bulb Temperature, F	79.598	.466	26.443	.259
Wet Bulb Temperature, F	66.491	.191	19.162	.106
J1-Water In, F	159.45	.058	70.806	.032
J2-Water Out, F	169.75	.062	76.528	.034
J3-Oil Sump, F	203.05	.463	95.030	.257
J4-Fuel Inlet, F	93.350	.068	34.083	.038
J5-Air After Filter, F	102.63	.067	39.241	.037
J6-Intake Manifold, F	103.48	.049	39.713	.027
J7-Fuel Return, F	94.016	.071	34.453	.039
P1-Fuel, PSIG	77.213	.486	532.36	3.349
P2-Oil Gallery, PSIG	47.273	.051	325.94	.349
P6-Ex Common, "H2OG	11.337	.822	2.821	.204
P7-Air Aft Filt, "H2OV	3.982	.300	.991	.075
P8-Blowby, "H2OG	.116	.046	.029	.011
P11-Baro (Vent), "Hg ABS	29.018	.002	98.265	.008
Speed, RPM	1100.6	2.361	1100.6	2.361
Load, Lb-Ft	534.67	2.417	724.91	3.277
Smoke, %	20.143	.682	20.143	.682
Fuel Flow, Lb/Hr	64.998	2.620	29.483	1.188
Horsepower	112.04	.591	83.538	.440
Corrected Horsepower	117.86	.621	87.870	.463
BSFC, lb/hp-hr	.580	.024	.353	.015
Corrected BSFC	.552	.023	.336	.014
Relative Humidity	50.369	.743	50.369	.743
Reference Pressure, inHg	28.725		97.273	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1390

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.73 in-Hg
Speed :	1101 RPM
Load :	534.7 lb-ft
Fuel Flow :	65.0 lb/hr
Brake Power :	112.09 bhp
BSFC :	.580 lb/bhp-hr
Indicated Power :	15.41 kW/cyl
Peak Pressure :	8.607 MPa
Peak Rate of Pressure Rise:	772.8 kPa/deg
Peak Heat Release Rate :	330.1 Joules/deg
Cumulative Heat Release :	3171.35 Joules
Apparent Combustion Efficiency :	50.1 %
Indicated Thermal Efficiency :	26.6 %
Brake Thermal Efficiency :	24.0 %
Ignition Delay :	1.8 degrees
Centroid Phasing :	185.4 degrees
Centroid Magnitude :	52.44 J/degree
Sensitivity :	22.6 degrees
Premixed/Diffusion Ratio :	.08043

APPENDIX G5
CUMMINS NH-220G DATA SHEETS
TEST FUEL TF01

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: Cummins NH220G Engine Tester: G. Phillips
Test Fuel: TF01N0158 7 Date: 4-13-88

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressur
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF01N0158 7 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressur
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF01N0158 7 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF01N01587 Date: 4-13-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	332	CN1671	CN1672
1800	333	CN1673	CN1674
1500	334	CN1675	CN1676
1300	335	CN1677	CN1678
1100	336	CN1679	CN1680

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF01N01587

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	337	CN1681	CN1682
1800	Full-Rack	338	CN1683	CN1684
1800	133	339	CN1685	CN1686
1800	98	340	CN1687	CN1688
1800	48	341	CN1689	CN1690
1800	13	342	CN1691	CN1692
1500	Full-Rack	343	CN1693	CN1694
1300	Full-Rack	344	CN1695	CN1696
1100	Full-Rack	345	CN1697	CN1698

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF01N01587 Date: 4-14-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	346	CN1699	CN1700
1800	347	CN1701	CN1702
1500	348	CN1703	CN1704
1300	349	CN1705	CN1706
1100	350	CN1707	CN1708

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF01N01587

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	351	CN1709	CN1710
1800	Full-Rack	352	CN1711	CN1712
1800	133	353	CN1713	CN1714
1800	98	354	CN1715	CN1716
1800	48	355	CN1717	CN1718
1800	13	356	CN1719	CN1720
1500	Full-Rack	357	CN1721	CN1722
1300	Full-Rack	358	CN1723	CN1724
1100	Full-Rack	359	CN1725	CN1726

CUMMINS NH220 LOG SHEET

TEST NO. 5 FUEL ~~FED#2 DF-2~~ BP02 V31L8087 DATE 4-13-88 PAGE 61

Operator Greg							
Time	11:55	12:10	12:25	12:35	12:50		
Test Hour	25min	15min	15min	10min	15min		
Speed, RPM	2099	1800	1300	1299	1101		
Load, lb-ft	491.8	544.1	579.7	577.4	553.4		
Fuel Flow, lb/hr	85.8	79.1	70.4	64.1	51.8		
Exh. Opacity, %	18.0	12.0	18.0	14.0	14.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1176	1182	1171	1140	1082		
Exhaust Cyl. 2	1284	1274	1239	1191	1096		
Exhaust Cyl. 3	1279	1279	1241	1191	1093		
Exhaust Cyl. 4	1238	1238	1194	1149	1061		
Exhaust Cyl. 5	1257	1274	1255	1214	1133		
Exhaust Cyl. 6	1175	1178	1150	1125	1058		
Exhaust Common	1283	1306	1292	1264	1170		
Water In	161	161	161	159	159		
Water Out	169	170	171	170	170		
Oil Sump	225	228	222	218	210		
Fuel	92	90	91	91	91		
Inlet Air	99	98	99	98	100		
Wet Bulb	63.2	83.3	63.8	60.9	62.0		
Dry Bulb	82.5	63.7	84.6	78.2	79.1		
PRESSURES, PSIG							
Fuel Pump	1320	120.0	103.0	91.0	71.0		
Oil Gallery	58.6	55.0	53.1	30.2	46.2		
LOW PRESSURES							
Intake Vac, in.water	5.3	4.0	3.1	2.5	2.0		
Exh. Comm., in.Water	27.0	20.0	16.0	13.0	13.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.06	29.06	29.06	29.06	29.06		

880413.115523 AL-17355-F AL-12920-L NH220				5
K1-Exhaust 1, F	1174.0	1.127	634.45	.626
K2-Exhaust 2, F	1283.8	.789	695.46	.438
K3-Exhaust 3, F	1276.8	.971	691.56	.539
K4-Exhaust 4, F	1234.0	1.347	667.80	.748
K5-Exhaust 5, F	1257.5	.610	680.83	.339
K6-Exhaust 6, F	1174.4	.760	634.67	.422
K7-Exhaust Common, F	1282.3	.601	694.61	.334
Dry Bulb Temperature, F	76.331	.077	24.629	.043
Wet Bulb Temperature, F	57.168	.023	13.982	.013
J1-Water In, F	162.31	.098	72.393	.054
J2-Water Out, F	169.44	.060	76.353	.033
J3-Oil Sump, F	223.50	.344	106.39	.191
J4-Fuel Inlet, F	92.633	.069	33.685	.038
J5-Air After Filter, F	101.18	.217	38.433	.120
J6-Intake Manifold, F	104.07	.194	40.037	.108
J7-Fuel Return, F	94.744	.071	34.858	.039
P1-Fuel, PSIG	131.46	.698	906.39	4.816
P2-Oil Gallery, PSIG	57.596	.078	397.11	.540
P6-Ex Common, "H2OG	27.161	.198	6.759	.049
P7-Air Aft Filt, "H2OV	5.679	.276	1.413	.069
P8-Blowby, "H2OG	.006	.029	.001	.007
P11-Baro (Vent), "Hg ABS	29.061	.003	98.412	.010
Speed, RPM	2099.8	3.953	2099.8	3.953
Load, Lb-Ft	499.06	3.630	676.63	4.922
Smoke, %	19.126	.365	19.126	.365
Fuel Flow, Lb/Hr	86.632	.358	39.296	.162
Horsepower	199.53	1.258	148.76	.938
Corrected Horsepower	207.48	1.308	154.69	.975
BSFC, lb/hp-hr	.434	.004	.264	.002
Corrected BSFC	.418	.004	.254	.002
Relative Humidity	28.905	.182	28.905	.182
Reference Pressure, inHg	28.644		96.998	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1672

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.64 in-Hg
Speed :	2100 RPM
Load :	499.1 lb-ft
Fuel Flow :	86.6 lb/hr
Brake Power :	199.56 bhp
BSFC :	.434 lb/bhp-hr
Indicated Power :	30.39 kW/cyl
Peak Pressure :	7.224 MPa
Peak Rate of Pressure Rise:	515.7 kPa/deg
Peak Heat Release Rate :	183.0 Joules/deg
Cumulative Heat Release :	3503.12 Joules
Apparent Combustion Efficiency :	78.4 %
Indicated Thermal Efficiency :	38.9 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	4.7 degrees
Centroid Phasing :	196.5 degrees
Centroid Magnitude :	35.90 J/degree
Sensitivity :	30.8 degrees
Premixed/Diffusion Ratio :	.15245

880413.121146 AL-17355-F AL-12920-L NH220 5

K1-Exhaust 1, F	1182.2	.927	638.99	.515
K2-Exhaust 2, F	1275.2	.864	690.69	.480
K3-Exhaust 3, F	1279.2	1.293	692.88	.718
K4-Exhaust 4, F	1237.8	.463	669.87	.257
K5-Exhaust 5, F	1274.6	.197	690.31	.110
K6-Exhaust 6, F	1178.0	1.037	636.65	.576
K7-Exhaust Common, F	1305.3	.365	707.42	.203
Dry Bulb Temperature, F	76.985	.186	24.992	.103
Wet Bulb Temperature, F	57.558	.042	14.199	.023
J1-Water In, F	162.44	.118	72.466	.065
J2-Water Out, F	170.73	.112	77.070	.062
J3-Oil Sump, F	228.99	.085	109.44	.047
J4-Fuel Inlet, F	90.727	.104	32.626	.058
J5-Air After Filter, F	99.868	.171	37.704	.095
J6-Intake Manifold, F	101.71	.143	38.729	.080
J7-Fuel Return, F	92.602	.092	33.668	.051
P1-Fuel, PSIG	117.95	.592	813.26	4.082
P2-Oil Gallery, PSIG	54.896	.020	378.49	.135
P6-Ex Common, "H2OG	19.714	.234	4.906	.058
P7-Air Aft Filt, "H2OV	4.194	.296	1.044	.074
P8-Blowby, "H2OG	.045	.032	.011	.008
P11-Baro (Vent), "Hg ABS	29.061	.003	98.411	.012
Speed, RPM	1801.8	2.934	1801.8	2.934
Load, Lb-Ft	549.17	5.004	744.57	6.785
Smoke, %	13.029	.666	13.029	.666
Fuel Flow, Lb/Hr	79.121	.420	35.889	.191
Horsepower	188.41	1.985	140.47	1.480
Corrected Horsepower	195.71	2.062	145.91	1.538
BSFC, lb/hp-hr	.420	.005	.256	.003
Corrected BSFC	.404	.005	.246	.003
Relative Humidity	28.688	.315	28.688	.315
Reference Pressure, inHg	28.752		97.367	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1674

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.75 in-Hg
Speed :	1802 RPM
Load :	549.2 lb-ft
Fuel Flow :	79.1 lb/hr
Brake Power :	188.43 bhp
BSFC :	.420 lb/bhp-hr
Indicated Power :	27.66 kW/cyl
Peak Pressure :	7.821 MPa
Peak Rate of Pressure Rise:	601.3 kPa/deg
Peak Heat Release Rate :	221.1 Joules/deg
Cumulative Heat Release :	3633.41 Joules
Apparent Combustion Efficiency :	76.4 %
Indicated Thermal Efficiency :	38.7 %
Brake Thermal Efficiency :	32.8 %
Ignition Delay :	4.6 degrees
Centroid Phasing :	194.2 degrees
Centroid Magnitude :	39.84 J/degree
Sensitivity :	28.7 degrees
Premixed/Diffusion Ratio :	.15925

880413.122452 AL-17355-F AL-12920-L NH220				5
K1-Exhaust 1, F	1171.9	1.237	633.30	.687
K2-Exhaust 2, F	1239.7	.355	670.96	.197
K3-Exhaust 3, F	1243.3	.714	672.93	.397
K4-Exhaust 4, F	1193.8	.366	645.42	.203
K5-Exhaust 5, F	1255.6	.516	679.77	.287
K6-Exhaust 6, F	1149.8	.765	620.99	.425
K7-Exhaust Common, F	1292.2	.476	700.13	.265
Dry Bulb Temperature, F	77.910	.163	25.506	.091
Wet Bulb Temperature, F	57.792	.052	14.329	.029
J1-Water In, F	161.68	.188	72.043	.104
J2-Water Out, F	171.21	.119	77.339	.066
J3-Oil Sump, F	223.64	.162	106.46	.090
J4-Fuel Inlet, F	90.979	.087	32.766	.049
J5-Air After Filter, F	100.41	.123	38.003	.068
J6-Intake Manifold, F	102.34	.086	39.075	.048
J7-Fuel Return, F	93.244	.095	34.025	.053
P1-Fuel, PSIG	100.89	.888	695.61	6.122
P2-Oil Gallery, PSIG	53.240	.071	367.08	.490
P6-Ex Common, "H2OG	15.798	.230	3.931	.057
P7-Air Aft Filt, "H2OV	3.330	.275	.829	.068
P8-Blowby, "H2OG	.009	.020	.002	.005
P11-Baro (Vent), "Hg ABS	29.062	.003	98.414	.009
Speed, RPM	1501.1	3.329	1501.1	3.329
Load, Lb-Ft	577.71	1.576	783.27	2.136
Smoke, %	19.099	.475	19.099	.475
Fuel Flow, Lb/Hr	70.425	.344	31.944	.156
Horsepower	165.12	.650	123.11	.485
Corrected Horsepower	171.58	.675	127.92	.504
BSFC, lb/hp-hr	.427	.003	.259	.002
Corrected BSFC	.410	.003	.250	.002
Relative Humidity	27.466	.244	27.466	.244
Reference Pressure, inHg	28.817		97.585	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1676

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.82 in-Hg
Speed :	1501 RPM
Load :	577.7 lb-ft
Fuel Flow :	70.4 lb/hr
Brake Power :	165.10 bhp
BSFC :	.426 lb/bhp-hr
Indicated Power :	24.38 kW/cyl
Peak Pressure :	8.561 MPa
Peak Rate of Pressure Rise:	739.1 kPa/deg
Peak Heat Release Rate :	288.8 Joules/deg
Cumulative Heat Release :	3759.06 Joules
Apparent Combustion Efficiency :	73.9 %
Indicated Thermal Efficiency :	38.3 %
Brake Thermal Efficiency :	32.3 %
Ignition Delay :	2.2 degrees
Centroid Phasing :	190.5 degrees
Centroid Magnitude :	46.52 J/degree
Sensitivity :	27.3 degrees
Premixed/Diffusion Ratio :	.07953

880413.123659 AL-17355-F AL-12920-L NH220 5

K1-Exhaust 1, F	1139.2	1.857	615.09	1.032
K2-Exhaust 2, F	1193.1	.714	645.06	.397
K3-Exhaust 3, F	1190.9	1.763	643.82	.979
K4-Exhaust 4, F	1149.7	.698	620.95	.388
K5-Exhaust 5, F	1214.5	.990	656.94	.550
K6-Exhaust 6, F	1122.6	.496	605.90	.275
K7-Exhaust Common, F	1263.0	1.064	683.88	.591
Dry Bulb Temperature, F	80.136	.427	26.742	.237
Wet Bulb Temperature, F	59.302	.032	15.168	.018
J1-Water In, F	159.79	.235	70.993	.131
J2-Water Out, F	170.41	.172	76.897	.095
J3-Oil Sump, F	218.52	.098	103.62	.055
J4-Fuel Inlet, F	91.359	.093	32.977	.052
J5-Air After Filter, F	99.345	.110	37.414	.061
J6-Intake Manifold, F	100.93	.070	38.295	.039
J7-Fuel Return, F	91.456	.061	33.031	.034
P1-Fuel, PSIG	88.165	.341	607.88	2.349
P2-Oil Gallery, PSIG	50.574	.044	348.70	.301
P6-Ex Common, "H2OG	14.769	.090	3.675	.022
P7-Air Aft Filt, "H2OV	2.688	.202	.669	.050
P8-Blowby, "H2OG	.020	.051	.005	.013
P11-Baro (Vent), "Hg ABS	29.061	.003	98.412	.009
Speed, RPM	1299.2	2.354	1299.2	2.354
Load, Lb-Ft	580.12	3.104	786.54	4.208
Smoke, %	14.444	.818	14.444	.818
Fuel Flow, Lb/Hr	63.747	.357	28.915	.162
Horsepower	143.50	.955	106.99	.712
Corrected Horsepower	149.07	.992	111.14	.739
BSFC, lb/hp-hr	.444	.004	.270	.002
Corrected BSFC	.428	.004	.260	.002
Relative Humidity	27.358	.763	27.358	.763
Reference Pressure, inHg	28.863		97.742	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1678

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.86 in-Hg
Speed :	1299 RPM
Load :	580.1 lb-ft
Fuel Flow :	63.7 lb/hr
Brake Power :	143.48 bhp
BSFC :	.444 lb/bhp-hr
Indicated Power :	21.12 kW/cyl
Peak Pressure :	8.882 MPa
Peak Rate of Pressure Rise:	787.8 kPa/deg
Peak Heat Release Rate :	319.6 Joules/deg
Cumulative Heat Release :	3729.79 Joules
Apparent Combustion Efficiency :	70.2 %
Indicated Thermal Efficiency :	36.7 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	1.8 degrees
Centroid Phasing :	188.5 degrees
Centroid Magnitude :	50.39 J/degree
Sensitivity :	25.8 degrees
Premixed/Diffusion Ratio :	.06927

880413.125130 AL-17355-F AL-12920-L NH220 5

K1-Exhaust 1, F	1082.5	.614	583.59	.341
K2-Exhaust 2, F	1099.1	1.160	592.85	.644
K3-Exhaust 3, F	1093.2	.477	589.56	.265
K4-Exhaust 4, F	1060.9	.638	571.64	.354
K5-Exhaust 5, F	1133.4	.540	611.88	.300
K6-Exhaust 6, F	1056.5	.423	569.16	.235
K7-Exhaust Common, F	1170.8	.456	632.68	.253
Dry Bulb Temperature, F	78.468	.106	25.816	.059
Wet Bulb Temperature, F	58.406	.126	14.670	.070
J1-Water In, F	159.52	.126	70.846	.070
J2-Water Out, F	170.03	.081	76.685	.045
J3-Oil Sump, F	210.49	.151	99.158	.084
J4-Fuel Inlet, F	90.638	.068	32.577	.038
J5-Air After Filter, F	99.466	.071	37.481	.040
J6-Intake Manifold, F	101.89	.089	38.829	.050
J7-Fuel Return, F	90.323	.099	32.402	.055
P1-Fuel, PSIG	68.654	.312	473.35	2.150
P2-Oil Gallery, PSIG	46.549	.040	320.94	.274
P6-Ex Common, "H2OG	12.724	.133	3.166	.033
P7-Air Aft Filt, "H2OV	2.052	.248	.511	.062
P8-Blowby, "H2OG	.049	.038	.012	.010
P11-Baro (Vent), "Hg ABS	29.060	.002	98.408	.008
Speed, RPM	1101.3	1.136	1101.3	1.136
Load, Lb-Ft	554.62	1.166	751.96	1.581
Smoke, %	15.934	.969	15.934	.969
Fuel Flow, Lb/Hr	52.546	.420	23.835	.190
Horsepower	116.30	.339	86.710	.253
Corrected Horsepower	120.80	.353	90.065	.263
BSFC, lb/hp-hr	.452	.004	.275	.002
Corrected BSFC	.435	.003	.265	.002
Relative Humidity	28.115	.335	28.115	.335
Reference Pressure, inHg	28.909		97.897	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CH1680

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.91 in-Hg
Speed :	1101 RPM
Load :	554.6 lb-ft
Fuel Flow :	52.4 lb/hr
Brake Power :	116.26 bhp
BSFC :	.451 lb/bhp-hr
Indicated Power :	17.20 kW/cyl
Peak Pressure :	8.857 MPa
Peak Rate of Pressure Rise:	744.6 kPa/deg
Peak Heat Release Rate :	308.4 Joules/deg
Cumulative Heat Release :	3521.25 Joules
Apparent Combustion Efficiency :	68.3 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	1.4 degrees
Centroid Phasing :	186.4 degrees
Centroid Magnitude :	50.12 J/degree
Sensitivity :	23.9 degrees
Premixed/Diffusion Ratio :	.05968

CUMMINS NH220 LOG SHEET

TEST NO. 5 FUEL TF01N0L587 DATE 4-13-88 PAGE 62

Operator Greg							
Time	35 min	15 min	1:50	2:00	2:10	2:15	2:30
Test Hour	1:25	1:40	10 min	10 min	10 min	5 min	15 min
Speed, RPM	2100	1800	1799	1800	1800	1799	1500
Load, lb–ft	505.6	544.9	371.3	270.5	134.2	46.1	564.6
Fuel Flow, lb/hr	93.9	85.1	53.0	42.9	30.4	17.7	77.2
Exh. Opacity, %	24.0	18.0	4.0	4.0	4.0	1.0	18.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1187	1179	835	696	504	379	1160
Exhaust Cyl. 2	1292	1275	942	790	593	442	1232
Exhaust Cyl. 3	1308	1284	932	782	583	445	1233
Exhaust Cyl. 4	1256	1239	895	742	551	431	1181
Exhaust Cyl. 5	1268	1267	875	728	538	415	1239
Exhaust Cyl. 6	1199	1188	846	681	502	387	1160
Exhaust Common	1306	1311	896	731	538	412	1302
Water In	161	161	162	163	167	169	160
Water Out	171	170	168	169	169	170	170
Oil Sump	232	231	225	218	215	211	211
Fuel	93	92	90	89	89	88	93
Inlet Air	101	99	100	98	97	102	101
Wet Bulb	62.5	62.2	62.1	62.0	62.8	62.4	62.6
Dry Bulb	81.0	82.0	82.0	81.0	81.8	82.0	82.2
PRESSURES, PSIG							
Fuel Pump	137.0	122.0	61	45.0	27.0	17.0	106.0
Oil Gallery	56.2	54.5	55.2	57.0	57.8	58.5	56.5
LOW PRESSURES							
Intake Vac, in.water	5.4	4.1	4.4	4.5	4.6	4.6	3.2
Exh. Comm., in.Water	27.5	20.0	16.0	13.0	12.5	10.0	16.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.04	29.03	29.03	29.03	29.02	29.02	29.01

CUMMINS NH220 LOG SHEET

TEST NO. 5 FUEL TF01R00/587 DATE 4/13-88 PAGE 63

Operator Grey							
Time	2:40	2:55					
Test Hour	10min	15min					
Speed, RPM	1300	1100					
Load, lb–ft	565.4	546.2					
Fuel Flow, lb/hr	64.6	55.8					
Exh. Opacity, %	20.0	34.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1123	1080					
Exhaust Cyl. 2	1174	1090					
Exhaust Cyl. 3	1175	1092					
Exhaust Cyl. 4	1131	1050					
Exhaust Cyl. 5	1195	1123					
Exhaust Cyl. 6	1124	1067					
Exhaust Common	1253	1174					
Water In	160	158					
Water Out	171	169					
Oil Sump	211	209					
Fuel	92	91					
Inlet Air	102	100					
Wet Bulb	63.2	63.9					
Dry Bulb	83.9	84.2					
PRESSURES, PSIG							
Fuel Pump	92.0	74.0					
Oil Gallery	52.6	46.6					
LOW PRESSURES							
Intake Vac, in.water	2.5	2.0					
Exh. Comm., in.Water	14.5	13.0					
Blowby, in.water	0	0					
Barometer, in.Hg	29.01	29.0					

980413.132744 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1185.7	.403	640.94	.224
K2-Exhaust 2, F	1292.6	.782	700.33	.435
K3-Exhaust 3, F	1304.2	.589	706.75	.327
K4-Exhaust 4, F	1251.3	.574	677.40	.319
K5-Exhaust 5, F	1266.4	.663	685.79	.368
K6-Exhaust 6, F	1196.6	.515	647.01	.286
K7-Exhaust Common, F	1303.5	.330	706.38	.183
Dry Bulb Temperature, F	82.852	.379	28.251	.211
Wet Bulb Temperature, F	60.398	.089	15.777	.050
J1-Water In, F	162.78	.219	72.656	.122
J2-Water Out, F	170.34	.153	76.856	.085
J3-Oil Sump, F	232.22	.206	111.23	.114
J4-Fuel Inlet, F	92.487	.033	33.604	.018
J5-Air After Filter, F	99.110	.117	37.283	.065
J6-Intake Manifold, F	99.936	.133	37.742	.074
J7-Fuel Return, F	94.940	.102	34.967	.057
P1-Fuel, PSIG	134.86	1.485	929.86	10.240
P2-Oil Gallery, PSIG	55.673	.051	383.85	.353
P6-Ex Common, "H2OG	27.610	.215	6.870	.054
P7-Air Aft Filt, "H2OV	5.879	.354	1.463	.088
P8-Blowby, "H2OG	.039	.044	.010	.011
P11-Baro (Vent), "Hg ABS	29.036	.002	98.328	.008
Speed, RPM	2101.7	2.639	2101.7	2.639
Load, Lb-Ft	510.40	3.423	692.01	4.641
Smoke, %	24.777	.686	24.777	.686
Fuel Flow, Lb/Hr	94.142	.676	42.702	.307
Horsepower	204.24	1.164	152.28	.868
Corrected Horsepower	212.33	1.210	158.31	.902
BSFC, lb/hp-hr	.461	.005	.280	.003
Corrected BSFC	.443	.005	.270	.003
Relative Humidity	25.293	.560	25.293	.560
Reference Pressure, inHg	28.604		96.864	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1682

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.60 in-Hg
Speed :	2101 RPM
Load :	510.4 lb-ft
Fuel Flow :	94.1 lb/hr
Brake Power :	204.18 bhp
BSFC :	.461 lb/bhp-hr
Indicated Power :	30.88 kW/cyl
Peak Pressure :	7.304 MPa
Peak Rate of Pressure Rise:	594.6 kPa/deg
Peak Heat Release Rate :	216.9 Joules/deg
Cumulative Heat Release :	3549.70 Joules
Apparent Combustion Efficiency :	73.9 %
Indicated Thermal Efficiency :	36.7 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	5.3 degrees
Centroid Phasing :	196.6 degrees
Centroid Magnitude :	42.63 J/degree
Sensitivity :	30.3 degrees
Premixed/Diffusion Ratio :	.17541

880413.133939 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1179.4	.634	637.43	.352
K2-Exhaust 2, F	1275.0	.964	690.56	.536
K3-Exhaust 3, F	1285.6	.764	696.42	.425
K4-Exhaust 4, F	1237.8	.666	669.88	.370
K5-Exhaust 5, F	1266.8	.722	686.01	.401
K6-Exhaust 6, F	1185.8	1.422	641.01	.790
K7-Exhaust Common, F	1309.8	1.034	709.89	.575
Dry Bulb Temperature, F	82.609	.603	28.116	.335
Wet Bulb Temperature, F	60.877	.102	16.043	.056
J1-Water In, F	162.09	.180	72.273	.100
J2-Water Out, F	170.40	.157	76.889	.087
J3-Oil Sump, F	231.50	.132	110.83	.074
J4-Fuel Inlet, F	92.014	.115	33.341	.064
J5-Air After Filter, F	98.776	.067	37.098	.037
J6-Intake Manifold, F	100.54	.039	38.077	.022
J7-Fuel Return, F	94.644	.083	34.802	.046
P1-Fuel, PSIG	119.52	1.534	824.09	10.574
P2-Oil Gallery, PSIG	54.400	.023	375.08	.157
P6-Ex Common, "H2OG	19.795	.156	4.926	.039
P7-Air Aft Filt, "H2OV	4.666	.552	1.161	.137
P8-Blowby, "H2OG	.011	.037	.003	.009
P11-Baro (Vent), "Hg ABS	29.030	.005	98.305	.017
Speed, RPM	1801.6	4.142	1801.6	4.142
Load, Lb-Ft	545.24	4.213	739.24	5.713
Smoke, %	18.837	.957	18.837	.957
Fuel Flow, Lb/Hr	84.657	1.392	38.400	.631
Horsepower	187.04	1.827	139.45	1.362
Corrected Horsepower	194.55	1.901	145.05	1.417
BSFC, lb/hp-hr	.453	.009	.275	.005
Corrected BSFC	.435	.008	.265	.005
Relative Humidity	27.001	.916	27.001	.916
Reference Pressure, inHg	28.686		97.143	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1684

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.69 in-Hg
Speed :	1802 RPM
Load :	545.2 lb-ft
Fuel Flow :	84.7 lb/hr
Brake Power :	187.06 bhp
BSFC :	.453 lb/bhp-hr
Indicated Power :	27.99 kW/cyl
Peak Pressure :	7.888 MPa
Peak Rate of Pressure Rise:	720.9 kPa/deg
Peak Heat Release Rate :	272.9 Joules/deg
Cumulative Heat Release :	3642.40 Joules
Apparent Combustion Efficiency :	72.2 %
Indicated Thermal Efficiency :	37.0 %
Brake Thermal Efficiency :	30.7 %
Ignition Delay :	6.2 degrees
Centroid Phasing :	193.8 degrees
Centroid Magnitude :	46.12 J/degree
Sensitivity :	26.6 degrees
Premixed/Diffusion Ratio :	.23460

880413.134938 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	836.74	.617	447.08	.343
K2-Exhaust 2, F	943.65	.881	506.47	.489
K3-Exhaust 3, F	933.32	.354	500.74	.197
K4-Exhaust 4, F	898.28	1.250	481.27	.694
K5-Exhaust 5, F	877.76	.628	469.87	.349
K6-Exhaust 6, F	844.37	.425	451.32	.236
K7-Exhaust Common, F	899.40	.744	481.89	.413
Dry Bulb Temperature, F	80.424	.404	26.902	.225
Wet Bulb Temperature, F	59.118	.179	15.066	.099
J1-Water In, F	162.79	.211	72.663	.117
J2-Water Out, F	167.63	.154	75.353	.086
J3-Oil Sump, F	225.11	.265	107.28	.147
J4-Fuel Inlet, F	89.886	.024	32.159	.013
J5-Air After Filter, F	99.987	.243	37.771	.135
J6-Intake Manifold, F	101.18	.248	38.432	.138
J7-Fuel Return, F	90.559	.158	32.533	.088
P1-Fuel, PSIG	58.577	.158	403.87	1.090
P2-Oil Gallery, PSIG	55.623	.054	383.50	.370
P6-Ex Common, "H2OG	15.495	.117	3.856	.029
P7-Air Aft Filt, "H2OV	4.839	.531	1.204	.132
P8-Blowby, "H2OG	.046	.041	.011	.010
P11-Baro (Vent), "Hg ABS	29.025	.005	98.291	.017
Speed, RPM	1800.5	3.405	1800.5	3.405
Load, Lb-Ft	370.98	4.554	502.98	6.175
Smoke, %	4.803	.192	4.803	.192
Fuel Flow, Lb/Hr	54.208	2.960	24.588	1.343
Horsepower	127.18	1.723	94.824	1.285
Corrected Horsepower	132.32	1.793	98.655	1.336
BSFC, lb/hp-hr	.426	.023	.259	.014
Corrected BSFC	.410	.022	.249	.013
Relative Humidity	26.321	.331	26.321	.331
Reference Pressure, inHg	28.670		97.086	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1686

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.67 in-Hg
Speed :	1801 RPM
Load :	371.0 lb-ft
Fuel Flow :	54.2 lb/hr
Brake Power :	127.22 bhp
BSFC :	.426 lb/bhp-hr
Indicated Power :	19.26 kW/cyl
Peak Pressure :	6.173 MPa
Peak Rate of Pressure Rise:	424.0 kPa/deg
Peak Heat Release Rate :	153.4 Joules/deg
Cumulative Heat Release :	2487.89 Joules
Apparent Combustion Efficiency :	77.1 %
Indicated Thermal Efficiency :	39.8 %
Brake Thermal Efficiency :	32.6 %
Ignition Delay :	9.9 degrees
Centroid Phasing :	193.8 degrees
Centroid Magnitude :	31.04 J/degree
Sensitivity :	22.9 degrees
Premixed/Diffusion Ratio :	.43106

880413.140000 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	697.43	.236	369.69	.131
K2-Exhaust 2, F	790.75	.240	421.53	.133
K3-Exhaust 3, F	780.35	.777	415.75	.432
K4-Exhaust 4, F	741.91	.481	394.39	.267
K5-Exhaust 5, F	726.27	.255	385.70	.141
K6-Exhaust 6, F	682.58	1.611	361.43	.895
K7-Exhaust Common, F	732.46	.592	389.15	.329
Dry Bulb Temperature, F	83.684	.564	28.713	.314
Wet Bulb Temperature, F	60.429	.216	15.794	.120
J1-Water In, F	165.40	.226	74.111	.126
J2-Water Out, F	168.66	.176	75.922	.098
J3-Oil Sump, F	219.03	.206	103.90	.114
J4-Fuel Inlet, F	89.158	.061	31.755	.034
J5-Air After Filter, F	97.834	.048	36.574	.027
J6-Intake Manifold, F	99.111	.036	37.284	.020
J7-Fuel Return, F	89.476	.112	31.931	.062
P1-Fuel, PSIG	41.208	.393	284.12	2.711
P2-Oil Gallery, PSIG	56.815	.103	391.73	.709
P6-Ex Common, "H2OG	14.221	.145	3.539	.036
P7-Air Aft Filt, "H2OV	5.121	.353	1.274	.088
P8-Blowby, "H2OG	.024	.041	.006	.010
P11-Baro (Vent), "Hg ABS	29.024	.003	98.286	.012
Speed, RPM	1799.8	2.822	1799.8	2.822
Load, Lb-Ft	264.61	3.113	358.76	4.221
Smoke, %	4.158	.171	4.158	.171
Fuel Flow, Lb/Hr	41.178	1.353	18.678	.614
Horsepower	90.680	1.157	67.609	.863
Corrected Horsepower	94.178	1.202	70.216	.896
BSFC, lb/hp-hr	.454	.017	.276	.010
Corrected BSFC	.437	.016	.266	.010
Relative Humidity	23.940	.506	23.940	.506
Reference Pressure, inHg	28.647		97.010	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1688

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.65 in-Hg
Speed :	1800 RPM
Load :	264.6 lb-ft
Fuel Flow :	41.2 lb/hr
Brake Power :	90.69 bhp
BSFC :	.454 lb/bhp-hr
Indicated Power :	15.09 kW/cyl
Peak Pressure :	5.596 MPa
Peak Rate of Pressure Rise:	328.7 kPa/deg
Peak Heat Release Rate :	123.1 Joules/deg
Cumulative Heat Release :	1955.85 Joules
Apparent Combustion Efficiency :	79.7 %
Indicated Thermal Efficiency :	41.0 %
Brake Thermal Efficiency :	30.6 %
Ignition Delay :	11.5 degrees
Centroid Phasing :	193.7 degrees
Centroid Magnitude :	27.63 J/degree
Sensitivity :	21.1 degrees
Premixed/Diffusion Ratio :	.54680

880413.140822 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	503.81	.680	262.12	.378
K2-Exhaust 2, F	597.03	.777	313.91	.432
K3-Exhaust 3, F	583.75	.854	306.53	.475
K4-Exhaust 4, F	552.81	1.707	289.34	.948
K5-Exhaust 5, F	539.96	.816	282.20	.454
K6-Exhaust 6, F	502.08	.400	261.16	.222
K7-Exhaust Common, F	541.58	1.461	283.10	.812
Dry Bulb Temperature, F	83.487	.296	28.604	.164
Wet Bulb Temperature, F	60.807	.061	16.004	.034
J1-Water In, F	167.06	.163	75.036	.090
J2-Water Out, F	168.78	.126	75.988	.070
J3-Oil Sump, F	214.70	.085	101.50	.047
J4-Fuel Inlet, F	89.042	.046	31.690	.026
J5-Air After Filter, F	97.142	.059	36.190	.033
J6-Intake Manifold, F	98.403	.023	36.891	.013
J7-Fuel Return, F	87.375	.127	30.764	.070
P1-Fuel, PSIG	23.344	.123	160.95	.850
P2-Oil Gallery, PSIG	57.728	.041	398.02	.281
P6-Ex Common, "H2OG	11.564	.085	2.878	.021
P7-Air Aft Filt, "H2OV	5.166	.527	1.286	.131
P8-Blowby, "H2OG	.062	.057	.016	.014
P11-Baro (Vent), "Hg ABS	29.024	.004	98.286	.012
Speed, RPM	1798.8	2.994	1798.8	2.994
Load, Lb-Ft	131.80	5.711	178.69	7.743
Smoke, %	5.813	.138	5.813	.138
Fuel Flow, Lb/Hr	27.569	2.730	12.505	1.238
Horsepower	45.142	2.012	33.657	1.500
Corrected Horsepower	46.876	2.089	34.949	1.559
BSFC, lb/hp-hr	.612	.071	.372	.043
Corrected BSFC	.590	.068	.359	.041
Relative Humidity	25.240	.552	25.240	.552
Reference Pressure, inHg	28.644		96.999	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1690

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.64 in-Hg
Speed :	1799 RPM
Load :	131.8 lb-ft
Fuel Flow :	27.6 lb/hr
Brake Power :	45.15 bhp
BSFC :	.611 lb/bhp-hr
Indicated Power :	8.80 kW/cyl
Peak Pressure :	4.824 MPa
Peak Rate of Pressure Rise:	190.7 kPa/deg
Peak Heat Release Rate :	79.2 Joules/deg
Cumulative Heat Release :	1188.91 Joules
Apparent Combustion Efficiency :	72.2 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	22.7 %
Ignition Delay :	14.2 degrees
Centroid Phasing :	193.9 degrees
Centroid Magnitude :	20.28 J/degree
Sensitivity :	18.8 degrees
Premixed/Diffusion Ratio :	.75441

880413.141639 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	380.56	1.124	193.64	.624
K2-Exhaust 2, F	444.74	.916	229.30	.509
K3-Exhaust 3, F	447.13	.787	230.63	.437
K4-Exhaust 4, F	430.77	1.405	221.54	.780
K5-Exhaust 5, F	412.98	.887	211.65	.493
K6-Exhaust 6, F	387.22	.857	197.34	.476
K7-Exhaust Common, F	414.16	1.155	212.31	.642
Dry Bulb Temperature, F	83.788	.399	28.771	.222
Wet Bulb Temperature, F	60.697	.141	15.943	.078
J1-Water In, F	169.27	.235	76.258	.131
J2-Water Out, F	170.15	.200	76.752	.111
J3-Oil Sump, F	210.83	.212	99.351	.118
J4-Fuel Inlet, F	87.677	.061	30.932	.034
J5-Air After Filter, F	101.40	.104	38.557	.058
J6-Intake Manifold, F	103.40	.152	39.667	.084
J7-Fuel Return, F	84.981	.121	29.434	.067
P1-Fuel, PSIG	13.134	.059	90.555	.405
P2-Oil Gallery, PSIG	58.393	.051	402.60	.350
P6-Ex Common, "H2OG	9.083	.117	2.260	.029
P7-Air Aft Filt, "H2OV	5.358	.468	1.333	.116
P8-Blowby, "H2OG	.034	.038	.009	.009
P11-Baro (Vent), "Hg ABS	29.021	.004	98.274	.014
Speed, RPM	1798.7	2.438	1798.7	2.438
Load, Lb-Ft	46.439	3.675	62.962	4.982
Smoke, %	1.353	.117	1.353	.117
Fuel Flow, Lb/Hr	17.693	.533	8.026	.242
Horsepower	15.903	1.244	11.857	.927
Corrected Horsepower	16.575	1.296	12.358	.966
BSFC, lb/hp-hr	1.118	.079	.680	.048
Corrected BSFC	1.072	.076	.652	.046
Relative Humidity	24.440	.478	24.440	.478
Reference Pressure, inHg	28.626		96.940	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1692

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.63 in-Hg
Speed :	1799 RPM
Load :	46.4 lb-ft
Fuel Flow :	17.7 lb/hr
Brake Power :	15.91 bhp
BSFC :	1.113 lb/bhp-hr
Indicated Power :	5.15 kW/cyl
Peak Pressure :	4.413 MPa
Peak Rate of Pressure Rise:	141.0 kPa/deg
Peak Heat Release Rate :	62.9 Joules/deg
Cumulative Heat Release :	747.498 Joules
Apparent Combustion Efficiency :	70.8 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	12.5 %
Ignition Delay :	15.5 degrees
Centroid Phasing :	193.1 degrees
Centroid Magnitude :	16.87 J/degree
Sensitivity :	16.6 degrees
Premixed/Diffusion Ratio :	.93885

880413.143010 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1160.5	.728	626.96	.405
K2-Exhaust 2, F	1231.4	.527	666.34	.293
K3-Exhaust 3, F	1233.0	.388	667.24	.216
K4-Exhaust 4, F	1179.4	.471	637.44	.262
K5-Exhaust 5, F	1240.1	1.198	671.14	.666
K6-Exhaust 6, F	1157.8	.623	625.45	.346
K7-Exhaust Common, F	1302.1	.271	705.61	.151
Dry Bulb Temperature, F	83.417	.278	28.565	.154
Wet Bulb Temperature, F	60.879	.182	16.044	.101
J1-Water In, F	160.98	.106	71.655	.059
J2-Water Out, F	169.99	.050	76.661	.028
J3-Oil Sump, F	210.52	.146	99.179	.081
J4-Fuel Inlet, F	92.679	.072	33.710	.040
J5-Air After Filter, F	100.73	.304	38.181	.169
J6-Intake Manifold, F	102.43	.360	39.125	.200
J7-Fuel Return, F	91.885	.239	33.269	.133
P1-Fuel, PSIG	103.04	1.873	710.47	12.911
P2-Oil Gallery, PSIG	55.896	.151	385.39	1.038
P6-Ex Common, "H2OG	15.286	.186	3.804	.046
P7-Air Aft Filt, "H2OV	4.028	.151	1.002	.038
P8-Blowby, "H2OG	.030	.025	.007	.006
P11-Baro (Vent), "Hg ABS	29.009	.002	98.237	.006
Speed, RPM	1499.4	2.031	1499.4	2.031
Load, Lb-Ft	564.43	2.754	765.26	3.734
Smoke, %	19.878	.785	19.878	.785
Fuel Flow, Lb/Hr	75.267	1.453	34.141	.659
Horsepower	161.14	.834	120.14	.622
Corrected Horsepower	167.97	.869	125.23	.648
BSFC, lb/hp-hr	.467	.010	.284	.006
Corrected BSFC	.448	.009	.273	.006
Relative Humidity	25.558	.134	25.558	.134
Reference Pressure, inHg	28.713		97.233	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1694

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.71 in-Hg
Speed :	1499 RPM
Load :	564.4 lb-ft
Fuel Flow :	75.3 lb/hr
Brake Power :	161.09 bhp
BSFC :	.467 lb/bhp-hr
Indicated Power :	24.14 kW/cyl
Peak Pressure :	8.435 MPa
Peak Rate of Pressure Rise:	856.9 kPa/deg
Peak Heat Release Rate :	338.1 Joules/deg
Cumulative Heat Release :	3725.53 Joules
Apparent Combustion Efficiency :	69.1 %
Indicated Thermal Efficiency :	35.9 %
Brake Thermal Efficiency :	29.7 %
Ignition Delay :	4.2 degrees
Centroid Phasing :	191.3 degrees
Centroid Magnitude :	53.63 J/degree
Sensitivity :	26.0 degrees
Premixed/Diffusion Ratio :	.16299

980413.144229 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1121.7	1.249	605.41	.694
K2-Exhaust 2, F	1172.4	1.025	633.58	.569
K3-Exhaust 3, F	1173.3	1.281	634.05	.712
K4-Exhaust 4, F	1129.1	.495	609.47	.275
K5-Exhaust 5, F	1196.3	1.110	646.82	.617
K6-Exhaust 6, F	1123.4	.868	606.33	.482
K7-Exhaust Common, F	1252.2	.643	677.88	.357
Dry Bulb Temperature, F	83.491	.366	28.606	.204
Wet Bulb Temperature, F	60.259	.092	15.700	.051
J1-Water In, F	160.45	.064	71.361	.035
J2-Water Out, F	170.67	.074	77.042	.041
J3-Oil Sump, F	211.98	.226	99.992	.126
J4-Fuel Inlet, F	90.822	.091	32.679	.051
J5-Air After Filter, F	101.87	.046	38.815	.025
J6-Intake Manifold, F	103.98	.069	39.989	.038
J7-Fuel Return, F	91.796	.116	33.220	.064
P1-Fuel, PSIG	89.664	.494	618.21	3.403
P2-Oil Gallery, PSIG	52.584	.035	362.56	.242
P6-Ex Common, "H2OG	13.901	.070	3.459	.017
P7-Air Aft Filt, "H2OV	3.460	.168	.861	.042
P8-Blowby, "H2OG	.019	.023	.005	.006
P11-Baro (Vent), "Hg ABS	29.005	.003	98.221	.010
Speed, RPM	1300.1	2.956	1300.1	2.956
Load, Lb-Ft	567.53	3.194	769.47	4.331
Smoke, %	20.409	.709	20.409	.709
Fuel Flow, Lb/Hr	65.898	1.013	29.891	.460
Horsepower	140.49	.839	104.75	.626
Corrected Horsepower	146.52	.875	109.24	.653
BSFC, lb/hp-hr	.469	.007	.285	.004
Corrected BSFC	.450	.007	.274	.004
Relative Humidity	23.848	.403	23.848	.403
Reference Pressure, inHg	28.750		97.359	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1696

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.75 in-Hg
Speed :	1300 RPM
Load :	567.5 lb-ft
Fuel Flow :	65.9 lb/hr
Brake Power :	140.47 bhp
BSFC :	.469 lb/bhp-hr
Indicated Power :	20.72 kW/cyl
Peak Pressure :	8.735 MPa
Peak Rate of Pressure Rise:	920.0 kPa/deg
Peak Heat Release Rate :	373.0 Joules/deg
Cumulative Heat Release :	3645.35 Joules
Apparent Combustion Efficiency :	67.0 %
Indicated Thermal Efficiency :	35.2 %
Brake Thermal Efficiency :	29.6 %
Ignition Delay :	4.2 degrees
Centroid Phasing :	189.2 degrees
Centroid Magnitude :	58.67 J/degree
Sensitivity :	24.0 degrees
Premixed/Diffusion Ratio :	.17287

880413.145440 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1060.5	.433	571.36	.241
K2-Exhaust 2, F	1090.4	1.534	588.00	.852
K3-Exhaust 3, F	1092.7	.770	589.27	.428
K4-Exhaust 4, F	1050.0	.330	565.56	.183
K5-Exhaust 5, F	1121.9	.429	605.51	.238
K6-Exhaust 6, F	1065.3	.306	574.03	.170
K7-Exhaust Common, F	1173.7	.720	634.25	.400
Dry Bulb Temperature, F	84.172	.292	28.984	.162
Wet Bulb Temperature, F	61.076	.033	16.153	.018
J1-Water In, F	158.31	.120	70.174	.066
J2-Water Out, F	169.19	.095	76.218	.053
J3-Oil Sump, F	208.99	.241	98.329	.134
J4-Fuel Inlet, F	91.042	.172	32.801	.096
J5-Air After Filter, F	100.65	.046	38.137	.026
J6-Intake Manifold, F	102.82	.051	39.343	.029
J7-Fuel Return, F	90.258	.059	32.365	.033
P1-Fuel, PSIG	70.685	.746	487.36	5.142
P2-Oil Gallery, PSIG	46.786	.066	322.58	.455
P6-Ex Common, "H2OG	11.728	.136	2.918	.034
P7-Air Aft Filt, "H2OV	2.895	.199	.720	.050
P8-Blowby, "H2OG	.041	.034	.010	.008
P11-Baro (Vent), "Hg ABS	28.993	.002	98.182	.009
Speed, RPM	1102.6	2.626	1102.6	2.626
Load, Lb-Ft	549.23	2.030	744.65	2.752
Smoke, %	34.564	.183	34.564	.183
Fuel Flow, Lb/Hr	56.125	.991	25.458	.449
Horsepower	115.31	.611	85.971	.456
Corrected Horsepower	120.24	.638	89.651	.475
BSFC, lb/hp-hr	.487	.008	.296	.005
Corrected BSFC	.467	.008	.284	.005
Relative Humidity	24.765	.484	24.765	.484
Reference Pressure, inHg	28.780		97.461	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1698

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.78 in-Hg
Speed :	1103 RPM
Load :	549.2 lb-ft
Fuel Flow :	56.1 lb/hr
Brake Power :	115.34 bhp
BSFC :	.486 lb/bhp-hr
Indicated Power :	17.08 kW/cyl
Peak Pressure :	8.839 MPa
Peak Rate of Pressure Rise:	902.8 kPa/deg
Peak Heat Release Rate :	381.4 Joules/deg
Cumulative Heat Release :	3473.89 Joules
Apparent Combustion Efficiency :	63.7 %
Indicated Thermal Efficiency :	34.1 %
Brake Thermal Efficiency :	28.6 %
Ignition Delay :	3.1 degrees
Centroid Phasing :	186.2 degrees
Centroid Magnitude :	61.00 J/degree
Sensitivity :	22.1 degrees
Premixed/Diffusion Ratio :	.13953

CUMMINS NH220 LOG SHEET

TEST NO. 5 FUEL BF02U31287 DATE 4-14-88 PAGE 64

Operator Greg							
Time	9:00	9:15	9:25	9:35	9:45		
Test Hour	25min	15min	10min	10min	10min		
Speed, RPM	2100	1800	1500	1299	1099		
Load, lb–ft	494.6	541.8	566.8	568.4	552.4		
Fuel Flow, lb/hr	86.4	79.7	71.1	63.6	52.1		
Exh. Opacity, %	24.0	17.0	15.0	18.0	22.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1185	1182	1169	1134	1074		
Exhaust Cyl. 2	1285	1270	1232	1184	1092		
Exhaust Cyl. 3	1285	1279	1241	1178	1093		
Exhaust Cyl. 4	1240	1238	1195	1147	1059		
Exhaust Cyl. 5	1263	1278	1262	1215	1134		
Exhaust Cyl. 6	1189	1188	1161	1126	1060		
Exhaust Common	1295	1317	1309	1271	1178		
Water In	162	162	161	159	158		
Water Out	169	170	171	169	169		
Oil Sump	220	224	218	214	208		
Fuel	93	91	90	91	90		
Inlet Air	100	100	101	98	99		
Wet Bulb	65.8	66.0	66.5	65.6	65.9		
Dry Bulb	72.3	73.0	74.4	72.0	73.0		
PRESSURES, PSIG							
Fuel Pump	133.0	120.0	104.0	91.0	70.0		
Oil Gallery	59.1	55.9	54.0	51.0	45.9		
LOW PRESSURES							
Intake Vac, in.water	5.4	4.2	3.1	2.6	2.0		
Exh. Comm., in.Water	27.0	20.0	16.5	15.5	13.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	28.98	28.99	28.98	28.99	28.99		

880414.090308 AL-17355-F AL-12920-L NH220				5
K1-Exhaust 1, F	1184.7	.857	640.40	.476
K2-Exhaust 2, F	1285.7	.562	696.51	.312
K3-Exhaust 3, F	1283.4	.784	695.23	.436
K4-Exhaust 4, F	1238.9	.674	670.52	.375
K5-Exhaust 5, F	1262.6	.613	683.67	.341
K6-Exhaust 6, F	1187.7	.625	642.08	.347
K7-Exhaust Common, F	1294.7	.351	701.50	.195
Dry Bulb Temperature, F	72.806	.364	22.670	.202
Wet Bulb Temperature, F	64.493	.047	18.052	.026
J1-Water In, F	162.63	.119	72.572	.066
J2-Water Out, F	169.39	.057	76.329	.032
J3-Oil Sump, F	219.84	.595	104.36	.330
J4-Fuel Inlet, F	92.594	.052	33.663	.029
J5-Air After Filter, F	99.416	.037	37.453	.021
J6-Intake Manifold, F	102.80	.025	39.334	.014
J7-Fuel Return, F	96.599	.209	35.888	.116
P1-Fuel, PSIG	131.00	1.435	903.22	9.894
P2-Oil Gallery, PSIG	58.183	.079	401.16	.547
P6-Ex Common, "H2OG	26.347	.125	6.556	.031
P7-Air Aft Filt, "H2OV	6.832	.164	1.700	.041
P8-Blowby, "H2OG	.006	.048	.001	.012
P11-Baro (Vent), "Hg ABS	28.984	.003	98.150	.010
Speed, RPM	2100.4	2.196	2100.4	2.196
Load, Lb-Ft	498.02	3.836	675.23	5.201
Smoke, %	26.253	.467	26.253	.467
Fuel Flow, Lb/Hr	86.519	.201	39.244	.091
Horsepower	199.17	1.528	148.50	1.139
Corrected Horsepower	209.22	1.605	155.98	1.196
BSFC, lb/hp-hr	.434	.003	.264	.002
Corrected BSFC	.414	.003	.252	.002
Relative Humidity	64.132	1.149	64.132	1.149
Reference Pressure, inHg	28.481		96.448	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1700

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.48 in-Hg
Speed :	2100 RPM
Load :	498.0 lb-ft
Fuel Flow :	86.5 lb/hr
Brake Power :	199.12 bhp
BSFC :	.434 lb/bhp-hr
Indicated Power :	30.74 kW/cyl
Peak Pressure :	7.223 MPa
Peak Rate of Pressure Rise:	521.6 kPa/deg
Peak Heat Release Rate :	184.0 Joules/deg
Cumulative Heat Release :	3539.58 Joules
Apparent Combustion Efficiency :	79.3 %
Indicated Thermal Efficiency :	39.3 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	5.2 degrees
Centroid Phasing :	196.7 degrees
Centroid Magnitude :	36.87 J/degree
Sensitivity :	30.5 degrees
Premixed/Diffusion Ratio :	.17016

880414.091321 AL-17355-F AL-12920-L NH220				5
K1-Exhaust 1, F	1181.6	.341	638.66	.189
K2-Exhaust 2, F	1270.0	.456	687.77	.254
K3-Exhaust 3, F	1282.0	1.808	694.45	1.005
K4-Exhaust 4, F	1236.6	.308	669.21	.171
K5-Exhaust 5, F	1278.0	.570	692.25	.316
K6-Exhaust 6, F	1184.9	1.259	640.52	.699
K7-Exhaust Common, F	1314.3	.370	712.41	.206
Dry Bulb Temperature, F	72.719	.417	22.621	.231
Wet Bulb Temperature, F	64.239	.149	17.911	.083
J1-Water In, F	162.81	.220	72.670	.122
J2-Water Out, F	170.64	.210	77.024	.117
J3-Oil Sump, F	225.11	.120	107.28	.067
J4-Fuel Inlet, F	90.977	.103	32.765	.057
J5-Air After Filter, F	99.594	.078	37.552	.043
J6-Intake Manifold, F	103.35	.065	39.639	.036
J7-Fuel Return, F	93.556	.076	34.198	.042
P1-Fuel, PSIG	117.81	.997	812.26	6.874
P2-Oil Gallery, PSIG	55.662	.046	383.77	.317
P6-Ex Common, "H2OG	18.799	.093	4.678	.023
P7-Air Aft Filt, "H2OV	5.656	.511	1.408	.127
P8-Blowby, "H2OG	.002	.029	.000	.007
P11-Baro (Vent), "Hg ABS	28.988	.004	98.164	.014
Speed, RPM	1800.9	2.804	1800.9	2.804
Load, Lb-Ft	542.35	4.119	735.33	5.585
Smoke, %	17.340	.255	17.340	.255
Fuel Flow, Lb/Hr	79.673	.275	36.139	.125
Horsepower	185.97	1.653	138.66	1.232
Corrected Horsepower	195.30	1.736	145.61	1.294
BSFC, lb/hp-hr	.428	.005	.261	.003
Corrected BSFC	.408	.004	.248	.003
Relative Humidity	63.429	.977	63.429	.977
Reference Pressure, inHg	28.572		96.755	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1702

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.57 in-Hg
Speed :	1801 RPM
Load :	542.4 lb-ft
Fuel Flow :	79.7 lb/hr
Brake Power :	186.00 bhp
BSFC :	.428 lb/bhp-hr
Indicated Power :	27.45 kW/cyl
Peak Pressure :	7.817 MPa
Peak Rate of Pressure Rise:	622.8 kPa/deg
Peak Heat Release Rate :	231.7 Joules/deg
Cumulative Heat Release :	3615.84 Joules
Apparent Combustion Efficiency :	75.4 %
Indicated Thermal Efficiency :	38.1 %
Brake Thermal Efficiency :	32.1 %
Ignition Delay :	3.7 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	40.79 J/degree
Sensitivity :	29.3 degrees
Premixed/Diffusion Ratio :	.12659

880414.092528 AL-17355-F AL-12920-L NH220				5
K1-Exhaust 1, F	1169.3	1.702	631.83	.946
K2-Exhaust 2, F	1234.5	.729	668.06	.405
K3-Exhaust 3, F	1242.0	.589	672.21	.327
K4-Exhaust 4, F	1195.2	.668	646.24	.371
K5-Exhaust 5, F	1262.3	.464	683.49	.258
K6-Exhaust 6, F	1160.3	.461	626.82	.256
K7-Exhaust Common, F	1308.9	.362	709.36	.201
Dry Bulb Temperature, F	72.344	.301	22.413	.167
Wet Bulb Temperature, F	64.222	.139	17.901	.077
J1-Water In, F	161.43	.128	71.904	.071
J2-Water Out, F	170.63	.084	77.014	.047
J3-Oil Sump, F	218.66	.188	103.70	.104
J4-Fuel Inlet, F	90.050	.027	32.250	.015
J5-Air After Filter, F	101.42	.073	38.565	.041
J6-Intake Manifold, F	104.90	.096	40.502	.054
J7-Fuel Return, F	92.267	.016	33.482	.009
P1-Fuel, PSIG	101.60	.650	700.50	4.485
P2-Oil Gallery, PSIG	53.998	.113	372.30	.776
P6-Ex Common, "H2OG	14.848	.161	3.695	.040
P7-Air Aft Filt, "H2OV	4.481	.121	1.115	.030
P8-Blowby, "H2OG	.005	.021	.001	.005
P11-Baro (Vent), "Hg ABS	28.987	.002	98.160	.008
Speed, RPM	1499.5	2.961	1499.5	2.961
Load, Lb-Ft	569.56	2.091	772.21	2.835
Smoke, %	16.487	.751	16.487	.751
Fuel Flow, Lb/Hr	71.072	.301	32.238	.137
Horsepower	162.61	.533	121.24	.397
Corrected Horsepower	171.07	.561	127.55	.418
BSFC, lb/hp-hr	.437	.002	.266	.001
Corrected BSFC	.415	.002	.253	.001
Relative Humidity	64.670	.638	64.670	.638
Reference Pressure, inHg	28.657		97.044	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1704

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.66 in-Hg
Speed :	1500 RPM
Load :	569.6 lb-ft
Fuel Flow :	71.1 lb/hr
Brake Power :	162.68 bhp
BSFC :	.437 lb/bhp-hr
Indicated Power :	23.92 kW/cyl
Peak Pressure :	8.484 MPa
Peak Rate of Pressure Rise:	758.2 kPa/deg
Peak Heat Release Rate :	298.9 Joules/deg
Cumulative Heat Release :	3702.47 Joules
Apparent Combustion Efficiency :	72.1 %
Indicated Thermal Efficiency :	37.2 %
Brake Thermal Efficiency :	31.5 %
Ignition Delay :	2.3 degrees
Centroid Phasing :	190.7 degrees
Centroid Magnitude :	47.15 J/degree
Sensitivity :	27.4 degrees
Premixed/Diffusion Ratio :	.08405

880414.093707 AL-17355-F AL-12920-L NH220				5
K1-Exhaust 1, F	1133.4	1.347	611.91	.748
K2-Exhaust 2, F	1182.5	.951	639.17	.528
K3-Exhaust 3, F	1178.1	.597	636.70	.332
K4-Exhaust 4, F	1146.0	.749	618.88	.416
K5-Exhaust 5, F	1218.1	1.081	658.92	.601
K6-Exhaust 6, F	1126.8	.659	608.24	.366
K7-Exhaust Common, F	1273.1	.573	689.51	.318
Dry Bulb Temperature, F	72.396	.367	22.442	.204
Wet Bulb Temperature, F	64.350	.117	17.972	.065
J1-Water In, F	159.34	.160	70.746	.089
J2-Water Out, F	169.70	.091	76.502	.051
J3-Oil Sump, F	215.20	.354	101.78	.197
J4-Fuel Inlet, F	91.419	.086	33.011	.048
J5-Air After Filter, F	98.799	.051	37.111	.029
J6-Intake Manifold, F	101.69	.063	38.717	.035
J7-Fuel Return, F	92.545	.071	33.636	.040
P1-Fuel, PSIG	88.003	.560	606.76	3.859
P2-Oil Gallery, PSIG	51.697	.061	356.44	.418
P6-Ex Common, "H2OG	14.118	.127	3.513	.032
P7-Air Aft Filt, "H2OV	3.655	.151	.909	.038
P8-Blowby, "H2OG	.007	.035	.002	.009
P11-Baro (Vent), "Hg ABS	28.991	.003	98.175	.009
Speed, RPM	1299.1	3.015	1299.1	3.015
Load, Lb-Ft	568.94	2.889	771.37	3.917
Smoke, %	19.442	1.838	19.442	1.838
Fuel Flow, Lb/Hr	63.528	.297	28.816	.135
Horsepower	140.73	.990	104.92	.738
Corrected Horsepower	147.70	1.039	110.12	.775
BSFC, lb/hp-hr	.451	.004	.275	.002
Corrected BSFC	.430	.003	.262	.002
Relative Humidity	64.996	.959	64.996	.959
Reference Pressure, inHg	28.722		97.265	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1706

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.72 in-Hg
Speed :	1299 RPM
Load :	568.9 lb-ft
Fuel Flow :	63.5 lb/hr
Brake Power :	140.71 bhp
BSFC :	.451 lb/bhp-hr
Indicated Power :	20.88 kW/cyl
Peak Pressure :	8.867 MPa
Peak Rate of Pressure Rise:	809.0 kPa/deg
Peak Heat Release Rate :	331.2 Joules/deg
Cumulative Heat Release :	3676.00 Joules
Apparent Combustion Efficiency :	69.4 %
Indicated Thermal Efficiency :	36.4 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	2.7 degrees
Centroid Phasing :	188.3 degrees
Centroid Magnitude :	51.45 J/degree
Sensitivity :	24.7 degrees
Premixed/Diffusion Ratio :	.10758

880414.094711 AL-17355-F AL-12920-L NH220				5
K1-Exhaust 1, F	1073.6	.371	578.69	.206
K2-Exhaust 2, F	1093.1	.631	589.49	.351
K3-Exhaust 3, F	1092.3	.536	589.05	.298
K4-Exhaust 4, F	1060.3	1.107	571.29	.615
K5-Exhaust 5, F	1134.4	.616	612.42	.342
K6-Exhaust 6, F	1060.9	.640	571.62	.356
K7-Exhaust Common, F	1178.0	.820	636.68	.456
Dry Bulb Temperature, F	72.617	.125	22.565	.070
Wet Bulb Temperature, F	64.411	.056	18.006	.031
J1-Water In, F	158.79	.128	70.440	.071
J2-Water Out, F	169.44	.104	76.355	.058
J3-Oil Sump, F	209.98	.330	98.877	.183
J4-Fuel Inlet, F	91.219	.061	32.900	.034
J5-Air After Filter, F	99.629	.125	37.572	.069
J6-Intake Manifold, F	102.59	.127	39.216	.070
J7-Fuel Return, F	91.171	.076	32.873	.042
P1-Fuel, PSIG	68.428	.516	471.79	3.558
P2-Oil Gallery, PSIG	46.575	.079	321.12	.547
P6-Ex Common, "H2OG	11.954	.142	2.975	.035
P7-Air Aft Filt, "H2OV	3.104	.153	.772	.038
P8-Blowby, "H2OG	.006	.034	.002	.008
P11-Baro (Vent), "Hg ABS	28.994	.002	98.185	.008
Speed, RPM	1098.6	1.943	1098.6	1.943
Load, Lb-Ft	550.53	2.075	746.41	2.813
Smoke, %	23.779	.920	23.779	.920
Fuel Flow, Lb/Hr	51.914	.428	23.548	.194
Horsepower	115.16	.378	85.862	.282
Corrected Horsepower	120.94	.397	90.172	.296
BSFC, lb/hp-hr	.451	.004	.274	.003
Corrected BSFC	.429	.004	.261	.003
Relative Humidity	64.458	.589	64.458	.589
Reference Pressure, inHg	28.766		97.412	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1708

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.77 in-Hg
Speed :	1099 RPM
Load :	550.5 lb-ft
Fuel Flow :	51.9 lb/hr
Brake Power :	115.19 bhp
BSFC :	.451 lb/bhp-hr
Indicated Power :	17.02 kW/cyl
Peak Pressure :	8.830 MPa
Peak Rate of Pressure Rise:	759.9 kPa/deg
Peak Heat Release Rate :	315.4 Joules/deg
Cumulative Heat Release :	3506.22 Joules
Apparent Combustion Efficiency :	68.5 %
Indicated Thermal Efficiency :	36.3 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	1.8 degrees
Centroid Phasing :	186.9 degrees
Centroid Magnitude :	50.18 J/degree
Sensitivity :	24.1 degrees
Premixed/Diffusion Ratio :	.07545

CUMMINS NH220 LOG SHEET

TEST NO. 5 FUEL ATF@IN02587 DATE 4-14-88 PAGE 65

Operator Greg							
Time	10:45	10:55	11:05	11:15	11:25	11:35	11:50
Test Hour	00 min	10 min	10 min	10 min	10 min	10 min	15 min
Speed, RPM	2099	1800	1800	1900	1800	1900	1500
Load, lb–ft	516.3	556.4	368.2	272.3	133.7	47.6	582.2
Fuel Flow, lb/hr	95.8	86.6	50.1	36.4	22.5	14.7	75.9
Exh. Opacity, %	34.0	22.0	6.0	6.0	2.0	1.0	20.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1190	1188	815	676	468	339	1156
Exhaust Cyl. 2	1301	1279	921	770	546	390	1234
Exhaust Cyl. 3	1313	1288	909	760	540	403	1237
Exhaust Cyl. 4	1252	1243	873	714	503	341	1186
Exhaust Cyl. 5	1277	1283	855	706	500	375	1236
Exhaust Cyl. 6	1204	1205	825	665	468	345	1170
Exhaust Common	1322	1934	872	710	497	372	1320
Water In	162	161	164	165	167	168	161
Water Out	170	170	169	168	169	170	170
Oil Sump	219	224	221	216	211	207	209
Fuel	93	89	87	87	89	94	89
Inlet Air	100	102	100	100	100	98	102
Wet Bulb	67.6	67.1	67.4	67.1	68.1	67.5	67.7
Dry Bulb	76.0	77.0	76.6	77.8	79.2	79.0	79.5
PRESSURES, PSIG							
Fuel Pump	137.0	122.0	57.0	41.0	23.0	15.0	106.0
Oil Gallery	60.1	56.0	56.0	57.0	57.9	58.3	56.4
LOW PRESSURES							
Intake Vac, in.water	5.4	4.2	4.5	4.5	4.7	4.7	3.9
Exh. Comm., in.Water	27.5	20.0	16.0	14.5	12.0	9.5	16.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.00	29.01	29.0	29.01	29.01	29.00	29.0

CUMMINS NH220 LOG SHEET

TEST NO. 5 FUEL TF01N01587 DATE 4-14-88 PAGE 66

Operator Grey							
Time	12:00	12:10					
Test Hour	10min	10min					
Speed, RPM	1300	1101					
Load, lb–ft	385.6	566.5					
Fuel Flow, lb/hr	68.9	54.9					
Exh. Opacity, %	22.0	25.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1116	1062					
Exhaust Cyl. 2	1166	1085					
Exhaust Cyl. 3	1159	1083					
Exhaust Cyl. 4	1123	1044					
Exhaust Cyl. 5	1198	1121					
Exhaust Cyl. 6	1125	1067					
Exhaust Common	1250	1167					
Water In	159	158					
Water Out	170	169					
Oil Sump	211	207					
Fuel	89	88					
Inlet Air	98	98					
Wet Bulb	68.1	57.8					
Dry Bulb	81.3	81.1					
PRESSURES, PSIG							
Fuel Pump	91.0	74.0					
Oil Gallery	52.8	46.5					
LOW PRESSURES							
Intake Vac, in.water	2.6	2.1					
Exh. Comm., in.Water	15.5	13.5					
Blowby, in.water	0	0					
Barometer, in.Hg	29.0	28.99					

880414.104748 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1189.6	.614	643.09	.341
K2-Exhaust 2, F	1299.5	.647	704.19	.359
K3-Exhaust 3, F	1311.7	.660	710.95	.367
K4-Exhaust 4, F	1248.3	1.378	675.74	.765
K5-Exhaust 5, F	1274.8	.761	690.43	.423
K6-Exhaust 6, F	1202.3	.285	650.17	.158
K7-Exhaust Common, F	1319.2	.523	715.10	.290
Dry Bulb Temperature, F	74.607	.633	23.671	.352
Wet Bulb Temperature, F	65.293	.165	18.496	.091
J1-Water In, F	162.70	.188	72.612	.105
J2-Water Out, F	169.56	.125	76.422	.069
J3-Oil Sump, F	216.94	.592	102.75	.329
J4-Fuel Inlet, F	94.022	.090	34.457	.050
J5-Air After Filter, F	99.292	.130	37.384	.072
J6-Intake Manifold, F	102.07	.083	38.925	.046
J7-Fuel Return, F	96.370	.055	35.761	.031
P1-Fuel, PSIG	135.74	1.386	935.89	9.558
P2-Oil Gallery, PSIG	58.624	.092	404.20	.635
P6-Ex Common, "H2OG	27.361	.168	6.808	.042
P7-Air Aft Filt, "H2OV	6.387	.386	1.589	.096
P8-Blowby, "H2OG	.017	.048	.004	.012
P11-Baro (Vent), "Hg ABS	29.002	.003	98.212	.012
Speed, RPM	2100.5	2.834	2100.5	2.834
Load, Lb-Ft	517.46	3.635	701.57	4.929
Smoke, %	34.263	.705	34.263	.705
Fuel Flow, Lb/Hr	95.371	.528	43.260	.239
Horsepower	206.95	1.418	154.30	1.057
Corrected Horsepower	217.27	1.489	161.99	1.110
BSFC, lb/hp-hr	.461	.005	.280	.003
Corrected BSFC	.439	.004	.267	.003
Relative Humidity	61.112	1.518	61.112	1.518
Reference Pressure, inHg	28.532		96.621	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1710

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.53 in-Hg
Speed :	2101 RPM
Load :	517.5 lb-ft
Fuel Flow :	95.4 lb/hr
Brake Power :	207.02 bhp
BSFC :	.461 lb/bhp-hr
Indicated Power :	31.30 kW/cyl
Peak Pressure :	7.244 MPa
Peak Rate of Pressure Rise:	587.3 kPa/deg
Peak Heat Release Rate :	216.0 Joules/deg
Cumulative Heat Release :	3598.82 Joules
Apparent Combustion Efficiency :	73.9 %
Indicated Thermal Efficiency :	36.7 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	6.7 degrees
Centroid Phasing :	197.0 degrees
Centroid Magnitude :	41.92 J/degree
Sensitivity :	29.3 degrees
Premixed/Diffusion Ratio :	.22813

880414.105750 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1188.2	.542	642.34	.301
K2-Exhaust 2, F	1278.7	.511	692.61	.284
K3-Exhaust 3, F	1288.5	.958	698.04	.532
K4-Exhaust 4, F	1242.1	.378	672.28	.210
K5-Exhaust 5, F	1282.2	.687	694.54	.382
K6-Exhaust 6, F	1202.7	2.074	650.39	1.152
K7-Exhaust Common, F	1333.2	.480	722.88	.267
Dry Bulb Temperature, F	75.166	.280	23.981	.155
Wet Bulb Temperature, F	65.178	.108	18.432	.060
J1-Water In, F	162.34	.136	72.411	.075
J2-Water Out, F	170.44	.115	76.913	.064
J3-Oil Sump, F	224.80	.369	107.11	.205
J4-Fuel Inlet, F	89.485	.069	31.936	.038
J5-Air After Filter, F	101.95	.052	38.862	.029
J6-Intake Manifold, F	104.81	.042	40.451	.023
J7-Fuel Return, F	91.316	.040	32.953	.022
P1-Fuel, PSIG	118.93	.935	819.98	6.446
P2-Oil Gallery, PSIG	55.659	.041	383.76	.282
P6-Ex Common, "H2OG	19.345	.166	4.814	.041
P7-Air Aft Filt, "H2OV	5.250	.438	1.306	.109
P8-Blowby, "H2OG	-.002	.046	-.000	.012
P11-Baro (Vent), "Hg ABS	29.003	.005	98.215	.018
Speed, RPM	1801.8	2.853	1801.8	2.853
Load, Lb-Ft	557.13	3.454	755.37	4.683
Smoke, %	23.763	.360	23.763	.360
Fuel Flow, Lb/Hr	85.801	.842	38.919	.382
Horsepower	191.13	1.455	142.51	1.085
Corrected Horsepower	201.06	1.531	149.91	1.141
BSFC, lb/hp-hr	.449	.006	.273	.004
Corrected BSFC	.427	.006	.260	.004
Relative Humidity	58.849	.552	58.849	.552
Reference Pressure, inHg	28.617		96.908	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1712

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.62 in-Hg
Speed :	1802 RPM
Load :	557.1 lb-ft
Fuel Flow :	85.8 lb/hr
Brake Power :	191.15 bhp
BSFC :	.449 lb/bhp-hr
Indicated Power :	27.64 kW/cyl
Peak Pressure :	7.777 MPa
Peak Rate of Pressure Rise:	701.1 kPa/deg
Peak Heat Release Rate :	265.2 Joules/deg
Cumulative Heat Release :	3633.55 Joules
Apparent Combustion Efficiency :	71.1 %
Indicated Thermal Efficiency :	36.0 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	6.1 degrees
Centroid Phasing :	194.6 degrees
Centroid Magnitude :	44.96 J/degree
Sensitivity :	27.5 degrees
Premixed/Diffusion Ratio :	.22136

880414.110651 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	817.71	2.141	436.51	1.190
K2-Exhaust 2, F	922.41	1.124	494.67	.625
K3-Exhaust 3, F	909.69	1.334	487.61	.741
K4-Exhaust 4, F	874.99	2.516	468.33	1.398
K5-Exhaust 5, F	856.46	1.677	458.03	.932
K6-Exhaust 6, F	826.32	1.275	441.29	.709
K7-Exhaust Common, F	877.31	1.829	469.61	1.016
Dry Bulb Temperature, F	75.228	.178	24.016	.099
Wet Bulb Temperature, F	65.618	.047	18.677	.026
J1-Water In, F	164.75	.172	73.748	.095
J2-Water Out, F	169.03	.101	76.130	.056
J3-Oil Sump, F	221.66	.426	105.37	.236
J4-Fuel Inlet, F	87.488	.132	30.827	.073
J5-Air After Filter, F	100.88	.053	38.269	.030
J6-Intake Manifold, F	103.28	.085	39.601	.047
J7-Fuel Return, F	88.699	.055	31.499	.030
P1-Fuel, PSIG	54.760	.218	377.56	1.503
P2-Oil Gallery, PSIG	56.237	.048	387.74	.329
P6-Ex Common, "H2OG	14.459	.117	3.598	.029
P7-Air Aft Filt, "H2OV	5.501	.275	1.369	.068
P8-Blowby, "H2OG	-.003	.048	-.001	.012
P11-Baro (Vent), "Hg ABS	29.000	.004	98.204	.012
Speed, RPM	1801.2	3.366	1801.2	3.366
Load, Lb-Ft	369.23	5.438	500.61	7.372
Smoke, %	7.773	.543	7.773	.543
Fuel Flow, Lb/Hr	52.499	2.459	23.813	1.115
Horsepower	126.63	2.020	94.413	1.506
Corrected Horsepower	133.16	2.124	99.282	1.584
BSFC, lb/hp-hr	.415	.021	.252	.013
Corrected BSFC	.394	.020	.240	.012
Relative Humidity	60.286	.572	60.286	.572
Reference Pressure, inHg	28.595		96.833	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1714

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.60 in-Hg
Speed :	1801 RPM
Load :	369.2 lb-ft
Fuel Flow :	52.5 lb/hr
Brake Power :	126.60 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	18.42 kW/cyl
Peak Pressure :	6.016 MPa
Peak Rate of Pressure Rise:	399.5 kPa/deg
Peak Heat Release Rate :	145.6 Joules/deg
Cumulative Heat Release :	2379.04 Joules
Apparent Combustion Efficiency :	76.1 %
Indicated Thermal Efficiency :	39.2 %
Brake Thermal Efficiency :	33.5 %
Ignition Delay :	10.5 degrees
Centroid Phasing :	194.2 degrees
Centroid Magnitude :	30.45 J/degree
Sensitivity :	22.7 degrees
Premixed/Diffusion Ratio :	.46298

880414.111604 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	677.08	.329	358.38	.183
K2-Exhaust 2, F	770.26	.311	410.14	.173
K3-Exhaust 3, F	758.09	.498	403.38	.276
K4-Exhaust 4, F	714.18	.791	378.99	.440
K5-Exhaust 5, F	704.79	.619	373.77	.344
K6-Exhaust 6, F	665.11	.483	351.73	.268
K7-Exhaust Common, F	710.65	.499	377.03	.277
Dry Bulb Temperature, F	76.069	.082	24.483	.046
Wet Bulb Temperature, F	65.596	.081	18.664	.045
J1-Water In, F	165.53	.107	74.183	.060
J2-Water Out, F	168.41	.082	75.785	.046
J3-Oil Sump, F	216.89	.125	102.72	.069
J4-Fuel Inlet, F	86.971	.036	30.539	.020
J5-Air After Filter, F	100.21	.037	37.895	.021
J6-Intake Manifold, F	102.40	.027	39.113	.015
J7-Fuel Return, F	87.794	.024	30.997	.013
P1-Fuel, PSIG	38.304	.287	264.09	1.981
P2-Oil Gallery, PSIG	57.365	.118	395.52	.811
P6-Ex Common, "H2OG	13.304	.198	3.310	.049
P7-Air Aft Filt, "H2OV	5.591	.279	1.391	.069
P8-Blowby, "H2OG	.019	.049	.005	.012
P11-Baro (Vent), "Hg ABS	29.006	.003	98.225	.009
Speed, RPM	1801.0	3.626	1801.0	3.626
Load, Lb-Ft	270.73	6.543	367.05	8.872
Smoke, %	7.257	.078	7.257	.078
Fuel Flow, Lb/Hr	38.862	1.164	17.628	.528
Horsepower	92.840	2.305	69.219	1.719
Corrected Horsepower	97.515	2.421	72.704	1.805
BSFC, lb/hp-hr	.419	.016	.255	.010
Corrected BSFC	.399	.015	.243	.009
Relative Humidity	57.531	.380	57.531	.380
Reference Pressure, inHg	28.595		96.832	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1716

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.60 in-Hg
Speed :	1801 RPM
Load :	270.7 lb-ft
Fuel Flow :	38.9 lb/hr
Brake Power :	92.83 bhp
BSFC :	.419 lb/bhp-hr
Indicated Power :	14.00 kW/cyl
Peak Pressure :	5.424 MPa
Peak Rate of Pressure Rise:	293.1 kPa/deg
Peak Heat Release Rate :	111.3 Joules/deg
Cumulative Heat Release :	1816.67 Joules
Apparent Combustion Efficiency :	78.4 %
Indicated Thermal Efficiency :	40.3 %
Brake Thermal Efficiency :	33.2 %
Ignition Delay :	12.5 degrees
Centroid Phasing :	194.2 degrees
Centroid Magnitude :	26.23 J/degree
Sensitivity :	20.8 degrees
Premixed/Diffusion Ratio :	.60009

880414.112500 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	469.78	.748	243.21	.415
K2-Exhaust 2, F	550.21	.862	287.89	.479
K3-Exhaust 3, F	539.04	.622	281.69	.345
K4-Exhaust 4, F	504.30	1.055	262.39	.586
K5-Exhaust 5, F	500.80	.510	260.44	.283
K6-Exhaust 6, F	468.14	.427	242.30	.237
K7-Exhaust Common, F	498.26	.782	259.03	.435
Dry Bulb Temperature, F	76.488	.090	24.715	.050
Wet Bulb Temperature, F	65.599	.072	18.666	.040
J1-Water In, F	167.25	.176	75.137	.098
J2-Water Out, F	168.65	.131	75.919	.073
J3-Oil Sump, F	211.65	.307	99.805	.171
J4-Fuel Inlet, F	88.520	.280	31.400	.156
J5-Air After Filter, F	100.01	.281	37.782	.156
J6-Intake Manifold, F	101.74	.264	38.746	.147
J7-Fuel Return, F	87.704	.028	30.947	.016
P1-Fuel, PSIG	19.538	.103	134.71	.707
P2-Oil Gallery, PSIG	58.190	.036	401.20	.249
P6-Ex Common, "H2OG	10.013	.044	2.492	.011
P7-Air Aft Filt, "H2OV	6.010	.410	1.495	.102
P8-Blowby, "H2OG	.015	.053	.004	.013
P11-Baro (Vent), "Hg ABS	29.005	.003	98.222	.009
Speed, RPM	1799.9	3.155	1799.9	3.155
Load, Lb-Ft	130.93	6.911	177.51	9.370
Smoke, %	4.313	1.110	4.313	1.110
Fuel Flow, Lb/Hr	22.609	.271	10.255	.123
Horsepower	44.870	2.362	33.454	1.761
Corrected Horsepower	47.116	2.481	35.128	1.849
BSFC, lb/hp-hr	.505	.027	.307	.016
Corrected BSFC	.481	.026	.293	.016
Relative Humidity	56.255	.152	56.255	.152
Reference Pressure, inHg	28.563		96.725	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1718

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.56 in-Hg
Speed :	1800 RPM
Load :	130.9 lb-ft
Fuel Flow :	22.6 lb/hr
Brake Power :	44.86 bhp
BSFC :	.504 lb/bhp-hr
Indicated Power :	7.57 kW/cyl
Peak Pressure :	4.661 MPa
Peak Rate of Pressure Rise:	164.9 kPa/deg
Peak Heat Release Rate :	75.9 Joules/deg
Cumulative Heat Release :	1040.79 Joules
Apparent Combustion Efficiency :	77.3 %
Indicated Thermal Efficiency :	37.5 %
Brake Thermal Efficiency :	27.6 %
Ignition Delay :	15.0 degrees
Centroid Phasing :	194.4 degrees
Centroid Magnitude :	19.38 J/degree
Sensitivity :	18.4 degrees
Premixed/Diffusion Ratio :	.81878

880414.113418 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	340.01	.635	171.12	.353
K2-Exhaust 2, F	392.74	.491	200.41	.273
K3-Exhaust 3, F	408.39	.157	209.11	.087
K4-Exhaust 4, F	390.23	.362	199.02	.201
K5-Exhaust 5, F	372.55	.366	189.19	.203
K6-Exhaust 6, F	343.96	.264	173.31	.147
K7-Exhaust Common, F	373.08	.419	189.49	.233
Dry Bulb Temperature, F	77.142	.081	25.079	.045
Wet Bulb Temperature, F	65.279	.025	18.488	.014
J1-Water In, F	168.54	.129	75.856	.072
J2-Water Out, F	169.24	.132	76.247	.073
J3-Oil Sump, F	207.53	.122	97.518	.068
J4-Fuel Inlet, F	93.354	.039	34.086	.022
J5-Air After Filter, F	98.143	.112	36.746	.062
J6-Intake Manifold, F	100.59	.067	38.108	.037
J7-Fuel Return, F	88.843	.047	31.579	.026
P1-Fuel, PSIG	11.045	.055	76.151	.380
P2-Oil Gallery, PSIG	58.669	.012	404.51	.081
P6-Ex Common, "H2OG	7.884	.102	1.962	.025
P7-Air Aft Filt, "H2OV	5.512	.546	1.372	.136
P8-Blowby, "H2OG	-.025	.035	-.006	.009
P11-Baro (Vent), "Hg ABS	29.005	.003	98.220	.010
Speed, RPM	1800.3	3.522	1800.3	3.522
Load, Lb-Ft	49.447	2.843	67.041	3.854
Smoke, %	1.717	.600	1.717	.600
Fuel Flow, Lb/Hr	14.821	.152	6.723	.069
Horsepower	16.949	.956	12.637	.713
Corrected Horsepower	17.756	1.001	13.239	.747
BSFC, lb/hp-hr	.877	.049	.533	.030
Corrected BSFC	.837	.047	.509	.028
Relative Humidity	53.183	.197	53.183	.197
Reference Pressure, inHg	28.599		96.848	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1720

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.60 in-Hg
Speed :	1800 RPM
Load :	49.4 lb-ft
Fuel Flow :	14.8 lb/hr
Brake Power :	16.95 bhp
BSFC :	.873 lb/bhp-hr
Indicated Power :	4.13 kW/cyl
Peak Pressure :	4.336 MPa
Peak Rate of Pressure Rise:	133.4 kPa/deg
Peak Heat Release Rate :	62.4 Joules/deg
Cumulative Heat Release :	629.080 Joules
Apparent Combustion Efficiency :	71.3 %
Indicated Thermal Efficiency :	31.2 %
Brake Thermal Efficiency :	15.9 %
Ignition Delay :	15.7 degrees
Centroid Phasing :	192.8 degrees
Centroid Magnitude :	16.72 J/degree
Sensitivity :	16.1 degrees
Premixed/Diffusion Ratio :	.97562

880414.115118 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1157.4	1.551	625.25	.862
K2-Exhaust 2, F	1233.8	.316	667.66	.176
K3-Exhaust 3, F	1236.2	.632	669.01	.351
K4-Exhaust 4, F	1184.3	.667	640.15	.370
K5-Exhaust 5, F	1253.1	.471	678.41	.262
K6-Exhaust 6, F	1166.8	.778	630.46	.432
K7-Exhaust Common, F	1317.5	.512	714.18	.284
Dry Bulb Temperature, F	77.921	.153	25.512	.085
Wet Bulb Temperature, F	65.339	.032	18.522	.018
J1-Water In, F	161.27	.183	71.819	.102
J2-Water Out, F	170.57	.113	76.983	.063
J3-Oil Sump, F	208.82	.275	98.232	.153
J4-Fuel Inlet, F	89.549	.030	31.972	.017
J5-Air After Filter, F	102.10	.041	38.944	.023
J6-Intake Manifold, F	105.12	.049	40.620	.027
J7-Fuel Return, F	90.772	.028	32.651	.016
P1-Fuel, PSIG	103.46	1.290	713.33	8.897
P2-Oil Gallery, PSIG	55.925	.027	385.59	.186
P6-Ex Common, "H2OG	15.412	.171	3.835	.043
P7-Air Aft Filt, "H2OV	4.369	.247	1.087	.061
P8-Blowby, "H2OG	-.019	.028	-.005	.007
P11-Baro (Vent), "Hg ABS	28.998	.002	98.198	.008
Speed, RPM	1500.0	2.300	1500.0	2.300
Load, Lb-Ft	581.65	1.598	788.61	2.167
Smoke, %	19.770	.513	19.770	.513
Fuel Flow, Lb/Hr	75.844	.892	34.402	.405
Horsepower	166.12	.478	123.86	.356
Corrected Horsepower	174.66	.503	130.22	.375
BSFC, lb/hp-hr	.457	.005	.278	.003
Corrected BSFC	.434	.005	.264	.003
Relative Humidity	51.162	.478	51.162	.478
Reference Pressure, inHg	28.676		97.109	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1722.

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.68 in-Hg
Speed :	1500 RPM
Load :	581.7 lb-ft
Fuel Flow :	75.8 lb/hr
Brake Power :	166.14 bhp
BSFC :	.456 lb/bhp-hr
Indicated Power :	23.84 kW/cyl
Peak Pressure :	8.383 MPa
Peak Rate of Pressure Rise:	830.2 kPa/deg
Peak Heat Release Rate :	325.2 Joules/deg
Cumulative Heat Release :	3677.87 Joules
Apparent Combustion Efficiency :	67.8 %
Indicated Thermal Efficiency :	35.2 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	4.6 degrees
Centroid Phasing :	191.4 degrees
Centroid Magnitude :	52.02 J/degree
Sensitivity :	25.8 degrees
Premixed/Diffusion Ratio :	.17733

980414.120151 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1116.6	.672	602.54	.373
K2-Exhaust 2, F	1169.8	.816	632.11	.453
K3-Exhaust 3, F	1159.9	1.425	626.60	.792
K4-Exhaust 4, F	1122.8	.816	605.97	.453
K5-Exhaust 5, F	1197.2	.744	647.34	.413
K6-Exhaust 6, F	1122.1	.671	605.64	.373
K7-Exhaust Common, F	1248.7	.590	675.93	.328
Dry Bulb Temperature, F	79.747	.552	26.526	.307
Wet Bulb Temperature, F	66.023	.096	18.902	.053
J1-Water In, F	159.98	.232	71.100	.129
J2-Water Out, F	170.13	.079	76.741	.044
J3-Oil Sump, F	210.99	.284	99.438	.158
J4-Fuel Inlet, F	89.448	.134	31.916	.075
J5-Air After Filter, F	98.343	.052	36.857	.029
J6-Intake Manifold, F	99.700	.092	37.611	.051
J7-Fuel Return, F	90.682	.061	32.601	.034
P1-Fuel, PSIG	89.192	.746	614.96	5.143
P2-Oil Gallery, PSIG	52.824	.023	364.21	.160
P6-Ex Common, "H2OG	14.052	.081	3.497	.020
P7-Air Aft Filt, "H2OV	3.683	.147	.917	.037
P8-Blowby, "H2OG	-.013	.041	-.003	.010
P11-Baro (Vent), "Hg ABS	28.992	.003	98.179	.011
Speed, RPM	1300.9	1.422	1300.9	1.422
Load, Lb-Ft	585.11	2.140	793.29	2.901
Smoke, %	23.330	1.197	23.330	1.197
Fuel Flow, Lb/Hr	66.770	1.179	30.286	.535
Horsepower	144.93	.595	108.05	.444
Corrected Horsepower	151.91	.624	113.26	.465
BSFC, lb/hp-hr	.461	.008	.280	.005
Corrected BSFC	.440	.008	.267	.005
Relative Humidity	48.463	1.208	48.463	1.208
Reference Pressure, inHg	28.721		97.262	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1724

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.72 in-Hg
Speed :	1301 RPM
Load :	585.1 lb-ft
Fuel Flow :	66.8 lb/hr
Brake Power :	144.94 bhp
BSFC :	.461 lb/bhp-hr
Indicated Power :	20.68 kW/cyl
Peak Pressure :	8.724 MPa
Peak Rate of Pressure Rise:	914.4 kPa/deg
Peak Heat Release Rate :	372.2 Joules/deg
Cumulative Heat Release :	3645.08 Joules
Apparent Combustion Efficiency :	66.2 %
Indicated Thermal Efficiency :	34.6 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	4.4 degrees
Centroid Phasing :	189.5 degrees
Centroid Magnitude :	58.32 J/degree
Sensitivity :	24.0 degrees
Premixed/Diffusion Ratio :	.18453

980414.121051 AL-16089-F AL-12920-L NH220				5
K1-Exhaust 1, F	1061.9	.413	572.16	.229
K2-Exhaust 2, F	1087.4	.717	586.32	.398
K3-Exhaust 3, F	1086.0	1.161	585.58	.645
K4-Exhaust 4, F	1045.1	.681	562.84	.378
K5-Exhaust 5, F	1122.4	.467	605.76	.259
K6-Exhaust 6, F	1061.5	.677	571.97	.376
K7-Exhaust Common, F	1169.8	.634	632.12	.352
Dry Bulb Temperature, F	79.839	.212	26.577	.118
Wet Bulb Temperature, F	65.897	.039	18.832	.022
J1-Water In, F	158.43	.109	70.241	.060
J2-Water Out, F	169.32	.059	76.289	.033
J3-Oil Sump, F	208.19	.156	97.884	.087
J4-Fuel Inlet, F	89.270	.085	31.816	.047
J5-Air After Filter, F	98.926	.037	37.181	.021
J6-Intake Manifold, F	100.53	.052	38.070	.029
J7-Fuel Return, F	90.510	.069	32.506	.039
P1-Fuel, PSIG	71.021	.691	489.67	4.762
P2-Oil Gallery, PSIG	46.827	.046	322.86	.317
P6-Ex Common, "H2OG	11.929	.118	2.968	.029
P7-Air Aft Filt, "H2OV	2.931	.219	.729	.054
P8-Blowby, "H2OG	.038	.036	.010	.009
P11-Baro (Vent), "Hg ABS	28.995	.002	98.189	.007
Speed, RPM	1100.8	1.473	1100.8	1.473
Load, Lb-Ft	567.34	2.095	769.21	2.841
Smoke, %	25.123	.315	25.123	.315
Fuel Flow, Lb/Hr	56.450	1.228	25.605	.557
Horsepower	118.91	.557	88.656	.415
Corrected Horsepower	124.66	.584	92.946	.435
BSFC, lb/hp-hr	.475	.011	.289	.007
Corrected BSFC	.453	.011	.275	.006
Relative Humidity	47.801	.512	47.801	.512
Reference Pressure, inHg	28.780		97.459	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1726

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.78 in-Hg
Speed :	1101 RPM
Load :	567.3 lb-ft
Fuel Flow :	56.5 lb/hr
Brake Power :	118.93 bhp
BSFC :	.475 lb/bhp-hr
Indicated Power :	17.04 kW/cyl
Peak Pressure :	8.807 MPa
Peak Rate of Pressure Rise:	890.1 kPa/deg
Peak Heat Release Rate :	375.6 Joules/deg
Cumulative Heat Release :	3478.59 Joules
Apparent Combustion Efficiency :	63.2 %
Indicated Thermal Efficiency :	33.7 %
Brake Thermal Efficiency :	29.3 %
Ignition Delay :	2.9 degrees
Centroid Phasing :	186.4 degrees
Centroid Magnitude :	60.30 J/degree
Sensitivity :	22.6 degrees
Premixed/Diffusion Ratio :	.12769

APPENDIX G6
CUMMINS NH-220G DATA SHEETS
TEST FUEL TF02

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: Cummins NH220G Engine Tester: G. Kellgren
Test Fuel: TF02N21L87 Date: 4-15-88

Step	Initials	Test Procedure
1.	G.L.P	Flush fuel system with BF-2
2.	G.L.P	Engine warmup
3.	G.L.P	Clean smokemeter lenses and adjust purge air
4.	G.L.P	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P	Compute corrected power levels and maximum cylinder pressur
6.	G.L.P	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P	Flush fuel system with TF02N21L87 test fuel
9.	G.L.P	Engine warmup
10.	G.L.P	Clean smokemeter lenses and adjust purge air
11.	G.L.P	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P	Flush fuel system with BF-2
13.	G.L.P	Engine warmup
14.	G.L.P	Clean smokemeter lenses and adjust purge air
15.	G.L.P	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P	Compute corrected power levels and maximum cylinder pressur
17.	G.L.P	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P	Flush fuel system with TF02N21L87 test fuel
20.	G.L.P	Engine warmup
21.	G.L.P	Clean smokemeter lenses and adjust purge air
22.	G.L.P	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF02N2IL87 Date: 4-15-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	360	CN1727	CN1728
1800	361	CN1729	CN1730
1500	362	CN1731	CN1732
1300	363	CN1733	CN1734
1100	364	CN1735	CN1736

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF02N2IL87

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	365	CN1737	CN1738
1800	Full-Rack	366	CN1739	CN1740
1800	133	367	CN1741	CN1742
1800	98	368	CN1743	CN1744
1800	48	369	CN1745	CN1746
1800	13	370	CN1747	CN1748
1500	Full-Rack	371	CN1749	CN1750
1300	Full-Rack	372	CN1751	CN1752
1100	Full-Rack	373	CN1753	CN1754

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF02N21L87 Date: 4-18-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	374	CN1755	CN1756
1800	375	CN1757	CN1758
1500	376	CN1759	CN1760
1300	377	CN1761	CN1762
1100	378	CN1763	CN1764

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF02N21L87

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	379	CN1765	CN1766
1800	Full-Rack	380	CN1767	CN1768
1800	133	381	CN1769	CN1770
1800	98	382	CN1771	CN1772
1800	48	383	CN1773	CN1774
1800	13	384	CN1775	CN1776
1500	Full-Rack	385	CN1777	CN1778
1300	Full-Rack	386	CN1779	CN1780
1100	Full-Rack	387	CN1781	CN1782

CUMMINS NH220 LOG SHEET

TEST NO. 6 FUEL BF/D2V31L87 DATE 4-15-88 PAGE 67

Operator Greg							
Time	12:40	12:55	1:10	1:20	1:35		
Test Hour	25min	15min	15min	10min	15min		
Speed, RPM	2100	1800	1500	1299	1100		
Load, lb–ft	500.7	547.8	579.8	584.5	565.3		
Fuel Flow, lb/hr	86.0	79.1	70.5	63.4	51.9		
Exh. Opacity, %	22.0	22.5	16.0	23.0	22.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1182	1180	1171	1131	1080		
Exhaust Cyl. 2	1284	1265	1238	1183	1090		
Exhaust Cyl. 3	1281	1279	1235	1179	1089		
Exhaust Cyl. 4	1239	1238	1191	1143	1056		
Exhaust Cyl. 5	1268	1282	1263	1220	1133		
Exhaust Cyl. 6	1183	1184	1155	1127	1062		
Exhaust Common	1297	1316	1304	1276	1183		
Water In	161	160	158	158	159		
Water Out	169	169	169	169	170		
Oil Sump	220	227	216	213	207		
Fuel	90	91	90	90	88		
Inlet Air	99	100	100	100	100		
Wet Bulb	69.1	69.2	69.2	70.1	69.2		
Dry Bulb	80.7	80.6	80.2	82.0	82.0		
PRESSURES, PSIG							
Fuel Pump	134.0	120.0	105.0	91.0	71.0		
Oil Gallery	58.9	55.8	54.0	51.5	46.1		
LOW PRESSURES							
Intake Vac, in.water	5.5	4.2	3.3	2.6	2.0		
Exh. Comm., in.Water	17.5	20.0	16.5	16.0	13.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.05	29.05	29.04	29.03	29.03		

880415.124157 AL-17355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1181.3	1.055	638.51	.586
K2-Exhaust 2, F	1283.8	.404	695.43	.225
K3-Exhaust 3, F	1282.0	.644	694.45	.358
K4-Exhaust 4, F	1236.6	.321	669.22	.178
K5-Exhaust 5, F	1265.7	.521	685.41	.290
K6-Exhaust 6, F	1181.8	.821	638.77	.456
K7-Exhaust Common, F	1295.2	.241	701.80	.134
Dry Bulb Temperature, F	77.283	.069	25.157	.038
Wet Bulb Temperature, F	66.362	.015	19.090	.008
J1-Water In, F	161.93	.090	72.185	.050
J2-Water Out, F	169.07	.049	76.151	.027
J3-Oil Sump, F	219.39	.659	104.11	.366
J4-Fuel Inlet, F	90.579	.053	32.544	.029
J5-Air After Filter, F	99.566	.164	37.537	.091
J6-Intake Manifold, F	101.57	.198	38.649	.110
J7-Fuel Return, F	92.879	.075	33.822	.042
P1-Fuel, PSIG	131.77	1.725	908.53	11.893
P2-Oil Gallery, PSIG	57.892	.084	399.15	.577
P6-Ex Common, "H2OG	27.496	.149	6.842	.037
P7-Air Aft Filt, "H2OV	5.847	.188	1.455	.047
P8-Blowby, "H2OG	.002	.040	.000	.010
P11-Baro (Vent), "Hg ABS	29.052	.003	98.380	.012
Speed, RPM	2100.4	3.892	2100.4	3.892
Load, Lb-Ft	501.82	3.017	680.37	4.090
Smoke, %	22.599	.374	22.599	.374
Fuel Flow, Lb/Hr	87.036	.292	39.479	.132
Horsepower	200.69	.913	149.63	.681
Corrected Horsepower	210.43	.958	156.89	.714
BSFC, lb/hp-hr	.434	.003	.264	.002
Corrected BSFC	.414	.003	.252	.002
Relative Humidity	56.535	.203	56.535	.203
Reference Pressure, inHg	28.622		96.924	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1728

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.62 in-Hg
Speed :	2100 RPM
Load :	501.8 lb-ft
Fuel Flow :	87.0 lb/hr
Brake Power :	200.64 bhp
BSFC :	.434 lb/bhp-hr
Indicated Power :	30.67 kW/cyl
Peak Pressure :	7.218 MPa
Peak Rate of Pressure Rise:	493.8 kPa/deg
Peak Heat Release Rate :	170.6 Joules/deg
Cumulative Heat Release :	3511.59 Joules
Apparent Combustion Efficiency :	78.2 %
Indicated Thermal Efficiency :	39.0 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	5.1 degrees
Centroid Phasing :	196.8 degrees
Centroid Magnitude :	36.13 J/degree
Sensitivity :	30.7 degrees
Premixed/Diffusion Ratio :	.16572

880415.125346 AL-17355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1180.8	.702	638.21	.390
K2-Exhaust 2, F	1267.7	.849	686.50	.472
K3-Exhaust 3, F	1279.7	.608	693.19	.338
K4-Exhaust 4, F	1236.6	.845	669.23	.470
K5-Exhaust 5, F	1281.6	.531	694.20	.295
K6-Exhaust 6, F	1184.9	.649	640.51	.361
K7-Exhaust Common, F	1316.4	.387	713.54	.215
Dry Bulb Temperature, F	78.316	.065	25.731	.036
Wet Bulb Temperature, F	66.833	.003	19.351	.002
J1-Water In, F	161.70	.151	72.054	.084
J2-Water Out, F	170.04	.109	76.687	.060
J3-Oil Sump, F	224.68	.213	107.04	.118
J4-Fuel Inlet, F	91.228	.067	32.904	.037
J5-Air After Filter, F	100.71	.079	38.175	.044
J6-Intake Manifold, F	102.95	.079	39.417	.044
J7-Fuel Return, F	93.758	.056	34.310	.031
P1-Fuel, PSIG	118.60	.700	817.75	4.824
P2-Oil Gallery, PSIG	55.411	.067	382.05	.460
P6-Ex Common, "H2OG	19.800	.120	4.927	.030
P7-Air Aft Filt, "H2OV	4.691	.508	1.167	.126
P8-Blowby, "H2OG	-.009	.038	-.002	.009
P11-Baro (Vent), "Hg ABS	29.045	.003	98.359	.011
Speed, RPM	1801.3	1.774	1801.3	1.774
Load, Lb-Ft	547.09	2.028	741.76	2.749
Smoke, %	25.093	.926	25.093	.926
Fuel Flow, Lb/Hr	78.703	.145	35.699	.066
Horsepower	187.64	.835	139.90	.622
Corrected Horsepower	197.02	.876	146.89	.653
BSFC, lb/hp-hr	.419	.002	.255	.001
Corrected BSFC	.399	.002	.243	.001
Relative Humidity	55.112	.191	55.112	.191
Reference Pressure, inHg	28.700		97.191	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1730

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.70 in-Hg
Speed :	1801 RPM
Load :	547.1 lb-ft
Fuel Flow :	78.7 lb/hr
Brake Power :	187.61 bhp
BSFC :	.419 lb/bhp-hr
Indicated Power :	27.53 kW/cyl
Peak Pressure :	7.835 MPa
Peak Rate of Pressure Rise:	620.3 kPa/deg
Peak Heat Release Rate :	230.4 Joules/deg
Cumulative Heat Release :	3613.86 Joules
Apparent Combustion Efficiency :	76.3 %
Indicated Thermal Efficiency :	38.7 %
Brake Thermal Efficiency :	32.8 %
Ignition Delay :	4.1 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	40.87 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.14199

880415.130859 AL-17355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1170.3	.823	632.41	.457
K2-Exhaust 2, F	1237.1	.591	669.51	.328
K3-Exhaust 3, F	1235.9	.533	668.83	.296
K4-Exhaust 4, F	1191.2	.514	643.98	.285
K5-Exhaust 5, F	1261.2	.654	682.90	.363
K6-Exhaust 6, F	1154.6	.798	623.67	.443
K7-Exhaust Common, F	1303.5	.425	706.41	.236
Dry Bulb Temperature, F	78.632	.349	25.907	.194
Wet Bulb Temperature, F	66.736	.058	19.298	.032
J1-Water In, F	159.25	.123	70.693	.068
J2-Water Out, F	168.99	.095	76.106	.053
J3-Oil Sump, F	217.59	.098	103.11	.054
J4-Fuel Inlet, F	91.305	.047	32.947	.026
J5-Air After Filter, F	100.65	.047	38.139	.026
J6-Intake Manifold, F	102.80	.047	39.335	.026
J7-Fuel Return, F	93.027	.033	33.904	.018
P1-Fuel, PSIG	101.93	.934	702.75	6.439
P2-Oil Gallery, PSIG	54.142	.112	373.30	.773
P6-Ex Common, "H2OG	15.880	.227	3.952	.057
P7-Air Aft Filt, "H2OV	3.729	.228	.928	.057
P8-Blowby, "H2OG	-.004	.019	-.001	.005
P11-Baro (Vent), "Hg ABS	29.039	.002	98.336	.007
Speed, RPM	1500.0	2.523	1500.0	2.523
Load, Lb-Ft	578.31	2.142	784.08	2.904
Smoke, %	15.795	.502	15.795	.502
Fuel Flow, Lb/Hr	70.553	.309	32.002	.140
Horsepower	165.17	.547	123.15	.408
Corrected Horsepower	173.42	.574	129.29	.428
BSFC, lb/hp-hr	.427	.003	.260	.002
Corrected BSFC	.407	.002	.248	.001
Relative Humidity	53.875	.843	53.875	.843
Reference Pressure, inHg	28.764		97.407	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1732

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.76 in-Hg
Speed :	1500 RPM
Load :	578.3 lb-ft
Fuel Flow :	70.6 lb/hr
Brake Power :	165.17 bhp
BSFC :	.427 lb/bhp-hr
Indicated Power :	24.01 kW/cyl
Peak Pressure :	8.499 MPa
Peak Rate of Pressure Rise:	744.3 kPa/deg
Peak Heat Release Rate :	297.3 Joules/deg
Cumulative Heat Release :	3682.88 Joules
Apparent Combustion Efficiency :	72.2 %
Indicated Thermal Efficiency :	37.6 %
Brake Thermal Efficiency :	32.2 %
Ignition Delay :	2.1 degrees
Centroid Phasing :	190.0 degrees
Centroid Magnitude :	47.10 J/degree
Sensitivity :	26.9 degrees
Premixed/Diffusion Ratio :	.07695

880415.132311 AL-17355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1132.6	.399	611.42	.222
K2-Exhaust 2, F	1186.0	.872	641.13	.484
K3-Exhaust 3, F	1179.2	.783	637.32	.435
K4-Exhaust 4, F	1143.0	.591	617.23	.329
K5-Exhaust 5, F	1222.1	.608	661.18	.338
K6-Exhaust 6, F	1126.3	.762	607.94	.423
K7-Exhaust Common, F	1275.3	.645	690.71	.358
Dry Bulb Temperature, F	78.808	.429	26.004	.238
Wet Bulb Temperature, F	66.849	.080	19.361	.045
J1-Water In, F	159.21	.134	70.672	.074
J2-Water Out, F	169.81	.110	76.564	.061
J3-Oil Sump, F	213.43	.196	100.80	.109
J4-Fuel Inlet, F	90.651	.062	32.584	.034
J5-Air After Filter, F	100.64	.044	38.131	.024
J6-Intake Manifold, F	102.73	.073	39.293	.040
J7-Fuel Return, F	91.794	.076	33.219	.042
P1-Fuel, PSIG	88.026	.597	606.92	4.118
P2-Oil Gallery, PSIG	51.841	.022	357.43	.155
P6-Ex Common, "H2OG	14.982	.107	3.728	.027
P7-Air Aft Filt, "H2OV	3.306	.231	.823	.057
P8-Blowby, "H2OG	.030	.043	.007	.011
P11-Baro (Vent), "Hg ABS	29.030	.002	98.308	.008
Speed, RPM	1299.3	1.641	1299.3	1.641
Load, Lb-Ft	582.67	1.283	789.99	1.740
Smoke, %	24.720	1.104	24.720	1.104
Fuel Flow, Lb/Hr	63.201	.352	28.667	.160
Horsepower	144.14	.323	107.47	.241
Corrected Horsepower	151.39	.339	112.87	.253
BSFC, lb/hp-hr	.438	.003	.267	.002
Corrected BSFC	.417	.003	.254	.002
Relative Humidity	53.760	1.002	53.760	1.002
Reference Pressure, inHg	28.787		97.484	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1734

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.79 in-Hg
Speed :	1299 RPM
Load :	582.7 lb-ft
Fuel Flow :	63.2 lb/hr
Brake Power :	144.12 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	21.03 kW/cyl
Peak Pressure :	8.856 MPa
Peak Rate of Pressure Rise:	783.1 kPa/deg
Peak Heat Release Rate :	315.6 Joules/deg
Cumulative Heat Release :	3695.20 Joules
Apparent Combustion Efficiency :	70.1 %
Indicated Thermal Efficiency :	36.8 %
Brake Thermal Efficiency :	31.4 %
Ignition Delay :	1.9 degrees
Centroid Phasing :	188.6 degrees
Centroid Magnitude :	50.30 J/degree
Sensitivity :	25.7 degrees
Premixed/Diffusion Ratio :	.07421

880415.133602 AL-12355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1078.9	.547	581.62	.304
K2-Exhaust 2, F	1091.8	.677	588.76	.376
K3-Exhaust 3, F	1090.5	.893	588.05	.496
K4-Exhaust 4, F	1054.4	.651	568.01	.362
K5-Exhaust 5, F	1136.4	.943	613.54	.524
K6-Exhaust 6, F	1062.7	.520	572.63	.289
K7-Exhaust Common, F	1183.8	.790	639.89	.439
Dry Bulb Temperature, F	78.850	.050	26.028	.028
Wet Bulb Temperature, F	67.216	.030	19.565	.017
J1-Water In, F	159.63	.112	70.903	.062
J2-Water Out, F	170.31	.076	76.837	.042
J3-Oil Sump, F	208.27	.318	97.930	.176
J4-Fuel Inlet, F	89.464	.078	31.924	.043
J5-Air After Filter, F	100.95	.070	38.308	.039
J6-Intake Manifold, F	103.05	.106	39.471	.059
J7-Fuel Return, F	89.737	.047	32.076	.026
P1-Fuel, PSIG	68.542	.770	472.58	5.308
P2-Oil Gallery, PSIG	46.711	.040	322.06	.276
P6-Ex Common, "H2OG	12.691	.129	3.158	.032
P7-Air Aft Filt, "H2OV	2.506	.169	.624	.042
P8-Blowby, "H2OG	.015	.036	.004	.009
P11-Baro (Vent), "Hg ABS	29.030	.003	98.305	.009
Speed, RPM	1099.3	1.465	1099.3	1.465
Load, Lb-Ft	561.04	2.616	760.66	3.547
Smoke, %	22.358	.655	22.358	.655
Fuel Flow, Lb/Hr	52.008	.215	23.590	.098
Horsepower	117.43	.619	87.553	.462
Corrected Horsepower	123.43	.651	92.023	.485
BSFC, lb/hp-hr	.443	.003	.269	.002
Corrected BSFC	.421	.003	.256	.002
Relative Humidity	54.882	.105	54.882	.105
Reference Pressure, inHg	28.845		97.681	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1736

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.85 in-Hg
Speed :	1099 RPM
Load :	561.0 lb-ft
Fuel Flow :	52.0 lb/hr
Brake Power :	117.39 bhp
BSFC :	.443 lb/bhp-hr
Indicated Power :	17.11 kW/cyl
Peak Pressure :	8.803 MPa
Peak Rate of Pressure Rise:	743.9 kPa/deg
Peak Heat Release Rate :	306.1 Joules/deg
Cumulative Heat Release :	3537.03 Joules
Apparent Combustion Efficiency :	69.0 %
Indicated Thermal Efficiency :	36.4 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	1.7 degrees
Centroid Phasing :	187.6 degrees
Centroid Magnitude :	48.89 J/degree
Sensitivity :	24.9 degrees
Premixed/Diffusion Ratio :	.06954

CUMMINS NH220 LOG SHEET

TEST NO. 6 FUEL TF02N2IL87 DATE 4-15-88 PAGE 68

Operator GRzg							
Time	2:10	2:20	2:30	2:40	2:50	2:55	3:10
Test Hour	40min	10min	10min	10min	10min	5min	15min
Speed, RPM	2099	1801	1801	1801	1800	1801	1501
Load, lb–ft	513.4	556.8	369.8	274.9	135.1	46.3	574.5
Fuel Flow, lb/hr	94.9	85.3	49.8	38.4	24.2	15.1	75.3
Exh. Opacity, %	30.0	25.0	5.5	5.0	2.0	1.0	36.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1175	1161	823	685	486	348	1127
Exhaust Cyl. 2	1280	1251	928	781	563	399	1201
Exhaust Cyl. 3	1286	1254	919	773	553	403	1190
Exhaust Cyl. 4	1236	1218	878	727	515	392	1150
Exhaust Cyl. 5	1263	1256	870	717	509	374	1208
Exhaust Cyl. 6	1196	1189	834	662	469	337	1150
Exhaust Common	1298	1301	883	717	507	374	1275
Water In	161	161	162	164	167	169	160
Water Out	170	170	168	168	169	170	170
Oil Sump	226	228	224	217	212	208	210
Fuel	93	92	91	91	90	88	93
Inlet Air	100	100	100	100	99	99	102
Wet Bulb	69.7	70.1	70.5	70.7	70.8	83.2	70.5
Dry Bulb	82.0	83.2	83.4	84.0	84.7	70.0	83.5
PRESSURES, PSIG							
Fuel Pump	136.0	122.0	59.0	44.0	24.0	15.0	105.0
Oil Gallery	57.8	54.9	55.2	56.9	57.8	58.2	56.8
LOW PRESSURES							
Intake Vac, in.water	5.6	4.3	4.5	4.7	4.8	4.9	3.4
Exh. Comm., in.Water	17.0	20.0	16.0	15.0	12.0	9.5	16.0
Blowby, in.water	6	0	0	0	0	0	0
Barometer, in.Hg	29.02	29.01	29.0	29.0	28.99	28.99	28.98

CUMMINS NH220 LOG SHEET

TEST NO. 6 FUEL TF82N2126787 DATE 4-15-88 PAGE 69

Operator Greg							
Time	3:20	3:30					
Test Hour	10 min	10 min					
Speed, RPM	1201	1101					
Load, lb–ft	576.2	570.4					
Fuel Flow, lb/hr	67.0	55.3					
Exh. Opacity, %	40.0	30.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1093	1042					
Exhaust Cyl. 2	1146	1067					
Exhaust Cyl. 3	1135	1064					
Exhaust Cyl. 4	1102	1024					
Exhaust Cyl. 5	1160	1094					
Exhaust Cyl. 6	1110	1054					
Exhaust Common	1218	1124					
Water In	158	158					
Water Out	169	170					
Oil Sump	209	208					
Fuel	91	89					
Inlet Air	101	99					
Wet Bulb	70.9	70.9					
Dry Bulb	84.7	84.5					
PRESSURES, PSIG							
Fuel Pump	92.0	74.0					
Oil Gallery	52.8	46.0					
LOW PRESSURES							
Intake Vac, in.water	2.7	2.1					
Exh. Comm., in.Water	15.0	13.5					
Blowby, in.water	0	0					
Barometer, in.Hg	28.98	28.98					

880415.140942 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1174.6	.410	634.76	.228
K2-Exhaust 2, F	1280.8	.672	693.77	.373
K3-Exhaust 3, F	1284.5	1.338	695.82	.743
K4-Exhaust 4, F	1235.3	.616	668.49	.342
K5-Exhaust 5, F	1263.0	.717	683.90	.398
K6-Exhaust 6, F	1193.5	.503	645.28	.279
K7-Exhaust Common, F	1297.7	.799	703.15	.444
Dry Bulb Temperature, F	81.439	.192	27.466	.107
Wet Bulb Temperature, F	68.164	.033	20.091	.018
J1-Water In, F	162.00	.133	72.222	.074
J2-Water Out, F	169.54	.048	76.410	.026
J3-Oil Sump, F	224.97	.165	107.21	.092
J4-Fuel Inlet, F	93.462	.115	34.146	.064
J5-Air After Filter, F	100.25	.040	37.917	.022
J6-Intake Manifold, F	101.76	.062	38.754	.035
J7-Fuel Return, F	95.001	.029	35.000	.016
P1-Fuel, PSIG	134.78	1.570	929.25	10.825
P2-Oil Gallery, PSIG	56.791	.075	391.56	.519
P6-Ex Common, "H2OG	27.044	.163	6.730	.041
P7-Air Aft Filt, "H2OV	6.501	.304	1.618	.076
P8-Blowby, "H2OG	.015	.049	.004	.012
P11-Baro (Vent), "Hg ABS	29.015	.003	98.256	.010
Speed, RPM	2100.4	2.202	2100.4	2.202
Load, Lb-Ft	516.59	1.385	700.40	1.878
Smoke, %	31.432	.748	31.432	.748
Fuel Flow, Lb/Hr	96.561	1.622	43.799	.736
Horsepower	206.60	.421	154.03	.314
Corrected Horsepower	217.16	.443	161.91	.330
BSFC, lb/hp-hr	.467	.008	.284	.005
Corrected BSFC	.445	.008	.271	.005
Relative Humidity	50.847	.429	50.847	.429
Reference Pressure, inHg	28.537		96.637	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1738

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.54 in-Hg
Speed :	2100 RPM
Load :	516.6 lb-ft
Fuel Flow :	96.6 lb/hr
Brake Power :	206.56 bhp
BSFC :	.468 lb/bhp-hr
Indicated Power :	31.65 kW/cyl
Peak Pressure :	7.365 MPa
Peak Rate of Pressure Rise:	759.4 kPa/deg
Peak Heat Release Rate :	298.2 Joules/deg
Cumulative Heat Release :	3586.88 Joules
Apparent Combustion Efficiency :	73.7 %
Indicated Thermal Efficiency :	37.2 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	8.7 degrees
Centroid Phasing :	196.4 degrees
Centroid Magnitude :	61.80 J/degree
Sensitivity :	26.7 degrees
Premixed/Diffusion Ratio :	.32656

880415.142120 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1164.6	1.103	629.23	.613
K2-Exhaust 2, F	1254.0	.880	678.87	.489
K3-Exhaust 3, F	1254.6	1.117	679.20	.620
K4-Exhaust 4, F	1219.2	.584	659.55	.325
K5-Exhaust 5, F	1257.6	1.220	680.87	.678
K6-Exhaust 6, F	1186.9	.517	641.58	.287
K7-Exhaust Common, F	1303.5	1.170	706.41	.650
Dry Bulb Temperature, F	82.021	.394	27.789	.219
Wet Bulb Temperature, F	68.441	.076	20.245	.042
J1-Water In, F	161.74	.076	72.077	.042
J2-Water Out, F	170.37	.050	76.872	.028
J3-Oil Sump, F	228.54	.087	109.19	.048
J4-Fuel Inlet, F	92.938	.054	33.855	.030
J5-Air After Filter, F	100.85	.049	38.250	.027
J6-Intake Manifold, F	102.24	.032	39.023	.018
J7-Fuel Return, F	94.284	.096	34.602	.053
P1-Fuel, PSIG	119.63	.715	824.83	4.930
P2-Oil Gallery, PSIG	54.869	.029	378.31	.203
P6-Ex Common, "H2OG	19.194	.165	4.776	.041
P7-Air Aft Filt, "H2OV	5.115	.656	1.273	.163
P8-Blowby, "H2OG	.011	.040	.003	.010
P11-Baro (Vent), "Hg ABS	29.009	.005	98.234	.018
Speed, RPM	1804.1	2.916	1804.1	2.916
Load, Lb-Ft	558.64	4.640	757.42	6.290
Smoke, %	25.541	.970	25.541	.970
Fuel Flow, Lb/Hr	85.055	.460	38.580	.209
Horsepower	191.90	1.826	143.07	1.362
Corrected Horsepower	201.88	1.921	150.52	1.432
BSFC, lb/hp-hr	.443	.006	.270	.003
Corrected BSFC	.421	.005	.256	.003
Relative Humidity	50.203	.833	50.203	.833
Reference Pressure, inHg	28.632		96.960	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1740

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.63 in-Hg
Speed :	1804 RPM
Load :	558.6 lb-ft
Fuel Flow :	85.1 lb/hr
Brake Power :	191.87 bhp
BSFC :	.444 lb/bhp-hr
Indicated Power :	28.35 kW/cyl
Peak Pressure :	7.954 MPa
Peak Rate of Pressure Rise:	939.4 kPa/deg
Peak Heat Release Rate :	368.6 Joules/deg
Cumulative Heat Release :	3664.97 Joules
Apparent Combustion Efficiency :	73.5 %
Indicated Thermal Efficiency :	37.8 %
Brake Thermal Efficiency :	31.8 %
Ignition Delay :	7.6 degrees
Centroid Phasing :	193.6 degrees
Centroid Magnitude :	63.42 J/degree
Sensitivity :	24.9 degrees
Premixed/Diffusion Ratio :	.30632

880415.143026 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	823.63	1.045	439.79	.581
K2-Exhaust 2, F	931.41	2.029	499.67	1.127
K3-Exhaust 3, F	916.71	1.461	491.50	.811
K4-Exhaust 4, F	882.09	2.481	472.27	1.379
K5-Exhaust 5, F	871.42	1.425	466.35	.792
K6-Exhaust 6, F	834.13	1.031	445.63	.573
K7-Exhaust Common, F	887.07	1.753	475.04	.974
Dry Bulb Temperature, F	81.729	.212	27.627	.118
Wet Bulb Temperature, F	68.424	.076	20.236	.042
J1-Water In, F	163.13	.098	72.851	.054
J2-Water Out, F	168.04	.078	75.578	.043
J3-Oil Sump, F	225.17	.440	107.32	.245
J4-Fuel Inlet, F	92.158	.092	33.421	.051
J5-Air After Filter, F	100.66	.030	38.143	.017
J6-Intake Manifold, F	101.27	.057	38.481	.031
J7-Fuel Return, F	91.944	.041	33.302	.023
P1-Fuel, PSIG	56.408	.159	388.92	1.097
P2-Oil Gallery, PSIG	55.668	.057	383.82	.392
P6-Ex Common, "H2OG	14.787	.085	3.680	.021
P7-Air Aft Filt, "H2OV	5.669	.481	1.411	.120
P8-Blowby, "H2OG	-.004	.041	-.001	.010
P11-Baro (Vent), "Hg ABS	28.999	.004	98.203	.013
Speed, RPM	1803.0	3.252	1803.0	3.252
Load, Lb-Ft	370.17	7.003	501.88	9.495
Smoke, %	6.576	.398	6.576	.390
Fuel Flow, Lb/Hr	52.176	1.294	23.667	.587
Horsepower	127.08	2.504	94.750	1.867
Corrected Horsepower	133.73	2.634	99.704	1.964
BSFC, lb/hp-hr	.411	.015	.250	.009
Corrected BSFC	.390	.014	.237	.009
Relative Humidity	50.916	.338	50.916	.338
Reference Pressure, inHg	28.583		96.791	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1742

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.58 in-Hg
Speed :	1803 RPM
Load :	370.2 lb-ft
Fuel Flow :	52.2 lb/hr
Brake Power :	127.09 bhp
BSFC :	.411 lb/bhp-hr
Indicated Power :	18.90 kW/cyl
Peak Pressure :	6.160 MPa
Peak Rate of Pressure Rise:	470.5 kPa/deg
Peak Heat Release Rate :	192.2 Joules/deg
Cumulative Heat Release :	2433.99 Joules
Apparent Combustion Efficiency :	79.5 %
Indicated Thermal Efficiency :	41.1 %
Brake Thermal Efficiency :	34.3 %
Ignition Delay :	12.9 degrees
Centroid Phasing :	194.8 degrees
Centroid Magnitude :	39.65 J/degree
Sensitivity :	21.0 degrees
Premixed/Diffusion Ratio :	.61306

880415.144020 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	686.92	.607	363.84	.337
K2-Exhaust 2, F	782.22	.405	416.79	.225
K3-Exhaust 3, F	770.58	.300	410.32	.167
K4-Exhaust 4, F	727.72	.747	386.51	.415
K5-Exhaust 5, F	715.81	.501	379.90	.278
K6-Exhaust 6, F	663.45	.693	350.80	.385
K7-Exhaust Common, F	719.51	.432	381.95	.240
Dry Bulb Temperature, F	81.458	.107	27.477	.059
Wet Bulb Temperature, F	68.185	.028	20.103	.016
J1-Water In, F	165.15	.064	73.974	.035
J2-Water Out, F	168.44	.043	75.800	.024
J3-Oil Sump, F	218.45	.049	103.58	.027
J4-Fuel Inlet, F	90.912	.041	32.729	.023
J5-Air After Filter, F	100.68	.077	38.157	.043
J6-Intake Manifold, F	101.44	.093	38.579	.052
J7-Fuel Return, F	91.026	.037	32.792	.021
P1-Fuel, PSIG	39.567	.185	272.80	1.273
P2-Oil Gallery, PSIG	56.910	.143	392.38	.988
P6-Ex Common, "H2OG	13.459	.171	3.349	.043
P7-Air Aft Filt, "H2OV	5.847	.534	1.455	.133
P8-Blowby, "H2OG	.004	.049	.001	.012
P11-Baro (Vent), "Hg ABS	28.996	.002	98.193	.008
Speed, RPM	1801.8	2.459	1801.8	2.459
Load, Lb-Ft	273.76	6.487	371.17	8.796
Smoke, %	5.648	.104	5.648	.104
Fuel Flow, Lb/Hr	38.623	.665	17.519	.301
Horsepower	93.919	2.290	70.024	1.708
Corrected Horsepower	98.825	2.410	73.681	1.797
BSFC, lb/hp-hr	.411	.009	.250	.005
Corrected BSFC	.391	.009	.238	.005
Relative Humidity	50.870	.219	50.870	.219
Reference Pressure, inHg	28.566		96.736	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1744

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.57 in-Hg
Speed :	1802 RPM
Load :	273.8 lb-ft
Fuel Flow :	38.6 lb/hr
Brake Power :	93.94 bhp
BSFC :	.411 lb/bhp-hr
Indicated Power :	14.53 kW/cyl
Peak Pressure :	5.623 MPa
Peak Rate of Pressure Rise:	349.3 kPa/deg
Peak Heat Release Rate :	155.5 Joules/deg
Cumulative Heat Release :	1878.18 Joules
Apparent Combustion Efficiency :	82.9 %
Indicated Thermal Efficiency :	42.7 %
Brake Thermal Efficiency :	34.3 %
Ignition Delay :	14.6 degrees
Centroid Phasing :	194.8 degrees
Centroid Magnitude :	36.02 J/degree
Sensitivity :	19.1 degrees
Premixed/Diffusion Ratio :	.76634

880415.144917 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	486.12	.873	252.29	.485
K2-Exhaust 2, F	565.28	.263	296.27	.146
K3-Exhaust 3, F	552.41	.637	289.12	.354
K4-Exhaust 4, F	516.77	1.501	269.32	.834
K5-Exhaust 5, F	510.86	.937	266.03	.520
K6-Exhaust 6, F	469.31	.627	242.95	.348
K7-Exhaust Common, F	510.17	1.132	265.65	.629
Dry Bulb Temperature, F	83.786	.162	28.770	.090
Wet Bulb Temperature, F	69.171	.037	20.650	.021
J1-Water In, F	167.23	.091	75.128	.050
J2-Water Out, F	168.79	.091	75.996	.051
J3-Oil Sump, F	212.81	.270	100.45	.150
J4-Fuel Inlet, F	90.132	.053	32.296	.029
J5-Air After Filter, F	99.992	.195	37.773	.108
J6-Intake Manifold, F	101.23	.274	38.462	.152
J7-Fuel Return, F	89.279	.109	31.821	.061
P1-Fuel, PSIG	20.691	.087	142.66	.601
P2-Oil Gallery, PSIG	57.958	.046	399.60	.316
P6-Ex Common, "H2OG	10.341	.062	2.573	.015
P7-Air Aft Filt, "H2OV	5.894	.495	1.467	.123
P8-Blowby, "H2OG	.009	.058	.002	.014
P11-Baro (Vent), "Hg ABS	28.993	.004	98.182	.012
Speed, RPM	1801.7	2.821	1801.7	2.821
Load, Lb-Ft	134.88	7.506	182.87	10.177
Smoke, %	3.602	.151	3.602	.151
Fuel Flow, Lb/Hr	24.230	.329	10.991	.149
Horsepower	46.268	2.563	34.497	1.911
Corrected Horsepower	48.676	2.696	36.291	2.010
BSFC, lb/hp-hr	.525	.029	.319	.017
Corrected BSFC	.499	.027	.304	.017
Relative Humidity	47.974	.319	47.974	.319
Reference Pressure, inHg	28.560		96.714	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1746

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.56 in-Hg
Speed :	1802 RPM
Load :	134.9 lb-ft
Fuel Flow :	24.2 lb/hr
Brake Power :	46.29 bhp
BSFC :	.523 lb/bhp-hr
Indicated Power :	8.13 kW/cyl
Peak Pressure :	4.676 MPa
Peak Rate of Pressure Rise:	189.4 kPa/deg
Peak Heat Release Rate :	109.5 Joules/deg
Cumulative Heat Release :	1105.55 Joules
Apparent Combustion Efficiency :	77.9 %
Indicated Thermal Efficiency :	38.1 %
Brake Thermal Efficiency :	27.0 %
Ignition Delay :	17.1 degrees
Centroid Phasing :	195.3 degrees
Centroid Magnitude :	27.61 J/degree
Sensitivity :	17.2 degrees
Premixed/Diffusion Ratio :	.98992

880415.145722 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	348.73	.646	175.96	.359
K2-Exhaust 2, F	400.64	.780	204.80	.433
K3-Exhaust 3, F	407.11	.827	208.40	.460
K4-Exhaust 4, F	392.94	.955	200.52	.530
K5-Exhaust 5, F	374.77	.762	190.43	.423
K6-Exhaust 6, F	337.76	.383	169.87	.213
K7-Exhaust Common, F	376.77	.895	191.54	.497
Dry Bulb Temperature, F	83.310	.444	28.506	.247
Wet Bulb Temperature, F	68.837	.079	20.465	.044
J1-Water In, F	169.69	.179	76.494	.100
J2-Water Out, F	170.44	.106	76.913	.059
J3-Oil Sump, F	208.68	.044	98.153	.025
J4-Fuel Inlet, F	88.717	.087	31.510	.048
J5-Air After Filter, F	98.896	.044	37.164	.024
J6-Intake Manifold, F	100.16	.030	37.864	.017
J7-Fuel Return, F	86.794	.106	30.441	.059
P1-Fuel, PSIG	10.912	.066	75.235	.458
P2-Oil Gallery, PSIG	58.415	.031	402.76	.213
P6-Ex Common, "H2OG	7.988	.099	1.988	.025
P7-Air Aft Filt, "H2OV	5.881	.359	1.464	.089
P8-Blowby, "H2OG	.005	.043	.001	.011
P11-Baro (Vent), "Hg ABS	28.992	.005	98.180	.017
Speed, RPM	1802.5	3.453	1802.5	3.453
Load, Lb-Ft	47.016	4.146	63.745	5.621
Smoke, %	1.339	.089	1.339	.089
Fuel Flow, Lb/Hr	15.055	.164	6.829	.074
Horsepower	16.134	1.401	12.029	1.045
Corrected Horsepower	16.954	1.472	12.640	1.098
BSFC, lb/hp-hr	.939	.081	.572	.049
Corrected BSFC	.894	.077	.544	.047
Relative Humidity	48.149	.899	48.149	.899
Reference Pressure, inHg	28.560		96.715	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1748

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.56 in-Hg
Speed :	1803 RPM
Load :	47.1 lb-ft
Fuel Flow :	15.1 lb/hr
Brake Power :	16.16 bhp
BSFC :	.934 lb/bhp-hr
Indicated Power :	4.40 kW/cyl
Peak Pressure :	4.121 MPa
Peak Rate of Pressure Rise:	105.1 kPa/deg
Peak Heat Release Rate :	71.9 Joules/deg
Cumulative Heat Release :	676.232 Joules
Apparent Combustion Efficiency :	76.4 %
Indicated Thermal Efficiency :	33.0 %
Brake Thermal Efficiency :	15.1 %
Ignition Delay :	17.1 degrees
Centroid Phasing :	195.7 degrees
Centroid Magnitude :	19.21 J/degree
Sensitivity :	17.6 degrees
Premixed/Diffusion Ratio :	.97469

880415.151036 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1127.5	.900	608.62	.500
K2-Exhaust 2, F	1200.0	.686	648.86	.381
K3-Exhaust 3, F	1189.6	.853	643.10	.474
K4-Exhaust 4, F	1147.7	.805	619.84	.447
K5-Exhaust 5, F	1204.6	.495	651.44	.275
K6-Exhaust 6, F	1146.1	.757	618.95	.421
K7-Exhaust Common, F	1271.6	.888	688.67	.493
Dry Bulb Temperature, F	83.215	.144	28.453	.080
Wet Bulb Temperature, F	69.012	.023	20.562	.013
J1-Water In, F	160.11	.099	71.172	.055
J2-Water Out, F	169.31	.056	76.282	.031
J3-Oil Sump, F	209.22	.143	98.457	.080
J4-Fuel Inlet, F	93.149	.107	33.972	.059
J5-Air After Filter, F	101.64	.101	38.690	.056
J6-Intake Manifold, F	103.45	.140	39.693	.078
J7-Fuel Return, F	93.905	.057	34.392	.032
P1-Fuel, PSIG	102.48	1.696	706.57	11.695
P2-Oil Gallery, PSIG	56.179	.028	387.34	.195
P6-Ex Common, "H2OG	14.757	.141	3.672	.035
P7-Air Aft Filt, "H2OV	4.537	.310	1.129	.077
P8-Blowby, "H2OG	.010	.028	.002	.007
P11-Baro (Vent), "Hg ABS	28.982	.002	98.145	.006
Speed, RPM	1501.8	3.104	1501.8	3.104
Load, Lb-Ft	575.94	2.481	780.87	3.364
Smoke, %	35.109	1.630	35.109	1.630
Fuel Flow, Lb/Hr	74.828	.511	33.941	.232
Horsepower	164.69	.670	122.79	.500
Corrected Horsepower	173.58	.706	129.42	.527
BSFC, lb/hp-hr	.454	.003	.276	.002
Corrected BSFC	.431	.003	.262	.002
Relative Humidity	48.923	.320	48.923	.320
Reference Pressure, inHg	28.649		97.015	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1750

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.65 in-Hg
Speed :	1502 RPM
Load :	575.9 lb-ft
Fuel Flow :	74.8 lb/hr
Brake Power :	164.70 bhp
BSFC :	.454 lb/bhp-hr
Indicated Power :	24.38 kW/cyl
Peak Pressure :	8.527 MPa
Peak Rate of Pressure Rise:	1147. kPa/deg
Peak Heat Release Rate :	463.8 Joules/deg
Cumulative Heat Release :	3691.45 Joules
Apparent Combustion Efficiency :	70.1 %
Indicated Thermal Efficiency :	37.0 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	190.5 degrees
Centroid Magnitude :	73.91 J/degree
Sensitivity :	22.9 degrees
Premixed/Diffusion Ratio :	.28769

880415.151919 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1094.0	.756	590.02	.420
K2-Exhaust 2, F	1147.5	.612	619.74	.340
K3-Exhaust 3, F	1133.6	.783	611.99	.435
K4-Exhaust 4, F	1102.1	.651	594.49	.362
K5-Exhaust 5, F	1161.2	1.542	627.31	.856
K6-Exhaust 6, F	1111.5	.989	599.70	.549
K7-Exhaust Common, F	1218.8	.672	659.36	.373
Dry Bulb Temperature, F	84.473	.342	29.151	.198
Wet Bulb Temperature, F	69.314	.160	20.730	.089
J1-Water In, F	158.33	.087	70.186	.048
J2-Water Out, F	168.98	.089	76.097	.050
J3-Oil Sump, F	209.23	.110	98.459	.061
J4-Fuel Inlet, F	91.201	.088	32.890	.049
J5-Air After Filter, F	101.01	.096	38.336	.053
J6-Intake Manifold, F	102.02	.147	38.902	.082
J7-Fuel Return, F	91.602	.047	33.112	.026
P1-Fuel, PSIG	89.102	.764	614.34	5.265
P2-Oil Gallery, PSIG	52.718	.019	363.48	.134
P6-Ex Common, "H2OG	13.403	.164	3.335	.041
P7-Air Aft Filt, "H2OV	3.918	.260	.975	.065
P8-Blowby, "H2OG	-.005	.051	-.001	.013
P11-Baro (Vent), "Hg ABS	28.978	.002	98.130	.007
Speed, RPM	1301.2	3.379	1301.2	3.379
Load, Lb-Ft	579.38	1.856	785.53	2.516
Smoke, %	40.518	2.338	40.518	2.338
Fuel Flow, Lb/Hr	66.776	.785	30.289	.356
Horsepower	143.54	.743	107.02	.554
Corrected Horsepower	151.21	.783	112.74	.584
BSFC, lb/hp-hr	.465	.006	.283	.003
Corrected BSFC	.442	.005	.269	.003
Relative Humidity	46.737	.424	46.737	.424
Reference Pressure, inHg	28.690		97.154	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1752

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.69 in-Hg
Speed :	1301 RPM
Load :	579.4 lb-ft
Fuel Flow :	66.8 lb/hr
Brake Power :	143.53 bhp
BSFC :	.465 lb/bhp-hr
Indicated Power :	20.96 kW/cyl
Peak Pressure :	8.817 MPa
Peak Rate of Pressure Rise:	1178. kPa/deg
Peak Heat Release Rate :	479.2 Joules/deg
Cumulative Heat Release :	3627.13 Joules
Apparent Combustion Efficiency :	66.8 %
Indicated Thermal Efficiency :	35.6 %
Brake Thermal Efficiency :	30.3 %
Ignition Delay :	5.7 degrees
Centroid Phasing :	188.4 degrees
Centroid Magnitude :	80.65 J/degree
Sensitivity :	21.6 degrees
Premixed/Diffusion Ratio :	.26517

980415.152830 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1043.4	.742	561.90	.412
K2-Exhaust 2, F	1069.4	.635	576.32	.353
K3-Exhaust 3, F	1065.4	1.021	574.13	.567
K4-Exhaust 4, F	1024.7	1.137	551.50	.632
K5-Exhaust 5, F	1093.1	1.126	589.48	.625
K6-Exhaust 6, F	1052.0	.455	566.65	.253
K7-Exhaust Common, F	1125.2	.718	607.33	.399
Dry Bulb Temperature, F	84.166	.118	28.981	.065
Wet Bulb Temperature, F	69.228	.025	20.682	.014
J1-Water In, F	158.62	.110	70.342	.061
J2-Water Out, F	169.50	.067	76.391	.037
J3-Oil Sump, F	208.61	.260	98.116	.145
J4-Fuel Inlet, F	89.611	.067	32.006	.037
J5-Air After Filter, F	98.829	.051	37.127	.028
J6-Intake Manifold, F	99.005	.069	37.225	.038
J7-Fuel Return, F	90.005	.159	32.225	.088
P1-Fuel, PSIG	70.432	.614	485.61	4.233
P2-Oil Gallery, PSIG	46.598	.048	321.28	.328
P6-Ex Common, "H2OG	11.832	.110	2.944	.027
P7-Air Aft Filt, "H2OV	3.397	.136	.845	.034
P8-Blowby, "H2OG	.026	.029	.007	.007
P11-Baro (Vent), "Hg ABS	28.975	.002	98.122	.007
Speed, RPM	1101.4	1.934	1101.4	1.934
Load, Lb-Ft	574.50	2.801	778.92	3.797
Smoke, %	29.838	1.726	29.838	1.726
Fuel Flow, Lb/Hr	55.571	.601	25.206	.273
Horsepower	120.48	.735	89.826	.548
Corrected Horsepower	126.69	.773	94.454	.576
BSFC, lb/hp-hr	.461	.006	.281	.004
Corrected BSFC	.439	.006	.267	.003
Relative Humidity	47.223	.272	47.223	.272
Reference Pressure, inHg	28.726		97.276	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1754

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.73 in-Hg
Speed :	1101 RPM
Load :	574.5 lb-ft
Fuel Flow :	55.6 lb/hr
Brake Power :	120.43 bhp
BSFC :	.462 lb/bhp-hr
Indicated Power :	17.47 kW/cyl
Peak Pressure :	8.933 MPa
Peak Rate of Pressure Rise:	1158. kPa/deg
Peak Heat Release Rate :	484.9 Joules/deg
Cumulative Heat Release :	3533.76 Joules
Apparent Combustion Efficiency :	66.2 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	30.6 %
Ignition Delay :	4.7 degrees
Centroid Phasing :	186.6 degrees
Centroid Magnitude :	81.47 J/degree
Sensitivity :	20.9 degrees
Premixed/Diffusion Ratio :	.22525

CUMMINS NH220 LOG SHEET

TEST NO. 6 FUEL BF@2U3TL-87 DATE 4-18-88 PAGE 70

Operator Greg							
Time	10:35	10:45	10:55	11:05	11:15		
Test Hour	30min	10min	10min	10min	10Min		
Speed, RPM	2100	1799	1499	1300	1101		
Load, lb–ft	494.1	539.1	570.9	574.9	535.6		
Fuel Flow, lb/hr	85.7	79.7	70.8	62.5	51.4		
Exh. Opacity, %	24.0	16.0	15.0	20.0	22.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1194	1190	1178	1138	1084		
Exhaust Cyl. 2	1298	1277	1242	1194	1100		
Exhaust Cyl. 3	1291	1281	1244	1182	1099		
Exhaust Cyl. 4	1246	1243	1201	1152	1070		
Exhaust Cyl. 5	1276	1290	1268	1223	1147		
Exhaust Cyl. 6	1189	1192	1163	1131	1067		
Exhaust Common	1304	1325	1313	1284	1194		
Water In	161	159	160	158	159		
Water Out	169	168	170	169	170		
Oil Sump	211	220	217	212	205		
Fuel	92	89	88	87	88		
Inlet Air	99	99	98	99	99		
Wet Bulb	60.7	61.3	62.0	63.1	63.0		
Dry Bulb	78.2	79.2	80.1	80.6	81.6		
PRESSURES, PSIG							
Fuel Pump	133.0	120.0	104.0	91.0	71.0		
Oil Gallery 59.5	~~60.9~~	56.1	53.5	50.8	45.9		
LOW PRESSURES							
Intake Vac, in.water	5.4	4.2	3.2	2.6	2.0		
Exh. Comm., in.Water	27.5	20.0	16.5	16.0	14.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	28.81	28.81	28.97	28.83	28.83		

880418.102922 AL-17355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1192.7	.516	644.84	.287
K2-Exhaust 2, F	1295.6	1.205	701.98	.669
K3-Exhaust 3, F	1288.9	1.194	698.29	.663
K4-Exhaust 4, F	1244.3	.535	673.50	.297
K5-Exhaust 5, F	1276.3	.532	691.27	.296
K6-Exhaust 6, F	1186.9	.397	641.59	.221
K7-Exhaust Common, F	1304.0	.254	706.66	.141
Dry Bulb Temperature, F	76.715	.045	24.842	.025
Wet Bulb Temperature, F	59.973	.024	15.541	.013
J1-Water In, F	162.44	.109	72.465	.061
J2-Water Out, F	169.43	.065	76.349	.036
J3-Oil Sump, F	210.65	.349	99.253	.194
J4-Fuel Inlet, F	92.669	.124	33.705	.069
J5-Air After Filter, F	98.926	.101	37.181	.056
J6-Intake Manifold, F	101.05	.103	38.361	.057
J7-Fuel Return, F	95.522	.075	35.290	.042
P1-Fuel, PSIG	131.14	1.763	904.18	12.158
P2-Oil Gallery, PSIG	58.917	.167	406.22	1.149
P6-Ex Common, "H2OG	24.122	.135	6.003	.034
P7-Air Aft Filt, "H2OV	9.292	.283	2.312	.070
P8-Blowby, "H2OG	-.024	.038	-.006	.009
P11-Baro (Vent), "Hg ABS	28.808	.003	97.554	.010
Speed, RPM	2100.2	3.806	2100.2	3.806
Load, Lb-Ft	491.62	2.842	666.54	3.853
Smoke, %	25.431	.470	25.431	.470
Fuel Flow, Lb/Hr	86.279	.384	39.135	.174
Horsepower	196.59	1.212	146.57	.904
Corrected Horsepower	206.38	1.272	153.87	.949
BSFC, lb/hp-hr	.439	.003	.267	.002
Corrected BSFC	.418	.003	.254	.002
Relative Humidity	36.877	.150	36.877	.150
Reference Pressure, inHg	28.124		95.239	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1756

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.12 in-Hg
Speed :	2100 RPM
Load :	491.6 lb-ft
Fuel Flow :	86.3 lb/hr
Brake Power :	196.57 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	30.95 kW/cyl
Peak Pressure :	7.246 MPa
Peak Rate of Pressure Rise:	525.9 kPa/deg
Peak Heat Release Rate :	185.6 Joules/deg
Cumulative Heat Release :	3518.02 Joules
Apparent Combustion Efficiency :	79.0 %
Indicated Thermal Efficiency :	39.7 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	5.2 degrees
Centroid Phasing :	195.7 degrees
Centroid Magnitude :	39.02 J/degree
Sensitivity :	29.5 degrees
Premixed/Diffusion Ratio :	.17518

880418.104207 AL-17355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1189.5	.574	643.08	.319
K2-Exhaust 2, F	1276.8	.789	691.56	.438
K3-Exhaust 3, F	1281.9	.556	694.36	.309
K4-Exhaust 4, F	1243.7	.676	673.17	.376
K5-Exhaust 5, F	1289.3	.344	698.52	.191
K6-Exhaust 6, F	1190.6	1.110	643.65	.616
K7-Exhaust Common, F	1325.1	.444	718.40	.247
Dry Bulb Temperature, F	76.936	.094	24.964	.052
Wet Bulb Temperature, F	60.203	.023	15.669	.013
J1-Water In, F	160.66	.150	71.477	.083
J2-Water Out, F	168.96	.085	76.087	.047
J3-Oil Sump, F	221.13	.138	105.07	.077
J4-Fuel Inlet, F	89.963	.130	32.201	.072
J5-Air After Filter, F	100.44	.084	38.020	.047
J6-Intake Manifold, F	102.54	.032	39.189	.018
J7-Fuel Return, F	91.044	.176	32.802	.098
P1-Fuel, PSIG	117.35	.962	809.13	6.636
P2-Oil Gallery, PSIG	55.720	.090	384.17	.623
P6-Ex Common, "H2OG	16.611	.157	4.133	.039
P7-Air Aft Filt, "H2OV	7.692	.474	1.914	.118
P8-Blowby, "H2OG	-.005	.031	-.001	.008
P11-Baro (Vent), "Hg ABS	28.817	.004	97.585	.012
Speed, RPM	1798.9	3.297	1798.9	3.297
Load, Lb-Ft	540.64	3.880	733.01	5.260
Smoke, %	16.669	.524	16.669	.524
Fuel Flow, Lb/Hr	79.648	.407	36.128	.185
Horsepower	185.19	1.623	138.07	1.210
Corrected Horsepower	194.64	1.706	145.11	1.272
BSFC, lb/hp-hr	.430	.005	.262	.003
Corrected BSFC	.409	.004	.249	.003
Relative Humidity	37.069	.185	37.069	.185
Reference Pressure, inHg	28.251		95.669	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1758

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.25 in-Hg
Speed :	1799 RPM
Load :	540.6 lb-ft
Fuel Flow :	79.6 lb/hr
Brake Power :	185.18 bhp
BSFC :	.430 lb/bhp-hr
Indicated Power :	27.52 kW/cyl
Peak Pressure :	7.797 MPa
Peak Rate of Pressure Rise:	619.9 kPa/deg
Peak Heat Release Rate :	229.6 Joules/deg
Cumulative Heat Release :	3581.61 Joules
Apparent Combustion Efficiency :	74.7 %
Indicated Thermal Efficiency :	38.3 %
Brake Thermal Efficiency :	32.0 %
Ignition Delay :	3.7 degrees
Centroid Phasing :	193.5 degrees
Centroid Magnitude :	40.18 J/degree
Sensitivity :	28.8 degrees
Premixed/Diffusion Ratio :	.12955

880418.105137 AL-17355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1176.2	.820	635.67	.456
K2-Exhaust 2, F	1245.4	.524	674.10	.291
K3-Exhaust 3, F	1245.9	.815	674.38	.453
K4-Exhaust 4, F	1200.3	.365	649.04	.203
K5-Exhaust 5, F	1268.6	1.099	686.98	.611
K6-Exhaust 6, F	1162.8	.647	628.23	.360
K7-Exhaust Common, F	1313.2	.333	711.80	.185
Dry Bulb Temperature, F	77.470	.224	25.261	.124
Wet Bulb Temperature, F	60.846	.041	16.026	.023
J1-Water In, F	160.76	.095	71.534	.053
J2-Water Out, F	170.37	.079	76.872	.044
J3-Oil Sump, F	218.08	.128	103.38	.071
J4-Fuel Inlet, F	88.600	.087	31.444	.048
J5-Air After Filter, F	99.223	.170	37.346	.095
J6-Intake Manifold, F	101.37	.207	38.539	.115
J7-Fuel Return, F	89.879	.079	32.155	.044
P1-Fuel, PSIG	101.53	.759	700.02	5.235
P2-Oil Gallery, PSIG	53.705	.179	370.28	1.233
P6-Ex Common, "H2OG	12.926	.099	3.216	.025
P7-Air Aft Filt, "H2OV	6.668	.191	1.659	.048
P8-Blowby, "H2OG	-.004	.017	-.001	.004
P11-Baro (Vent), "Hg ABS	28.822	.002	97.602	.007
Speed, RPM	1500.5	3.019	1500.5	3.019
Load, Lb-Ft	571.17	1.174	774.39	1.592
Smoke, %	16.964	1.810	16.964	1.810
Fuel Flow, Lb/Hr	70.478	.392	31.968	.178
Horsepower	163.18	.364	121.66	.271
Corrected Horsepower	171.37	.382	127.77	.285
BSFC, lb/hp-hr	.432	.003	.263	.002
Corrected BSFC	.411	.003	.250	.002
Relative Humidity	37.813	.443	37.813	.443
Reference Pressure, inHg	28.332		95.941	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1760

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.33 in-Hg
Speed :	1501 RPM
Load :	571.2 lb-ft
Fuel Flow :	70.5 lb/hr
Brake Power :	163.25 bhp
BSFC :	.432 lb/bhp-hr
Indicated Power :	24.20 kW/cyl
Peak Pressure :	8.489 MPa
Peak Rate of Pressure Rise:	752.5 kPa/deg
Peak Heat Release Rate :	296.3 Joules/deg
Cumulative Heat Release :	3704.58 Joules
Apparent Combustion Efficiency :	72.8 %
Indicated Thermal Efficiency :	38.0 %
Brake Thermal Efficiency :	31.9 %
Ignition Delay :	2.2 degrees
Centroid Phasing :	189.9 degrees
Centroid Magnitude :	47.30 J/degree
Sensitivity :	26.8 degrees
Premixed/Diffusion Ratio :	.08085

880418.110020 AL-17355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1138.7	1.594	614.85	.886
K2-Exhaust 2, F	1195.5	.686	646.38	.381
K3-Exhaust 3, F	1184.8	.439	640.43	.244
K4-Exhaust 4, F	1153.1	.731	622.82	.406
K5-Exhaust 5, F	1224.1	1.124	662.27	.624
K6-Exhaust 6, F	1132.5	.804	611.39	.447
K7-Exhaust Common, F	1285.7	.467	696.47	.259
Dry Bulb Temperature, F	77.388	.179	25.215	.099
Wet Bulb Temperature, F	60.402	.035	15.779	.020
J1-Water In, F	159.05	.172	70.586	.095
J2-Water Out, F	169.71	.100	76.504	.055
J3-Oil Sump, F	213.77	.249	100.98	.138
J4-Fuel Inlet, F	88.652	.054	31.474	.030
J5-Air After Filter, F	99.244	.070	37.358	.039
J6-Intake Manifold, F	101.04	.147	38.358	.082
J7-Fuel Return, F	89.340	.119	31.856	.066
P1-Fuel, PSIG	88.684	.474	611.46	3.271
P2-Oil Gallery, PSIG	51.113	.054	352.41	.375
P6-Ex Common, "H2OG	12.150	.099	3.023	.025
P7-Air Aft Filt, "H2OV	5.864	.289	1.459	.072
P8-Blowby, "H2OG	.003	.055	.001	.014
P11-Baro (Vent), "Hg ABS	28.829	.003	97.627	.011
Speed, RPM	1300.6	3.317	1300.6	3.317
Load, Lb-Ft	575.27	1.991	779.96	2.700
Smoke, %	21.085	.826	21.085	.826
Fuel Flow, Lb/Hr	64.282	.995	29.158	.451
Horsepower	142.46	.609	106.22	.454
Corrected Horsepower	149.51	.639	111.47	.477
BSFC, lb/hp-hr	.451	.008	.275	.005
Corrected BSFC	.430	.007	.262	.004
Relative Humidity	36.617	.328	36.617	.328
Reference Pressure, inHg	28.398		96.166	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1762

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.40 in-Hg
Speed :	1301 RPM
Load :	575.3 lb-ft
Fuel Flow :	64.3 lb/hr
Brake Power :	142.51 bhp
BSFC :	.451 lb/bhp-hr
Indicated Power :	21.18 kW/cyl
Peak Pressure :	8.862 MPa
Peak Rate of Pressure Rise:	802.8 kPa/deg
Peak Heat Release Rate :	328.1 Joules/deg
Cumulative Heat Release :	3672.03 Joules
Apparent Combustion Efficiency :	68.5 %
Indicated Thermal Efficiency :	36.5 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	1.8 degrees
Centroid Phasing :	187.2 degrees
Centroid Magnitude :	52.19 J/degree
Sensitivity :	24.5 degrees
Premixed/Diffusion Ratio :	.07157

880418.111010 AL-17355-F AL-12920-L NH220				6
K1-Exhaust 1, F	1083.0	.899	583.87	.500
K2-Exhaust 2, F	1104.2	1.076	595.69	.598
K3-Exhaust 3, F	1102.5	1.095	594.73	.608
K4-Exhaust 4, F	1069.7	.539	576.52	.300
K5-Exhaust 5, F	1147.7	.483	619.81	.269
K6-Exhaust 6, F	1065.6	.596	574.25	.331
K7-Exhaust Common, F	1197.2	1.052	647.35	.585
Dry Bulb Temperature, F	79.089	.220	26.161	.122
Wet Bulb Temperature, F	62.158	.130	16.754	.072
J1-Water In, F	159.47	.096	70.818	.053
J2-Water Out, F	170.29	.072	76.830	.040
J3-Oil Sump, F	206.33	.100	96.851	.056
J4-Fuel Inlet, F	89.417	.046	31.898	.026
J5-Air After Filter, F	99.379	.034	37.433	.019
J6-Intake Manifold, F	101.56	.059	38.645	.033
J7-Fuel Return, F	89.922	.062	32.179	.034
P1-Fuel, PSIG	69.160	.362	476.84	2.496
P2-Oil Gallery, PSIG	46.175	.072	318.36	.497
P6-Ex Common, "H2OG	10.057	.098	2.503	.024
P7-Air Aft Filt, "H2OV	5.226	.157	1.300	.039
P8-Blowby, "H2OG	.026	.020	.006	.005
P11-Baro (Vent), "Hg ABS	28.831	.001	97.632	.005
Speed, RPM	1101.4	3.434	1101.4	3.434
Load, Lb-Ft	553.99	2.497	751.11	3.386
Smoke, %	22.801	.838	22.801	.838
Fuel Flow, Lb/Hr	52.106	.520	23.635	.236
Horsepower	116.18	.795	86.618	.593
Corrected Horsepower	122.08	.836	91.021	.623
BSFC, lb/hp-hr	.449	.005	.273	.003
Corrected BSFC	.427	.005	.260	.003
Relative Humidity	38.049	.667	38.049	.667
Reference Pressure, inHg	28.446		96.330	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CM1764

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.45 in-Hg
Speed :	1101 RPM
Load :	554.0 lb-ft
Fuel Flow :	52.1 lb/hr
Brake Power :	116.14 bhp
BSFC :	.449 lb/bhp-hr
Indicated Power :	17.23 kW/cyl
Peak Pressure :	8.834 MPa
Peak Rate of Pressure Rise:	757.6 kPa/deg
Peak Heat Release Rate :	312.7 Joules/deg
Cumulative Heat Release :	3537.60 Joules
Apparent Combustion Efficiency :	69.0 %
Indicated Thermal Efficiency :	36.6 %
Brake Thermal Efficiency :	30.7 %
Ignition Delay :	1.4 degrees
Centroid Phasing :	187.4 degrees
Centroid Magnitude :	50.08 J/degree
Sensitivity :	25.0 degrees
Premixed/Diffusion Ratio :	.05555

CUMMINS NH220 LOG SHEET

TEST NO. 6 FUEL TF02N21L87 DATE 4-18-88 PAGE 71

Operator Greg							
Time	11:45	11:55	12:05	12:15	12:25	12:32	12:47
Test Hour	30 min	10 min	10 min	10 min	10 min	7 min	15 min
Speed, RPM	2100	1800	1800	1801	1800	1800	1499
Load, lb–ft	513.1	555.2	369.7	272.3	133.5	46.8	572.6
Fuel Flow, lb/hr	95.0	84.7	51.9	40.5	24.1	15.0	76.7
Exh. Opacity, %	30.0	25.0	6.0	5.0	3.0	0	28.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1182	1167	813	694	487	356	1139
Exhaust Cyl. 2	1289	1258	960	781	560	396	1208
Exhaust Cyl. 3	1293	1260	902	771	548	408	1199
Exhaust Cyl. 4	1244	1226	863	728	511	392	1168
Exhaust Cyl. 5	1272	1265	858	717	510	385	1233
Exhaust Cyl. 6	1201	1192	821	655	470	337	1162
Exhaust Common	1306	1309	869	714	504	377	1291
Water In	162	161	163	164	167	168	160
Water Out	170	170	168	168	169	170	170
Oil Sump	219	223	220	215	210	208	208
Fuel	93	92	89	88	88	87	90
Inlet Air	99	99	98	102	99	99	102
Wet Bulb	62.7	63.1	63.1	63.7	63.9	63.3	63.5
Dry Bulb	82.2	83.0	83.0	84.0	84.0	83.5	83.7
PRESSURES, PSIG							
Fuel Pump	136.0	121.0	57.0	42.0	24.0	15.0	105.0
Oil Gallery	58.8	56.4	55.8	57.1	58.0	58.3	36.1
LOW PRESSURES							
Intake Vac, in.water	5.5	4.3	4.6	4.7	4.9	5.0	3.5
Exh. Comm., in.Water	27.0	19.5	16.0	14.0	12.0	9.5	16.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	28.83	28.83	28.83	28.83	28.83	28.83	28.77

CUMMINS NH220 LOG SHEET

TEST NO. 6 FUEL TF02N2/L57 DATE 4-18-88 PAGE 72

Operator Greg							
Time	12:55	1:05					
Test Hour	0 min	10 min					
Speed, RPM	1300	1100					
Load, lb–ft	577.7	563.1					
Fuel Flow, lb/hr	65.3	55.0					
Exh. Opacity, %	37.0	28.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1093	1049					
Exhaust Cyl. 2	1149	1072					
Exhaust Cyl. 3	1142	1068					
Exhaust Cyl. 4	1117	1036					
Exhaust Cyl. 5	1183	1105					
Exhaust Cyl. 6	1120	1063					
Exhaust Common	1233	1138					
Water In	159	158					
Water Out	170	170					
Oil Sump	208	205					
Fuel	91	90					
Inlet Air	102	102					
Wet Bulb	64.5	64.0					
Dry Bulb	84.6	83.9					
PRESSURES, PSIG							
Fuel Pump	92.0	73.0					
Oil Gallery	52.2	45.9					
LOW PRESSURES							
Intake Vac, in.water	2.8	2.2					
Exh. Comm., in.Water	14.5	13.0					
Blowby, in.water	0	0					
Barometer, in.Hg	28.82	28.81					

880418.114000 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1182.8	.434	639.32	.241
K2-Exhaust 2, F	1280.4	.443	698.01	.246
K3-Exhaust 3, F	1292.1	.485	700.07	.269
K4-Exhaust 4, F	1240.4	.524	671.35	.291
K5-Exhaust 5, F	1269.5	.753	687.52	.418
K6-Exhaust 6, F	1198.2	.678	647.88	.377
K7-Exhaust Common, F	1304.5	.538	706.96	.299
Dry Bulb Temperature, F	79.601	.496	26.445	.275
Wet Bulb Temperature, F	62.065	.122	16.703	.068
J1-Water In, F	162.40	.098	72.444	.054
J2-Water Out, F	169.87	.052	76.596	.029
J3-Oil Sump, F	218.82	.624	103.79	.347
J4-Fuel Inlet, F	93.701	.024	34.278	.013
J5-Air After Filter, F	99.687	.064	37.604	.035
J6-Intake Manifold, F	100.92	.045	38.287	.025
J7-Fuel Return, F	95.688	.095	35.382	.053
P1-Fuel, PSIG	134.88	1.549	930.00	10.682
P2-Oil Gallery, PSIG	57.483	.087	396.33	.601
P6-Ex Common, "H2OG	24.629	.105	6.129	.026
P7-Air Aft Filt, "H2OV	8.844	.331	2.201	.082
P8-Blowby, "H2OG	.018	.035	.005	.009
P11-Baro (Vent), "Hg ABS	28.832	.004	97.636	.013
Speed, RPM	2100.2	2.940	2100.2	2.940
Load, Lb-Ft	514.03	3.184	696.93	4.317
Smoke, %	30.267	.749	30.267	.749
Fuel Flow, Lb/Hr	94.312	.629	42.779	.285
Horsepower	205.55	1.003	153.25	.748
Corrected Horsepower	215.98	1.054	161.03	.786
BSFC, lb/hp-hr	.459	.004	.279	.002
Corrected BSFC	.437	.004	.266	.002
Relative Humidity	36.603	.820	36.603	.820
Reference Pressure, inHg	28.182		95.433	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1766

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.18 in-Hg
Speed :	2100 RPM
Load :	514.0 lb-ft
Fuel Flow :	94.3 lb/hr
Brake Power :	205.52 bhp
BSFC :	.459 lb/bhp-hr
Indicated Power :	31.73 kW/cyl
Peak Pressure :	7.362 MPa
Peak Rate of Pressure Rise:	759.8 kPa/deg
Peak Heat Release Rate :	298.1 Joules/deg
Cumulative Heat Release :	3595.08 Joules
Apparent Combustion Efficiency :	75.7 %
Indicated Thermal Efficiency :	38.2 %
Brake Thermal Efficiency :	30.7 %
Ignition Delay :	7.4 degrees
Centroid Phasing :	196.1 degrees
Centroid Magnitude :	59.85 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.26877

880418.115125 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1168.4	.572	631.32	.318
K2-Exhaust 2, F	1258.9	.352	681.63	.196
K3-Exhaust 3, F	1258.5	.495	681.41	.275
K4-Exhaust 4, F	1225.3	.540	662.94	.300
K5-Exhaust 5, F	1266.5	.540	685.81	.300
K6-Exhaust 6, F	1189.1	1.251	642.82	.695
K7-Exhaust Common, F	1310.2	.480	710.12	.266
Dry Bulb Temperature, F	79.147	.037	26.193	.020
Wet Bulb Temperature, F	61.556	.045	16.420	.025
J1-Water In, F	161.66	.196	72.035	.109
J2-Water Out, F	170.28	.073	76.821	.040
J3-Oil Sump, F	225.26	.137	107.37	.076
J4-Fuel Inlet, F	92.364	.029	33.536	.016
J5-Air After Filter, F	100.10	.084	37.831	.047
J6-Intake Manifold, F	100.90	.070	38.279	.039
J7-Fuel Return, F	94.073	.025	34.485	.014
P1-Fuel, PSIG	119.22	.890	822.01	6.134
P2-Oil Gallery, PSIG	55.131	.064	380.12	.439
P6-Ex Common, "H2OG	16.813	.128	4.184	.032
P7-Air Aft Filt, "H2OV	7.624	.327	1.897	.081
P8-Blowby, "H2OG	.010	.032	.003	.008
P11-Baro (Vent), "Hg ABS	28.834	.005	97.644	.015
Speed, RPM	1802.3	3.314	1802.3	3.314
Load, Lb-Ft	556.85	3.091	754.99	4.191
Smoke, %	25.433	1.485	25.433	1.485
Fuel Flow, Lb/Hr	85.248	.791	38.668	.359
Horsepower	191.09	1.266	142.47	.944
Corrected Horsepower	200.78	1.330	149.69	.991
BSFC, lb/hp-hr	.446	.005	.271	.003
Corrected BSFC	.425	.005	.258	.003
Relative Humidity	36.094	.182	36.094	.182
Reference Pressure, inHg	28.273		95.745	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1768

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.27 in-Hg
Speed :	1802 RPM
Load :	556.9 lb-ft
Fuel Flow :	85.2 lb/hr
Brake Power :	191.08 bhp
BSFC :	.446 lb/bhp-hr
Indicated Power :	28.29 kW/cyl
Peak Pressure :	7.929 MPa
Peak Rate of Pressure Rise:	929.9 kPa/deg
Peak Heat Release Rate :	366.3 Joules/deg
Cumulative Heat Release :	3626.89 Joules
Apparent Combustion Efficiency :	72.5 %
Indicated Thermal Efficiency :	37.7 %
Brake Thermal Efficiency :	31.6 %
Ignition Delay :	7.3 degrees
Centroid Phasing :	193.1 degrees
Centroid Magnitude :	61.84 J/degree
Sensitivity :	24.9 degrees
Premixed/Diffusion Ratio :	.29209

880418.120116 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	815.07	1.796	435.04	.998
K2-Exhaust 2, F	917.83	22.421	492.13	12.456
K3-Exhaust 3, F	904.71	1.666	484.84	.926
K4-Exhaust 4, F	866.43	1.878	463.57	1.044
K5-Exhaust 5, F	860.56	1.962	460.31	1.090
K6-Exhaust 6, F	824.50	2.330	440.28	1.295
K7-Exhaust Common, F	872.40	1.981	466.89	1.101
Dry Bulb Temperature, F	79.560	.058	26.422	.032
Wet Bulb Temperature, F	61.498	.051	16.388	.029
J1-Water In, F	163.47	.099	73.038	.055
J2-Water Out, F	168.16	.098	75.645	.055
J3-Oil Sump, F	221.11	.151	105.06	.084
J4-Fuel Inlet, F	89.547	.159	31.971	.088
J5-Air After Filter, F	98.483	.044	36.935	.024
J6-Intake Manifold, F	99.172	.046	37.318	.026
J7-Fuel Return, F	89.188	.181	31.771	.101
P1-Fuel, PSIG	55.257	.408	380.98	2.816
P2-Oil Gallery, PSIG	56.056	.082	386.49	.566
P6-Ex Common, "H2OG	12.435	.094	3.094	.023
P7-Air Aft Filt, "H2OV	8.076	.306	2.010	.076
P8-Blowby, "H2OG	.024	.049	.006	.012
P11-Baro (Vent), "Hg ABS	28.830	.003	97.629	.010
Speed, RPM	1802.1	3.758	1802.1	3.758
Load, Lb-Ft	366.00	4.102	496.23	5.562
Smoke, %	7.111	.101	7.111	.101
Fuel Flow, Lb/Hr	52.092	.665	23.628	.302
Horsepower	125.59	1.548	93.636	1.154
Corrected Horsepower	131.76	1.624	98.233	1.211
BSFC, lb/hp-hr	.415	.006	.252	.003
Corrected BSFC	.395	.005	.241	.003
Relative Humidity	35.002	.171	35.002	.171
Reference Pressure, inHg	28.236		95.618	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1770

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.24 in-Hg
Speed :	1802 RPM
Load :	366.0 lb-ft
Fuel Flow :	52.1 lb/hr
Brake Power :	125.58 bhp
BSFC :	.415 lb/bhp-hr
Indicated Power :	18.99 kW/cyl
Peak Pressure :	6.153 MPa
Peak Rate of Pressure Rise:	489.7 kPa/deg
Peak Heat Release Rate :	200.3 Joules/deg
Cumulative Heat Release :	2434.16 Joules
Apparent Combustion Efficiency :	79.6 %
Indicated Thermal Efficiency :	41.4 %
Brake Thermal Efficiency :	34.0 %
Ignition Delay :	12.7 degrees
Centroid Phasing :	194.5 degrees
Centroid Magnitude :	40.19 J/degree
Sensitivity :	20.8 degrees
Premixed/Diffusion Ratio :	.61084

880418.121100 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	682.52	1.023	361.40	.569
K2-Exhaust 2, F	779.49	.909	415.27	.505
K3-Exhaust 3, F	770.07	1.160	410.04	.645
K4-Exhaust 4, F	726.81	.472	386.00	.262
K5-Exhaust 5, F	713.20	.851	378.44	.473
K6-Exhaust 6, F	653.80	.726	345.44	.403
K7-Exhaust Common, F	713.95	.470	378.86	.261
Dry Bulb Temperature, F	80.878	.055	27.155	.030
Wet Bulb Temperature, F	62.191	.020	16.773	.011
J1-Water In, F	164.72	.087	73.734	.048
J2-Water Out, F	168.04	.037	75.578	.021
J3-Oil Sump, F	216.33	.111	102.41	.062
J4-Fuel Inlet, F	88.891	.047	31.606	.026
J5-Air After Filter, F	102.14	.083	38.966	.046
J6-Intake Manifold, F	104.68	.049	40.379	.027
J7-Fuel Return, F	88.407	.117	31.337	.065
P1-Fuel, PSIG	38.944	.154	268.51	1.063
P2-Oil Gallery, PSIG	57.322	.092	395.22	.636
P6-Ex Common, "H2OG	11.049	.106	2.749	.026
P7-Air Aft Filt, "H2OV	7.937	.443	1.975	.110
P8-Blowby, "H2OG	-.003	.035	-.001	.009
P11-Baro (Vent), "Hg ABS	28.829	.003	97.626	.009
Speed, RPM	1801.4	3.169	1801.4	3.169
Load, Lb-Ft	272.61	4.164	369.60	5.646
Smoke, %	6.506	1.434	6.506	1.434
Fuel Flow, Lb/Hr	41.622	1.421	18.879	.644
Horsepower	93.503	1.546	69.714	1.153
Corrected Horsepower	98.441	1.628	73.395	1.214
BSFC, lb/hp-hr	.445	.016	.271	.010
Corrected BSFC	.423	.015	.257	.009
Relative Humidity	34.170	.140	34.170	.140
Reference Pressure, inHg	28.245		95.649	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1772

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.25 in-Hg
Speed :	1801 RPM
Load :	272.6 lb-ft
Fuel Flow :	41.6 lb/hr
Brake Power :	93.48 bhp
BSFC :	.445 lb/bhp-hr
Indicated Power :	14.64 kW/cyl
Peak Pressure :	5.596 MPa
Peak Rate of Pressure Rise:	343.3 kPa/deg
Peak Heat Release Rate :	153.0 Joules/deg
Cumulative Heat Release :	1879.51 Joules
Apparent Combustion Efficiency :	77.0 %
Indicated Thermal Efficiency :	39.9 %
Brake Thermal Efficiency :	31.7 %
Ignition Delay :	14.6 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	35.54 J/degree
Sensitivity :	19.1 degrees
Premixed/Diffusion Ratio :	.76466

980418.122112 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	487.46	.587	253.03	.326
K2-Exhaust 2, F	559.30	.298	292.95	.166
K3-Exhaust 3, F	546.81	.376	286.01	.209
K4-Exhaust 4, F	513.60	.815	267.56	.453
K5-Exhaust 5, F	510.42	.461	265.79	.256
K6-Exhaust 6, F	469.62	.508	243.12	.282
K7-Exhaust Common, F	505.66	.615	263.14	.342
Dry Bulb Temperature, F	81.153	.070	27.307	.039
Wet Bulb Temperature, F	62.314	.058	16.841	.032
J1-Water In, F	167.07	.055	75.041	.030
J2-Water Out, F	168.73	.061	75.960	.034
J3-Oil Sump, F	210.27	.181	99.037	.101
J4-Fuel Inlet, F	88.710	.023	31.506	.013
J5-Air After Filter, F	99.346	.126	37.415	.070
J6-Intake Manifold, F	100.77	.111	38.204	.061
J7-Fuel Return, F	86.939	.091	30.522	.051
P1-Fuel, PSIG	20.458	.089	141.05	.611
P2-Oil Gallery, PSIG	58.048	.035	400.23	.242
P6-Ex Common, "H2OG	8.062	.051	2.006	.013
P7-Air Aft Filt, "H2OV	8.250	.418	2.053	.104
P8-Blowby, "H2OG	.017	.038	.004	.009
P11-Baro (Vent), "Hg ABS	28.829	.004	97.626	.014
Speed, RPM	1801.1	2.897	1801.1	2.897
Load, Lb-Ft	130.27	3.540	176.62	4.800
Smoke, %	3.199	.139	3.199	.139
Fuel Flow, Lb/Hr	24.354	.254	11.047	.115
Horsepower	44.673	1.250	33.308	.932
Corrected Horsepower	46.917	1.312	34.980	.978
BSFC, lb/hp-hr	.546	.015	.332	.009
Corrected BSFC	.519	.015	.316	.009
Relative Humidity	33.942	.128	33.942	.128
Reference Pressure, inHg	28.222		95.571	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1774

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.22 in-Hg
Speed :	1801 RPM
Load :	130.3 lb-ft
Fuel Flow :	24.4 lb/hr
Brake Power :	44.68 bhp
BSFC :	.546 lb/bhp-hr
Indicated Power :	8.42 kW/cyl
Peak Pressure :	4.727 MPa
Peak Rate of Pressure Rise:	202.0 kPa/deg
Peak Heat Release Rate :	114.3 Joules/deg
Cumulative Heat Release :	1129.70 Joules
Apparent Combustion Efficiency :	78.9 %
Indicated Thermal Efficiency :	39.2 %
Brake Thermal Efficiency :	25.8 %
Ignition Delay :	17.0 degrees
Centroid Phasing :	195.4 degrees
Centroid Magnitude :	29.04 J/degree
Sensitivity :	17.4 degrees
Premixed/Diffusion Ratio :	.97904

880418.122924 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	357.17	.902	180.65	.501
K2-Exhaust 2, F	399.50	.492	204.16	.274
K3-Exhaust 3, F	411.75	.493	210.97	.274
K4-Exhaust 4, F	395.27	1.201	201.82	.667
K5-Exhaust 5, F	387.28	.957	197.38	.532
K6-Exhaust 6, F	337.40	.827	169.67	.459
K7-Exhaust Common, F	380.75	1.150	193.75	.639
Dry Bulb Temperature, F	81.007	.146	27.226	.081
Wet Bulb Temperature, F	62.275	.112	16.819	.062
J1-Water In, F	168.71	.151	75.952	.084
J2-Water Out, F	169.44	.122	76.358	.068
J3-Oil Sump, F	207.85	.108	97.694	.060
J4-Fuel Inlet, F	87.935	.093	31.075	.052
J5-Air After Filter, F	98.651	.028	37.028	.016
J6-Intake Manifold, F	100.48	.036	38.044	.020
J7-Fuel Return, F	84.640	.119	29.245	.066
P1-Fuel, PSIG	10.959	.059	75.560	.406
P2-Oil Gallery, PSIG	58.508	.027	403.40	.186
P6-Ex Common, "H2OG	5.794	.058	1.442	.014
P7-Air Aft Filt, "H2OV	8.237	.387	2.050	.096
P8-Blowby, "H2OG	-.013	.035	-.003	.009
P11-Baro (Vent), "Hg ABS	28.826	.004	97.617	.015
Speed, RPM	1800.2	3.472	1800.2	3.472
Load, Lb-Ft	48.024	3.092	65.111	4.192
Smoke, %	.184	.051	.184	.051
Fuel Flow, Lb/Hr	15.112	.135	6.855	.061
Horsepower	16.460	1.039	12.272	.774
Corrected Horsepower	17.278	1.090	12.882	.813
BSFC, lb/hp-hr	.921	.056	.560	.034
Corrected BSFC	.878	.054	.534	.033
Relative Humidity	34.139	.220	34.139	.220
Reference Pressure, inHg	28.220		95.565	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1776

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.22 in-Hg
Speed :	1800 RPM
Load :	48.0 lb-ft
Fuel Flow :	15.1 lb/hr
Brake Power :	16.46 bhp
BSFC :	.918 lb/bhp-hr
Indicated Power :	4.52 kW/cyl
Peak Pressure :	4.130 MPa
Peak Rate of Pressure Rise:	105.2 kPa/deg
Peak Heat Release Rate :	74.8 Joules/deg
Cumulative Heat Release :	672.704 Joules
Apparent Combustion Efficiency :	75.8 %
Indicated Thermal Efficiency :	34.0 %
Brake Thermal Efficiency :	15.4 %
Ignition Delay :	17.5 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	19.91 J/degree
Sensitivity :	16.5 degrees
Premixed/Diffusion Ratio :	1.05966

880418.124611 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1137.9	1.211	614.38	.673
K2-Exhaust 2, F	1209.9	1.347	654.38	.748
K3-Exhaust 3, F	1198.4	1.690	647.99	.939
K4-Exhaust 4, F	1167.0	.685	630.53	.380
K5-Exhaust 5, F	1234.3	1.755	667.92	.975
K6-Exhaust 6, F	1158.5	.507	625.85	.282
K7-Exhaust Common, F	1291.0	.650	699.47	.361
Dry Bulb Temperature, F	81.217	.077	27.343	.043
Wet Bulb Temperature, F	62.279	.093	16.822	.052
J1-Water In, F	159.91	.056	71.062	.031
J2-Water Out, F	169.39	.057	76.328	.032
J3-Oil Sump, F	208.91	.099	98.282	.055
J4-Fuel Inlet, F	90.494	.134	32.496	.074
J5-Air After Filter, F	102.34	.066	39.076	.037
J6-Intake Manifold, F	104.39	.048	40.216	.027
J7-Fuel Return, F	90.245	.046	32.358	.026
P1-Fuel, PSIG	101.94	1.500	702.84	10.339
P2-Oil Gallery, PSIG	55.678	.022	383.89	.151
P6-Ex Common, "H2OG	12.758	.092	3.175	.023
P7-Air Aft Filt, "H2OV	6.770	.200	1.685	.050
P8-Blowby, "H2OG	.009	.025	.002	.006
P11-Baro (Vent), "Hg ABS	28.818	.003	97.589	.009
Speed, RPM	1501.1	3.235	1501.1	3.235
Load, Lb-Ft	573.41	2.369	777.44	3.212
Smoke, %	28.858	2.056	28.858	2.056
Fuel Flow, Lb/Hr	75.984	.780	34.466	.354
Horsepower	163.89	.965	122.19	.720
Corrected Horsepower	172.64	1.017	128.71	.758
BSFC, lb/hp-hr	.464	.004	.282	.003
Corrected BSFC	.440	.004	.268	.003
Relative Humidity	33.716	.239	33.716	.239
Reference Pressure, inHg	28.320		95.903	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1778

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.32 in-Hg
Speed :	1501 RPM
Load :	573.4 lb-ft
Fuel Flow :	76.0 lb/hr
Brake Power :	163.88 bhp
BSFC :	.464 lb/bhp-hr
Indicated Power :	24.42 kW/cyl
Peak Pressure :	8.509 MPa
Peak Rate of Pressure Rise:	1107. kPa/deg
Peak Heat Release Rate :	443.8 Joules/deg
Cumulative Heat Release :	3702.81 Joules
Apparent Combustion Efficiency :	69.2 %
Indicated Thermal Efficiency :	36.5 %
Brake Thermal Efficiency :	30.4 %
Ignition Delay :	6.6 degrees
Centroid Phasing :	190.4 degrees
Centroid Magnitude :	71.24 J/degree
Sensitivity :	22.9 degrees
Premixed/Diffusion Ratio :	.28689

880418.125512 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1094.6	1.533	590.34	.852
K2-Exhaust 2, F	1149.0	.688	620.56	.382
K3-Exhaust 3, F	1138.3	1.031	614.63	.573
K4-Exhaust 4, F	1115.8	.949	602.12	.527
K5-Exhaust 5, F	1180.2	1.038	637.91	.576
K6-Exhaust 6, F	1120.4	.770	604.68	.428
K7-Exhaust Common, F	1232.4	1.615	666.88	.897
Dry Bulb Temperature, F	82.245	.267	27.914	.148
Wet Bulb Temperature, F	62.979	.036	17.211	.020
J1-Water In, F	159.50	.116	70.833	.065
J2-Water Out, F	170.09	.082	76.715	.045
J3-Oil Sump, F	208.08	.144	97.820	.080
J4-Fuel Inlet, F	91.228	.044	32.904	.024
J5-Air After Filter, F	102.64	.033	39.245	.018
J6-Intake Manifold, F	104.42	.088	40.234	.049
J7-Fuel Return, F	92.036	.071	33.353	.039
P1-Fuel, PSIG	89.487	.722	616.99	4.979
P2-Oil Gallery, PSIG	52.185	.019	359.80	.134
P6-Ex Common, "H2OG	11.294	.088	2.810	.022
P7-Air Aft Filt, "H2OV	6.223	.270	1.549	.067
P8-Blowby, "H2OG	.020	.046	.005	.011
P11-Baro (Vent), "Hg ABS	28.814	.003	97.574	.010
Speed, RPM	1299.8	2.416	1299.8	2.416
Load, Lb-Ft	574.59	2.467	779.04	3.344
Smoke, %	34.887	2.031	34.887	2.031
Fuel Flow, Lb/Hr	66.395	.830	30.116	.377
Horsepower	142.21	.654	106.03	.488
Corrected Horsepower	149.92	.689	111.77	.514
BSFC, lb/hp-hr	.467	.006	.284	.004
Corrected BSFC	.443	.006	.269	.004
Relative Humidity	33.561	.556	33.561	.556
Reference Pressure, inHg	28.356		96.024	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1780

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.36 in-Hg
Speed :	1300 RPM
Load :	574.6 lb-ft
Fuel Flow :	66.4 lb/hr
Brake Power :	142.23 bhp
BSFC :	.467 lb/bhp-hr
Indicated Power :	20.93 kW/cyl
Peak Pressure :	8.797 MPa
Peak Rate of Pressure Rise:	1178. kPa/deg
Peak Heat Release Rate :	487.6 Joules/deg
Cumulative Heat Release :	3600.23 Joules
Apparent Combustion Efficiency :	66.7 %
Indicated Thermal Efficiency :	35.8 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	5.7 degrees
Centroid Phasing :	187.5 degrees
Centroid Magnitude :	81.55 J/degree
Sensitivity :	20.8 degrees
Premixed/Diffusion Ratio :	.27655

880418.130343 AL-16088-F AL-12920-L NH220				6
K1-Exhaust 1, F	1047.3	.699	564.08	.388
K2-Exhaust 2, F	1072.6	.619	578.11	.344
K3-Exhaust 3, F	1068.6	.953	575.92	.530
K4-Exhaust 4, F	1036.9	.811	558.26	.451
K5-Exhaust 5, F	1105.8	.627	596.57	.348
K6-Exhaust 6, F	1063.0	.275	572.78	.153
K7-Exhaust Common, F	1140.3	.443	615.74	.246
Dry Bulb Temperature, F	82.511	.105	28.062	.058
Wet Bulb Temperature, F	63.008	.042	17.226	.024
J1-Water In, F	158.54	.095	70.298	.053
J2-Water Out, F	169.70	.064	76.500	.036
J3-Oil Sump, F	205.81	.140	96.559	.078
J4-Fuel Inlet, F	90.214	.092	32.341	.051
J5-Air After Filter, F	101.90	.027	38.836	.015
J6-Intake Manifold, F	103.55	.046	39.751	.026
J7-Fuel Return, F	91.082	.084	32.823	.047
P1-Fuel, PSIG	70.639	.694	487.04	4.786
P2-Oil Gallery, PSIG	46.234	.069	318.77	.479
P6-Ex Common, "H2OG	9.584	.060	2.385	.015
P7-Air Aft Filt, "H2OV	5.447	.147	1.356	.037
P8-Blowby, "H2OG	.013	.031	.003	.008
P11-Baro (Vent), "Hg ABS	28.813	.002	97.571	.007
Speed, RPM	1098.6	.923	1098.6	.923
Load, Lb-Ft	562.15	2.766	762.16	3.750
Smoke, %	26.083	1.303	26.083	1.303
Fuel Flow, Lb/Hr	55.162	.663	25.021	.301
Horsepower	117.59	.552	87.674	.411
Corrected Horsepower	123.88	.581	92.362	.433
BSFC, lb/hp-hr	.469	.007	.285	.004
Corrected BSFC	.445	.006	.271	.004
Relative Humidity	33.094	.255	33.094	.255
Reference Pressure, inHg	28.412		96.215	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1782

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.41 in-Hg
Speed :	1099 RPM
Load :	562.2 lb-ft
Fuel Flow :	55.2 lb/hr
Brake Power :	117.64 bhp
BSFC :	.469 lb/bhp-hr
Indicated Power :	17.45 kW/cyl
Peak Pressure :	8.926 MPa
Peak Rate of Pressure Rise:	1145. kPa/deg
Peak Heat Release Rate :	477.8 Joules/deg
Cumulative Heat Release :	3509.28 Joules
Apparent Combustion Efficiency :	66.1 %
Indicated Thermal Efficiency :	35.9 %
Brake Thermal Efficiency :	30.1 %
Ignition Delay :	4.9 degrees
Centroid Phasing :	186.2 degrees
Centroid Magnitude :	81.19 J/degree
Sensitivity :	20.3 degrees
Premixed/Diffusion Ratio :	.24043

APPENDIX G7
CUMMINS NH-220G DATA SHEETS
TEST FUEL TF08

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: Cummins NH220G Engine Tester: G. Phillips
Test Fuel: TF08N19087 Date: 4-20-88

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressur
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF08N19087 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressur
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF08N19087 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF08N19U87 Date: 4-20-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	389	CN1783	CN1784
1800	390	CN1785	CN1786
1500	391	CN1787	CN1788
1300	392	CN1789	CN1790
1100	393	CN1791	CN1792

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF08N19U87

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	394	CN1793	CN1794
1800	Full-Rack	395	CN1795	CN1796
1800	133	396	CN1797	CN1798
1800	98	397	CN1799	CN1800
1800	48	398	CN1801	CN1802
1800	13	399	CN1803	CN1804
1500	Full-Rack	400	CN1805	CN1806
1300	Full-Rack	401	CN1807	CN1808
1100	Full-Rack	402	CN1809	CN1810

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF08N19087 Date: 4-20-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	403	CN1811	CN1812
1800	404	CN1813	CN1814
1500	405	CN1815	CN1816
1300	406	CN1817	CN1818
1100	407	CN1819	CN1820

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF08N19087

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	408	CN1821	CN1822
1800	Full-Rack	409	CN1823	CN1824
1800	133	410	CN1825	CN1826
1800	98	411	CN1827	CN1828
1800	48	412	CN1829	CN1830
1800	13	413	CN1831	CN1832
1500	Full-Rack	414	CN1833	CN1834
1300	Full-Rack	415	CN1835	CN1836
1100	Full-Rack	416	CN1837	CN1838

CUMMINS NH220 LOG SHEET

TEST NO. 7 FUEL BF02V31L87 DATE 4-20-87 PAGE 73

Operator JR & D							
Time	9:00	9:15	9:25	9:35	9:45		
Test Hour	45min	15min	10min	10min	10min		
Speed, RPM	2100	1801	1500	1300	1100		
Load, lb–ft	487.9	533.7	572.8	580.0	563.7		
Fuel Flow, lb/hr	87.4	80.0	71.6	63.6	52.8		
Exh. Opacity, %	22.0	17.0	16.5	22.5	18.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1193	1189	1175	1146	1082		
Exhaust Cyl. 2	1292	1285	1237	1187	1092		
Exhaust Cyl. 3	1290	1278	1238	1179	1096		
Exhaust Cyl. 4	1244	1241	1198	1151	1070		
Exhaust Cyl. 5	1271	1282	1261	1217	1134		
Exhaust Cyl. 6	1191	1188	1160	1134	1063		
Exhaust Common	1303	1320	1310	1282	1185		
Water In	162	161	158	159	159		
Water Out	169	169	169	169	170		
Oil Sump	219	222	215	207	203		
Fuel	90	92	89	88	88		
Inlet Air	98	97	98	97	98		
Wet Bulb	64.1	65.0	65.2	65.1	64.8		
Dry Bulb	74.9	76.1	76.1	76.0	74.2		
PRESSURES, PSIG							
Fuel Pump	134.0	120.0	104.0	90.0	71.0		
Oil Gallery	58.1	55.8	54.2	51.3	45.9		
LOW PRESSURES							
Intake Vac, in.water	5.8	4.5	3.5	2.9	2.2		
Exh. Comm., in.Water	27.0	20.0	16.0	15.5	13.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	28.95	28.95	28.96	28.96	28.96		

980420.090211 AL-17355-F AL-12920-L NH220				?
K1-Exhaust 1, F	1192.5	.803	644.71	.446
K2-Exhaust 2, F	1292.3	.585	700.18	.325
K3-Exhaust 3, F	1289.5	.272	698.61	.151
K4-Exhaust 4, F	1243.2	.459	672.91	.255
K5-Exhaust 5, F	1270.0	.473	687.76	.263
K6-Exhaust 6, F	1192.5	.663	644.71	.368
K7-Exhaust Common, F	1302.8	.376	706.01	.209
Dry Bulb Temperature, F	73.372	.508	22.985	.282
Wet Bulb Temperature, F	63.461	.063	17.478	.035
J1-Water In, F	162.58	.071	72.542	.040
J2-Water Out, F	169.36	.050	76.309	.028
J3-Oil Sump, F	218.06	.421	103.37	.234
J4-Fuel Inlet, F	90.236	.077	32.353	.043
J5-Air After Filter, F	98.790	.037	37.106	.021
J6-Intake Manifold, F	103.40	.024	39.669	.014
J7-Fuel Return, F	94.579	.069	34.766	.038
P1-Fuel, PSIG	131.75	1.578	908.38	10.882
P2-Oil Gallery, PSIG	57.611	.065	397.21	.447
P6-Ex Common, "H2OG	27.242	.106	6.779	.026
P7-Air Aft Filt, "H2OV	5.618	.357	1.398	.089
P8-Blowby, "H2OG	.014	.047	.003	.012
P11-Baro (Vent), "Hg ABS	28.952	.003	98.043	.011
Speed, RPM	2098.2	2.878	2098.2	2.878
Load, Lb-Ft	490.02	2.819	664.38	3.822
Smoke, %	22.713	.262	22.713	.262
Fuel Flow, Lb/Hr	87.183	.275	39.545	.125
Horsepower	195.77	1.174	145.96	.875
Corrected Horsepower	205.47	1.232	153.19	.919
BSFC, lb/hp-hr	.445	.003	.271	.002
Corrected BSFC	.424	.002	.258	.002
Relative Humidity	58.245	1.534	58.245	1.534
Reference Pressure, inHg	28.539		96.643	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1784

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.54 in-Hg
Speed :	2098 RPM
Load :	490.0 lb-ft
Fuel Flow :	87.2 lb/hr
Brake Power :	195.74 bhp
BSFC :	.445 lb/bhp-hr
Indicated Power :	30.50 kW/cyl
Peak Pressure :	7.238 MPa
Peak Rate of Pressure Rise:	515.2 kPa/deg
Peak Heat Release Rate :	181.4 Joules/deg
Cumulative Heat Release :	3476.94 Joules
Apparent Combustion Efficiency :	77.2 %
Indicated Thermal Efficiency :	38.7 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	4.4 degrees
Centroid Phasing :	196.0 degrees
Centroid Magnitude :	36.06 J/degree
Sensitivity :	30.6 degrees
Premixed/Diffusion Ratio :	.14383

880420.091300 AL-17355-F AL-12920-L NH220				7
K1-Exhaust 1, F	1188.9	.539	642.75	.300
K2-Exhaust 2, F	1273.5	1.291	689.71	.717
K3-Exhaust 3, F	1277.5	.990	691.94	.550
K4-Exhaust 4, F	1240.0	.187	671.13	.104
K5-Exhaust 5, F	1283.0	.805	694.99	.447
K6-Exhaust 6, F	1189.4	.566	643.01	.314
K7-Exhaust Common, F	1319.8	.743	715.44	.413
Dry Bulb Temperature, F	74.819	.735	23.788	.408
Wet Bulb Temperature, F	64.288	.172	17.938	.096
J1-Water In, F	161.61	.105	72.003	.058
J2-Water Out, F	169.45	.078	76.359	.043
J3-Oil Sump, F	223.63	.189	106.46	.105
J4-Fuel Inlet, F	92.371	.027	33.539	.015
J5-Air After Filter, F	98.023	.107	36.679	.059
J6-Intake Manifold, F	101.81	.136	38.785	.076
J7-Fuel Return, F	95.841	.042	35.467	.024
P1-Fuel, PSIG	118.12	.787	814.38	5.427
P2-Oil Gallery, PSIG	55.616	.074	383.46	.509
P6-Ex Common, "H2OG	19.832	.235	4.935	.058
P7-Air Aft Filt, "H2OV	4.307	.395	1.072	.098
P8-Blowby, "H2OG	.010	.047	.002	.012
P11-Baro (Vent), "Hg ABS	28.956	.004	98.054	.014
Speed, RPM	1800.1	2.427	1800.1	2.427
Load, Lb-Ft	536.00	2.444	726.72	3.313
Smoke, %	18.172	.428	18.172	.428
Fuel Flow, Lb/Hr	80.087	.189	36.327	.086
Horsepower	183.71	1.016	136.97	.758
Corrected Horsepower	192.73	1.066	143.69	.795
BSFC, lb/hp-hr	.436	.003	.265	.002
Corrected BSFC	.416	.003	.253	.002
Relative Humidity	56.715	1.904	56.715	1.904
Reference Pressure, inHg	28.639		96.982	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1786

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.64 in-Hg
Speed :	1800 RPM
Load :	536.0 lb-ft
Fuel Flow :	80.1 lb/hr
Brake Power :	183.70 bhp
BSFC :	.436 lb/bhp-hr
Indicated Power :	27.52 kW/cyl
Peak Pressure :	7.744 MPa
Peak Rate of Pressure Rise:	578.3 kPa/deg
Peak Heat Release Rate :	210.4 Joules/deg
Cumulative Heat Release :	3599.78 Joules
Apparent Combustion Efficiency :	74.6 %
Indicated Thermal Efficiency :	38.0 %
Brake Thermal Efficiency :	31.6 %
Ignition Delay :	3.8 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	38.80 J/degree
Sensitivity :	29.2 degrees
Premixed/Diffusion Ratio :	.12975

980420.092418 AL-17355-F AL-12920-L NH220				7
K1-Exhaust 1, F	1173.3	.629	634.08	.350
K2-Exhaust 2, F	1239.0	.756	670.54	.420
K3-Exhaust 3, F	1236.1	.488	668.93	.271
K4-Exhaust 4, F	1197.1	.520	647.29	.289
K5-Exhaust 5, F	1259.2	.318	681.78	.177
K6-Exhaust 6, F	1161.1	.608	627.26	.338
K7-Exhaust Common, F	1308.8	.302	709.34	.168
Dry Bulb Temperature, F	74.216	.280	23.453	.156
Wet Bulb Temperature, F	64.315	.194	17.953	.108
J1-Water In, F	159.95	.153	71.081	.085
J2-Water Out, F	169.27	.076	76.262	.042
J3-Oil Sump, F	216.50	.151	102.50	.084
J4-Fuel Inlet, F	89.399	.057	31.888	.032
J5-Air After Filter, F	98.742	.063	37.079	.035
J6-Intake Manifold, F	102.72	.040	39.291	.022
J7-Fuel Return, F	91.503	.044	33.057	.024
P1-Fuel, PSIG	102.15	.700	704.30	4.824
P2-Oil Gallery, PSIG	54.527	.040	375.95	.274
P6-Ex Common, "H2OG	16.136	.122	4.015	.030
P7-Air Aft Filt, "H2OV	3.001	.264	.747	.066
P8-Blowby, "H2OG	-.006	.017	-.002	.004
P11-Baro (Vent), "Hg ABS	28.964	.001	98.083	.005
Speed, RPM	1502.0	2.218	1502.0	2.218
Load, Lb-Ft	571.81	2.728	775.26	3.698
Smoke, %	16.659	.720	16.659	.720
Fuel Flow, Lb/Hr	71.622	.151	32.487	.068
Horsepower	163.53	.714	121.92	.532
Corrected Horsepower	171.66	.749	127.98	.559
BSFC, lb/hp-hr	.438	.002	.266	.001
Corrected BSFC	.417	.002	.254	.001
Relative Humidity	58.708	.524	58.708	.524
Reference Pressure, inHg	28.743		97.335	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1788

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.74 in-Hg
Speed :	1502 RPM
Load :	571.8 lb-ft
Fuel Flow :	71.6 lb/hr
Brake Power :	163.53 bhp
BSFC :	.438 lb/bhp-hr
Indicated Power :	24.41 kW/cyl
Peak Pressure :	8.518 MPa
Peak Rate of Pressure Rise:	753.3 kPa/deg
Peak Heat Release Rate :	296.9 Joules/deg
Cumulative Heat Release :	3714.12 Joules
Apparent Combustion Efficiency :	71.9 %
Indicated Thermal Efficiency :	37.7 %
Brake Thermal Efficiency :	31.4 %
Ignition Delay :	2.5 degrees
Centroid Phasing :	190.0 degrees
Centroid Magnitude :	47.28 J/degree
Sensitivity :	26.5 degrees
Premixed/Diffusion Ratio :	.09246

980420.093357 AL-17355-F AL-12920-L NH220				7
K1-Exhaust 1, F	1145.8	.696	618.77	.386
K2-Exhaust 2, F	1188.9	1.039	642.72	.577
K3-Exhaust 3, F	1180.3	.692	637.95	.385
K4-Exhaust 4, F	1152.3	.565	622.39	.314
K5-Exhaust 5, F	1215.4	.683	657.42	.380
K6-Exhaust 6, F	1133.5	1.021	611.95	.567
K7-Exhaust Common, F	1281.5	1.129	694.16	.627
Dry Bulb Temperature, F	74.029	.876	23.350	.486
Wet Bulb Temperature, F	64.466	.273	18.037	.152
J1-Water In, F	159.24	.061	70.690	.034
J2-Water Out, F	169.41	.080	76.340	.045
J3-Oil Sump, F	208.21	.440	97.893	.245
J4-Fuel Inlet, F	88.503	.072	31.391	.040
J5-Air After Filter, F	97.766	.061	36.537	.034
J6-Intake Manifold, F	101.67	.053	38.704	.030
J7-Fuel Return, F	90.096	.063	32.276	.035
P1-Fuel, PSIG	88.678	.839	611.41	5.788
P2-Oil Gallery, PSIG	51.934	.048	358.07	.331
P6-Ex Common, "H2OG	15.426	.053	3.839	.013
P7-Air Aft Filt, "H2OV	2.329	.194	.580	.048
P8-Blowby, "H2OG	-.015	.044	-.004	.011
P11-Baro (Vent), "Hg ABS	28.964	.003	98.085	.009
Speed, RPM	1300.0	2.696	1300.0	2.696
Load, Lb-Ft	581.94	1.950	789.01	2.644
Smoke, %	23.300	.698	23.300	.698
Fuel Flow, Lb/Hr	63.943	.243	29.004	.110
Horsepower	144.04	.655	107.39	.488
Corrected Horsepower	151.11	.687	112.66	.512
BSFC, lb/hp-hr	.444	.003	.270	.002
Corrected BSFC	.423	.003	.257	.002
Relative Humidity	59.913	1.867	59.913	1.867
Reference Pressure, inHg	28.793		97.505	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1790

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.79 in-Hg
Speed :	1300 RPM
Load :	581.9 lb-ft
Fuel Flow :	63.9 lb/hr
Brake Power :	144.03 bhp
BSFC :	.444 lb/bhp-hr
Indicated Power :	21.26 kW/cyl
Peak Pressure :	8.861 MPa
Peak Rate of Pressure Rise:	792.4 kPa/deg
Peak Heat Release Rate :	324.8 Joules/deg
Cumulative Heat Release :	3706.61 Joules
Apparent Combustion Efficiency :	69.6 %
Indicated Thermal Efficiency :	36.8 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	2.8 degrees
Centroid Phasing :	188.1 degrees
Centroid Magnitude :	51.71 J/degree
Sensitivity :	24.3 degrees
Premixed/Diffusion Ratio :	.11526

980420.094242 AL-17355-F AL-12920-L NH220				7
K1-Exhaust 1, F	1082.6	.563	583.65	.313
K2-Exhaust 2, F	1095.6	1.161	590.89	.645
K3-Exhaust 3, F	1097.4	.552	591.89	.307
K4-Exhaust 4, F	1071.6	1.472	577.57	.818
K5-Exhaust 5, F	1137.9	1.002	614.41	.557
K6-Exhaust 6, F	1063.7	.961	573.19	.534
K7-Exhaust Common, F	1189.0	1.549	642.75	.861
Dry Bulb Temperature, F	71.548	.243	21.971	.135
Wet Bulb Temperature, F	63.030	.021	17.239	.011
J1-Water In, F	159.81	.126	71.006	.070
J2-Water Out, F	170.15	.120	76.748	.067
J3-Oil Sump, F	203.51	.415	95.283	.231
J4-Fuel Inlet, F	87.927	.061	31.070	.034
J5-Air After Filter, F	98.894	.164	37.163	.091
J6-Intake Manifold, F	102.73	.156	39.295	.087
J7-Fuel Return, F	88.594	.091	31.441	.051
P1-Fuel, PSIG	68.731	.366	473.89	2.525
P2-Oil Gallery, PSIG	46.772	.070	322.48	.483
P6-Ex Common, "H2OG	13.005	.036	3.236	.009
P7-Air Aft Filt, "H2OV	1.572	.153	.391	.038
P8-Blowby, "H2OG	.013	.029	.003	.007
P11-Baro (Vent), "Hg ABS	28.964	.002	98.084	.007
Speed, RPM	1099.8	2.456	1099.8	2.456
Load, Lb-Ft	559.67	1.985	758.81	2.692
Smoke, %	17.624	.481	17.624	.481
Fuel Flow, Lb/Hr	52.779	.114	23.940	.052
Horsepower	117.20	.447	87.382	.333
Corrected Horsepower	122.99	.469	91.701	.350
BSFC, lb/hp-hr	.450	.002	.274	.001
Corrected BSFC	.429	.002	.261	.001
Relative Humidity	62.720	.841	62.720	.841
Reference Pressure, inHg	28.849		97.692	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1792

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.85 in-Hg
Speed :	1100 RPM
Load :	559.7 lb-ft
Fuel Flow :	52.8 lb/hr
Brake Power :	117.23 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	17.10 kW/cyl
Peak Pressure :	8.807 MPa
Peak Rate of Pressure Rise:	758.3 kPa/deg
Peak Heat Release Rate :	316.5 Joules/deg
Cumulative Heat Release :	3495.98 Joules
Apparent Combustion Efficiency :	67.2 %
Indicated Thermal Efficiency :	35.8 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	2.0 degrees
Centroid Phasing :	186.1 degrees
Centroid Magnitude :	50.67 J/degree
Sensitivity :	23.2 degrees
Premixed/Diffusion Ratio :	.08588

CUMMINS NH220 LOG SHEET

TEST NO. 7 FUEL TF08N1987 DATE 4-20-88 PAGE 74

Operator Craig							
Time	10:15	10:30	10:40	10:50	11:00	11:20	11:35
Test Hour	25min	15min	10min	10min	10min	20min	15min
Speed, RPM	2100	1801	1801	1801	1801	1800	1500
Load, lb-ft	499.9	540.9	369.2	272.3	132.9	46.9	556.1
Fuel Flow, lb/hr	103.2	95.1	60.7	47.3	28.5	16.3	81.7
Exh. Opacity, %	36.0	24.0	8.0	6.0	5.0	4.0	28.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1171	1167	935	692	498	363	1126
Exhaust Cyl. 2	1271	1257	958	778	559	407	1207
Exhaust Cyl. 3	1308	1289	934	771	582	410	1218
Exhaust Cyl. 4	1233	1240	897	727	515	384	1164
Exhaust Cyl. 5	1243	1255	869	710	506	366	1205
Exhaust Cyl. 6	1168	1173	836	679	480	335	1129
Exhaust Common	1286	1310	892	718	506	371	1270
Water In	162	161	163	164	168	168	160
Water Out	170	170	168	168	170	169	170
Oil Sump	220	224	220	213	208	202	206
Fuel	90	91	91	90	88	86	91
Inlet Air	99	99	98	97	100	99	102
Wet Bulb	65.0	64.2	64.5	64.5	64.9	65.1	65.8
Dry Bulb	75.2	75.0	75.2	75.0	75.3	75.8	77.3
PRESSURES, PSIG							
Fuel Pump	138.0	126.0	61.0	45.0	25.0	15.0	107.0
Oil Gallery	58.8	55.2	55.9	57.2	58.2	59.1	57.0
LOW PRESSURES							
Intake Vac, in.water	6.0	4.6	4.9	5.1	5.2	5.3	3.6
Exh. Comm., in.Water	27.0	19.5	15.5	14.0	11.0	9.0	15.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	28.97	28.97	28.97	28.97	28.97	28.96	28.95

CUMMINS NH220 LOG SHEET

TEST NO. 7 FUEL TF08N19087 DATE 4-20-88 PAGE 75

Operator Gray							
Time	11:45	11:55					
Test Hour	10 MIN	10 MIN					
Speed, RPM	1300	1100					
Load, lb–ft	566.1	553.3					
Fuel Flow, lb/hr	70.3	61.1					
Exh. Opacity, %	40.0	42.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1104	1046					
Exhaust Cyl. 2	1166	1082					
Exhaust Cyl. 3	1159	1074					
Exhaust Cyl. 4	1125	1038					
Exhaust Cyl. 5	1171	1090					
Exhaust Cyl. 6	1115	1058					
Exhaust Common	1246	1141					
Water In	158	158					
Water Out	169	170					
Oil Sump	205	203					
Fuel	91	91					
Inlet Air	102	99					
Wet Bulb	65.1	65.3					
Dry Bulb	77.0	77.0					
PRESSURES, PSIG							
Fuel Pump	95.0	78.0					
Oil Gallery	53.5	47.3					
LOW PRESSURES							
Intake Vac, in.water	3.0	2.2					
Exh. Comm., in.Water	14.5	12.5					
Blowby, in.water	0	0					
Barometer, in.Hg	28.95	28.95					

980420.101117 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	1171.2	1.491	632.88	.828
K2-Exhaust 2, F	1275.7	.919	690.93	.510
K3-Exhaust 3, F	1309.9	.467	709.93	.260
K4-Exhaust 4, F	1232.6	.819	666.99	.455
K5-Exhaust 5, F	1242.1	.459	672.29	.255
K6-Exhaust 6, F	1168.3	.529	631.26	.294
K7-Exhaust Common, F	1288.0	.530	697.77	.295
Dry Bulb Temperature, F	72.255	.291	22.364	.162
Wet Bulb Temperature, F	63.445	.036	17.470	.020
J1-Water In, F	162.61	.086	72.563	.048
J2-Water Out, F	169.57	.038	76.428	.021
J3-Oil Sump, F	218.98	.167	103.88	.093
J4-Fuel Inlet, F	89.483	.095	31.935	.053
J5-Air After Filter, F	99.325	.100	37.403	.056
J6-Intake Manifold, F	102.92	.205	39.398	.114
J7-Fuel Return, F	94.090	.091	34.494	.050
P1-Fuel, PSIG	136.94	2.975	944.15	20.509
P2-Oil Gallery, PSIG	57.802	.080	398.53	.549
P6-Ex Common, "H2OG	27.457	.132	6.832	.033
P7-Air Aft Filt, "H2OV	5.470	.215	1.361	.054
P8-Blowby, "H2OG	.003	.035	.001	.009
P11-Baro (Vent), "Hg ABS	28.971	.003	98.107	.010
Speed, RPM	2102.4	2.806	2102.4	2.806
Load, Lb-Ft	496.80	4.101	673.56	5.560
Smoke, %	38.866	1.429	38.866	1.429
Fuel Flow, Lb/Hr	102.64	1.810	46.558	.821
Horsepower	198.87	1.548	148.27	1.154
Corrected Horsepower	208.77	1.625	155.65	1.212
BSFC, lb/hp-hr	.516	.009	.314	.006
Corrected BSFC	.492	.009	.299	.005
Relative Humidity	61.909	.907	61.909	.907
Reference Pressure, inHg	28.569		96.744	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1794

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.57 in-Hg
Speed :	2102 RPM
Load :	496.8 lb-ft
Fuel Flow :	102.6 lb/hr
Brake Power :	198.83 bhp
BSFC :	.516 lb/bhp-hr
Indicated Power :	30.27 kW/cyl
Peak Pressure :	7.078 MPa
Peak Rate of Pressure Rise:	581.8 kPa/deg
Peak Heat Release Rate :	214.3 Joules/deg
Cumulative Heat Release :	3458.45 Joules
Apparent Combustion Efficiency :	66.6 %
Indicated Thermal Efficiency :	33.3 %
Brake Thermal Efficiency :	27.2 %
Ignition Delay :	8.0 degrees
Centroid Phasing :	196.9 degrees
Centroid Magnitude :	40.61 J/degree
Sensitivity :	27.9 degrees
Premixed/Diffusion Ratio :	.28527

880420.102502 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	1165.5	.571	629.71	.317
K2-Exhaust 2, F	1256.9	.701	680.49	.390
K3-Exhaust 3, F	1289.7	.682	698.71	.379
K4-Exhaust 4, F	1235.8	.928	668.80	.516
K5-Exhaust 5, F	1253.3	1.170	678.52	.650
K6-Exhaust 6, F	1168.6	1.444	631.43	.802
K7-Exhaust Common, F	1308.1	.716	708.93	.398
Dry Bulb Temperature, F	71.912	.223	22.173	.124
Wet Bulb Temperature, F	63.365	.060	17.425	.033
J1-Water In, F	161.58	.140	71.988	.078
J2-Water Out, F	169.65	.145	76.472	.080
J3-Oil Sump, F	224.45	.226	106.92	.126
J4-Fuel Inlet, F	91.752	.037	33.196	.021
J5-Air After Filter, F	99.764	.204	37.647	.113
J6-Intake Manifold, F	102.91	.175	39.392	.097
J7-Fuel Return, F	94.589	.033	34.772	.018
P1-Fuel, PSIG	124.92	.565	861.29	3.895
P2-Oil Gallery, PSIG	55.370	.015	381.76	.100
P6-Ex Common, "H2OG	19.878	.232	4.947	.058
P7-Air Aft Filt, "H2OV	3.878	.274	.965	.068
P8-Blowby, "H2OG	-.005	.046	-.001	.011
P11-Baro (Vent), "Hg ABS	28.972	.003	98.110	.010
Speed, RPM	1799.6	2.545	1799.6	2.545
Load, Lb-Ft	541.63	2.215	734.35	3.003
Smoke, %	23.309	.257	23.309	.257
Fuel Flow, Lb/Hr	94.148	2.634	42.705	1.195
Horsepower	185.59	.938	138.37	.700
Corrected Horsepower	194.90	.986	145.32	.735
BSFC, lb/hp-hr	.507	.016	.309	.010
Corrected BSFC	.483	.015	.294	.009
Relative Humidity	62.779	.592	62.779	.592
Reference Pressure, inHg	28.687		97.144	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1796

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.69 in-Hg
Speed :	1800 RPM
Load :	541.6 lb-ft
Fuel Flow :	94.1 lb/hr
Brake Power :	185.62 bhp
BSFC :	.507 lb/bhp-hr
Indicated Power :	27.39 kW/cyl
Peak Pressure :	7.599 MPa
Peak Rate of Pressure Rise:	665.3 kPa/deg
Peak Heat Release Rate :	248.0 Joules/deg
Cumulative Heat Release :	3582.58 Joules
Apparent Combustion Efficiency :	64.4 %
Indicated Thermal Efficiency :	32.8 %
Brake Thermal Efficiency :	27.6 %
Ignition Delay :	7.0 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	44.00 J/degree
Sensitivity :	27.0 degrees
Premixed/Diffusion Ratio :	.25751

880420.103521 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	834.14	.492	445.63	.273
K2-Exhaust 2, F	936.37	.281	502.43	.156
K3-Exhaust 3, F	936.28	.575	502.38	.319
K4-Exhaust 4, F	899.79	.732	482.11	.407
K5-Exhaust 5, F	871.12	.762	466.18	.423
K6-Exhaust 6, F	834.76	.786	445.98	.437
K7-Exhaust Common, F	895.05	.812	479.47	.451
Dry Bulb Temperature, F	71.983	.163	22.213	.090
Wet Bulb Temperature, F	63.364	.024	17.425	.013
J1-Water In, F	164.08	.120	73.380	.066
J2-Water Out, F	168.65	.099	75.915	.055
J3-Oil Sump, F	221.92	.407	105.51	.226
J4-Fuel Inlet, F	91.173	.091	32.874	.050
J5-Air After Filter, F	98.853	.067	37.141	.037
J6-Intake Manifold, F	101.59	.056	38.659	.031
J7-Fuel Return, F	89.954	.123	32.196	.068
P1-Fuel, PSIG	59.871	.200	412.80	1.382
P2-Oil Gallery, PSIG	56.357	.157	388.57	1.085
P6-Ex Common, "H2OG	15.610	.045	3.884	.011
P7-Air Aft Filt, "H2OV	4.270	.344	1.062	.086
P8-Blowby, "H2OG	-.015	.034	-.004	.009
P11-Baro (Vent), "Hg ABS	28.968	.003	98.096	.009
Speed, RPM	1803.2	3.112	1803.2	3.112
Load, Lb-Ft	370.38	3.481	502.16	4.720
Smoke, %	10.080	.556	10.080	.556
Fuel Flow, Lb/Hr	60.056	5.188	27.241	2.353
Horsepower	127.17	1.393	94.813	1.038
Corrected Horsepower	133.46	1.462	99.503	1.090
BSFC, lb/hp-hr	.472	.040	.287	.024
Corrected BSFC	.450	.038	.274	.023
Relative Humidity	62.531	.501	62.531	.501
Reference Pressure, inHg	28.654		97.033	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1798

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.65 in-Hg
Speed :	1803 RPM
Load :	370.4 lb-ft
Fuel Flow :	60.1 lb/hr
Brake Power :	127.16 bhp
BSFC :	.473 lb/bhp-hr
Indicated Power :	19.13 kW/cyl
Peak Pressure :	6.006 MPa
Peak Rate of Pressure Rise:	405.7 kPa/deg
Peak Heat Release Rate :	150.4 Joules/deg
Cumulative Heat Release :	2496.88 Joules
Apparent Combustion Efficiency :	70.4 %
Indicated Thermal Efficiency :	35.9 %
Brake Thermal Efficiency :	29.7 %
Ignition Delay :	11.1 degrees
Centroid Phasing :	195.9 degrees
Centroid Magnitude :	30.90 J/degree
Sensitivity :	23.8 degrees
Premixed/Diffusion Ratio :	.46704

880420.104528 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	693.50	.760	367.50	.422
K2-Exhaust 2, F	779.19	.579	415.11	.322
K3-Exhaust 3, F	771.41	.652	410.78	.362
K4-Exhaust 4, F	729.26	.650	387.37	.361
K5-Exhaust 5, F	710.52	.527	376.96	.293
K6-Exhaust 6, F	679.65	.212	359.81	.118
K7-Exhaust Common, F	720.35	.809	382.42	.449
Dry Bulb Temperature, F	72.361	.081	22.423	.045
Wet Bulb Temperature, F	63.581	.004	17.545	.002
J1-Water In, F	164.74	.091	73.743	.050
J2-Water Out, F	167.78	.068	75.433	.038
J3-Oil Sump, F	214.53	.313	101.41	.174
J4-Fuel Inlet, F	89.644	.087	32.024	.048
J5-Air After Filter, F	97.676	.028	36.487	.016
J6-Intake Manifold, F	100.30	.037	37.943	.021
J7-Fuel Return, F	87.559	.032	30.866	.018
P1-Fuel, PSIG	41.846	.174	288.52	1.202
P2-Oil Gallery, PSIG	57.626	.033	397.32	.227
P6-Ex Common, "H2OG	14.195	.034	3.532	.008
P7-Air Aft Filt, "H2OV	4.495	.341	1.118	.085
P8-Blowby, "H2OG	-.023	.031	-.006	.008
P11-Baro (Vent), "Hg ABS	28.970	.004	98.103	.012
Speed, RPM	1801.9	3.709	1801.9	3.709
Load, Lb-Ft	272.62	3.784	369.62	5.131
Smoke, %	6.805	.077	6.805	.077
Fuel Flow, Lb/Hr	44.612	2.221	20.235	1.008
Horsepower	93.532	1.424	69.735	1.061
Corrected Horsepower	98.059	1.492	73.110	1.113
BSFC, lb/hp-hr	.477	.022	.290	.014
Corrected BSFC	.455	.021	.277	.013
Relative Humidity	62.072	.270	62.072	.270
Reference Pressure, inHg	28.639		96.983	

HAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1800

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.64 in-Hg
Speed :	1802 RPM
Load :	272.6 lb-ft
Fuel Flow :	44.6 lb/hr
Brake Power :	93.53 bhp
BSFC :	.477 lb/bhp-hr
Indicated Power :	14.69 kW/cyl
Peak Pressure :	5.474 MPa
Peak Rate of Pressure Rise:	308.4 kPa/deg
Peak Heat Release Rate :	122.3 Joules/deg
Cumulative Heat Release :	1907.99 Joules
Apparent Combustion Efficiency :	72.4 %
Indicated Thermal Efficiency :	37.1 %
Brake Thermal Efficiency :	29.4 %
Ignition Delay :	13.2 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	28.32 J/degree
Sensitivity :	20.7 degrees
Premixed/Diffusion Ratio :	.63765

880420.105805 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	498.84	.552	259.35	.307
K2-Exhaust 2, F	560.03	.301	293.35	.167
K3-Exhaust 3, F	551.96	.310	288.87	.172
K4-Exhaust 4, F	515.50	.496	268.61	.275
K5-Exhaust 5, F	504.89	.308	262.71	.171
K6-Exhaust 6, F	479.41	.278	248.56	.155
K7-Exhaust Common, F	505.36	.336	262.98	.187
Dry Bulb Temperature, F	72.751	.115	22.639	.064
Wet Bulb Temperature, F	63.897	.044	17.721	.025
J1-Water In, F	167.92	.147	75.512	.081
J2-Water Out, F	169.24	.142	76.242	.079
J3-Oil Sump, F	208.47	.082	98.040	.046
J4-Fuel Inlet, F	87.927	.090	31.071	.050
J5-Air After Filter, F	99.910	.051	37.728	.029
J6-Intake Manifold, F	103.50	.063	39.721	.035
J7-Fuel Return, F	83.620	.071	28.678	.040
P1-Fuel, PSIG	21.363	.177	147.30	1.217
P2-Oil Gallery, PSIG	58.589	.020	403.96	.139
P6-Ex Common, "H2OG	10.980	.102	2.732	.025
P7-Air Aft Filt, "H2OV	4.592	.458	1.143	.114
P8-Blowby, "H2OG	.003	.035	.001	.009
P11-Baro (Vent), "Hg ABS	28.970	.003	98.103	.011
Speed, RPM	1801.7	3.237	1801.7	3.237
Load, Lb-Ft	134.38	4.544	182.19	6.160
Smoke, %	5.411	.084	5.411	.084
Fuel Flow, Lb/Hr	26.673	2.167	12.099	.983
Horsepower	46.098	1.588	34.370	1.184
Corrected Horsepower	48.436	1.669	36.112	1.244
BSFC, lb/hp-hr	.580	.059	.353	.036
Corrected BSFC	.552	.056	.336	.034
Relative Humidity	61.977	.256	61.977	.256
Reference Pressure, inHg	28.632		96.959	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1802

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.63 in-Hg
Speed :	1802 RPM
Load :	134.4 lb-ft
Fuel Flow :	26.7 lb/hr
Brake Power :	46.11 bhp
BSFC :	.579 lb/bhp-hr
Indicated Power :	8.53 kW/cyl
Peak Pressure :	4.729 MPa
Peak Rate of Pressure Rise:	184.5 kPa/deg
Peak Heat Release Rate :	92.4 Joules/deg
Cumulative Heat Release :	1144.79 Joules
Apparent Combustion Efficiency :	72.6 %
Indicated Thermal Efficiency :	36.0 %
Brake Thermal Efficiency :	24.2 %
Ignition Delay :	15.6 degrees
Centroid Phasing :	194.7 degrees
Centroid Magnitude :	21.32 J/degree
Sensitivity :	18.0 degrees
Premixed/Diffusion Ratio :	.86723

980420.111627 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	364.53	.854	184.74	.475
K2-Exhaust 2, F	409.40	.654	209.67	.363
K3-Exhaust 3, F	411.29	.615	210.72	.342
K4-Exhaust 4, F	387.66	.787	197.59	.437
K5-Exhaust 5, F	368.55	.814	186.97	.452
K6-Exhaust 6, F	339.00	1.110	170.55	.617
K7-Exhaust Common, F	375.24	1.087	190.69	.604
Dry Bulb Temperature, F	73.998	.144	23.332	.080
Wet Bulb Temperature, F	64.408	.024	18.004	.013
J1-Water In, F	168.39	.354	75.771	.197
J2-Water Out, F	168.84	.379	76.022	.211
J3-Oil Sump, F	202.33	.268	94.630	.149
J4-Fuel Inlet, F	86.267	.044	30.148	.024
J5-Air After Filter, F	99.149	.075	37.305	.042
J6-Intake Manifold, F	103.03	.046	39.459	.026
J7-Fuel Return, F	81.110	.037	27.283	.021
P1-Fuel, PSIG	11.008	.090	75.895	.619
P2-Oil Gallery, PSIG	59.273	.015	408.67	.106
P6-Ex Common, "H2OG	8.589	.055	2.137	.014
P7-Air Aft Filt, "H2OV	4.725	.321	1.176	.080
P8-Blowby, "H2OG	.003	.021	.001	.005
P11-Barp (Vent), "Hg ABS	28.959	.003	98.066	.011
Speed, RPM	1800.5	3.367	1800.5	3.367
Load, Lb-Ft	43.986	2.291	59.637	3.107
Smoke, %	4.467	.107	4.467	.107
Fuel Flow, Lb/Hr	16.593	.196	7.527	.089
Horsepower	15.079	.778	11.243	.580
Corrected Horsepower	15.841	.817	11.810	.609
BSFC, lb/hp-hr	1.103	.060	.671	.036
Corrected BSFC	1.050	.057	.639	.034
Relative Humidity	59.766	.442	59.766	.442
Reference Pressure, inHg	28.611		96.889	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1804

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.61 in-Hg
Speed :	1801 RPM
Load :	44.0 lb-ft
Fuel Flow :	16.6 lb/hr
Brake Power :	15.08 bhp
BSFC :	1.100 lb/bhp-hr
Indicated Power :	4.84 kW/cyl
Peak Pressure :	4.380 MPa
Peak Rate of Pressure Rise:	161.2 kPa/deg
Peak Heat Release Rate :	81.4 Joules/deg
Cumulative Heat Release :	707.811 Joules
Apparent Combustion Efficiency :	72.2 %
Indicated Thermal Efficiency :	32.9 %
Brake Thermal Efficiency :	12.7 %
Ignition Delay :	16.4 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	20.82 J/degree
Sensitivity :	16.5 degrees
Premixed/Diffusion Ratio :	.99311

880420.113045 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	1127.0	.706	608.34	.392
K2-Exhaust 2, F	1206.6	.480	652.56	.267
K3-Exhaust 3, F	1218.1	1.851	658.94	1.028
K4-Exhaust 4, F	1161.6	.538	627.53	.299
K5-Exhaust 5, F	1204.6	.596	651.46	.331
K6-Exhaust 6, F	1127.1	.619	608.38	.344
K7-Exhaust Common, F	1268.0	.547	686.68	.304
Dry Bulb Temperature, F	74.681	.103	23.712	.057
Wet Bulb Temperature, F	64.593	.023	18.107	.013
J1-Water In, F	160.86	.175	71.588	.097
J2-Water Out, F	169.39	.110	76.329	.061
J3-Oil Sump, F	205.35	.156	96.308	.086
J4-Fuel Inlet, F	90.162	.068	32.312	.038
J5-Air After Filter, F	101.45	.105	38.583	.059
J6-Intake Manifold, F	105.39	.090	40.770	.050
J7-Fuel Return, F	92.759	.037	33.755	.020
P1-Fuel, PSIG	104.85	.646	722.95	4.452
P2-Oil Gallery, PSIG	56.497	.042	389.53	.290
P6-Ex Common, "H2OG	15.328	.158	3.814	.039
P7-Air Aft Filt, "H2OV	3.349	.330	.833	.082
P8-Blowby, "H2OG	-.010	.024	-.003	.006
P11-Baro (Vent), "Hg ABS	28.953	.001	98.047	.003
Speed, RPM	1500.1	2.187	1500.1	2.187
Load, Lb-Ft	556.75	2.938	754.85	3.983
Smoke, %	26.739	.457	26.739	.457
Fuel Flow, Lb/Hr	79.542	10.974	36.080	4.978
Horsepower	159.03	.712	118.57	.531
Corrected Horsepower	167.43	.750	124.83	.559
BSFC, lb/hp-hr	.500	.070	.304	.043
Corrected BSFC	.475	.066	.289	.040
Relative Humidity	58.249	.305	58.249	.305
Reference Pressure, inHg	28.707		97.212	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1806

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.71 in-Hg
Speed :	1500 RPM
Load :	556.8 lb-ft
Fuel Flow :	79.5 lb/hr
Brake Power :	159.03 bhp
BSFC :	.500 lb/bhp-hr
Indicated Power :	23.40 kW/cyl
Peak Pressure :	8.058 MPa
Peak Rate of Pressure Rise:	845.5 kPa/deg
Peak Heat Release Rate :	330.3 Joules/deg
Cumulative Heat Release :	3592.61 Joules
Apparent Combustion Efficiency :	63.7 %
Indicated Thermal Efficiency :	33.2 %
Brake Thermal Efficiency :	28.0 %
Ignition Delay :	5.3 degrees
Centroid Phasing :	192.0 degrees
Centroid Magnitude :	51.57 J/degree
Sensitivity :	25.6 degrees
Premixed/Diffusion Ratio :	.20678

880420.114020 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	1103.5	.762	595.25	.423
K2-Exhaust 2, F	1165.7	1.204	629.82	.669
K3-Exhaust 3, F	1159.3	1.316	626.27	.731
K4-Exhaust 4, F	1122.6	.640	605.88	.355
K5-Exhaust 5, F	1169.1	1.301	631.72	.723
K6-Exhaust 6, F	1114.7	.357	601.51	.198
K7-Exhaust Common, F	1244.3	.401	673.49	.223
Dry Bulb Temperature, F	74.844	.059	23.802	.033
Wet Bulb Temperature, F	64.519	.013	18.066	.007
J1-Water In, F	158.71	.126	70.396	.070
J2-Water Out, F	168.99	.105	76.108	.059
J3-Oil Sump, F	205.01	.167	96.115	.093
J4-Fuel Inlet, F	91.280	.051	32.933	.028
J5-Air After Filter, F	103.16	.059	39.534	.033
J6-Intake Manifold, F	106.75	.058	41.530	.032
J7-Fuel Return, F	92.692	.067	33.718	.037
P1-Fuel, PSIG	93.473	.622	644.47	4.289
P2-Oil Gallery, PSIG	53.551	.025	369.22	.170
P6-Ex Common, "H2OG	14.813	.106	3.686	.026
P7-Air Aft Filt, "H2OV	2.487	.177	.619	.044
P8-Blowby, "H2OG	-.020	.025	-.005	.006
P11-Baro (Vent), "Hg ABS	28.951	.002	98.039	.006
Speed, RPM	1300.2	2.195	1300.2	2.195
Load, Lb-Ft	566.37	1.631	767.89	2.211
Smoke, %	41.193	1.199	41.193	1.199
Fuel Flow, Lb/Hr	74.485	2.368	33.786	1.074
Horsepower	140.21	.427	104.53	.319
Corrected Horsepower	147.83	.450	110.22	.336
BSFC, lb/hp-hr	.531	.018	.323	.011
Corrected BSFC	.504	.017	.307	.010
Relative Humidity	57.459	.159	57.459	.159
Reference Pressure, inHg	28.768		97.419	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1808

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.77 in-Hg
Speed :	1300 RPM
Load :	566.4 lb-ft
Fuel Flow :	74.5 lb/hr
Brake Power :	140.20 bhp
BSFC :	.531 lb/bhp-hr
Indicated Power :	20.64 kW/cyl
Peak Pressure :	8.527 MPa
Peak Rate of Pressure Rise:	917.5 kPa/deg
Peak Heat Release Rate :	368.1 Joules/deg
Cumulative Heat Release :	3566.51 Joules
Apparent Combustion Efficiency :	58.5 %
Indicated Thermal Efficiency :	31.2 %
Brake Thermal Efficiency :	26.4 %
Ignition Delay :	5.4 degrees
Centroid Phasing :	188.9 degrees
Centroid Magnitude :	58.46 J/degree
Sensitivity :	22.5 degrees
Premixed/Diffusion Ratio :	.24175

880420.115046 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	1046.2	.618	563.43	.344
K2-Exhaust 2, F	1082.3	.711	583.49	.395
K3-Exhaust 3, F	1070.7	.804	577.03	.447
K4-Exhaust 4, F	1037.6	.515	558.68	.286
K5-Exhaust 5, F	1091.0	.477	588.34	.265
K6-Exhaust 6, F	1058.7	.598	570.41	.332
K7-Exhaust Common, F	1140.3	.439	615.71	.244
Dry Bulb Temperature, F	74.885	.133	23.825	.074
Wet Bulb Temperature, F	64.579	.024	18.099	.013
J1-Water In, F	158.95	.166	70.529	.092
J2-Water Out, F	169.96	.097	76.643	.054
J3-Oil Sump, F	202.94	.263	94.965	.146
J4-Fuel Inlet, F	91.681	.034	33.156	.019
J5-Air After Filter, F	100.95	.390	38.304	.217
J6-Intake Manifold, F	103.47	.465	39.706	.259
J7-Fuel Return, F	92.075	.059	33.375	.033
P1-Fuel, PSIG	75.887	.535	523.22	3.688
P2-Oil Gallery, PSIG	47.638	.040	328.45	.278
P6-Ex Common, "H2OG	12.713	.074	3.164	.018
P7-Air Aft Filt, "H2OV	1.846	.178	.459	.044
P8-Blowby, "H2OG	.028	.036	.007	.009
P11-Baro (Vent), "Hg ABS	28.950	.002	98.037	.006
Speed, RPM	1100.5	1.855	1100.5	1.855
Load, Lb-Ft	557.45	2.176	755.79	2.950
Smoke, %	41.133	1.323	41.133	1.323
Fuel Flow, Lb/Hr	63.503	4.332	28.804	1.965
Horsepower	116.80	.524	87.087	.391
Corrected Horsepower	122.92	.551	91.645	.411
BSFC, lb/hp-hr	.544	.037	.331	.022
Corrected BSFC	.517	.035	.314	.021
Relative Humidity	57.552	.376	57.552	.376
Reference Pressure, inHg	28.815		97.577	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1810

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.82 in-Hg
Speed :	1101 RPM
Load :	557.5 lb-ft
Fuel Flow :	63.5 lb/hr
Brake Power :	116.87 bhp
BSFC :	.543 lb/bhp-hr
Indicated Power :	17.05 kW/cyl
Peak Pressure :	8.768 MPa
Peak Rate of Pressure Rise:	948.0 kPa/deg
Peak Heat Release Rate :	392.9 Joules/deg
Cumulative Heat Release :	3440.10 Joules
Apparent Combustion Efficiency :	56.0 %
Indicated Thermal Efficiency :	30.3 %
Brake Thermal Efficiency :	25.8 %
Ignition Delay :	3.8 degrees
Centroid Phasing :	186.0 degrees
Centroid Magnitude :	64.52 J/degree
Sensitivity :	21.1 degrees
Premixed/Diffusion Ratio :	.18055

CUMMINS NH220 LOG SHEET

TEST NO. 7 FUEL BF02U37L87 DATE 4-20-88 PAGE 76

Operator Craig							
Time	12:25	12:45	12:55	1:05	1:15		
Test Hour	25 min	20 min	10 min	10 min	10 min		
Speed, RPM	2100	1799	1500	1301	1099		
Load, lb–ft	499.8	540.4	570.2	582.2	558.9		
Fuel Flow, lb/hr	87.0	78.1	70.2	63.2	51.6		
Exh. Opacity, %	28.0	19.0	19.0	25.0	20.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1189	1191	1177	1142	1077		
Exhaust Cyl. 2	1290	1281	1236	1186	1091		
Exhaust Cyl. 3	1293	1290	1243	1183	1095		
Exhaust Cyl. 4	1250	1245	1200	1151	1065		
Exhaust Cyl. 5	1272	1288	1240	1217	1134		
Exhaust Cyl. 6	1193	1193	1161	1131	1055		
Exhaust Common	1308	1331	1314	1285	1185		
Water In	162	161	160	158	157		
Water Out	170	170	170	170	169		
Oil Sump	226	227	219	212	208		
Fuel	89	89	90	90	88		
Inlet Air	101	102	100	99	98		
Wet Bulb	66.2	67.0	67.6	67.1	66.8		
Dry Bulb	78.9	80.0	81.0	80.9	81.1		
PRESSURES, PSIG							
Fuel Pump	134.0	121.0	104.0	91.0	71.0		
Oil Gallery	578	55.0	53.0	50.1	45.0		
LOW PRESSURES							
Intake Vac, in.water	6.3	4.9	3.7	3.0	2.3		
Exh. Comm., in.Water	17.0	19.5	16.0	15.0	12.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	28.95	28.94	28.94	28.93	28.93		

880420.122740 AL-17355-F AL-12920-L NH220				7
K1-Exhaust 1, F	1191.1	.990	643.96	.550
K2-Exhaust 2, F	1292.4	1.288	700.20	.716
K3-Exhaust 3, F	1295.0	1.105	701.65	.614
K4-Exhaust 4, F	1249.5	.252	676.41	.140
K5-Exhaust 5, F	1272.8	.702	689.33	.390
K6-Exhaust 6, F	1193.2	.732	645.12	.407
K7-Exhaust Common, F	1309.0	.457	709.43	.254
Dry Bulb Temperature, F	77.042	.113	25.024	.063
Wet Bulb Temperature, F	65.638	.022	18.688	.012
J1-Water In, F	162.66	.073	72.586	.040
J2-Water Out, F	169.97	.039	76.649	.022
J3-Oil Sump, F	227.08	.093	108.38	.051
J4-Fuel Inlet, F	89.723	.039	32.068	.022
J5-Air After Filter, F	101.06	.133	38.367	.074
J6-Intake Manifold, F	102.53	.139	39.185	.077
J7-Fuel Return, F	93.491	.083	34.161	.046
P1-Fuel, PSIG	132.64	1.486	914.52	10.247
P2-Oil Gallery, PSIG	56.316	.039	388.28	.268
P6-Ex Common, "H2OG	27.356	.092	6.807	.023
P7-Air Aft Filt, "H2OV	6.131	.302	1.526	.075
P8-Blowby, "H2OG	-.002	.039	-.000	.010
P11-Baro (Vent), "Hg ABS	28.945	.003	98.018	.011
Speed, RPM	2102.4	2.374	2102.4	2.374
Load, Lb-Ft	499.70	2.075	677.50	2.814
Smoke, %	28.852	.407	28.852	.407
Fuel Flow, Lb/Hr	87.125	.184	39.519	.083
Horsepower	200.04	.740	149.14	.552
Corrected Horsepower	210.66	.780	157.06	.581
BSFC, lb/hp-hr	.436	.002	.265	.001
Corrected BSFC	.414	.001	.252	.001
Relative Humidity	54.756	.279	54.756	.279
Reference Pressure, inHg	28.494		96.491	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1812

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.49 in-Hg
Speed :	2102 RPM
Load :	499.7 lb-ft
Fuel Flow :	87.1 lb/hr
Brake Power :	199.99 bhp
BSFC :	.436 lb/bhp-hr
Indicated Power :	30.40 kW/cyl
Peak Pressure :	7.200 MPa
Peak Rate of Pressure Rise:	502.1 kPa/deg
Peak Heat Release Rate :	175.9 Joules/deg
Cumulative Heat Release :	3499.57 Joules
Apparent Combustion Efficiency :	77.9 %
Indicated Thermal Efficiency :	38.6 %
Brake Thermal Efficiency :	31.6 %
Ignition Delay :	4.7 degrees
Centroid Phasing :	196.8 degrees
Centroid Magnitude :	34.46 J/degree
Sensitivity :	31.1 degrees
Premixed/Diffusion Ratio :	.15071

980420.124059 AL-17355-F AL-12920-L NH220				7
K1-Exhaust 1, F	1191.3	.374	644.03	.208
K2-Exhaust 2, F	1280.7	.792	693.73	.440
K3-Exhaust 3, F	1289.7	.841	698.75	.467
K4-Exhaust 4, F	1244.6	.553	673.69	.307
K5-Exhaust 5, F	1289.9	.623	698.83	.346
K6-Exhaust 6, F	1192.3	.638	644.60	.355
K7-Exhaust Common, F	1331.4	.555	721.88	.308
Dry Bulb Temperature, F	78.167	.130	25.648	.072
Wet Bulb Temperature, F	66.061	.023	18.923	.013
J1-Water In, F	162.32	.106	72.400	.059
J2-Water Out, F	170.71	.085	77.062	.047
J3-Oil Sump, F	227.88	.084	108.82	.046
J4-Fuel Inlet, F	90.201	.029	32.334	.016
J5-Air After Filter, F	103.10	.059	39.501	.033
J6-Intake Manifold, F	104.72	.038	40.402	.021
J7-Fuel Return, F	92.625	.079	33.681	.044
P1-Fuel, PSIG	117.68	.896	811.39	6.178
P2-Oil Gallery, PSIG	54.936	.065	378.77	.447
P6-Ex Common, "H2OG	19.749	.181	4.914	.045
P7-Air Aft Filt, "H2OV	4.551	.546	1.133	.136
P8-Blowby, "H2OG	-.019	.059	-.005	.015
P11-Baro (Vent), "Hg ABS	28.944	.005	98.016	.016
Speed, RPM	1799.6	3.152	1799.6	3.152
Load, Lb-Ft	540.88	4.130	733.33	5.599
Smoke, %	19.726	.325	19.726	.325
Fuel Flow, Lb/Hr	78.638	.608	35.670	.276
Horsepower	185.34	1.617	139.18	1.206
Corrected Horsepower	195.55	1.706	145.80	1.272
BSFC, lb/hp-hr	.424	.003	.258	.002
Corrected BSFC	.402	.003	.245	.002
Relative Humidity	52.944	.346	52.944	.346
Reference Pressure, inHg	28.609		96.882	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1814

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.61 in-Hg
Speed :	1800 RPM
Load :	540.9 lb-ft
Fuel Flow :	78.6 lb/hr
Brake Power :	185.38 bhp
BSFC :	.424 lb/bhp-hr
Indicated Power :	27.46 kW/cyl
Peak Pressure :	7.750 MPa
Peak Rate of Pressure Rise:	581.8 kPa/deg
Peak Heat Release Rate :	212.1 Joules/deg
Cumulative Heat Release :	3606.95 Joules
Apparent Combustion Efficiency :	76.2 %
Indicated Thermal Efficiency :	38.7 %
Brake Thermal Efficiency :	32.4 %
Ignition Delay :	3.6 degrees
Centroid Phasing :	194.2 degrees
Centroid Magnitude :	38.36 J/degree
Sensitivity :	29.6 degrees
Premixed/Diffusion Ratio :	.12109

880420.125052 AL-17355-F AL-12920-L NH220				7
K1-Exhaust 1, F	1178.3	.738	636.81	.410
K2-Exhaust 2, F	1240.4	.648	671.32	.360
K3-Exhaust 3, F	1244.7	.726	673.74	.403
K4-Exhaust 4, F	1200.0	.645	648.88	.358
K5-Exhaust 5, F	1262.2	.843	683.42	.468
K6-Exhaust 6, F	1161.9	.501	627.72	.279
K7-Exhaust Common, F	1315.8	.753	713.21	.418
Dry Bulb Temperature, F	79.170	.327	26.205	.182
Wet Bulb Temperature, F	66.355	.057	19.086	.032
J1-Water In, F	160.89	.084	71.603	.047
J2-Water Out, F	170.64	.053	77.025	.029
J3-Oil Sump, F	221.27	.453	105.15	.252
J4-Fuel Inlet, F	90.539	.086	32.522	.048
J5-Air After Filter, F	100.56	.066	38.086	.037
J6-Intake Manifold, F	101.37	.126	38.541	.070
J7-Fuel Return, F	92.677	.024	33.709	.014
P1-Fuel, PSIG	101.90	.878	702.55	6.053
P2-Oil Gallery, PSIG	53.261	.082	367.22	.564
P6-Ex Common, "H2OG	15.842	.087	3.942	.022
P7-Air Aft Filt, "H2OV	3.481	.231	.866	.058
P8-Blowby, "H2OG	-.015	.013	-.004	.003
P11-Baro (Vent), "Hg ABS	28.936	.002	97.989	.005
Speed, RPM	1499.2	2.119	1499.2	2.119
Load, Lb-Ft	572.57	2.363	776.29	3.204
Smoke, %	19.559	.442	19.559	.442
Fuel Flow, Lb/Hr	70.645	.197	32.044	.089
Horsepower	163.45	.529	121.86	.395
Corrected Horsepower	172.10	.557	128.31	.416
BSFC, lb/hp-hr	.432	.002	.263	.001
Corrected BSFC	.410	.002	.250	.001
Relative Humidity	51.128	.765	51.128	.765
Reference Pressure, inHg	28.680		97.122	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1816

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.68 in-Hg
Speed :	1499 RPM
Load :	572.6 lb-ft
Fuel Flow :	70.6 lb/hr
Brake Power :	163.43 bhp
BSFC :	.432 lb/bhp-hr
Indicated Power :	24.12 kW/cyl
Peak Pressure :	8.496 MPa
Peak Rate of Pressure Rise:	731.0 kPa/deg
Peak Heat Release Rate :	291.5 Joules/deg
Cumulative Heat Release :	3699.51 Joules
Apparent Combustion Efficiency :	72.5 %
Indicated Thermal Efficiency :	37.8 %
Brake Thermal Efficiency :	31.8 %
Ignition Delay :	2.2 degrees
Centroid Phasing :	190.3 degrees
Centroid Magnitude :	46.34 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.08034

980420.130052 AL-17355-F AL-12920-L NH220				7
K1-Exhaust 1, F	1142.8	1.336	617.11	.742
K2-Exhaust 2, F	1186.9	.597	641.61	.332
K3-Exhaust 3, F	1183.2	1.155	639.58	.642
K4-Exhaust 4, F	1151.8	.392	622.09	.218
K5-Exhaust 5, F	1216.0	.515	657.77	.286
K6-Exhaust 6, F	1128.1	.565	608.93	.314
K7-Exhaust Common, F	1285.6	.356	696.42	.198
Dry Bulb Temperature, F	79.670	.439	26.483	.244
Wet Bulb Temperature, F	66.631	.111	19.239	.062
J1-Water In, F	159.01	.147	70.559	.082
J2-Water Out, F	169.80	.152	76.557	.084
J3-Oil Sump, F	213.86	.191	101.04	.106
J4-Fuel Inlet, F	90.610	.067	32.561	.037
J5-Air After Filter, F	100.07	.052	37.816	.029
J6-Intake Manifold, F	100.75	.045	38.192	.025
J7-Fuel Return, F	91.722	.085	33.179	.047
P1-Fuel, PSIG	88.866	.754	612.71	5.196
P2-Oil Gallery, PSIG	50.492	.055	348.13	.382
P6-Ex Common, "H2OG	14.928	.110	3.715	.027
P7-Air Aft Filt, "H2OV	2.860	.259	.712	.064
P8-Blowby, "H2OG	.013	.032	.003	.008
P11-Baro (Vent), "Hg ABS	28.929	.002	97.963	.007
Speed, RPM	1301.7	2.209	1301.7	2.209
Load, Lb-Ft	584.12	2.571	791.95	3.485
Smoke, %	24.778	.873	24.778	.873
Fuel Flow, Lb/Hr	63.970	.371	29.016	.168
Horsepower	144.78	.787	107.94	.587
Corrected Horsepower	152.44	.829	113.65	.618
BSFC, lb/hp-hr	.442	.004	.269	.002
Corrected BSFC	.420	.004	.255	.002
Relative Humidity	50.676	.932	50.676	.932
Reference Pressure, inHg	28.718		97.251	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1818

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.72 in-Hg
Speed :	1302 RPM
Load :	584.1 lb-ft
Fuel Flow :	64.0 lb/hr
Brake Power :	144.80 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	21.06 kW/cyl
Peak Pressure :	8.859 MPa
Peak Rate of Pressure Rise:	790.8 kPa/deg
Peak Heat Release Rate :	320.4 Joules/deg
Cumulative Heat Release :	3657.01 Joules
Apparent Combustion Efficiency :	68.6 %
Indicated Thermal Efficiency :	36.4 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	1.7 degrees
Centroid Phasing :	187.3 degrees
Centroid Magnitude :	51.17 J/degree
Sensitivity :	24.7 degrees
Premixed/Diffusion Ratio :	.06788

880420.131028 AL-17355-F AL-12920-L NH220				7
K1-Exhaust 1, F	1077.5	.802	580.81	.446
K2-Exhaust 2, F	1094.8	.959	590.45	.533
K3-Exhaust 3, F	1097.0	.944	591.69	.525
K4-Exhaust 4, F	1066.7	.739	574.85	.411
K5-Exhaust 5, F	1136.4	.674	613.57	.375
K6-Exhaust 6, F	1057.8	.854	569.86	.474
K7-Exhaust Common, F	1187.8	1.311	642.11	.728
Dry Bulb Temperature, F	79.880	.337	26.600	.187
Wet Bulb Temperature, F	66.371	.028	19.095	.016
J1-Water In, F	158.41	.115	70.227	.064
J2-Water Out, F	169.39	.068	76.327	.038
J3-Oil Sump, F	208.06	.270	97.813	.150
J4-Fuel Inlet, F	89.651	.108	32.029	.060
J5-Air After Filter, F	100.01	.120	37.783	.067
J6-Intake Manifold, F	100.62	.157	38.125	.087
J7-Fuel Return, F	89.326	.142	31.848	.079
P1-Fuel, PSIG	68.572	.895	472.79	6.171
P2-Oil Gallery, PSIG	45.606	.081	314.45	.560
P6-Ex Common, "H2OG	12.412	.062	3.089	.015
P7-Air Aft Filt, "H2OV	2.183	.216	.543	.054
P8-Blowby, "H2OG	.032	.022	.008	.006
P11-Baro (Vent), "Hg ABS	28.929	.002	97.964	.006
Speed, RPM	1099.7	2.006	1099.7	2.006
Load, Lb-Ft	561.12	2.205	760.78	2.990
Smoke, %	20.464	.335	20.464	.335
Fuel Flow, Lb/Hr	51.578	.342	23.395	.155
Horsepower	117.50	.574	87.602	.428
Corrected Horsepower	123.66	.604	92.196	.450
BSFC, lb/hp-hr	.439	.003	.267	.002
Corrected BSFC	.417	.003	.254	.002
Relative Humidity	49.261	.869	49.261	.869
Reference Pressure, inHg	28.768		97.420	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1820

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.77 in-Hg
Speed :	1100 RPM
Load :	561.1 lb-ft
Fuel Flow :	51.6 lb/hr
Brake Power :	117.52 bhp
BSFC :	.439 lb/bhp-hr
Indicated Power :	17.05 kW/cyl
Peak Pressure :	8.807 MPa
Peak Rate of Pressure Rise:	771.3 kPa/deg
Peak Heat Release Rate :	321.6 Joules/deg
Cumulative Heat Release :	3481.51 Joules
Apparent Combustion Efficiency :	68.5 %
Indicated Thermal Efficiency :	36.6 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	1.9 degrees
Centroid Phasing :	186.2 degrees
Centroid Magnitude :	51.10 J/degree
Sensitivity :	23.3 degrees
Premixed/Diffusion Ratio :	.07947

CUMMINS NH220 LOG SHEET

TEST NO. 7 FUEL TFO8N19087 DATE 4-20-88 PAGE 77

Operator Greg							
Time	1:45	1:55	2:05	2:15	2:55	3:05	3:15
Test Hour	30min	10min	10min	10min	40min	10min	10min
Speed, RPM	2099	1801	1801	1800	1900	1801	1500
Load, lb–ft	499.1	539.7	368.5	270.2	133.3	46.8	360.3
Fuel Flow, lb/hr	103.9	84.4	57.1	44.3	25.7	16.5	64.8
Exh. Opacity, %	42.0	28.0	10.5	8.0	6.0	5.0	30.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1174	1160	829	694	498	372	1122
Exhaust Cyl. 2	1272	1257	947	795	563	412	1199
Exhaust Cyl. 3	1308	1287	936	776	561	418	1205
Exhaust Cyl. 4	1236	1235	893	733	526	404	1147
Exhaust Cyl. 5	1246	1249	867	719	510	376	1194
Exhaust Cyl. 6	1167	1169	833	687	479	344	1124
Exhaust Common	1288	1305	889	726	514	383	1260
Water In	161	160	163	164	166	169	160
Water Out	170	169	168	168	168	170	169
Oil Sump	220	225	221	216	210	206	207
Fuel	91	92	91	90	89	89	91
Inlet Air	100	100	99	98	98	97	100
Wet Bulb	67.8	67.7	68.0	68.0	68.4	68.0	68.7
Dry Bulb	83.2	83.5	84.1	84.1	86.0	85.2	86.2
PRESSURES, PSIG							
Fuel Pump	138.0	125.0	62.0	44.0	25.0	15.0	109.0
Oil Gallery	58.3	58.7	56.0	57.0	58.1	58.6	57.0
LOW PRESSURES							
Intake Vac, in.water	6.4	4.9	5.2	5.4	5.5	5.6	3.8
Exh. Comm., in.Water	27.0	19.5	15.0	14.0	11.0	9.0	15.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	28.92	28.91	28.90	28.90	28.88	28.87	28.87

CUMMINS NH220 LOG SHEET

TEST NO. 7 FUEL TF08NH0187 DATE 4-20-88 PAGE 78

Operator Greg							
Time	3:25	3:39					
Test Hour	10 Min	8 Min					
Speed, RPM	1301	1100					
Load, lb–ft	572.8	551.1					
Fuel Flow, lb/hr	73.3	65.9					
Exh. Opacity, %	37.0	34.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1095	1042					
Exhaust Cyl. 2	1162	1084					
Exhaust Cyl. 3	1154	1068					
Exhaust Cyl. 4	1123	1041					
Exhaust Cyl. 5	1171	1094					
Exhaust Cyl. 6	1116	1054					
Exhaust Common	1243	1146					
Water In	159	158					
Water Out	170	168					
Oil Sump	205	204					
Fuel	92	91					
Inlet Air	100	100					
Wet Bulb	67.1	69.0					
Dry Bulb	87.5	87.0					
PRESSURES, PSIG							
Fuel Pump	95.0	78.0					
Oil Gallery	53.8	46.9					
LOW PRESSURES							
Intake Vac, in.water	3.1	2.4					
Exh. Comm., in.Water	14.5	12.0					
Blowby, in.water	0	0					
Barometer, in.Hg	28.86	28.86					

880420.134001 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	1174.6	1.126	634.78	.626
K2-Exhaust 2, F	1272.6	.325	689.20	.181
K3-Exhaust 3, F	1309.5	.416	709.74	.231
K4-Exhaust 4, F	1232.7	.570	667.04	.317
K5-Exhaust 5, F	1246.6	.398	674.79	.221
K6-Exhaust 6, F	1167.6	.483	630.91	.268
K7-Exhaust Common, F	1288.9	.286	698.27	.159
Dry Bulb Temperature, F	81.988	.287	27.771	.159
Wet Bulb Temperature, F	66.943	.079	19.413	.044
J1-Water In, F	162.22	.090	72.346	.050
J2-Water Out, F	169.54	.049	76.413	.027
J3-Oil Sump, F	220.07	.540	104.48	.300
J4-Fuel Inlet, F	91.258	.025	32.921	.014
J5-Air After Filter, F	100.27	.057	37.930	.031
J6-Intake Manifold, F	100.19	.052	37.882	.029
J7-Fuel Return, F	93.740	.045	34.300	.025
P1-Fuel, PSIG	136.17	1.947	938.83	13.424
P2-Oil Gallery, PSIG	57.590	.053	397.07	.364
P6-Ex Common, "H2OG	26.698	.158	6.643	.039
P7-Air Aft Filt, "H2OV	6.278	.366	1.562	.091
P8-Blowby, "H2OG	.029	.028	.007	.007
P11-Baro (Vent), "Hg ABS	28.917	.003	97.923	.010
Speed, RPM	2101.2	2.343	2101.2	2.343
Load, Lb-Ft	499.64	1.712	677.42	2.321
Smoke, %	45.245	1.512	45.245	1.512
Fuel Flow, Lb/Hr	103.30	1.945	46.856	.882
Horsepower	199.89	.686	149.03	.512
Corrected Horsepower	210.49	.723	156.94	.539
BSFC, lb/hp-hr	.517	.010	.314	.006
Corrected BSFC	.491	.010	.299	.006
Relative Humidity	45.670	.658	45.670	.658
Reference Pressure, inHg	28.455		96.359	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1822

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.46 in-Hg
Speed :	2101 RPM
Load :	499.6 lb-ft
Fuel Flow :	103.3 lb/hr
Brake Power :	199.86 bhp
BSFC :	.517 lb/bhp-hr
Indicated Power :	30.19 kW/cyl
Peak Pressure :	7.081 MPa
Peak Rate of Pressure Rise:	585.6 kPa/deg
Peak Heat Release Rate :	215.4 Joules/deg
Cumulative Heat Release :	3466.77 Joules
Apparent Combustion Efficiency :	66.3 %
Indicated Thermal Efficiency :	33.0 %
Brake Thermal Efficiency :	27.1 %
Ignition Delay :	7.3 degrees
Centroid Phasing :	197.2 degrees
Centroid Magnitude :	40.74 J/degree
Sensitivity :	28.9 degrees
Premixed/Diffusion Ratio :	.25260

880420.135044 AL-16085-F AL-12920-L NH220				?
K1-Exhaust 1, F	1161.0	.461	627.24	.256
K2-Exhaust 2, F	1256.7	.725	680.39	.403
K3-Exhaust 3, F	1287.8	.669	697.65	.372
K4-Exhaust 4, F	1233.3	.643	667.37	.357
K5-Exhaust 5, F	1249.4	.395	676.35	.219
K6-Exhaust 6, F	1167.1	.734	630.61	.408
K7-Exhaust Common, F	1303.6	.449	706.44	.250
Dry Bulb Temperature, F	81.612	.243	27.562	.135
Wet Bulb Temperature, F	66.533	.060	19.185	.033
J1-Water In, F	160.91	.083	71.617	.046
J2-Water Out, F	169.33	.066	76.293	.036
J3-Oil Sump, F	225.81	.221	107.67	.123
J4-Fuel Inlet, F	92.558	.065	33.643	.036
J5-Air After Filter, F	100.47	.227	38.042	.126
J6-Intake Manifold, F	100.56	.249	38.089	.139
J7-Fuel Return, F	94.473	.057	34.707	.032
P1-Fuel, PSIG	123.33	1.020	850.35	7.033
P2-Oil Gallery, PSIG	55.317	.090	381.40	.619
P6-Ex Common, "H2OG	19.092	.190	4.751	.047
P7-Air Aft Filt, "H2OV	5.318	.445	1.323	.111
P8-Blowby, "H2OG	.001	.056	.000	.014
P11-Baro (Vent), "Hg ABS	28.907	.006	97.891	.019
Speed, RPM	1803.8	3.784	1803.8	3.784
Load, Lb-Ft	543.19	5.779	736.46	7.835
Smoke, %	28.104	.331	28.104	.331
Fuel Flow, Lb/Hr	87.571	2.513	39.722	1.140
Horsepower	186.56	2.170	139.09	1.618
Corrected Horsepower	196.48	2.286	146.49	1.704
BSFC, lb/hp-hr	.469	.013	.286	.008
Corrected BSFC	.446	.012	.271	.007
Relative Humidity	45.343	.450	45.343	.450
Reference Pressure, inHg	28.516		96.567	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1824

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.52 in-Hg
Speed :	1804 RPM
Load :	543.2 lb-ft
Fuel Flow :	87.6 lb/hr
Brake Power :	186.58 bhp
BSFC :	.469 lb/bhp-hr
Indicated Power :	27.38 kW/cyl
Peak Pressure :	7.593 MPa
Peak Rate of Pressure Rise:	697.6 kPa/deg
Peak Heat Release Rate :	263.6 Joules/deg
Cumulative Heat Release :	3576.02 Joules
Apparent Combustion Efficiency :	69.2 %
Indicated Thermal Efficiency :	35.2 %
Brake Thermal Efficiency :	29.8 %
Ignition Delay :	6.5 degrees
Centroid Phasing :	194.8 degrees
Centroid Magnitude :	44.22 J/degree
Sensitivity :	27.3 degrees
Premixed/Diffusion Ratio :	.23666

880420.140140 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	831.49	1.194	444.16	.663
K2-Exhaust 2, F	940.13	9.257	504.52	5.143
K3-Exhaust 3, F	935.54	1.145	501.96	.636
K4-Exhaust 4, F	896.51	1.324	480.28	.736
K5-Exhaust 5, F	870.19	1.033	465.66	.574
K6-Exhaust 6, F	834.67	1.416	445.93	.787
K7-Exhaust Common, F	892.19	1.202	477.88	.668
Dry Bulb Temperature, F	82.254	.320	27.919	.178
Wet Bulb Temperature, F	67.048	.076	19.471	.042
J1-Water In, F	163.72	.065	73.179	.036
J2-Water Out, F	168.54	.067	75.857	.037
J3-Oil Sump, F	221.41	.217	105.23	.120
J4-Fuel Inlet, F	91.304	.060	32.947	.033
J5-Air After Filter, F	99.665	.222	37.592	.123
J6-Intake Manifold, F	99.307	.221	37.393	.123
J7-Fuel Return, F	91.173	.168	32.874	.093
P1-Fuel, PSIG	59.456	.223	409.93	1.534
P2-Oil Gallery, PSIG	56.099	.053	386.79	.368
P6-Ex Common, "H2OG	14.667	.054	3.650	.014
P7-Air Aft Filt, "H2OV	5.546	.592	1.380	.147
P8-Blowby, "H2OG	.005	.065	.001	.016
P11-Baro (Vent), "Hg ABS	28.901	.004	97.870	.014
Speed, RPM	1801.6	3.596	1801.6	3.596
Load, Lb-Ft	368.60	8.692	499.75	11.785
Smoke, %	11.301	.101	11.301	.101
Fuel Flow, Lb/Hr	57.356	4.075	26.016	1.848
Horsepower	126.44	3.118	94.274	2.325
Corrected Horsepower	133.15	3.283	99.275	2.448
BSFC, lb/hp-hr	.454	.035	.276	.021
Corrected BSFC	.431	.033	.262	.020
Relative Humidity	45.348	.690	45.348	.690
Reference Pressure, inHg	28.493		96.489	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CH1826

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.49 in-Hg
Speed :	1802 RPM
Load :	368.6 lb-ft
Fuel Flow :	57.4 lb/hr
Brake Power :	126.47 bhp
BSFC :	.454 lb/bhp-hr
Indicated Power :	18.92 kW/cyl
Peak Pressure :	6.011 MPa
Peak Rate of Pressure Rise:	419.4 kPa/deg
Peak Heat Release Rate :	156.2 Joules/deg
Cumulative Heat Release :	2455.58 Joules
Apparent Combustion Efficiency :	72.4 %
Indicated Thermal Efficiency :	37.2 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	11.1 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	31.10 J/degree
Sensitivity :	23.0 degrees
Premixed/Diffusion Ratio :	.48226

880420.141026 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	688.03	1.214	364.46	.674
K2-Exhaust 2, F	779.27	1.239	415.15	.688
K3-Exhaust 3, F	769.53	1.418	409.74	.788
K4-Exhaust 4, F	730.13	1.244	387.85	.691
K5-Exhaust 5, F	712.01	1.425	377.78	.792
K6-Exhaust 6, F	680.34	1.494	360.19	.830
K7-Exhaust Common, F	721.77	1.013	383.21	.563
Dry Bulb Temperature, F	82.453	.539	28.029	.300
Wet Bulb Temperature, F	66.925	.128	19.403	.071
J1-Water In, F	164.64	.075	73.688	.041
J2-Water Out, F	167.92	.050	75.509	.028
J3-Oil Sump, F	217.46	.162	103.03	.090
J4-Fuel Inlet, F	90.406	.053	32.448	.029
J5-Air After Filter, F	99.683	.092	37.602	.051
J6-Intake Manifold, F	99.873	.117	37.707	.065
J7-Fuel Return, F	89.000	.134	31.667	.075
P1-Fuel, PSIG	41.321	.489	284.90	3.375
P2-Oil Gallery, PSIG	57.133	.034	393.92	.234
P6-Ex Common, "H2OG	13.312	.098	3.313	.024
P7-Air Aft Filt, "H2OV	5.603	.382	1.394	.095
P8-Blowby, "H2OG	.016	.052	.004	.013
P11-Baro (Vent), "Hg ABS	28.903	.004	97.877	.014
Speed, RPM	1804.1	3.346	1804.1	3.346
Load, Lb-Ft	274.88	5.272	372.68	7.148
Smoke, %	9.034	.152	9.034	.152
Fuel Flow, Lb/Hr	45.062	3.925	20.440	1.780
Horsepower	94.425	1.879	70.401	1.401
Corrected Horsepower	99.407	1.978	74.115	1.475
BSFC, lb/hp-hr	.478	.045	.291	.027
Corrected BSFC	.454	.043	.276	.026
Relative Humidity	44.496	.933	44.496	.933
Reference Pressure, inHg	28.491		96.482	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1828

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.49 in-Hg
Speed :	1804 RPM
Load :	274.9 lb-ft
Fuel Flow :	45.1 lb/hr
Brake Power :	94.42 bhp
BSFC :	.478 lb/bhp-hr
Indicated Power :	14.69 kW/cyl
Peak Pressure :	5.474 MPa
Peak Rate of Pressure Rise:	325.9 kPa/deg
Peak Heat Release Rate :	131.3 Joules/deg
Cumulative Heat Release :	1919.90 Joules
Apparent Combustion Efficiency :	72.2 %
Indicated Thermal Efficiency :	36.7 %
Brake Thermal Efficiency :	29.3 %
Ignition Delay :	13.3 degrees
Centroid Phasing :	194.8 degrees
Centroid Magnitude :	28.45 J/degree
Sensitivity :	20.5 degrees
Premixed/Diffusion Ratio :	.64677

880420.145251 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	498.20	.563	259.00	.313
K2-Exhaust 2, F	565.09	.572	296.16	.318
K3-Exhaust 3, F	561.48	.799	294.15	.444
K4-Exhaust 4, F	527.47	1.410	275.26	.783
K5-Exhaust 5, F	512.40	1.224	266.89	.680
K6-Exhaust 6, F	479.16	.464	248.42	.258
K7-Exhaust Common, F	516.11	1.169	268.95	.649
Dry Bulb Temperature, F	85.352	.644	29.640	.358
Wet Bulb Temperature, F	67.555	.095	19.753	.053
J1-Water In, F	166.35	.133	74.638	.074
J2-Water Out, F	167.97	.086	75.540	.048
J3-Oil Sump, F	209.30	.141	98.499	.078
J4-Fuel Inlet, F	89.048	.049	31.693	.027
J5-Air After Filter, F	98.285	.229	36.825	.127
J6-Intake Manifold, F	98.994	.288	37.219	.160
J7-Fuel Return, F	88.643	.067	31.468	.037
P1-Fuel, PSIG	21.263	.176	146.60	1.217
P2-Oil Gallery, PSIG	58.339	.020	402.23	.136
P6-Ex Common, "H2OG	10.076	.044	2.507	.011
P7-Air Aft Filt, "H2OV	5.988	.293	1.490	.073
P8-Blowby, "H2OG	-.013	.036	-.003	.009
P11-Baro (Vent), "Hg ABS	28.881	.003	97.802	.009
Speed, RPM	1803.3	2.674	1803.3	2.674
Load, Lb-Ft	136.88	9.558	185.59	12.959
Smoke, %	6.859	.089	6.859	.089
Fuel Flow, Lb/Hr	26.839	2.546	12.174	1.155
Horsepower	47.003	3.326	35.044	2.480
Corrected Horsepower	49.442	3.499	36.863	2.609
BSFC, lb/hp-hr	.571	.037	.347	.022
Corrected BSFC	.543	.035	.330	.021
Relative Humidity	39.739	1.144	39.739	1.144
Reference Pressure, inHg	28.441		96.311	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1830

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.44 in-Hg
Speed :	1803 RPM
Load :	136.9 lb-ft
Fuel Flow :	26.8 lb/hr
Brake Power :	47.00 bhp
BSFC :	.570 lb/bhp-hr
Indicated Power :	8.51 kW/cyl
Peak Pressure :	4.745 MPa
Peak Rate of Pressure Rise:	197.5 kPa/deg
Peak Heat Release Rate :	97.8 Joules/deg
Cumulative Heat Release :	1152.12 Joules
Apparent Combustion Efficiency :	72.8 %
Indicated Thermal Efficiency :	35.8 %
Brake Thermal Efficiency :	24.6 %
Ignition Delay :	15.9 degrees
Centroid Phasing :	194.3 degrees
Centroid Magnitude :	22.47 J/degree
Sensitivity :	17.4 degrees
Premixed/Diffusion Ratio :	.91732

980420.150137 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	372.82	.362	189.34	.201
K2-Exhaust 2, F	414.04	1.045	212.25	.581
K3-Exhaust 3, F	420.22	1.129	215.68	.627
K4-Exhaust 4, F	401.73	.967	205.41	.537
K5-Exhaust 5, F	377.37	1.235	191.87	.686
K6-Exhaust 6, F	344.52	.587	173.62	.326
K7-Exhaust Common, F	385.31	1.171	196.28	.651
Dry Bulb Temperature, F	86.579	.252	30.322	.140
Wet Bulb Temperature, F	67.606	.066	19.781	.037
J1-Water In, F	169.39	.145	76.328	.081
J2-Water Out, F	170.13	.154	76.736	.086
J3-Oil Sump, F	206.45	.147	96.916	.082
J4-Fuel Inlet, F	88.731	.064	31.517	.036
J5-Air After Filter, F	97.270	.149	36.261	.083
J6-Intake Manifold, F	98.176	.108	36.764	.060
J7-Fuel Return, F	87.019	.083	30.566	.046
P1-Fuel, PSIG	11.370	.049	78.393	.338
P2-Oil Gallery, PSIG	58.486	.025	403.25	.172
P6-Ex Common, "H2OG	7.552	.045	1.879	.011
P7-Air Aft Filt, "H2OV	6.467	.523	1.609	.130
P8-Blowby, "H2OG	-.013	.028	-.003	.007
P11-Baro (Vent), "Hg ABS	28.871	.003	97.768	.010
Speed, RPM	1801.7	2.768	1801.7	2.768
Load, Lb-Ft	42.921	3.160	58.193	4.284
Smoke, %	5.253	.053	5.253	.053
Fuel Flow, Lb/Hr	16.707	.269	7.578	.122
Horsepower	14.724	1.081	10.978	.806
Corrected Horsepower	15.473	1.136	11.536	.847
BSFC, lb/hp-hr	1.140	.086	.694	.052
Corrected BSFC	1.085	.082	.660	.050
Relative Humidity	37.308	.376	37.308	.376
Reference Pressure, inHg	28.395		96.157	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1832

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.40 in-Hg
Speed :	1802 RPM
Load :	42.9 lb-ft
Fuel Flow :	16.7 lb/hr
Brake Power :	14.73 bhp
BSFC :	1.134 lb/bhp-hr
Indicated Power :	4.94 kW/cyl
Peak Pressure :	4.376 MPa
Peak Rate of Pressure Rise:	156.4 kPa/deg
Peak Heat Release Rate :	79.3 Joules/deg
Cumulative Heat Release :	726.135 Joules
Apparent Combustion Efficiency :	73.6 %
Indicated Thermal Efficiency :	33.3 %
Brake Thermal Efficiency :	12.4 %
Ignition Delay :	17.0 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	20.04 J/degree
Sensitivity :	16.0 degrees
Premixed/Diffusion Ratio :	1.05694

880420.151032 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	1121.8	1.161	605.44	.645
K2-Exhaust 2, F	1197.0	1.974	647.21	1.096
K3-Exhaust 3, F	1203.2	2.275	650.65	1.264
K4-Exhaust 4, F	1141.4	3.289	616.31	1.827
K5-Exhaust 5, F	1190.7	2.645	643.70	1.469
K6-Exhaust 6, F	1121.5	1.759	605.28	.977
K7-Exhaust Common, F	1253.3	3.557	678.52	1.976
Dry Bulb Temperature, F	84.049	.494	28.916	.274
Wet Bulb Temperature, F	67.163	.049	19.535	.027
J1-Water In, F	160.36	.080	71.314	.045
J2-Water Out, F	168.86	.046	76.033	.026
J3-Oil Sump, F	206.10	.201	96.723	.112
J4-Fuel Inlet, F	90.228	.126	32.349	.070
J5-Air After Filter, F	99.433	.180	37.463	.100
J6-Intake Manifold, F	101.17	.166	38.428	.092
J7-Fuel Return, F	92.749	.060	33.749	.034
P1-Fuel, PSIG	106.12	.613	731.69	4.226
P2-Oil Gallery, PSIG	56.561	.036	389.97	.252
P6-Ex Common, "H2OG	14.256	.104	3.547	.026
P7-Air Aft Filt, "H2OV	4.535	.299	1.129	.074
P8-Blowby, "H2OG	.007	.041	.002	.010
P11-Baro (Vent), "Hg ABS	28.867	.002	97.756	.008
Speed, RPM	1501.1	2.844	1501.1	2.844
Load, Lb-Ft	561.42	2.956	761.18	4.008
Smoke, %	27.626	.839	27.626	.839
Fuel Flow, Lb/Hr	73.017	10.208	33.120	4.630
Horsepower	160.47	.767	119.64	.572
Corrected Horsepower	169.05	.808	126.04	.602
BSFC, lb/hp-hr	.455	.063	.277	.038
Corrected BSFC	.432	.060	.263	.036
Relative Humidity	41.500	.980	41.500	.980
Reference Pressure, inHg	28.534		96.626	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1834

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.53 in-Hg
Speed :	1501 RPM
Load :	561.4 lb-ft
Fuel Flow :	73.0 lb/hr
Brake Power :	160.45 bhp
BSFC :	.455 lb/bhp-hr
Indicated Power :	23.65 kW/cyl
Peak Pressure :	8.118 MPa
Peak Rate of Pressure Rise:	831.5 kPa/deg
Peak Heat Release Rate :	327.9 Joules/deg
Cumulative Heat Release :	3621.49 Joules
Apparent Combustion Efficiency :	70.0 %
Indicated Thermal Efficiency :	36.5 %
Brake Thermal Efficiency :	30.8 %
Ignition Delay :	5.6 degrees
Centroid Phasing :	192.1 degrees
Centroid Magnitude :	52.00 J/degree
Sensitivity :	25.5 degrees
Premixed/Diffusion Ratio :	.21928

980420.151944 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	1096.9	1.232	591.62	.685
K2-Exhaust 2, F	1160.1	1.201	626.73	.667
K3-Exhaust 3, F	1153.1	.926	622.85	.514
K4-Exhaust 4, F	1123.0	.413	606.13	.229
K5-Exhaust 5, F	1172.7	1.474	633.71	.819
K6-Exhaust 6, F	1110.8	.732	599.32	.407
K7-Exhaust Common, F	1242.9	.879	672.71	.488
Dry Bulb Temperature, F	85.480	.508	29.711	.282
Wet Bulb Temperature, F	67.533	.098	19.741	.054
J1-Water In, F	158.75	.145	70.414	.080
J2-Water Out, F	169.20	.105	76.225	.059
J3-Oil Sump, F	205.30	.216	96.277	.120
J4-Fuel Inlet, F	91.838	.081	33.243	.045
J5-Air After Filter, F	99.750	.182	37.639	.101
J6-Intake Manifold, F	100.97	.227	38.318	.126
J7-Fuel Return, F	91.949	.034	33.305	.019
P1-Fuel, PSIG	93.280	.480	643.15	3.308
P2-Oil Gallery, PSIG	53.352	.017	367.85	.120
P6-Ex Common, "H2OG	13.418	.086	3.339	.021
P7-Air Aft Filt, "H2OV	3.859	.145	.960	.036
P8-Blowby, "H2OG	-.017	.037	-.004	.009
P11-Baro (Vent), "Hg ABS	28.861	.002	97.734	.007
Speed, RPM	1302.7	3.191	1302.7	3.191
Load, Lb-Ft	571.37	1.975	774.67	2.677
Smoke, %	36.408	.939	36.408	.939
Fuel Flow, Lb/Hr	74.293	2.316	33.699	1.051
Horsepower	141.73	.678	105.67	.506
Corrected Horsepower	149.37	.715	111.37	.533
BSFC, lb/hp-hr	.524	.016	.319	.010
Corrected BSFC	.497	.015	.303	.009
Relative Humidity	39.412	.851	39.412	.851
Reference Pressure, inHg	28.577		96.773	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1836

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.58 in-Hg
Speed :	1303 RPM
Load :	571.4 lb-ft
Fuel Flow :	74.3 lb/hr
Brake Power :	141.76 bhp
BSFC :	.524 lb/bhp-hr
Indicated Power :	20.72 kW/cyl
Peak Pressure :	8.592 MPa
Peak Rate of Pressure Rise:	930.2 kPa/deg
Peak Heat Release Rate :	380.5 Joules/deg
Cumulative Heat Release :	3588.87 Joules
Apparent Combustion Efficiency :	59.1 %
Indicated Thermal Efficiency :	31.4 %
Brake Thermal Efficiency :	26.7 %
Ignition Delay :	5.1 degrees
Centroid Phasing :	188.8 degrees
Centroid Magnitude :	60.00 J/degree
Sensitivity :	22.7 degrees
Premixed/Diffusion Ratio :	.22586

880420.152928 AL-16085-F AL-12920-L NH220				7
K1-Exhaust 1, F	1043.8	.863	562.13	.479
K2-Exhaust 2, F	1085.2	.875	585.13	.486
K3-Exhaust 3, F	1067.5	1.234	575.28	.686
K4-Exhaust 4, F	1041.6	.810	560.86	.450
K5-Exhaust 5, F	1096.0	.574	591.13	.319
K6-Exhaust 6, F	1054.5	.525	568.05	.291
K7-Exhaust Common, F	1147.0	1.374	619.42	.763
Dry Bulb Temperature, F	85.008	.188	29.449	.105
Wet Bulb Temperature, F	67.769	.024	19.872	.014
J1-Water In, F	156.74	.248	69.301	.138
J2-Water Out, F	168.13	.129	75.629	.071
J3-Oil Sump, F	203.75	.286	95.414	.159
J4-Fuel Inlet, F	91.549	.052	33.083	.029
J5-Air After Filter, F	100.04	.109	37.802	.060
J6-Intake Manifold, F	100.43	.175	38.016	.097
J7-Fuel Return, F	91.300	.066	32.945	.036
P1-Fuel, PSIG	75.543	.741	520.85	5.111
P2-Oil Gallery, PSIG	47.238	.042	325.70	.292
P6-Ex Common, "H2OG	11.119	.069	2.767	.017
P7-Air Aft Filt, "H2OV	3.179	.132	.791	.033
P8-Blowby, "H2OG	.023	.039	.006	.010
P11-Baro (Vent), "Hg ABS	28.857	.003	97.720	.009
Speed, RPM	1100.0	2.892	1100.0	2.892
Load, Lb-Ft	555.00	2.752	752.48	3.732
Smoke, %	34.225	.822	34.225	.822
Fuel Flow, Lb/Hr	61.942	3.164	28.097	1.435
Horsepower	116.25	.639	86.670	.476
Corrected Horsepower	122.62	.674	91.425	.503
BSFC, lb/hp-hr	.533	.028	.324	.017
Corrected BSFC	.505	.027	.307	.016
Relative Humidity	41.089	.366	41.089	.366
Reference Pressure, inHg	28.623		96.928	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1838

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.62 in-Hg
Speed :	1100 RPM
Load :	555.0 lb-ft
Fuel Flow :	61.9 lb/hr
Brake Power :	116.24 bhp
BSFC :	.533 lb/bhp-hr
Indicated Power :	17.00 kW/cyl
Peak Pressure :	8.769 MPa
Peak Rate of Pressure Rise:	951.0 kPa/deg
Peak Heat Release Rate :	393.8 Joules/deg
Cumulative Heat Release :	3438.56 Joules
Apparent Combustion Efficiency :	57.4 %
Indicated Thermal Efficiency :	31.0 %
Brake Thermal Efficiency :	26.3 %
Ignition Delay :	3.8 degrees
Centroid Phasing :	186.1 degrees
Centroid Magnitude :	64.12 J/degree
Sensitivity :	21.3 degrees
Premixed/Diffusion Ratio :	.17775

APPENDIX G8
CUMMINS NH-220G DATA SHEETS
TEST FUEL TF07

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine
Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: Cummins NH220G Engine Tester: G. Killgore
Test Fuel: TF07N11087 Date: 4-5-88

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressures
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF07N11087 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressures
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF07N11087 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: IF07N11U87 Date: 4-5-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	263	CN1559	CN1560
1800	264	CN1561	CN1562
1500	265	CN1563	CN1564
1300	266	CN1565	CN1566
1100	267	CN1567	CN1568

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: IF07N11U87

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	268	CN1569	CN1570
1800	Full-Rack	269	CN1571	CN1572
1800	133	270	CN1573	CN1574
1800	98	271	CN1575	CN1576
1800	48	272	CN1577	CN1578
1800	13	273	CN1579	CN1580
1500	Full-Rack	274	CN1581	CN1582
1300	Full-Rack	275	CN1583	CN1584
1100	Full-Rack	276	CN1585	CN1586

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF07N11U87 Date: 4-5-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	279	CN1587	CN1588
1800	280	CN1589	CN1590
1500	281	CN1591	CN1592
1300	282	CN1593	CN1594
1100	283	CN1595	CN1596

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF07N11U87

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	284	CN1597	CN1598
1800	Full-Rack	285	CN1599	CN1600
1800	133	286	CN1601	CN1602
1800	98	287	CN1603	CN1604
1800	48	288	CN1605	CN1606
1800	13	289	CN1607	CN1608
1500	Full-Rack	290	CN1609	CN1610
1300	Full-Rack	291	CN1611	CN1612
1100	Full-Rack	292	CN1613	CN1614

CUMMINS NH220 LOG SHEET

TEST NO. 8 FUEL BF02V31087 DATE 4-5-88 PAGE 49

Operator Greg							
Time	8:50	9:00	9:15	9:25	9:40		
Test Hour	30 min	10 min	15 min	10 min	15 min		
Speed, RPM	2099	1900	1501	1298	1101		
Load, lb–ft	480.0	520.1	549.4	553.7	535.4		
Fuel Flow, lb/hr	25.3	79.3	70.8	62.8	51.6		
Exh. Opacity, %	30.0	17.5	15.5	17.0	14.0		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1185	1188	1160	1124	1067		
Exhaust Cyl. 2	1295	1276	1238	1173	1079		
Exhaust Cyl. 3	1271	1273	1235	1176	1078		
Exhaust Cyl. 4	1246	1248	1208	1155	1070		
Exhaust Cyl. 5	1272	1291	1276	1222	1140		
Exhaust Cyl. 6	1188	1189	1164	1127	1057		
Exhaust Common	1298	1327	1328	1291	1190		
Water In	162	161	159	159	159		
Water Out	170	170	169	170	169		
Oil Sump	216	222	217	210	204		
Fuel	88	88	87	87	87		
Inlet Air	100	101	102	100	103		
Wet Bulb	71.8	71.9	72.9	72.4	72.5		
Dry Bulb	75.9	76.0	78.0	78.0	78.0		
PRESSURES, PSIG							
Fuel Pump	134.0	120.0	105.0	91.0	72.0		
Oil Gallery	58.4	55.7	54.0	51.1	46.6		
LOW PRESSURES							
Intake Vac, in.water	4.4	3.3	2.5	2.0	1.5		
Exh. Comm., in.Water	17.5	20.0	16.0	15.5	13.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	28.96	28.97	28.97	28.98	28.98		

980405.084917 AL-17355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1187.1	.685	641.73	.381
K2-Exhaust 2, F	1300.8	.671	704.90	.373
K3-Exhaust 3, F	1270.8	.600	688.21	.333
K4-Exhaust 4, F	1244.1	.555	673.41	.309
K5-Exhaust 5, F	1271.5	.386	688.61	.214
K6-Exhaust 6, F	1186.6	.597	641.42	.331
K7-Exhaust Common, F	1297.7	.342	703.15	.190
Dry Bulb Temperature, F	75.223	.064	24.013	.036
Wet Bulb Temperature, F	71.831	.025	22.128	.014
J1-Water In, F	163.67	.223	73.150	.124
J2-Water Out, F	170.45	.166	76.915	.092
J3-Oil Sump, F	212.83	.484	100.46	.269
J4-Fuel Inlet, F	88.158	.028	31.199	.016
J5-Air After Filter, F	101.10	.077	38.387	.043
J6-Intake Manifold, F	104.83	.054	40.463	.030
J7-Fuel Return, F	91.897	.047	33.276	.026
P1-Fuel, PSIG	132.53	1.091	913.76	7.521
P2-Oil Gallery, PSIG	58.546	.101	403.66	.695
P6-Ex Common, "H2OG	22.371	.174	5.567	.043
P7-Air Aft Filt, "H2OV	10.183	.236	2.534	.059
P8-Blowby, "H2OG	-.032	.047	-.008	.012
P11-Baro (Vent), "Hg ABS	28.959	.003	98.067	.010
Speed, RPM	2099.5	2.837	2099.5	2.837
Load, Lb-Ft	477.07	3.515	646.82	4.766
Smoke, %	29.975	.389	29.975	.389
Fuel Flow, Lb/Hr	85.814	.387	38.924	.175
Horsepower	190.71	1.347	142.19	1.004
Corrected Horsepower	202.43	1.429	150.93	1.066
BSFC, lb/hp-hr	.450	.004	.274	.002
Corrected BSFC	.424	.004	.258	.002
Relative Humidity	85.047	.249	85.047	.249
Reference Pressure, inHg	28.210		95.531	

NAVY HIGH SPEED DIESEL - CUMMINS NH220C FILE : CN1560

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.21 in-Hg
Speed :	2100 RPM
Load :	477.1 lb-ft
Fuel Flow :	85.8 lb/hr
Brake Power :	190.77 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	28.81 kW/cyl
Peak Pressure :	7.099 MPa
Peak Rate of Pressure Rise:	537.6 kPa/deg
Peak Heat Release Rate :	189.3 Joules/deg
Cumulative Heat Release :	3374.74 Joules
Apparent Combustion Efficiency :	76.2 %
Indicated Thermal Efficiency :	37.2 %
Brake Thermal Efficiency :	30.6 %
Ignition Delay :	4.8 degrees
Centroid Phasing :	198.1 degrees
Centroid Magnitude :	37.41 J/degree
Sensitivity :	32.3 degrees
Premixed/Diffusion Ratio :	.14917

880405.090344 AL-17355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1187.0	.583	641.64	.324
K2-Exhaust 2, F	1276.4	.673	691.32	.374
K3-Exhaust 3, F	1271.0	.239	688.31	.133
K4-Exhaust 4, F	1248.4	.562	675.77	.312
K5-Exhaust 5, F	1291.7	.975	699.82	.542
K6-Exhaust 6, F	1185.7	.955	640.96	.530
K7-Exhaust Common, F	1326.5	.444	719.14	.247
Dry Bulb Temperature, F	75.532	.045	24.184	.025
Wet Bulb Temperature, F	72.001	.024	22.223	.013
J1-Water In, F	162.39	.265	72.441	.147
J2-Water Out, F	170.42	.213	76.898	.118
J3-Oil Sump, F	222.50	.146	105.83	.081
J4-Fuel Inlet, F	88.880	.026	31.600	.014
J5-Air After Filter, F	100.78	.073	38.211	.041
J6-Intake Manifold, F	104.46	.093	40.257	.052
J7-Fuel Return, F	92.245	.043	33.470	.024
P1-Fuel, PSIG	118.79	.792	819.02	5.463
P2-Oil Gallery, PSIG	55.426	.054	382.15	.373
P6-Ex Common, "H2OG	14.877	.326	3.702	.081
P7-Air Aft Filt, "H2OV	9.207	.494	2.291	.123
P8-Blowby, "H2OG	-.011	.047	-.003	.012
P11-Baro (Vent), "Hg ABS	28.966	.003	98.090	.012
Speed, RPM	1797.8	2.852	1797.8	2.852
Load, Lb-Ft	520.53	3.576	705.75	4.848
Smoke, %	18.128	.360	18.128	.360
Fuel Flow, Lb/Hr	78.639	.146	35.670	.066
Horsepower	178.19	1.382	132.85	1.030
Corrected Horsepower	189.06	1.466	140.96	1.093
BSFC, lb/hp-hr	.441	.003	.269	.002
Corrected BSFC	.416	.003	.253	.002
Relative Humidity	84.516	.178	84.516	.178
Reference Pressure, inHg	28.289		95.797	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1562

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.29 in-Hg
Speed :	1798 RPM
Load :	520.5 lb-ft
Fuel Flow :	78.6 lb/hr
Brake Power :	178.19 bhp
BSFC :	.441 lb/bhp-hr
Indicated Power :	26.09 kW/cyl
Peak Pressure :	7.631 MPa
Peak Rate of Pressure Rise:	632.3 kPa/deg
Peak Heat Release Rate :	233.7 Joules/deg
Cumulative Heat Release :	3468.15 Joules
Apparent Combustion Efficiency :	73.2 %
Indicated Thermal Efficiency :	36.7 %
Brake Thermal Efficiency :	31.2 %
Ignition Delay :	4.1 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	39.54 J/degree
Sensitivity :	29.8 degrees
Premixed/Diffusion Ratio :	.13876

880405.091519 AL-17355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1161.4	.832	627.46	.462
K2-Exhaust 2, F	1237.4	.635	669.65	.353
K3-Exhaust 3, F	1235.7	.642	668.70	.356
K4-Exhaust 4, F	1209.1	.308	653.97	.171
K5-Exhaust 5, F	1278.3	.456	692.37	.253
K6-Exhaust 6, F	1169.1	.596	631.73	.331
K7-Exhaust Common, F	1331.5	.612	721.93	.340
Dry Bulb Temperature, F	76.642	.043	24.801	.024
Wet Bulb Temperature, F	72.047	.030	22.248	.017
J1-Water In, F	160.33	.291	71.294	.162
J2-Water Out, F	169.77	.222	76.537	.123
J3-Oil Sump, F	219.34	.135	104.08	.075
J4-Fuel Inlet, F	88.887	.028	31.604	.016
J5-Air After Filter, F	103.28	.076	39.598	.042
J6-Intake Manifold, F	106.86	.056	41.589	.031
J7-Fuel Return, F	91.610	.051	33.117	.028
P1-Fuel, PSIG	103.12	1.032	710.97	7.115
P2-Oil Gallery, PSIG	53.826	.096	371.12	.663
P6-Ex Common, "H2OG	11.083	.259	2.758	.065
P7-Air Aft Filt, "H2OV	7.977	.254	1.985	.063
P8-Blowby, "H2OG	-.018	.016	-.004	.004
P11-Baro (Vent), "Hg ABS	28.972	.002	98.110	.007
Speed, RPM	1500.9	1.969	1500.9	1.969
Load, Lb-Ft	549.03	1.777	744.38	2.410
Smoke, %	15.851	.486	15.851	.486
Fuel Flow, Lb/Hr	70.553	1.033	32.002	.469
Horsepower	156.90	.571	116.98	.426
Corrected Horsepower	166.75	.607	124.33	.452
BSFC, lb/hp-hr	.450	.008	.274	.005
Corrected BSFC	.423	.007	.257	.004
Relative Humidity	80.336	.197	80.336	.197
Reference Pressure, inHg	28.385		96.123	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1564

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.39 in-Hg
Speed :	1501 RPM
Load :	549.0 lb-ft
Fuel Flow :	70.6 lb/hr
Brake Power :	156.90 bhp
BSFC :	.450 lb/bhp-hr
Indicated Power :	22.83 kW/cyl
Peak Pressure :	8.364 MPa
Peak Rate of Pressure Rise:	812.7 kPa/deg
Peak Heat Release Rate :	328.9 Joules/deg
Cumulative Heat Release :	3534.17 Joules
Apparent Combustion Efficiency :	69.3 %
Indicated Thermal Efficiency :	35.8 %
Brake Thermal Efficiency :	30.6 %
Ignition Delay :	2.3 degrees
Centroid Phasing :	190.5 degrees
Centroid Magnitude :	48.96 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.08585

880405.092730 AL-17355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1124.4	.704	606.89	.391
K2-Exhaust 2, F	1175.5	.929	635.27	.516
K3-Exhaust 3, F	1179.0	.856	637.23	.475
K4-Exhaust 4, F	1154.5	.630	623.61	.350
K5-Exhaust 5, F	1225.1	.998	662.82	.554
K6-Exhaust 6, F	1128.6	.762	609.20	.423
K7-Exhaust Common, F	1291.4	.951	699.67	.528
Dry Bulb Temperature, F	76.414	.091	24.675	.050
Wet Bulb Temperature, F	71.957	.024	22.198	.013
J1-Water In, F	160.06	.267	71.143	.148
J2-Water Out, F	170.16	.205	76.758	.114
J3-Oil Sump, F	212.80	.090	100.45	.050
J4-Fuel Inlet, F	88.484	.044	31.380	.024
J5-Air After Filter, F	101.94	.130	38.853	.072
J6-Intake Manifold, F	105.21	.078	40.670	.043
J7-Fuel Return, F	90.751	.047	32.640	.026
P1-Fuel, PSIG	88.992	.619	613.58	4.269
P2-Oil Gallery, PSIG	51.323	.063	353.86	.432
P6-Ex Common, "H2OG	10.143	.344	2.524	.086
P7-Air Aft Filt, "H2OV	7.471	.235	1.859	.058
P8-Blowby, "H2OG	-.025	.048	-.006	.012
P11-Baro (Vent), "Hg ABS	28.979	.003	98.133	.009
Speed, RPM	1299.4	2.298	1299.4	2.298
Load, Lb-Ft	554.60	1.589	751.93	2.154
Smoke, %	17.592	.910	17.592	.910
Fuel Flow, Lb/Hr	62.525	.745	28.361	.338
Horsepower	137.22	.366	102.31	.273
Corrected Horsepower	145.62	.389	108.57	.290
BSFC, lb/hp-hr	.456	.006	.277	.003
Corrected BSFC	.429	.005	.261	.003
Relative Humidity	80.844	.275	80.844	.275
Reference Pressure, inHg	28.429		96.273	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1566

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.43 in-Hg
Speed :	1299 RPM
Load :	554.6 lb-ft
Fuel Flow :	62.5 lb/hr
Brake Power :	137.17 bhp
BSFC :	.456 lb/bhp-hr
Indicated Power :	19.99 kW/cyl
Peak Pressure :	8.719 MPa
Peak Rate of Pressure Rise:	818.7 kPa/deg
Peak Heat Release Rate :	340.2 Joules/deg
Cumulative Heat Release :	3540.72 Joules
Apparent Combustion Efficiency :	67.9 %
Indicated Thermal Efficiency :	35.4 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	1.4 degrees
Centroid Phasing :	188.5 degrees
Centroid Magnitude :	51.27 J/degree
Sensitivity :	26.0 degrees
Premixed/Diffusion Ratio :	.05507

880405.093937 AL-17355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1067.3	1.719	575.15	.955
K2-Exhaust 2, F	1080.6	1.251	582.58	.695
K3-Exhaust 3, F	1078.5	.524	581.40	.291
K4-Exhaust 4, F	1070.8	.719	577.12	.399
K5-Exhaust 5, F	1141.4	.436	616.31	.242
K6-Exhaust 6, F	1057.7	1.066	569.84	.592
K7-Exhaust Common, F	1191.5	.614	644.17	.341
Dry Bulb Temperature, F	76.656	.098	24.809	.054
Wet Bulb Temperature, F	71.979	.022	22.211	.012
J1-Water In, F	159.21	.169	70.673	.094
J2-Water Out, F	169.35	.176	76.307	.098
J3-Oil Sump, F	205.69	.292	96.493	.162
J4-Fuel Inlet, F	87.626	.062	30.904	.034
J5-Air After Filter, F	103.48	.096	39.711	.053
J6-Intake Manifold, F	106.89	.091	41.605	.050
J7-Fuel Return, F	89.570	.030	31.983	.017
P1-Fuel, PSIG	69.149	.440	476.76	3.035
P2-Oil Gallery, PSIG	46.767	.082	322.45	.566
P6-Ex Common, "H2OG	8.006	.213	1.992	.053
P7-Air Aft Filt, "H2OV	6.742	.079	1.678	.020
P8-Blowby, "H2OG	.020	.028	.005	.007
P11-Baro (Vent), "Hg ABS	28.980	.002	98.138	.006
Speed, RPM	1101.5	2.492	1101.5	2.492
Load, Lb-Ft	535.79	2.358	726.43	3.197
Smoke, %	14.878	.331	14.878	.331
Fuel Flow, Lb/Hr	51.349	.419	23.292	.190
Horsepower	112.37	.679	83.782	.506
Corrected Horsepower	119.40	.722	89.021	.538
BSFC, lb/hp-hr	.457	.003	.278	.002
Corrected BSFC	.430	.003	.262	.002
Relative Humidity	80.008	.338	80.008	.338
Reference Pressure, inHg	28.484		96.458	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1568

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.48 in-Hg
Speed :	1102 RPM
Load :	535.8 lb-ft
Fuel Flow :	51.3 lb/hr
Brake Power :	112.42 bhp
BSFC :	.456 lb/bhp-hr
Indicated Power :	16.17 kW/cyl
Peak Pressure :	8.652 MPa
Peak Rate of Pressure Rise:	751.8 kPa/deg
Peak Heat Release Rate :	319.0 Joules/deg
Cumulative Heat Release :	3391.53 Joules
Apparent Combustion Efficiency :	67.2 %
Indicated Thermal Efficiency :	34.9 %
Brake Thermal Efficiency :	30.2 %
Ignition Delay :	1.6 degrees
Centroid Phasing :	188.2 degrees
Centroid Magnitude :	49.17 J/degree
Sensitivity :	25.7 degrees
Premixed/Diffusion Ratio :	.06163

CUMMINS NH220 LOG SHEET

TEST NO. 9 FUEL TF07NH1087 DATE 4-5-87 PAGE 50

Operator Greg							
Time	10:30	10:40	10:55	11:05	11:15	11:25	11:35
Test Hour	40min	10min	15min	10min	10min	10min	10min
Speed, RPM	2100	1900	1800	1800	1800	1800	1500
Load, lb–ft	475.1	514.5	368.5	271.1	135.2	45.5	541.1
Fuel Flow, lb/hr	95.7	92.2	59.5	47.7	26.6	17.4	86.4
Exh. Opacity, %	36.0	15.0	6.0	5.0	3.0	2.0	20.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1156	1151	843	694	496	331	1118
Exhaust Cyl. 2	1266	1252	954	791	575	426	1205
Exhaust Cyl. 3	1283	1270	949	786	569	427	1217
Exhaust Cyl. 4	1219	1230	911	748	534	419	1169
Exhaust Cyl. 5	1234	1244	980	728	514	386	1212
Exhaust Cyl. 6	1153	1157	849	697	496	357	1124
Exhaust Common	1272	1293	908	737	519	390	1272
Water In	162	161	166	168	169	169	162
Water Out	170	169	171	171	170	170	171
Oil Sump	228	225	220	216	210	208	208
Fuel	88	88	86	86	87	89	91
Inlet Air	101	100	100	99	99	98	101
Wet Bulb	73.0	73.8	73.7	73.9	73.6	73.0	73.1
Dry Bulb	79.5	80.3	79.8	80.2	80.0	79.1	79.0
PRESSURES, PSIG							
Fuel Pump	137.0	125.0	65.0	47.0	26.0	16.0	107.0
Oil Gallery	56.1	55.2	56.5	57.0	58.0	58.2	56.9
LOW PRESSURES							
Intake Vac, in.water	4.4	3.3	3.5	3.6	3.8	3.9	2.5
Exh. Comm., in.Water	17.0	20.0	16.0	15.0	12.5	10.0	16.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	28.99	29.00	29.01	29.00	29.00	29.01	29.00

CUMMINS NH220 LOG SHEET

TEST NO. 8 FUEL ___ DATE 4-5-88 PAGE 51

TF07N111087

Operator Grey							
Time	11:50	12:00					
Test Hour	15 min	10 min					
Speed, RPM	1300	1099					
Load, lb–ft	550.2	533.1					
Fuel Flow, lb/hr	79.2	63.3					
Exh. Opacity, %	26.0	27.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1090	1038					
Exhaust Cyl. 2	1161	1072					
Exhaust Cyl. 3	1175	1080					
Exhaust Cyl. 4	1138	1054					
Exhaust Cyl. 5	1186	1111					
Exhaust Cyl. 6	1105	1050					
Exhaust Common	1260	1175					
Water In	160	160					
Water Out	170	170					
Oil Sump	203	204					
Fuel	92	92					
Inlet Air	101	102					
Wet Bulb	72.9	73.5					
Dry Bulb	78.9	80.0					
PRESSURES, PSIG							
Fuel Pump	95.0	76.0					
Oil Gallery	53.2	46.8					
LOW PRESSURES							
Intake Vac, in.water	2.0	1.5					
Exh. Comm., in.Water	14.5	12.5					
Blowby, in.water	0	0					
Barometer, in.Hg	28.99	28.99					

880405.102710 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1155.7	1.154	624.30	.641
K2-Exhaust 2, F	1266.6	.848	685.87	.471
K3-Exhaust 3, F	1286.1	.746	696.74	.414
K4-Exhaust 4, F	1228.1	.907	664.50	.504
K5-Exhaust 5, F	1234.9	.538	668.27	.299
K6-Exhaust 6, F	1151.5	.369	621.94	.205
K7-Exhaust Common, F	1272.3	.232	689.05	.129
Dry Bulb Temperature, F	78.571	.034	25.873	.019
Wet Bulb Temperature, F	72.622	.023	22.568	.013
J1-Water In, F	163.15	.099	72.861	.055
J2-Water Out, F	170.04	.023	76.690	.013
J3-Oil Sump, F	228.37	.283	109.10	.157
J4-Fuel Inlet, F	89.101	.076	31.723	.042
J5-Air After Filter, F	100.94	.075	38.300	.042
J6-Intake Manifold, F	103.43	.061	39.682	.034
J7-Fuel Return, F	92.183	.115	33.435	.064
P1-Fuel, PSIG	136.54	1.841	941.44	12.691
P2-Oil Gallery, PSIG	55.970	.035	385.90	.241
P6-Ex Common, "H2OG	27.116	.404	6.747	.101
P7-Air Aft Filt, "H2OV	4.811	.298	1.197	.074
P8-Blowby, "H2OG	-.010	.034	-.003	.008
P11-Baro (Vent), "Hg ABS	28.992	.003	98.178	.010
Speed, RPM	2100.6	2.904	2100.6	2.904
Load, Lb-Ft	475.92	2.036	645.26	2.760
Smoke, %	34.966	.539	34.966	.539
Fuel Flow, Lb/Hr	98.831	1.767	44.829	.802
Horsepower	190.35	.875	141.92	.653
Corrected Horsepower	201.74	.928	150.41	.692
BSFC, lb/hp-hr	.519	.010	.316	.006
Corrected BSFC	.490	.010	.298	.006
Relative Humidity	75.457	.101	75.457	.101
Reference Pressure, inHg	28.638		96.980	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1570

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.64 in-Hg
Speed :	2101 RPM
Load :	475.9 lb-ft
Fuel Flow :	98.8 lb/hr
Brake Power :	190.38 bhp
BSFC :	.519 lb/bhp-hr
Indicated Power :	28.76 kW/cyl
Peak Pressure :	7.039 MPa
Peak Rate of Pressure Rise:	536.5 kPa/deg
Peak Heat Release Rate :	191.1 Joules/deg
Cumulative Heat Release :	3367.12 Joules
Apparent Combustion Efficiency :	66.7 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	26.8 %
Ignition Delay :	6.5 degrees
Centroid Phasing :	198.1 degrees
Centroid Magnitude :	36.35 J/degree
Sensitivity :	30.6 degrees
Premixed/Diffusion Ratio :	.21160

880405.104246 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1150.8	.362	621.56	.201
K2-Exhaust 2, F	1251.7	.663	677.62	.368
K3-Exhaust 3, F	1272.3	.510	689.07	.284
K4-Exhaust 4, F	1229.6	.577	665.36	.321
K5-Exhaust 5, F	1244.6	.582	673.64	.323
K6-Exhaust 6, F	1153.6	.648	623.10	.360
K7-Exhaust Common, F	1293.4	.484	700.75	.269
Dry Bulb Temperature, F	78.703	.101	25.946	.056
Wet Bulb Temperature, F	72.868	.021	22.704	.012
J1-Water In, F	161.73	.093	72.073	.051
J2-Water Out, F	169.43	.039	76.350	.021
J3-Oil Sump, F	226.33	.047	107.96	.026
J4-Fuel Inlet, F	88.596	.043	31.442	.024
J5-Air After Filter, F	101.19	.058	38.439	.032
J6-Intake Manifold, F	103.39	.052	39.660	.029
J7-Fuel Return, F	91.184	.131	32.880	.073
P1-Fuel, PSIG	123.97	.744	854.76	5.132
P2-Oil Gallery, PSIG	55.096	.033	379.87	.229
P6-Ex Common, "H2OG	19.505	.320	4.854	.080
P7-Air Aft Filt, "H2OV	3.362	.396	.837	.098
P8-Blowby, "H2OG	.009	.043	.002	.011
P11-Baro (Vent), "Hg ABS	28.996	.006	98.191	.020
Speed, RPM	1803.1	3.479	1803.1	3.479
Load, Lb-Ft	515.80	2.821	699.32	3.825
Smoke, %	25.098	.209	25.098	.209
Fuel Flow, Lb/Hr	89.733	2.208	40.702	1.002
Horsepower	177.09	1.302	132.03	.971
Corrected Horsepower	187.75	1.381	139.98	1.029
BSFC, lb/hp-hr	.507	.014	.308	.008
Corrected BSFC	.478	.013	.291	.008
Relative Humidity	75.933	.344	75.933	.344
Reference Pressure, inHg	28.749		97.353	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1572

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.75 in-Hg
Speed :	1803 RPM
Load :	515.8 lb-ft
Fuel Flow :	89.7 lb/hr
Brake Power :	177.07 bhp
BSFC :	.507 lb/bhp-hr
Indicated Power :	25.83 kW/cyl
Peak Pressure :	7.492 MPa
Peak Rate of Pressure Rise:	617.3 kPa/deg
Peak Heat Release Rate :	229.0 Joules/deg
Cumulative Heat Release :	3433.92 Joules
Apparent Combustion Efficiency :	64.3 %
Indicated Thermal Efficiency :	32.2 %
Brake Thermal Efficiency :	27.4 %
Ignition Delay :	6.0 degrees
Centroid Phasing :	195.7 degrees
Centroid Magnitude :	38.52 J/degree
Sensitivity :	28.7 degrees
Premixed/Diffusion Ratio :	.21038

880405.105700 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	843.16	.472	450.64	.262
K2-Exhaust 2, F	954.99	.516	512.77	.287
K3-Exhaust 3, F	948.71	.624	509.28	.346
K4-Exhaust 4, F	912.02	.393	488.90	.218
K5-Exhaust 5, F	880.49	.392	471.38	.218
K6-Exhaust 6, F	849.86	.774	454.37	.430
K7-Exhaust Common, F	908.71	.238	487.06	.132
Dry Bulb Temperature, F	78.868	.021	26.038	.012
Wet Bulb Temperature, F	73.025	.021	22.792	.012
J1-Water In, F	166.64	.079	74.799	.044
J2-Water Out, F	170.87	.064	77.149	.035
J3-Oil Sump, F	221.26	.054	105.14	.030
J4-Fuel Inlet, F	86.870	.063	30.483	.035
J5-Air After Filter, F	100.15	.033	37.858	.019
J6-Intake Manifold, F	102.55	.049	39.194	.027
J7-Fuel Return, F	88.291	.066	31.273	.037
P1-Fuel, PSIG	63.303	.199	436.46	1.373
P2-Oil Gallery, PSIG	56.341	.142	388.46	.980
P6-Ex Common, "H2OG	15.943	.380	3.967	.095
P7-Air Aft Filt, "H2OV	3.549	.515	.883	.128
P8-Blowby, "H2OG	-.004	.048	-.001	.012
P11-Baro (Vent), "Hg ABS	29.000	.003	98.206	.010
Speed, RPM	1801.7	2.807	1801.7	2.807
Load, Lb-Ft	368.62	3.166	499.77	4.293
Smoke, %	6.350	.243	6.350	.243
Fuel Flow, Lb/Hr	59.340	.650	26.916	.295
Horsepower	126.46	1.247	94.282	.930
Corrected Horsepower	133.95	1.321	99.866	.985
BSFC, lb/hp-hr	.469	.008	.286	.005
Corrected BSFC	.443	.007	.270	.005
Relative Humidity	75.945	.093	75.945	.093
Reference Pressure, inHg	28.739		97.322	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1574

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.74 in-Hg
Speed :	1802 RPM
Load :	368.6 lb-ft
Fuel Flow :	59.3 lb/hr
Brake Power :	126.47 bhp
BSFC :	.469 lb/bhp-hr
Indicated Power :	18.50 kW/cyl
Peak Pressure :	6.073 MPa
Peak Rate of Pressure Rise:	395.4 kPa/deg
Peak Heat Release Rate :	137.8 Joules/deg
Cumulative Heat Release :	2430.22 Joules
Apparent Combustion Efficiency :	68.8 %
Indicated Thermal Efficiency :	34.9 %
Brake Thermal Efficiency :	29.6 %
Ignition Delay :	9.5 degrees
Centroid Phasing :	195.4 degrees
Centroid Magnitude :	27.87 J/degree
Sensitivity :	24.9 degrees
Premixed/Diffusion Ratio :	.38137

880405.110557 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	694.31	.639	367.95	.355
K2-Exhaust 2, F	794.04	.470	423.35	.261
K3-Exhaust 3, F	785.88	.998	418.82	.554
K4-Exhaust 4, F	748.64	1.199	398.14	.666
K5-Exhaust 5, F	727.25	.740	386.25	.411
K6-Exhaust 6, F	698.01	.491	370.00	.273
K7-Exhaust Common, F	740.16	1.020	393.42	.567
Dry Bulb Temperature, F	79.339	.004	26.299	.002
Wet Bulb Temperature, F	73.388	.003	22.993	.001
J1-Water In, F	168.27	.207	75.707	.115
J2-Water Out, F	171.16	.191	77.312	.106
J3-Oil Sump, F	216.97	.161	102.76	.090
J4-Fuel Inlet, F	86.567	.063	30.315	.035
J5-Air After Filter, F	99.882	.041	37.712	.023
J6-Intake Manifold, F	102.14	.032	38.968	.018
J7-Fuel Return, F	87.654	.026	30.919	.014
P1-Fuel, PSIG	43.127	.352	297.35	2.426
P2-Oil Gallery, PSIG	57.034	.112	393.23	.770
P6-Ex Common, "H2OG	14.592	.194	3.631	.048
P7-Air Aft Filt, "H2OV	3.647	.357	.908	.089
P8-Blowby, "H2OG	.023	.044	.006	.011
P11-Baro (Vent), "Hg ABS	28.996	.004	98.191	.013
Speed, RPM	1802.3	3.009	1802.3	3.009
Load, Lb-Ft	272.04	2.957	368.83	4.009
Smoke, %	5.435	.202	5.435	.202
Fuel Flow, Lb/Hr	44.701	1.311	20.276	.595
Horsepower	93.353	.991	69.602	.739
Corrected Horsepower	98.906	1.050	73.741	.783
BSFC, lb/hp-hr	.479	.015	.291	.009
Corrected BSFC	.452	.014	.275	.008
Relative Humidity	75.658	.016	75.658	.016
Reference Pressure, inHg	28.727		97.282	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1576

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.73 in-Hg
Speed :	1802 RPM
Load :	272.0 lb-ft
Fuel Flow :	44.7 lb/hr
Brake Power :	93.33 bhp
BSFC :	.479 lb/bhp-hr
Indicated Power :	14.00 kW/cyl
Peak Pressure :	5.412 MPa
Peak Rate of Pressure Rise:	293.8 kPa/deg
Peak Heat Release Rate :	99.8 Joules/deg
Cumulative Heat Release :	1831.56 Joules
Apparent Combustion Efficiency :	68.8 %
Indicated Thermal Efficiency :	35.0 %
Brake Thermal Efficiency :	29.0 %
Ignition Delay :	11.4 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	23.64 J/degree
Sensitivity :	22.6 degrees
Premixed/Diffusion Ratio :	.50650

980405.111547 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	496.32	.640	257.96	.355
K2-Exhaust 2, F	576.72	.431	302.62	.240
K3-Exhaust 3, F	568.94	.571	298.30	.317
K4-Exhaust 4, F	535.48	.965	279.71	.536
K5-Exhaust 5, F	514.94	.674	268.30	.375
K6-Exhaust 6, F	493.95	.364	256.64	.202
K7-Exhaust Common, F	520.90	.761	271.61	.423
Dry Bulb Temperature, F	79.737	.031	26.520	.017
Wet Bulb Temperature, F	73.529	.023	23.072	.013
J1-Water In, F	169.17	.263	76.208	.146
J2-Water Out, F	170.46	.241	76.924	.134
J3-Oil Sump, F	211.59	.180	99.773	.100
J4-Fuel Inlet, F	87.161	.140	30.645	.078
J5-Air After Filter, F	99.506	.096	37.503	.053
J6-Intake Manifold, F	101.92	.093	38.843	.052
J7-Fuel Return, F	86.795	.020	30.441	.011
P1-Fuel, PSIG	22.538	.105	155.39	.722
P2-Oil Gallery, PSIG	57.950	.039	399.55	.271
P6-Ex Common, "H2OG	11.584	.140	2.882	.035
P7-Air Aft Filt, "H2OV	3.728	.473	.928	.118
P8-Blowby, "H2OG	-.003	.052	-.001	.013
P11-Baro (Vent), "Hg ABS	28.999	.004	98.202	.014
Speed, RPM	1801.8	4.837	1801.8	4.837
Load, Lb-Ft	134.10	5.074	181.82	6.880
Smoke, %	3.307	.065	3.307	.065
Fuel Flow, Lb/Hr	26.948	.517	12.224	.234
Horsepower	46.008	1.798	34.303	1.340
Corrected Horsepower	48.724	1.904	36.327	1.419
BSFC, lb/hp-hr	.587	.025	.357	.015
Corrected BSFC	.554	.023	.337	.014
Relative Humidity	74.791	.083	74.791	.083
Reference Pressure, inHg	28.725		97.274	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1578

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.73 in-Hg
Speed :	1802 RPM
Load :	134.1 lb-ft
Fuel Flow :	26.9 lb/hr
Brake Power :	46.01 bhp
BSFC :	.585 lb/bhp-hr
Indicated Power :	7.85 kW/cyl
Peak Pressure :	4.698 MPa
Peak Rate of Pressure Rise:	200.0 kPa/deg
Peak Heat Release Rate :	74.8 Joules/deg
Cumulative Heat Release :	1070.75 Joules
Apparent Combustion Efficiency :	66.8 %
Indicated Thermal Efficiency :	32.6 %
Brake Thermal Efficiency :	23.8 %
Ignition Delay :	14.1 degrees
Centroid Phasing :	195.4 degrees
Centroid Magnitude :	18.81 J/degree
Sensitivity :	20.3 degrees
Premixed/Diffusion Ratio :	.69827

880405.112427 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	327.60	.669	164.22	.372
K2-Exhaust 2, F	424.46	.840	218.04	.467
K3-Exhaust 3, F	423.31	.379	217.40	.210
K4-Exhaust 4, F	410.61	1.140	210.34	.633
K5-Exhaust 5, F	381.66	.792	194.25	.440
K6-Exhaust 6, F	355.11	.764	179.51	.425
K7-Exhaust Common, F	385.93	.878	196.63	.488
Dry Bulb Temperature, F	78.978	.021	26.099	.011
Wet Bulb Temperature, F	73.215	.019	22.897	.011
J1-Water In, F	169.26	.217	76.254	.120
J2-Water Out, F	169.80	.183	76.558	.102
J3-Oil Sump, F	207.63	.193	97.575	.107
J4-Fuel Inlet, F	88.597	.041	31.443	.023
J5-Air After Filter, F	98.390	.043	36.884	.024
J6-Intake Manifold, F	100.84	.036	38.243	.020
J7-Fuel Return, F	86.916	.071	30.509	.040
P1-Fuel, PSIG	12.397	.067	85.474	.463
P2-Oil Gallery, PSIG	58.464	.047	403.09	.326
P6-Ex Common, "H2OG	9.276	.196	2.308	.049
P7-Air Aft Filt, "H2OV	3.794	.550	.944	.137
P8-Blowby, "H2OG	.008	.033	.002	.008
P11-Baro (Vent), "Hg ABS	29.004	.005	98.220	.016
Speed, RPM	1802.6	4.631	1802.6	4.631
Load, Lb-Ft	44.615	1.636	60.490	2.218
Smoke, %	1.811	.105	1.811	.105
Fuel Flow, Lb/Hr	17.539	.375	7.956	.170
Horsepower	15.313	.553	11.417	.412
Corrected Horsepower	16.195	.585	12.075	.436
BSFC, lb/hp-hr	1.147	.047	.698	.029
Corrected BSFC	1.084	.045	.660	.027
Relative Humidity	76.281	.088	76.281	.088
Reference Pressure, inHg	28.725		97.275	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1580

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.73 in-Hg
Speed :	1803 RPM
Load :	44.6 lb-ft
Fuel Flow :	15.3 lb/hr
Brake Power :	15.32 bhp
BSFC :	.999 lb/bhp-hr
Indicated Power :	3.31 kW/cyl
Peak Pressure :	4.299 MPa
Peak Rate of Pressure Rise:	162.4 kPa/deg
Peak Heat Release Rate :	69.3 Joules/deg
Cumulative Heat Release :	511.290 Joules
Apparent Combustion Efficiency :	56.1 %
Indicated Thermal Efficiency :	24.2 %
Brake Thermal Efficiency :	13.9 %
Ignition Delay :	15.7 degrees
Centroid Phasing :	194.5 degrees
Centroid Magnitude :	17.09 J/degree
Sensitivity :	17.7 degrees
Premixed/Diffusion Ratio :	.88667

880405.113709 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1114.9	.799	601.61	.444
K2-Exhaust 2, F	1207.3	.399	652.97	.222
K3-Exhaust 3, F	1217.9	.494	658.85	.274
K4-Exhaust 4, F	1165.4	.534	629.69	.297
K5-Exhaust 5, F	1208.8	.805	653.81	.447
K6-Exhaust 6, F	1122.7	.501	605.93	.278
K7-Exhaust Common, F	1268.6	.683	686.98	.380
Dry Bulb Temperature, F	79.275	.039	26.264	.022
Wet Bulb Temperature, F	73.310	.019	22.950	.010
J1-Water In, F	162.26	.212	72.366	.118
J2-Water Out, F	170.40	.137	76.989	.076
J3-Oil Sump, F	207.15	.377	97.307	.209
J4-Fuel Inlet, F	90.051	.081	32.251	.045
J5-Air After Filter, F	100.68	.052	38.157	.029
J6-Intake Manifold, F	104.10	.046	40.058	.025
J7-Fuel Return, F	92.648	.071	33.694	.040
P1-Fuel, PSIG	105.07	1.070	724.42	7.388
P2-Oil Gallery, PSIG	56.435	.028	389.11	.195
P6-Ex Common, "H2OG	15.039	.346	3.742	.086
P7-Air Aft Filt, "H2OV	2.653	.216	.660	.054
P8-Blowby, "H2OG	-.002	.018	-.000	.005
P11-Baro (Vent), "Hg ABS	28.996	.002	98.190	.007
Speed, RPM	1499.6	2.816	1499.6	2.816
Load, Lb-Ft	541.75	1.493	734.50	2.024
Smoke, %	20.606	.502	20.606	.502
Fuel Flow, Lb/Hr	74.396	8.869	33.746	4.023
Horsepower	154.69	.382	115.33	.285
Corrected Horsepower	163.99	.405	122.27	.302
BSFC, lb/hp-hr	.481	.057	.293	.035
Corrected BSFC	.454	.054	.276	.033
Relative Humidity	75.589	.080	75.589	.080
Reference Pressure, inHg	28.800		97.529	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1582

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.80 in-Hg
Speed :	1500 RPM
Load :	541.8 lb-ft
Fuel Flow :	74.4 lb/hr
Brake Power :	154.74 bhp
BSFC :	.481 lb/bhp-hr
Indicated Power :	22.26 kW/cyl
Peak Pressure :	7.993 MPa
Peak Rate of Pressure Rise:	748.4 kPa/deg
Peak Heat Release Rate :	291.2 Joules/deg
Cumulative Heat Release :	3481.41 Joules
Apparent Combustion Efficiency :	65.4 %
Indicated Thermal Efficiency :	33.4 %
Brake Thermal Efficiency :	28.9 %
Ignition Delay :	3.9 degrees
Centroid Phasing :	192.4 degrees
Centroid Magnitude :	45.40 J/degree
Sensitivity :	27.5 degrees
Premixed/Diffusion Ratio :	.14261

880405.114913 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1087.8	.663	586.57	.368
K2-Exhaust 2, F	1159.8	.317	626.54	.176
K3-Exhaust 3, F	1176.0	.728	635.57	.405
K4-Exhaust 4, F	1137.2	.553	614.00	.307
K5-Exhaust 5, F	1185.2	.298	640.66	.165
K6-Exhaust 6, F	1103.3	.701	595.18	.389
K7-Exhaust Common, F	1258.2	.275	681.22	.153
Dry Bulb Temperature, F	79.038	.059	26.132	.033
Wet Bulb Temperature, F	73.188	.025	22.882	.014
J1-Water In, F	160.30	.225	71.279	.125
J2-Water Out, F	169.94	.188	76.632	.105
J3-Oil Sump, F	204.17	.222	95.648	.123
J4-Fuel Inlet, F	92.177	.064	33.432	.036
J5-Air After Filter, F	101.41	.041	38.559	.023
J6-Intake Manifold, F	104.83	.111	40.459	.062
J7-Fuel Return, F	94.237	.056	34.576	.031
P1-Fuel, PSIG	92.901	.323	640.53	2.229
P2-Oil Gallery, PSIG	53.475	.033	368.70	.225
P6-Ex Common, "H2OG	13.739	.372	3.419	.093
P7-Air Aft Filt, "H2OV	2.199	.210	.547	.052
P8-Blowby, "H2OG	-.029	.030	-.007	.007
P11-Baro (Vent), "Hg ABS	28.992	.003	98.177	.012
Speed, RPM	1299.7	2.547	1299.7	2.547
Load, Lb-Ft	549.70	2.170	745.29	2.943
Smoke, %	25.175	.705	25.175	.705
Fuel Flow, Lb/Hr	71.450	8.286	32.409	3.758
Horsepower	136.03	.686	101.42	.512
Corrected Horsepower	144.32	.728	107.60	.543
BSFC, lb/hp-hr	.525	.062	.320	.037
Corrected BSFC	.495	.058	.301	.035
Relative Humidity	75.969	.173	75.969	.173
Reference Pressure, inHg	28.830		97.629	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1584

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.83 in-Hg
Speed :	1300 RPM
Load :	549.7 lb-ft
Fuel Flow :	71.5 lb/hr
Brake Power :	136.06 bhp
BSFC :	.525 lb/bhp-hr
Indicated Power :	19.69 kW/cyl
Peak Pressure :	8.420 MPa
Peak Rate of Pressure Rise:	803.2 kPa/deg
Peak Heat Release Rate :	328.8 Joules/deg
Cumulative Heat Release :	3493.97 Joules
Apparent Combustion Efficiency :	59.2 %
Indicated Thermal Efficiency :	30.8 %
Brake Thermal Efficiency :	26.4 %
Ignition Delay :	4.0 degrees
Centroid Phasing :	190.3 degrees
Centroid Magnitude :	50.61 J/degree
Sensitivity :	25.3 degrees
Premixed/Diffusion Ratio :	.15899

880405.115948 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1038.6	1.089	559.20	.605
K2-Exhaust 2, F	1074.7	.453	579.26	.251
K3-Exhaust 3, F	1085.3	.478	585.19	.266
K4-Exhaust 4, F	1057.5	.921	569.72	.512
K5-Exhaust 5, F	1113.2	.322	600.67	.179
K6-Exhaust 6, F	1051.3	1.055	566.25	.586
K7-Exhaust Common, F	1179.0	1.424	637.22	.791
Dry Bulb Temperature, F	79.454	.067	26.363	.037
Wet Bulb Temperature, F	73.224	.033	22.902	.018
J1-Water In, F	160.49	.221	71.381	.123
J2-Water Out, F	170.54	.136	76.967	.076
J3-Oil Sump, F	206.07	.243	96.706	.135
J4-Fuel Inlet, F	93.280	.084	34.044	.046
J5-Air After Filter, F	103.69	.149	39.830	.083
J6-Intake Manifold, F	106.73	.264	41.514	.146
J7-Fuel Return, F	93.394	.092	34.108	.051
P1-Fuel, PSIG	75.138	.399	518.06	2.748
P2-Oil Gallery, PSIG	47.104	.042	324.77	.290
P6-Ex Common, "H2OG	11.434	.200	2.845	.050
P7-Air Aft Filt, "H2OV	1.804	.213	.449	.053
P8-Blowby, "H2OG	.030	.014	.008	.004
P11-Baro (Vent), "Hg ABS	28.989	.002	98.168	.006
Speed, RPM	1100.4	2.228	1100.4	2.228
Load, Lb-Ft	535.07	2.483	725.45	3.366
Smoke, %	27.673	.690	27.673	.690
Fuel Flow, Lb/Hr	61.206	2.939	27.762	1.333
Horsepower	112.10	.661	83.582	.492
Corrected Horsepower	119.17	.702	88.851	.524
BSFC, lb/hp-hr	.546	.025	.332	.015
Corrected BSFC	.514	.024	.312	.014
Relative Humidity	74.629	.140	74.629	.140
Reference Pressure, inHg	28.856		97.718	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1586

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.86 in-Hg
Speed :	1100 RPM
Load :	535.1 lb-ft
Fuel Flow :	61.2 lb/hr
Brake Power :	112.07 bhp
BSFC :	.546 lb/bhp-hr
Indicated Power :	15.92 kW/cyl
Peak Pressure :	8.582 MPa
Peak Rate of Pressure Rise:	806.7 kPa/deg
Peak Heat Release Rate :	339.2 Joules/deg
Cumulative Heat Release :	3322.56 Joules
Apparent Combustion Efficiency :	55.6 %
Indicated Thermal Efficiency :	29.1 %
Brake Thermal Efficiency :	25.4 %
Ignition Delay :	2.6 degrees
Centroid Phasing :	187.9 degrees
Centroid Magnitude :	53.25 J/degree
Sensitivity :	24.3 degrees
Premixed/Diffusion Ratio :	.10744

CUMMINS NH220 LOG SHEET

TEST NO. 8 FUEL BF03V3TU87 DATE 4-5-88 PAGE 52

Operator GREG							
Time	12:40	12:50	1:00	1:15	1:25		
Test Hour	30min	10min	10min	15min	10min		
Speed, RPM	2099	1801	1501	1301	1100		
Load, lb–ft	481.7	519.7	554.2	556.4	540.3		
Fuel Flow, lb/hr	84.9	77.4	69.7	62.1	49.8		
Exh. Opacity, %	39.0	21.0	16.0	20.0	17.5		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1182	1176	1153	1115	1054		
Exhaust Cyl. 2	1291	1272	1229	1177	1070		
Exhaust Cyl. 3	1285	1271	1232	1177	1070		
Exhaust Cyl. 4	1248	1238	1201	1147	1045		
Exhaust Cyl. 5	1268	1282	1268	1217	1114		
Exhaust Cyl. 6	1189	1188	1164	1125	1045		
Exhaust Common	1303	1321	1320	1280	1160		
Water In	163	161	161	160	158		
Water Out	170	169	171	171	168		
Oil Sump	222	225	217	212	206		
Fuel	93	93	90	89	87		
Inlet Air	101	102	102	102	97		
Wet Bulb	73.9	74.3	74.5	74.2	74.9		
Dry Bulb	80.8	81.0	81.9	81.2	82.4		
PRESSURES, PSIG							
Fuel Pump	135.0	121.0	104.5	90.0	70.0		
Oil Gallery	58.1	55.1	53.4	51.0	46.9		
LOW PRESSURES							
Intake Vac, in.water	4.5	3.3	2.5	2.0	1.6		
Exh. Comm., in.Water	27.0	20.0	16.0	15.0	13.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	28.98	28.98	28.97	28.97	28.98		

880405.123852 AL-17355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1180.7	.946	638.15	.526
K2-Exhaust 2, F	1291.4	.739	699.65	.411
K3-Exhaust 3, F	1282.0	.624	694.43	.346
K4-Exhaust 4, F	1246.2	.421	674.56	.234
K5-Exhaust 5, F	1268.4	.421	686.91	.234
K6-Exhaust 6, F	1187.6	.830	642.02	.461
K7-Exhaust Common, F	1302.5	.274	705.85	.152
Dry Bulb Temperature, F	80.652	.058	27.029	.032
Wet Bulb Temperature, F	74.212	.025	23.451	.014
J1-Water In, F	163.17	.219	72.875	.122
J2-Water Out, F	170.07	.175	76.704	.097
J3-Oil Sump, F	221.47	.522	105.26	.290
J4-Fuel Inlet, F	93.421	.030	34.123	.017
J5-Air After Filter, F	101.00	.049	38.332	.027
J6-Intake Manifold, F	103.09	.070	39.496	.039
J7-Fuel Return, F	97.792	.064	36.551	.035
P1-Fuel, PSIG	133.83	1.446	922.70	9.967
P2-Oil Gallery, PSIG	57.060	.073	393.42	.502
P6-Ex Common, "H2OG	26.920	.348	6.699	.087
P7-Air Aft Filt, "H2OV	5.011	.250	1.247	.062
P8-Blowby, "H2OG	.018	.044	.004	.011
P11-Baro (Vent), "Hg ABS	28.976	.003	98.123	.011
Speed, RPM	2100.0	3.320	2100.0	3.320
Load, Lb-Ft	482.71	1.428	654.46	1.936
Smoke, %	42.112	.741	42.112	.741
Fuel Flow, Lb/Hr	86.006	.579	39.012	.263
Horsepower	193.01	.503	143.90	.375
Corrected Horsepower	204.97	.534	152.82	.398
BSFC, lb/hp-hr	.446	.003	.271	.002
Corrected BSFC	.420	.002	.255	.001
Relative Humidity	74.184	.149	74.184	.149
Reference Pressure, inHg	28.607		96.875	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1588

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.61 in-Hg
Speed :	2100 RPM
Load :	482.7 lb-ft
Fuel Flow :	86.0 lb/hr
Brake Power :	193.01 bhp
BSFC :	.446 lb/bhp-hr
Indicated Power :	28.94 kW/cyl
Peak Pressure :	7.150 MPa
Peak Rate of Pressure Rise:	551.8 kPa/deg
Peak Heat Release Rate :	195.6 Joules/deg
Cumulative Heat Release :	3362.38 Joules
Apparent Combustion Efficiency :	75.7 %
Indicated Thermal Efficiency :	37.2 %
Brake Thermal Efficiency :	30.9 %
Ignition Delay :	5.8 degrees
Centroid Phasing :	197.4 degrees
Centroid Magnitude :	38.55 J/degree
Sensitivity :	30.6 degrees
Premixed/Diffusion Ratio :	.18920

880405.125214 AL-12355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1174.5	.591	634.70	.328
K2-Exhaust 2, F	1269.2	.943	687.34	.524
K3-Exhaust 3, F	1268.9	.446	687.17	.248
K4-Exhaust 4, F	1234.8	.772	668.20	.429
K5-Exhaust 5, F	1280.3	.567	693.51	.315
K6-Exhaust 6, F	1184.9	1.162	640.48	.646
K7-Exhaust Common, F	1319.4	.292	715.25	.162
Dry Bulb Temperature, F	81.006	.048	27.226	.026
Wet Bulb Temperature, F	74.302	.023	23.501	.013
J1-Water In, F	161.24	.086	71.800	.048
J2-Water Out, F	169.14	.019	76.188	.011
J3-Oil Sump, F	226.06	.206	107.81	.115
J4-Fuel Inlet, F	93.821	.068	34.345	.038
J5-Air After Filter, F	101.74	.053	38.745	.030
J6-Intake Manifold, F	103.72	.112	39.844	.062
J7-Fuel Return, F	97.204	.074	36.224	.041
P1-Fuel, PSIG	118.19	.708	814.86	4.885
P2-Oil Gallery, PSIG	55.217	.032	380.71	.220
P6-Ex Common, "H2OG	19.223	.210	4.783	.052
P7-Air Aft Filt, "H2OV	3.820	.422	.950	.105
P8-Blowby, "H2OG	-.012	.055	-.003	.014
P11-Baro (Vent), "Hg ABS	28.979	.004	98.135	.012
Speed, RPM	1801.0	3.742	1801.0	3.742
Load, Lb-Ft	519.23	3.261	703.98	4.421
Smoke, %	20.616	.373	20.616	.373
Fuel Flow, Lb/Hr	77.945	.375	35.355	.170
Horsepower	178.06	1.381	132.75	1.030
Corrected Horsepower	189.19	1.468	141.05	1.094
BSFC, lb/hp-hr	.438	.004	.266	.002
Corrected BSFC	.412	.004	.251	.002
Relative Humidity	73.302	.186	73.302	.186
Reference Pressure, inHg	28.699		97.184	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1590

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.70 in-Hg
Speed :	1801 RPM
Load :	519.2 lb-ft
Fuel Flow :	77.9 lb/hr
Brake Power :	178.04 bhp
BSFC :	.438 lb/bhp-hr
Indicated Power :	25.94 kW/cyl
Peak Pressure :	7.662 MPa
Peak Rate of Pressure Rise:	643.8 kPa/deg
Peak Heat Release Rate :	239.8 Joules/deg
Cumulative Heat Release :	3454.15 Joules
Apparent Combustion Efficiency :	73.7 %
Indicated Thermal Efficiency :	36.9 %
Brake Thermal Efficiency :	31.4 %
Ignition Delay :	4.4 degrees
Centroid Phasing :	194.8 degrees
Centroid Magnitude :	39.88 J/degree
Sensitivity :	29.4 degrees
Premixed/Diffusion Ratio :	.14995

980405.130220 AL-17355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1154.4	1.150	623.54	.639
K2-Exhaust 2, F	1229.8	.895	665.44	.497
K3-Exhaust 3, F	1232.9	.403	667.18	.224
K4-Exhaust 4, F	1199.0	.568	648.31	.316
K5-Exhaust 5, F	1266.3	.864	685.73	.480
K6-Exhaust 6, F	1160.3	.349	626.81	.194
K7-Exhaust Common, F	1317.7	.475	714.26	.264
Dry Bulb Temperature, F	81.167	.062	27.315	.035
Wet Bulb Temperature, F	74.309	.049	23.505	.027
J1-Water In, F	161.77	.094	72.095	.052
J2-Water Out, F	170.89	.082	77.162	.046
J3-Oil Sump, F	219.81	.419	104.34	.233
J4-Fuel Inlet, F	91.488	.049	33.049	.027
J5-Air After Filter, F	102.84	.039	39.357	.022
J6-Intake Manifold, F	105.28	.042	40.712	.023
J7-Fuel Return, F	94.166	.037	34.537	.020
P1-Fuel, PSIG	102.19	1.049	704.58	7.232
P2-Oil Gallery, PSIG	53.344	.030	367.80	.206
P6-Ex Common, "H2OG	15.221	.348	3.788	.087
P7-Air Aft Filt, "H2OV	2.910	.294	.724	.073
P8-Blowby, "H2OG	.005	.025	.001	.006
P11-Baro (Vent), "Hg ABS	28.975	.001	98.119	.005
Speed, RPM	1501.9	2.752	1501.9	2.752
Load, Lb-Ft	553.76	1.455	750.80	1.973
Smoke, %	17.462	.382	17.462	.382
Fuel Flow, Lb/Hr	69.953	.509	31.730	.231
Horsepower	158.36	.381	118.07	.284
Corrected Horsepower	168.45	.405	125.59	.302
BSFC, lb/hp-hr	.442	.004	.269	.002
Corrected BSFC	.415	.004	.253	.002
Relative Humidity	72.784	.124	72.784	.124
Reference Pressure, inHg	28.761		97.394	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1592

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.76 in-Hg
Speed :	1502 RPM
Load :	553.8 lb-ft
Fuel Flow :	70.0 lb/hr
Brake Power :	158.38 bhp
BSFC :	.442 lb/bhp-hr
Indicated Power :	22.78 kW/cyl
Peak Pressure :	8.396 MPa
Peak Rate of Pressure Rise:	799.5 kPa/deg
Peak Heat Release Rate :	321.9 Joules/deg
Cumulative Heat Release :	3550.84 Joules
Apparent Combustion Efficiency :	70.3 %
Indicated Thermal Efficiency :	36.0 %
Brake Thermal Efficiency :	31.1 %
Ignition Delay :	2.0 degrees
Centroid Phasing :	190.6 degrees
Centroid Magnitude :	48.17 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.07112

880405.131348 AL-17355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1116.4	1.277	602.45	.709
K2-Exhaust 2, F	1177.5	.481	636.37	.267
K3-Exhaust 3, F	1177.3	1.124	636.30	.625
K4-Exhaust 4, F	1146.6	.589	619.25	.327
K5-Exhaust 5, F	1217.9	.677	658.81	.376
K6-Exhaust 6, F	1124.5	.957	606.92	.532
K7-Exhaust Common, F	1281.4	.693	694.13	.385
Dry Bulb Temperature, F	81.541	.057	27.523	.032
Wet Bulb Temperature, F	74.486	.026	23.604	.014
J1-Water In, F	160.92	.088	71.625	.049
J2-Water Out, F	170.88	.059	77.158	.033
J3-Oil Sump, F	213.91	.204	101.06	.113
J4-Fuel Inlet, F	89.542	.061	31.968	.034
J5-Air After Filter, F	102.70	.047	39.276	.026
J6-Intake Manifold, F	104.79	.077	40.439	.043
J7-Fuel Return, F	91.822	.054	33.235	.030
P1-Fuel, PSIG	88.131	.617	607.64	4.254
P2-Oil Gallery, PSIG	51.045	.059	351.94	.406
P6-Ex Common, "H2OG	13.898	.106	3.458	.026
P7-Air Aft Filt, "H2OV	2.355	.268	.586	.067
P8-Blowby, "H2OG	.010	.023	.002	.006
P11-Baro (Vent), "Hg ABS	28.975	.003	98.122	.010
Speed, RPM	1300.8	2.503	1300.8	2.503
Load, Lb-Ft	559.43	2.010	758.48	2.726
Smoke, %	19.969	.811	19.969	.811
Fuel Flow, Lb/Hr	62.464	.442	28.333	.201
Horsepower	138.55	.696	103.30	.519
Corrected Horsepower	147.37	.740	109.88	.552
BSFC, lb/hp-hr	.451	.003	.274	.002
Corrected BSFC	.424	.003	.258	.002
Relative Humidity	72.173	.166	72.173	.166
Reference Pressure, inHg	28.802		97.535	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1594

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.80 in-Hg
Speed :	1301 RPM
Load :	559.4 lb-ft
Fuel Flow :	62.5 lb/hr
Brake Power :	138.57 bhp
BSFC :	.451 lb/bhp-hr
Indicated Power :	19.90 kW/cyl
Peak Pressure :	8.717 MPa
Peak Rate of Pressure Rise:	833.1 kPa/deg
Peak Heat Release Rate :	347.0 Joules/deg
Cumulative Heat Release :	3542.42 Joules
Apparent Combustion Efficiency :	68.0 %
Indicated Thermal Efficiency :	35.2 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	1.8 degrees
Centroid Phasing :	189.0 degrees
Centroid Magnitude :	52.03 J/degree
Sensitivity :	26.2 degrees
Premixed/Diffusion Ratio :	.06868

880405.132649 AL-17355-F AL-12920-L NH220				8
K1-Exhaust 1, F	1054.7	.564	568.19	.313
K2-Exhaust 2, F	1071.9	.369	577.72	.205
K3-Exhaust 3, F	1071.5	1.033	577.50	.574
K4-Exhaust 4, F	1048.3	.745	564.61	.414
K5-Exhaust 5, F	1118.5	.414	603.59	.230
K6-Exhaust 6, F	1045.0	1.575	562.77	.875
K7-Exhaust Common, F	1165.1	.728	629.53	.404
Dry Bulb Temperature, F	82.993	.423	28.329	.235
Wet Bulb Temperature, F	75.262	.137	24.034	.076
J1-Water In, F	158.68	.210	70.378	.117
J2-Water Out, F	168.76	.099	75.978	.055
J3-Oil Sump, F	208.45	.659	98.027	.366
J4-Fuel Inlet, F	87.976	.038	31.098	.021
J5-Air After Filter, F	97.024	.140	36.125	.078
J6-Intake Manifold, F	97.613	.187	36.452	.104
J7-Fuel Return, F	89.494	.088	31.941	.049
P1-Fuel, PSIG	67.473	.261	465.21	1.797
P2-Oil Gallery, PSIG	46.692	.064	321.93	.441
P6-Ex Common, "H2OG	12.020	.170	2.991	.042
P7-Air Aft Filt, "H2OV	1.838	.225	.457	.056
P8-Blowby, "H2OG	.043	.028	.011	.007
P11-Baro (Vent), "Hg ABS	28.977	.003	98.127	.011
Speed, RPM	1100.8	1.641	1100.8	1.641
Load, Lb-Ft	542.41	3.497	735.40	4.741
Smoke, %	18.022	.695	18.022	.695
Fuel Flow, Lb/Hr	50.367	.594	22.846	.269
Horsepower	113.68	.830	84.760	.619
Corrected Horsepower	120.36	.879	89.740	.655
BSFC, lb/hp-hr	.443	.005	.270	.003
Corrected BSFC	.418	.005	.255	.003
Relative Humidity	70.200	.897	70.200	.897
Reference Pressure, inHg	28.842		97.669	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1596

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	1101 RPM
Load :	542.4 lb-ft
Fuel Flow :	50.4 lb/hr
Brake Power :	113.71 bhp
BSFC :	.443 lb/bhp-hr
Indicated Power :	16.16 kW/cyl
Peak Pressure :	8.709 MPa
Peak Rate of Pressure Rise:	772.4 kPa/deg
Peak Heat Release Rate :	321.5 Joules/deg
Cumulative Heat Release :	3381.23 Joules
Apparent Combustion Efficiency :	68.1 %
Indicated Thermal Efficiency :	35.5 %
Brake Thermal Efficiency :	31.0 %
Ignition Delay :	1.7 degrees
Centroid Phasing :	187.6 degrees
Centroid Magnitude :	51.34 J/degree
Sensitivity :	24.9 degrees
Premixed/Diffusion Ratio :	.06972

CUMMINS NH220 LOG SHEET

TEST NO. 8 FUEL TF07N11087 DATE 4-6-88 PAGE 53

Operator Greg							
Time	9:15	9:25	9:40	9:55	10:15	10:30	10:50
Test Hour	45min	10min	15min	15min	20min	15min	20min
Speed, RPM	2100	1799	1801	1799	1800	1800	1500
Load, lb–ft	481.7	522.5	369.4	270.5	135.2	47.3	542.2
Fuel Flow, lb/hr	98.7	91.3	60.4	45.9	26.2	19.2	84.5
Exh. Opacity, %	31.0	18.0	5.5	5.0	3.0	2.0	16.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1149	1151	837	686	488	331	1120
Exhaust Cyl. 2	1256	1246	945	779	567	424	1209
Exhaust Cyl. 3	1279	1274	941	775	556	422	1220
Exhaust Cyl. 4	1222	1233	905	730	520	410	1173
Exhaust Cyl. 5	1219	1239	876	718	505	379	1200
Exhaust Cyl. 6	1145	1153	843	692	487	356	1121
Exhaust Common	1254	1280	899	724	507	382	1253
Water In	163	161	166	168	169	170	160
Water Out	170	170	171	171	170	171	168
Oil Sump	226	224	216	212	205	201	205
Fuel	89	91	90	88	86	90	87
Inlet Air	99	102	101	99	98	97	100
Wet Bulb	63.1	63.8	63.0	62.5	61.1	62.2	62.9
Dry Bulb	79.0	79.3	78.5	78.9	77.9	77.4	78.4
PRESSURES, PSIG							
Fuel Pump	137.0	123.0	65.0	46.0	26.0	16.0	108.0
Oil Gallery	56.8	55.2	56.8	57.8	59.0	59.5	56.8
LOW PRESSURES							
Intake Vac, in.water	4.5	3.4	3.6	3.9	3.9	3.9	2.6
Exh. Comm., in.Water	17.0	20.0	16.0	15.0	12.0	10.0	15.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.27	29.27	29.28	29.28	29.28	29.31	29.30

CUMMINS NH220 LOG SHEET

TEST NO. 8 FUEL TF07D11087 DATE 4-6-88 PAGE 54

Operator C-REG							
Time	11:00	11:15					
Test Hour	10 min	15 min					
Speed, RPM	1301	1099					
Load, lb–ft	560.1	543.2					
Fuel Flow, lb/hr	62.4	59.6					
Exh. Opacity, %	19.5	20.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1090	1041					
Exhaust Cyl. 2	1161	1084					
Exhaust Cyl. 3	1172	1090					
Exhaust Cyl. 4	1138	1059					
Exhaust Cyl. 5	1171	1104					
Exhaust Cyl. 6	1102	1049					
Exhaust Common	1230	1168					
Water In	159	160					
Water Out	169	170					
Oil Sump	203	204					
Fuel	89	89					
Inlet Air	100	102					
Wet Bulb	63.0	61.5					
Dry Bulb	79.0	79.0					
PRESSURES, PSIG							
Fuel Pump	95.0	77.0					
Oil Gallery	53.3	48.1					
LOW PRESSURES							
Intake Vac, in.water	2.1	1.6					
Exh. Comm., in.Water	14.0	13.0					
Blowby, in.water	0	0					
Barometer, in.Hg	29.31	29.32					

880406.091349 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1148.9	.751	620.52	.417
K2-Exhaust 2, F	1253.4	.398	678.55	.221
K3-Exhaust 3, F	1278.6	.436	692.53	.242
K4-Exhaust 4, F	1221.3	.612	660.70	.340
K5-Exhaust 5, F	1220.7	.649	660.37	.360
K6-Exhaust 6, F	1143.7	.606	617.60	.337
K7-Exhaust Common, F	1254.2	.494	679.00	.274
Dry Bulb Temperature, F	76.753	.321	24.863	.179
Wet Bulb Temperature, F	60.547	.031	15.860	.017
J1-Water In, F	163.71	.184	73.170	.102
J2-Water Out, F	170.34	.149	76.857	.083
J3-Oil Sump, F	225.95	.336	107.75	.187
J4-Fuel Inlet, F	89.311	.023	31.839	.013
J5-Air After Filter, F	99.246	.135	37.359	.075
J6-Intake Manifold, F	104.90	.232	40.500	.129
J7-Fuel Return, F	92.662	.028	33.701	.016
P1-Fuel, PSIG	136.61	1.959	941.92	13.505
P2-Oil Gallery, PSIG	56.564	.025	389.99	.172
P6-Ex Common, "H2OG	26.864	.294	6.685	.073
P7-Air Aft Filt, "H2OV	4.655	.276	1.158	.069
P8-Blowby, "H2OG	-.000	.060	-.000	.015
P11-Baro (Vent), "Hg ABS	29.269	.005	99.117	.017
Speed, RPM	2102.1	2.119	2102.1	2.119
Load, Lb-Ft	479.07	2.689	649.53	3.646
Smoke, %	33.584	.555	33.584	.555
Fuel Flow, Lb/Hr	98.889	1.277	44.855	.579
Horsepower	191.75	.997	142.96	.744
Corrected Horsepower	198.24	1.031	147.80	.769
BSFC, lb/hp-hr	.516	.007	.314	.004
Corrected BSFC	.499	.006	.303	.004
Relative Humidity	38.307	.718	38.307	.718
Reference Pressure, inHg	28.927		97.957	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1598

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.93 in-Hg
Speed :	2102 RPM
Load :	479.1 lb-ft
Fuel Flow :	98.9 lb/hr
Brake Power :	191.75 bhp
BSFC :	.516 lb/bhp-hr
Indicated Power :	29.03 kW/cyl
Peak Pressure :	7.060 MPa
Peak Rate of Pressure Rise:	503.6 kPa/deg
Peak Heat Release Rate :	177.0 Joules/deg
Cumulative Heat Release :	3390.23 Joules
Apparent Combustion Efficiency :	67.1 %
Indicated Thermal Efficiency :	32.8 %
Brake Thermal Efficiency :	26.9 %
Ignition Delay :	6.3 degrees
Centroid Phasing :	198.1 degrees
Centroid Magnitude :	34.23 J/degree
Sensitivity :	30.8 degrees
Premixed/Diffusion Ratio :	.20473

880406.092629 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1150.1	.643	621.19	.357
K2-Exhaust 2, F	1247.1	.724	675.07	.402
K3-Exhaust 3, F	1275.0	.774	690.54	.430
K4-Exhaust 4, F	1230.9	.696	666.06	.387
K5-Exhaust 5, F	1237.6	.419	669.79	.233
K6-Exhaust 6, F	1152.2	.807	622.34	.449
K7-Exhaust Common, F	1279.5	.350	693.07	.194
Dry Bulb Temperature, F	76.664	.127	24.813	.071
Wet Bulb Temperature, F	60.392	.052	15.774	.029
J1-Water In, F	162.51	.162	72.505	.090
J2-Water Out, F	170.21	.119	76.785	.066
J3-Oil Sump, F	225.17	.314	107.32	.175
J4-Fuel Inlet, F	90.467	.052	32.482	.029
J5-Air After Filter, F	102.68	.159	39.266	.088
J6-Intake Manifold, F	108.11	.215	42.281	.119
J7-Fuel Return, F	93.540	.124	34.189	.069
P1-Fuel, PSIG	123.01	.543	848.15	3.744
P2-Oil Gallery, PSIG	55.396	.020	381.94	.136
P6-Ex Common, "H2OG	19.136	.463	4.762	.115
P7-Air Aft Filt, "H2OV	3.482	.539	.866	.134
P8-Blowby, "H2OG	-.006	.056	-.001	.014
P11-Baro (Vent), "Hg ABS	29.278	.004	99.146	.015
Speed, RPM	1798.2	4.066	1798.2	4.066
Load, Lb-Ft	523.84	4.247	710.23	5.758
Smoke, %	18.199	.328	18.199	.328
Fuel Flow, Lb/Hr	90.760	2.851	41.168	1.293
Horsepower	179.36	1.757	133.73	1.310
Corrected Horsepower	185.92	1.821	138.61	1.358
BSFC, lb/hp-hr	.506	.015	.308	.009
Corrected BSFC	.488	.015	.297	.009
Relative Humidity	38.018	.221	38.018	.221
Reference Pressure, inHg	29.022		98.279	

NAVY HIGH SPEED DIESEL - CUMMINS NH220C FILE : CN1600

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.02 in-Hg
Speed :	1798 RPM
Load :	523.8 lb-ft
Fuel Flow :	90.8 lb/hr
Brake Power :	179.32 bhp
BSFC :	.506 lb/bhp-hr
Indicated Power :	25.92 kW/cyl
Peak Pressure :	7.527 MPa
Peak Rate of Pressure Rise:	575.0 kPa/deg
Peak Heat Release Rate :	207.1 Joules/deg
Cumulative Heat Release :	3435.80 Joules
Apparent Combustion Efficiency :	63.4 %
Indicated Thermal Efficiency :	31.9 %
Brake Thermal Efficiency :	27.4 %
Ignition Delay :	6.0 degrees
Centroid Phasing :	195.5 degrees
Centroid Magnitude :	37.05 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.21130

880406.093937 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	840.08	.523	448.93	.291
K2-Exhaust 2, F	946.90	.812	508.28	.451
K3-Exhaust 3, F	946.72	1.020	508.18	.567
K4-Exhaust 4, F	909.57	.691	487.54	.384
K5-Exhaust 5, F	878.74	.503	470.41	.279
K6-Exhaust 6, F	846.73	1.001	452.63	.556
K7-Exhaust Common, F	902.64	.575	483.69	.319
Dry Bulb Temperature, F	76.478	.044	24.710	.024
Wet Bulb Temperature, F	60.559	.017	15.866	.010
J1-Water In, F	166.31	.134	74.617	.075
J2-Water Out, F	170.43	.121	76.906	.067
J3-Oil Sump, F	219.10	.322	103.95	.179
J4-Fuel Inlet, F	89.364	.040	31.869	.022
J5-Air After Filter, F	101.09	.057	38.385	.031
J6-Intake Manifold, F	106.94	.033	41.633	.019
J7-Fuel Return, F	90.760	.131	32.645	.073
P1-Fuel, PSIG	63.196	.212	435.72	1.460
P2-Oil Gallery, PSIG	56.723	.103	391.09	.708
P6-Ex Common, "H2OG	15.533	.144	3.865	.036
P7-Air Aft Filt, "H2OV	3.766	.420	.937	.104
P8-Blowby, "H2OG	.013	.054	.003	.013
P11-Baro (Vent), "Hg ABS	29.278	.003	99.145	.012
Speed, RPM	1800.1	3.077	1800.1	3.077
Load, Lb-Ft	370.83	3.719	502.78	5.043
Smoke, %	5.345	.127	5.345	.127
Fuel Flow, Lb/Hr	58.934	.875	26.732	.397
Horsepower	127.10	1.383	94.762	1.031
Corrected Horsepower	131.59	1.432	98.112	1.068
BSFC, lb/hp-hr	.464	.006	.282	.004
Corrected BSFC	.448	.006	.272	.004
Relative Humidity	39.010	.113	39.010	.113
Reference Pressure, inHg	29.001		98.207	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1602

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.00 in-Hg
Speed :	1800 RPM
Load :	370.8 lb-ft
Fuel Flow :	58.9 lb/hr
Brake Power :	127.08 bhp
BSFC :	.463 lb/bhp-hr
Indicated Power :	18.47 kW/cyl
Peak Pressure :	6.153 MPa
Peak Rate of Pressure Rise:	366.9 kPa/deg
Peak Heat Release Rate :	121.8 Joules/deg
Cumulative Heat Release :	2414.10 Joules
Apparent Combustion Efficiency :	68.7 %
Indicated Thermal Efficiency :	35.1 %
Brake Thermal Efficiency :	30.0 %
Ignition Delay :	8.8 degrees
Centroid Phasing :	194.9 degrees
Centroid Magnitude :	26.33 J/degree
Sensitivity :	25.1 degrees
Premixed/Diffusion Ratio :	.35080

880406.095440 AL-16084-F AL-12920-L NH220 8

K1-Exhaust 1, F	684.22	.526	362.34	.292
K2-Exhaust 2, F	780.00	.284	415.56	.158
K3-Exhaust 3, F	774.60	.251	412.56	.140
K4-Exhaust 4, F	730.70	.773	388.17	.430
K5-Exhaust 5, F	716.11	.673	380.06	.374
K6-Exhaust 6, F	690.62	.465	365.90	.258
K7-Exhaust Common, F	722.98	.306	383.88	.170
Dry Bulb Temperature, F	77.380	.163	25.211	.091
Wet Bulb Temperature, F	60.455	.020	15.808	.011
J1-Water In, F	168.72	.159	75.957	.088
J2-Water Out, F	171.22	.134	77.345	.075
J3-Oil Sump, F	212.64	.320	100.36	.178
J4-Fuel Inlet, F	87.867	.041	31.037	.023
J5-Air After Filter, F	98.997	.104	37.220	.058
J6-Intake Manifold, F	104.72	.035	40.400	.020
J7-Fuel Return, F	87.916	.028	31.064	.016
P1-Fuel, PSIG	43.080	.169	297.03	1.164
P2-Oil Gallery, PSIG	57.845	.127	398.83	.873
P6-Ex Common, "H2OG	14.441	.147	3.594	.037
P7-Air Aft Filt, "H2OV	3.906	.473	.972	.118
P8-Blowby, "H2OG	.008	.064	.002	.016
P11-Baro (Vent), "Hg ABS	29.282	.004	99.160	.013
Speed, RPM	1799.8	4.334	1799.8	4.334
Load, Lb-Ft	268.19	4.471	363.61	6.061
Smoke, %	5.179	.140	5.179	.140
Fuel Flow, Lb/Hr	45.138	2.270	20.474	1.030
Horsepower	91.907	1.632	68.524	1.217
Corrected Horsepower	94.922	1.686	70.771	1.257
BSFC, lb/hp-hr	.491	.021	.299	.013
Corrected BSFC	.475	.020	.289	.012
Relative Humidity	36.499	.398	36.499	.398
Reference Pressure, inHg	28.995		98.187	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1604

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.99 in-Hg
Speed :	1800 RPM
Load :	268.2 lb-ft
Fuel Flow :	45.1 lb/hr
Brake Power :	91.92 bhp
BSFC :	.491 lb/bhp-hr
Indicated Power :	13.94 kW/cyl
Peak Pressure :	5.490 MPa
Peak Rate of Pressure Rise:	305.9 kPa/deg
Peak Heat Release Rate :	101.8 Joules/deg
Cumulative Heat Release :	1816.77 Joules
Apparent Combustion Efficiency :	67.5 %
Indicated Thermal Efficiency :	34.5 %
Brake Thermal Efficiency :	28.3 %
Ignition Delay :	10.6 degrees
Centroid Phasing :	194.1 degrees
Centroid Magnitude :	22.55 J/degree
Sensitivity :	22.5 degrees
Premixed/Diffusion Ratio :	.47252

980406.101643 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	484.68	.644	251.49	.358
K2-Exhaust 2, F	567.09	.267	297.27	.149
K3-Exhaust 3, F	555.74	.220	290.97	.122
K4-Exhaust 4, F	518.49	.240	270.27	.133
K5-Exhaust 5, F	503.64	.507	262.02	.282
K6-Exhaust 6, F	486.32	.308	252.40	.171
K7-Exhaust Common, F	505.71	.203	263.17	.113
Dry Bulb Temperature, F	76.877	.095	24.931	.053
Wet Bulb Temperature, F	60.139	.017	15.633	.009
J1-Water In, F	168.00	.179	75.558	.100
J2-Water Out, F	169.00	.145	76.111	.080
J3-Oil Sump, F	204.92	.153	96.069	.085
J4-Fuel Inlet, F	84.634	.118	29.241	.065
J5-Air After Filter, F	97.261	.075	36.256	.041
J6-Intake Manifold, F	102.69	.063	39.271	.035
J7-Fuel Return, F	90.754	.868	32.641	.482
P1-Fuel, PSIG	22.775	.151	157.03	1.041
P2-Oil Gallery, PSIG	59.499	.023	410.23	.158
P6-Ex Common, "H2OG	11.218	.092	2.792	.023
P7-Air Aft Filt, "H2OV	3.858	.429	.960	.107
P8-Blowby, "H2OG	.032	.051	.008	.013
P11-Baro (Vent), "Hg ABS	29.284	.003	99.166	.010
Speed, RPM	1799.9	1.653	1799.9	1.653
Load, Lb-Ft	133.50	5.829	181.00	7.903
Smoke, %	3.042	.098	3.042	.098
Fuel Flow, Lb/Hr	26.466	1.772	12.005	.804
Horsepower	45.752	2.005	34.111	1.495
Corrected Horsepower	47.170	2.067	35.168	1.541
BSFC, lb/hp-hr	.578	.018	.352	.011
Corrected BSFC	.561	.017	.341	.011
Relative Humidity	36.697	.246	36.697	.246
Reference Pressure, inHg	29.000		98.205	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1606

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.00 in-Hg
Speed :	1800 RPM
Load :	133.5 lb-ft
Fuel Flow :	26.5 lb/hr
Brake Power :	45.75 bhp
BSFC :	.579 lb/bhp-hr
Indicated Power :	7.70 kW/cyl
Peak Pressure :	4.763 MPa
Peak Rate of Pressure Rise:	207.7 kPa/deg
Peak Heat Release Rate :	75.7 Joules/deg
Cumulative Heat Release :	1049.71 Joules
Apparent Combustion Efficiency :	66.4 %
Indicated Thermal Efficiency :	32.5 %
Brake Thermal Efficiency :	24.0 %
Ignition Delay :	13.9 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	18.16 J/degree
Sensitivity :	20.1 degrees
Premixed/Diffusion Ratio :	.69377

980406.103038 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	332.08	.781	166.71	.434
K2-Exhaust 2, F	427.62	.857	219.79	.476
K3-Exhaust 3, F	422.11	.417	216.73	.232
K4-Exhaust 4, F	407.79	1.306	208.77	.725
K5-Exhaust 5, F	380.13	.661	193.41	.367
K6-Exhaust 6, F	355.85	.799	179.92	.444
K7-Exhaust Common, F	384.73	.999	195.96	.555
Dry Bulb Temperature, F	76.986	.117	24.992	.065
Wet Bulb Temperature, F	59.605	.024	15.336	.013
J1-Water In, F	170.48	.233	76.931	.130
J2-Water Out, F	170.70	.230	77.056	.128
J3-Oil Sump, F	201.31	.211	94.062	.117
J4-Fuel Inlet, F	89.380	.118	31.878	.065
J5-Air After Filter, F	95.614	.071	35.341	.040
J6-Intake Manifold, F	101.52	.092	38.621	.051
J7-Fuel Return, F	112.61	.032	44.782	.018
P1-Fuel, PSIG	12.648	.080	87.203	.553
P2-Oil Gallery, PSIG	59.630	.013	411.13	.090
P6-Ex Common, "H2OG	9.362	.106	2.330	.026
P7-Air Aft Filt, "H2OV	3.522	.544	.876	.135
P8-Blowby, "H2OG	-.031	.052	-.008	.013
P11-Baro (Vent), "Hg ABS	29.305	.005	99.238	.018
Speed, RPM	1800.8	2.005	1800.8	2.005
Load, Lb-Ft	45.741	1.606	62.016	2.177
Smoke, %	1.985	.081	1.985	.081
Fuel Flow, Lb/Hr	17.929	.134	8.132	.061
Horsepower	15.683	.538	11.693	.401
Corrected Horsepower	16.124	.553	12.021	.412
BSFC, lb/hp-hr	1.145	.043	.696	.026
Corrected BSFC	1.113	.042	.677	.026
Relative Humidity	34.747	.215	34.747	.215
Reference Pressure, inHg	29.046		98.360	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1608

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.05 in-Hg
Speed :	1801 RPM
Load :	45.7 lb-ft
Fuel Flow :	17.9 lb/hr
Brake Power :	15.69 bhp
BSFC :	1.141 lb/bhp-hr
Indicated Power :	3.59 kW/cyl
Peak Pressure :	4.386 MPa
Peak Rate of Pressure Rise:	158.6 kPa/deg
Peak Heat Release Rate :	65.2 Joules/deg
Cumulative Heat Release :	553.426 Joules
Apparent Combustion Efficiency :	51.9 %
Indicated Thermal Efficiency :	22.4 %
Brake Thermal Efficiency :	12.2 %
Ignition Delay :	15.4 degrees
Centroid Phasing :	194.0 degrees
Centroid Magnitude :	15.66 J/degree
Sensitivity :	17.7 degrees
Premixed/Diffusion Ratio :	.87040

880406.105321 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1121.8	.669	605.45	.371
K2-Exhaust 2, F	1207.3	.380	652.93	.211
K3-Exhaust 3, F	1219.7	.395	659.84	.220
K4-Exhaust 4, F	1174.1	.905	634.52	.503
K5-Exhaust 5, F	1200.7	.575	649.25	.319
K6-Exhaust 6, F	1120.6	.647	604.76	.359
K7-Exhaust Common, F	1250.6	.613	676.99	.340
Dry Bulb Temperature, F	76.246	.245	24.581	.136
Wet Bulb Temperature, F	59.259	.056	15.144	.031
J1-Water In, F	160.09	.110	71.159	.061
J2-Water Out, F	168.57	.076	75.870	.042
J3-Oil Sump, F	205.27	.220	96.260	.122
J4-Fuel Inlet, F	86.579	.231	30.322	.128
J5-Air After Filter, F	99.815	.118	37.675	.066
J6-Intake Manifold, F	105.02	.128	40.566	.071
J7-Fuel Return, F	111.75	.744	44.305	.413
P1-Fuel, PSIG	105.82	1.024	729.60	7.063
P2-Oil Gallery, PSIG	56.506	.028	389.59	.190
P6-Ex Common, "H2OG	15.187	.395	3.779	.098
P7-Air Aft Filt, "H2OV	2.263	.203	.563	.050
P8-Blowby, "H2OG	-.003	.038	-.001	.010
P11-Baro (Vent), "Hg ABS	29.306	.001	99.240	.004
Speed, RPM	1500.8	2.091	1500.8	2.091
Load, Lb-Ft	552.07	2.076	748.50	2.814
Smoke, %	16.776	.424	16.776	.424
Fuel Flow, Lb/Hr	78.737	2.662	35.714	1.208
Horsepower	157.76	.676	117.62	.504
Corrected Horsepower	162.80	.698	121.38	.520
BSFC, lb/hp-hr	.499	.016	.304	.010
Corrected BSFC	.484	.016	.294	.009
Relative Humidity	35.396	.431	35.396	.431
Reference Pressure, inHg	29.139		98.676	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1610

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.14 in-Hg
Speed :	1501 RPM
Load :	552.1 lb-ft
Fuel Flow :	78.7 lb/hr
Brake Power :	157.79 bhp
BSFC :	.499 lb/bhp-hr
Indicated Power :	22.45 kW/cyl
Peak Pressure :	7.988 MPa
Peak Rate of Pressure Rise:	685.9 kPa/deg
Peak Heat Release Rate :	264.1 Joules/deg
Cumulative Heat Release :	3492.25 Joules
Apparent Combustion Efficiency :	62.0 %
Indicated Thermal Efficiency :	31.9 %
Brake Thermal Efficiency :	27.9 %
Ignition Delay :	4.6 degrees
Centroid Phasing :	192.8 degrees
Centroid Magnitude :	41.63 J/degree
Sensitivity :	27.2 degrees
Premixed/Diffusion Ratio :	.16757

880406.110118 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1092.0	.732	588.89	.407
K2-Exhaust 2, F	1163.2	.888	628.46	.494
K3-Exhaust 3, F	1175.2	.931	635.09	.517
K4-Exhaust 4, F	1139.0	.649	615.00	.360
K5-Exhaust 5, F	1173.9	.859	634.40	.477
K6-Exhaust 6, F	1101.2	1.847	593.98	1.026
K7-Exhaust Common, F	1232.0	.864	666.65	.480
Dry Bulb Temperature, F	75.692	.085	24.274	.047
Wet Bulb Temperature, F	59.151	.032	15.084	.018
J1-Water In, F	159.83	.091	71.019	.051
J2-Water Out, F	169.38	.076	76.320	.042
J3-Oil Sump, F	203.15	.167	95.082	.093
J4-Fuel Inlet, F	89.776	.367	32.098	.204
J5-Air After Filter, F	99.365	.058	37.425	.032
J6-Intake Manifold, F	104.20	.061	40.110	.034
J7-Fuel Return, F	89.251	.246	31.806	.136
P1-Fuel, PSIG	93.377	.447	643.81	3.083
P2-Oil Gallery, PSIG	53.811	.028	371.01	.196
P6-Ex Common, "H2OG	14.125	.142	3.515	.035
P7-Air Aft Filt, "H2OV	1.559	.268	.388	.067
P8-Blowby, "H2OG	-.012	.048	-.003	.012
P11-Baro (Vent), "Hg ABS	29.314	.003	99.267	.011
Speed, RPM	1300.7	1.900	1300.7	1.900
Load, Lb-Ft	560.46	2.318	759.87	3.142
Smoke, %	19.370	.434	19.370	.434
Fuel Flow, Lb/Hr	75.584	3.696	34.284	1.676
Horsepower	138.80	.677	103.48	.505
Corrected Horsepower	143.14	.698	106.72	.521
BSFC, lb/hp-hr	.545	.025	.331	.015
Corrected BSFC	.528	.024	.321	.015
Relative Humidity	36.372	.185	36.372	.185
Reference Pressure, inHg	29.199		98.878	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1612

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.20 in-Hg
Speed :	1301 RPM
Load :	560.5 lb-ft
Fuel Flow :	75.6 lb/hr
Brake Power :	138.84 bhp
BSFC :	.544 lb/bhp-hr
Indicated Power :	19.91 kW/cyl
Peak Pressure :	8.551 MPa
Peak Rate of Pressure Rise:	800.0 kPa/deg
Peak Heat Release Rate :	323.3 Joules/deg
Cumulative Heat Release :	3525.94 Joules
Apparent Combustion Efficiency :	56.5 %
Indicated Thermal Efficiency :	29.4 %
Brake Thermal Efficiency :	25.5 %
Ignition Delay :	3.8 degrees
Centroid Phasing :	190.1 degrees
Centroid Magnitude :	48.33 J/degree
Sensitivity :	25.3 degrees
Premixed/Diffusion Ratio :	.15123

880406.111729 AL-16084-F AL-12920-L NH220				8
K1-Exhaust 1, F	1041.4	1.042	560.78	.579
K2-Exhaust 2, F	1083.2	.821	583.99	.456
K3-Exhaust 3, F	1086.9	.649	586.03	.361
K4-Exhaust 4, F	1057.0	.447	569.44	.248
K5-Exhaust 5, F	1106.1	.312	596.73	.174
K6-Exhaust 6, F	1052.4	.737	566.90	.410
K7-Exhaust Common, F	1170.4	.608	632.47	.338
Dry Bulb Temperature, F	75.707	.092	24.282	.051
Wet Bulb Temperature, F	58.977	.013	14.987	.007
J1-Water In, F	159.77	.147	70.985	.082
J2-Water Out, F	169.99	.108	76.659	.060
J3-Oil Sump, F	202.60	.178	94.776	.099
J4-Fuel Inlet, F	87.952	.386	31.085	.214
J5-Air After Filter, F	102.02	.072	38.898	.040
J6-Intake Manifold, F	106.37	.061	41.319	.034
J7-Fuel Return, F	98.823	.230	37.124	.128
P1-Fuel, PSIG	75.783	.713	522.51	4.918
P2-Oil Gallery, PSIG	49.154	.031	338.91	.211
P6-Ex Common, "H2OG	13.054	.307	3.248	.077
P7-Air Aft Filt, "H2OV	.788	.198	.196	.049
P8-Blowby, "H2OG	.015	.026	.004	.006
P11-Baro (Vent), "Hg ABS	29.334	.002	99.337	.008
Speed, RPM	1099.9	2.026	1099.9	2.026
Load, Lb-Ft	542.82	2.570	735.97	3.484
Smoke, %	21.153	.488	21.153	.488
Fuel Flow, Lb/Hr	60.339	2.870	27.370	1.302
Horsepower	113.68	.602	84.757	.449
Corrected Horsepower	117.41	.622	87.538	.464
BSFC, lb/hp-hr	.531	.025	.323	.015
Corrected BSFC	.514	.025	.313	.015
Relative Humidity	35.762	.239	35.762	.239
Reference Pressure, inHg	29.276		99.141	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1614

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.28 in-Hg
Speed :	1100 RPM
Load :	542.8 lb-ft
Fuel Flow :	60.3 lb/hr
Brake Power :	113.69 bhp
BSFC :	.530 lb/bhp-hr
Indicated Power :	16.21 kW/cyl
Peak Pressure :	8.685 MPa
Peak Rate of Pressure Rise:	781.2 kPa/deg
Peak Heat Release Rate :	322.2 Joules/deg
Cumulative Heat Release :	3382.96 Joules
Apparent Combustion Efficiency :	57.5 %
Indicated Thermal Efficiency :	30.1 %
Brake Thermal Efficiency :	26.2 %
Ignition Delay :	2.5 degrees
Centroid Phasing :	187.7 degrees
Centroid Magnitude :	51.41 J/degree
Sensitivity :	24.3 degrees
Premixed/Diffusion Ratio :	.10135

APPENDIX G9
CUMMINS NH-220G DATA SHEETS
TEST FUEL TF34

APPENDICES KEY

Item 1. Operator Checklist

Item 2. Operator Run List for First Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 3. Operator Run List for Second Data Set, Includes Run Numbers and Cylinder Pressure Filenames for:

- Base Fuel Full-Rack Power Check
- Test Fuel Performance Matrix

Item 4. A portion of an *Operator Log Sheet* is shown as Sample 1. The test Date, Time, Fuel Number, and Operating Conditions are included on the *Operator Log Sheet*. *Operator Log Sheets* are included in the Order shown on the Operator Run List.

Item 5. Computer Printout from Data Acquisition System is shown as Sample 2 and Sample 3. Computer Printout has Time Stamp Keyed to *Operator Log Sheet* as shown in Sample 2. Operating Condition on Computer Printout is also keyed to *Operator Log Sheet* as shown in Sample 3. Sample 3 also shows the column definitions. There is ONE Computer Printout for Each Operating Condition.

Item 6. Cylinder Pressure History Calculations are shown as Sample 4. The Cylinder Pressure Data Report is keyed to the Operating Condition from the *Operator Log Sheet*. Cylinder Pressure Data is also keyed to the Operator Run List Cylinder Pressure Average Filename. There is ONE Cylinder Pressure Data Report for each Operating Condition.

Balance of Appendix repeats the sequence described in Items 4 through 6 above.

DETROIT DIESEL 6V-53N LOG SHEET

TEST NO. 1 FUEL DF-2 AL-15299-F BF02U13L86 DATE 6-5-87 PAGE 1

Fuel

Time

Operator	GREG						
Time	10:35	10:50	11:05	12:00	12:15		
Test Hour							
Speed, RPM	2800	2500	2200	1800	1400		
Load, lb-ft	350.1	381.9	400.3	404.0	378.8		
Fuel Flow, lb/hr	77.8	75.4	68.6	62.3	52.8		

Sample 1. Operator Log

Year Month Day 24-hour clock Minute Seconds

870603.103427 AL-15299-F AL-12920-L 6V-53 1

Sample 2. Computer Log Time Stamp Keyed to Operator Log Sheet

Variable	10 Point Average	10 Point Std. Dev.	SI Avg.	SI Std. Dev.
P5 C3 Airbox Pres., psig	4.737	.015	32.661	.102
P10 C3 Exh Comm, inH2Og	27.982	.209	6.963	.052
P11 C3 Intake Vac,inH2Ov	15.682	.075	3.902	.019
P12 C3 Blowby, inH2Og	.047	.006	.012	.001
C3 Speed, RPM	2799.6	2.552	2799.6	2.552
C3 Fuel Flow, lb/hr	78.413	1.971	35.568	.849
C3 Smoke, %	3.904	.265	3.904	.265
Cell 3 Load, lb-ft	348.15	1.393	472.03	1.889
K1 C3 Exhaust 1, F	760.30	.379	404.61	.210
K2 C3 Exhaust 2, F	813.77	.569	434.32	.316

Sample 3. Computer Log of Operating Condition Keyed to Operator Log

```
NAVY HIGH SPEED DIESEL - DETROIT DIESEL 6V-53N          FILE   DN1112
Bore :                                    98.4 mm
Stroke :                                 114.3 mm
Displacement :                          5217.9 cc
Compression Ratio :                     21.0 to 1
Injection Timing :                       18 BTDC
Crankangle Offset :                     180.0 degrees
Reference Pressure :                    37.52 in-Hg
Speed :                                 2800 RPM
Load  :                                 348.2 lb-ft
Fuel Flow :                              78.4 lb/hr
Brake Power :                           185.64 bhp
BSFC :                                  .422 lb/bhp-hr
```

Cylinder Pressure Data AVG Filename from Operator Run List

Sample 4. Cylinder Pressure Data Report Keyed to Operator Log and Run List

Navy High-Speed Diesel Engine Performance Test Checklist

Laboratory BFLRF(SwRI)
Engine Type: Cummins NH220G Engine Tester: G. Pilkington
Test Fuel: TF34N28T88 Date: 4-7-88

Step	Initials	Test Procedure
1.	G.L.P.	Flush fuel system with BF-2
2.	G.L.P.	Engine warmup
3.	G.L.P.	Clean smokemeter lenses and adjust purge air
4.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
5.	G.L.P.	Compute corrected power levels and maximum cylinder pressur
6.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
7.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
8.	G.L.P.	Flush fuel system with TF34N28T88 test fuel
9.	G.L.P.	Engine warmup
10.	G.L.P.	Clean smokemeter lenses and adjust purge air
11.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
12.	G.L.P.	Flush fuel system with BF-2
13.	G.L.P.	Engine warmup
14.	G.L.P.	Clean smokemeter lenses and adjust purge air
15.	G.L.P.	Full rack power check with BF-2. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.
16.	G.L.P.	Compute corrected power levels and maximum cylinder pressur
17.	G.L.P.	Compare to 95% confidence bands of BF-2 performance
18.	G.L.P.	Determine action; i.e. continue or contact DTNSRDC
19.	G.L.P.	Flush fuel system with TF34N28T88 test fuel
20.	G.L.P.	Engine warmup
21.	G.L.P.	Clean smokemeter lenses and adjust purge air
22.	G.L.P.	Complete performance testing load-speed matrix. Maintain fuel temperature at 32±2C, air temperature at 38±2C, and coolant temperature at 77±2C. Set exhaust back pressure at 50±2mm of mercury under full-rack conditions at rated speed.

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF34N28J88 Date: 4-7-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	293	CN1615	CN1616
1800	294	CN1617	CN1618
1500	295	CN1619	CN1620
1300	296	CN1621	CN1622
1100	297	CN1623	CN1624

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF34N28J88

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	298	CN1625	CN1626
1800	Full-Rack	299	CN1627	CN1628
1800	133	300	CN1629	CN1630
1800	98	301	CN1631	CN1632
1800	48	302	CN1633	CN1634
1800	13	303	CN1635	CN1636
1500	Full-Rack	304	CN1637	CN1638
1300	Full-Rack	305	CN1639	CN1640
1100	Full-Rack	306	CN1641	CN1642

Navy High-Speed Diesel Engine
Performance Test Plan
Fuel Blend Testing Sequence

Engine Type: Cummins NH220G Engine Tester: BFLRF(SwRI)

Fuel Blend: TF34N28J88 Date: 4-11-88

Engine Operating Conditions

Fuel Temperature	86F - 94F
Inlet Air Temperature	97F - 104F
Coolant Out Temperature	167F - 174F

Cummins NH220G Full Rack Power Check - BF-2 Fuel Only

Speed	Run #	RAW File	AVG File
2100	307	CN1643	CN1644
1800	308	CN1645	CN1646
1500	309	CN1647	CN1648
1300	310	CN1649	CN1650
1100	311	CN1651	CN1652

Cummins NH220G Speed-Power Points for Performance Evaluations

Fuel Blend: TF34N28J88

Speed	CBHP	Run #	RAW File	AVG File
2100	Full-Rack	312	CN1653	CN1654
1800	Full-Rack	313	CN1655	CN1656
1800	133	314	CN1657	CN1658
1800	98	315	CN1659	CN1660
1800	48	316	CN1661	CN1662
1800	13	317	CN1663	CN1664
1500	Full-Rack	318	CN1665	CN1666
1300	Full-Rack	319	CN1667	CN1668
1100	Full-Rack	320	CN1669	CN1670

CUMMINS NH220 LOG SHEET

TEST NO. 9 FUEL 8F02V310187 DATE 4-7-88 PAGE 55

Operator Greg							
Time	12:10	12:20	12:30	12:45	1:00		
Test Hour	40 min	10 min	10 min	15 min	15 min		
Speed, RPM	2100	1799	1499	1299	1100		
Load, lb–ft	497.1	541.6	553.7	462.1	543.2		
Fuel Flow, lb/hr	85.0	78.4	68.8	62.7	50.7		
Exh. Opacity, %	19.0	15.0	12.0	13.0	12.5		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1174	1180	1160	1127	1072		
Exhaust Cyl. 2	1275	1262	1230	1180	1083		
Exhaust Cyl. 3	1261	1260	1225	1177	1072		
Exhaust Cyl. 4	1235	1235	1194	1152	1053		
Exhaust Cyl. 5	1254	1268	1249	1213	1115		
Exhaust Cyl. 6	1184	1181	1153	1124	1047		
Exhaust Common	1275	1298	1284	1263	1150		
Water In	162	161	160	159	159		
Water Out	169	170	170	170	170		
Oil Sump	227	226	219	211	207		
Fuel	93	91	90	90	89		
Inlet Air	98	97	103	99	99		
Wet Bulb	66	63.2	65.6	64.9	65.3		
Dry Bulb	85.2	85.0	85.2	83.0	84.2		
PRESSURES, PSIG							
Fuel Pump	133.0	121.0	102.0	91.0	70.0		
Oil Gallery	57.2	54.9	53.0	50.3	46.1		
LOW PRESSURES							
Intake Vac, in.water	4.4	3.4	2.6	2.1	1.6		
Exh. Comm., in.Water	27.0	20.0	15.5	15.0	13.5		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.15	29.15	29.15	29.14	29.13		

880407.121040 AL-17355-F AL-12920-L NH220				9
K1-Exhaust 1, F	1172.6	.565	633.64	.314
K2-Exhaust 2, F	1275.9	.266	691.03	.148
K3-Exhaust 3, F	1260.5	.596	682.52	.331
K4-Exhaust 4, F	1235.5	.550	668.61	.306
K5-Exhaust 5, F	1256.2	1.080	680.09	.600
K6-Exhaust 6, F	1183.6	.772	639.80	.429
K7-Exhaust Common, F	1278.7	.878	692.59	.488
Dry Bulb Temperature, F	81.684	.106	27.602	.059
Wet Bulb Temperature, F	61.414	.044	16.341	.024
J1-Water In, F	162.77	.246	72.648	.137
J2-Water Out, F	170.16	.234	76.757	.130
J3-Oil Sump, F	227.39	.387	108.55	.215
J4-Fuel Inlet, F	94.696	.052	34.831	.029
J5-Air After Filter, F	99.696	.333	37.609	.185
J6-Intake Manifold, F	101.80	.517	38.781	.287
J7-Fuel Return, F	97.667	.041	36.482	.023
P1-Fuel, PSIG	132.90	1.157	916.33	7.975
P2-Oil Gallery, PSIG	55.893	.022	385.37	.151
P6-Ex Common, "H2OG	26.153	.165	6.508	.041
P7-Air Aft Filt, "H2OV	4.251	.234	1.058	.058
P8-Blowby, "H2OG	.024	.051	.006	.013
P11-Baro (Vent), "Hg ABS	29.151	.004	98.716	.012
Speed, RPM	2101.4	2.951	2101.4	2.951
Load, Lb-Ft	501.44	4.084	679.85	5.537
Smoke, %	19.377	.317	19.377	.317
Fuel Flow, Lb/Hr	85.187	.169	38.640	.077
Horsepower	200.63	1.710	149.59	1.275
Corrected Horsepower	208.16	1.774	155.20	1.323
BSFC, lb/hp-hr	.425	.004	.258	.002
Corrected BSFC	.409	.004	.249	.002
Relative Humidity	30.116	.117	30.116	.117
Reference Pressure, inHg	28.838		97.658	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1616

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	2101 RPM
Load :	501.4 lb-ft
Fuel Flow :	85.2 lb/hr
Brake Power :	200.58 bhp
BSFC :	.425 lb/bhp-hr
Indicated Power :	29.16 kW/cyl
Peak Pressure :	7.255 MPa
Peak Rate of Pressure Rise:	552.5 kPa/deg
Peak Heat Release Rate :	195.6 Joules/deg
Cumulative Heat Release :	3405.69 Joules
Apparent Combustion Efficiency :	77.5 %
Indicated Thermal Efficiency :	37.9 %
Brake Thermal Efficiency :	32.4 %
Ignition Delay :	4.3 degrees
Centroid Phasing :	197.2 degrees
Centroid Magnitude :	37.21 J/degree
Sensitivity :	32.0 degrees
Premixed/Diffusion Ratio :	.13378

880407.122220 AL-17355-F AL-12920-L NH220				9
K1-Exhaust 1, F	1177.3	.850	636.30	.472
K2-Exhaust 2, F	1262.8	.674	683.80	.375
K3-Exhaust 3, F	1256.9	.547	680.51	.304
K4-Exhaust 4, F	1233.1	.545	667.29	.303
K5-Exhaust 5, F	1267.2	.650	686.20	.361
K6-Exhaust 6, F	1176.3	.628	635.71	.349
K7-Exhaust Common, F	1294.9	.397	701.61	.221
Dry Bulb Temperature, F	82.358	.194	27.976	.108
Wet Bulb Temperature, F	61.730	.038	16.516	.021
J1-Water In, F	162.04	.257	72.242	.143
J2-Water Out, F	170.32	.206	76.845	.114
J3-Oil Sump, F	228.28	.131	109.05	.073
J4-Fuel Inlet, F	91.180	.079	32.878	.044
J5-Air After Filter, F	96.614	.130	35.897	.072
J6-Intake Manifold, F	98.054	.116	36.697	.065
J7-Fuel Return, F	93.900	.047	34.389	.026
P1-Fuel, PSIG	118.80	.513	819.12	3.540
P2-Oil Gallery, PSIG	54.744	.037	377.45	.255
P6-Ex Common, "H2OG	18.578	.222	4.623	.055
P7-Air Aft Filt, "H2OV	3.103	.699	.772	.174
P8-Blowby, "H2OG	-.003	.035	-.001	.009
P11-Baro (Vent), "Hg ABS	29.149	.004	98.711	.015
Speed, RPM	1799.7	3.230	1799.7	3.230
Load, Lb-Ft	540.42	5.796	732.70	7.858
Smoke, %	14.864	.497	14.864	.497
Fuel Flow, Lb/Hr	78.299	.317	35.516	.144
Horsepower	185.18	2.267	138.07	1.690
Corrected Horsepower	191.63	2.346	142.87	1.749
BSFC, lb/hp-hr	.423	.005	.257	.003
Corrected BSFC	.409	.005	.249	.003
Relative Humidity	29.667	.359	29.667	.359
Reference Pressure, inHg	28.921		97.938	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1618

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.92 in-Hg
Speed :	1800 RPM
Load :	540.4 lb-ft
Fuel Flow :	78.3 lb/hr
Brake Power :	185.21 bhp
BSFC :	.423 lb/bhp-hr
Indicated Power :	26.52 kW/cyl
Peak Pressure :	7.826 MPa
Peak Rate of Pressure Rise:	640.1 kPa/deg
Peak Heat Release Rate :	238.3 Joules/deg
Cumulative Heat Release :	3515.43 Joules
Apparent Combustion Efficiency :	74.6 %
Indicated Thermal Efficiency :	37.5 %
Brake Thermal Efficiency :	32.5 %
Ignition Delay :	3.9 degrees
Centroid Phasing :	194.5 degrees
Centroid Magnitude :	40.54 J/degree
Sensitivity :	29.6 degrees
Premixed/Diffusion Ratio :	.13040

880407.123438 AL-17355-F AL-12920-L NH220				9
K1-Exhaust 1, F	1155.8	.637	624.34	.354
K2-Exhaust 2, F	1228.5	.192	664.74	.107
K3-Exhaust 3, F	1220.5	.302	660.28	.168
K4-Exhaust 4, F	1190.0	.536	643.34	.298
K5-Exhaust 5, F	1245.4	.715	674.11	.397
K6-Exhaust 6, F	1148.9	.869	620.50	.483
K7-Exhaust Common, F	1279.2	.411	692.88	.228
Dry Bulb Temperature, F	83.514	.442	28.619	.245
Wet Bulb Temperature, F	62.262	.094	16.812	.052
J1-Water In, F	160.47	.306	71.374	.170
J2-Water Out, F	170.03	.202	76.681	.112
J3-Oil Sump, F	220.45	.231	104.70	.128
J4-Fuel Inlet, F	91.137	.075	32.854	.041
J5-Air After Filter, F	103.00	.388	39.445	.215
J6-Intake Manifold, F	105.47	.496	40.818	.276
J7-Fuel Return, F	92.888	.065	33.826	.036
P1-Fuel, PSIG	100.08	.908	690.02	6.259
P2-Oil Gallery, PSIG	53.543	.121	369.17	.834
P6-Ex Common, "H2OG	14.381	.435	3.578	.108
P7-Air Aft Filt, "H2OV	2.356	.242	.586	.060
P8-Blowby, "H2OG	.016	.022	.004	.006
P11-Baro (Vent), "Hg ABS	29.143	.001	98.689	.005
Speed, RPM	1498.2	1.848	1498.2	1.848
Load, Lb-Ft	547.25	1.653	741.96	2.241
Smoke, %	13.213	.233	13.213	.233
Fuel Flow, Lb/Hr	68.694	.434	31.159	.197
Horsepower	156.11	.451	116.39	.336
Corrected Horsepower	162.53	.469	121.17	.350
BSFC, lb/hp-hr	.440	.003	.268	.002
Corrected BSFC	.423	.003	.257	.002
Relative Humidity	28.905	.599	28.905	.599
Reference Pressure, inHg	28.970		98.102	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1620

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.97 in-Hg
Speed :	1498 RPM
Load :	547.3 lb-ft
Fuel Flow :	68.7 lb/hr
Brake Power :	156.10 bhp
BSFC :	.440 lb/bhp-hr
Indicated Power :	22.87 kW/cyl
Peak Pressure :	8.415 MPa
Peak Rate of Pressure Rise:	739.5 kPa/deg
Peak Heat Release Rate :	297.7 Joules/deg
Cumulative Heat Release :	3563.10 Joules
Apparent Combustion Efficiency :	71.7 %
Indicated Thermal Efficiency :	36.9 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	2.2 degrees
Centroid Phasing :	190.9 degrees
Centroid Magnitude :	45.42 J/degree
Sensitivity :	27.7 degrees
Premixed/Diffusion Ratio :	.08020

880407.124925 AL-17355-F AL-12920-L NH220				9
K1-Exhaust 1, F	1124.8	1.462	607.13	.812
K2-Exhaust 2, F	1180.4	.803	637.97	.446
K3-Exhaust 3, F	1174.5	.406	634.73	.225
K4-Exhaust 4, F	1150.1	.495	621.17	.275
K5-Exhaust 5, F	1212.5	1.207	655.86	.670
K6-Exhaust 6, F	1115.8	.930	602.09	.517
K7-Exhaust Common, F	1260.7	.477	682.61	.265
Dry Bulb Temperature, F	82.070	.480	27.817	.266
Wet Bulb Temperature, F	61.428	.119	16.349	.066
J1-Water In, F	160.01	.116	71.119	.065
J2-Water Out, F	170.39	.066	76.881	.037
J3-Oil Sump, F	212.49	.302	100.27	.168
J4-Fuel Inlet, F	89.851	.122	32.139	.068
J5-Air After Filter, F	98.558	.147	36.977	.082
J6-Intake Manifold, F	99.842	.136	37.690	.076
J7-Fuel Return, F	90.380	.123	32.433	.068
P1-Fuel, PSIG	88.718	.668	611.69	4.603
P2-Oil Gallery, PSIG	51.392	.050	354.33	.343
P6-Ex Common, "H2OG	13.400	.145	3.334	.036
P7-Air Aft Filt, "H2OV	1.787	.215	.445	.054
P8-Blowby, "H2OG	.021	.048	.005	.012
P11-Baro (Vent), "Hg ABS	29.142	.002	98.686	.006
Speed, RPM	1300.3	2.096	1300.3	2.096
Load, Lb-Ft	564.95	3.338	765.97	4.525
Smoke, %	14.620	.651	14.620	.651
Fuel Flow, Lb/Hr	62.667	.641	28.425	.291
Horsepower	139.87	1.003	104.28	.748
Corrected Horsepower	145.00	1.040	108.10	.775
BSFC, lb/hp-hr	.448	.004	.273	.002
Corrected BSFC	.432	.004	.263	.002
Relative Humidity	29.414	.739	29.414	.739
Reference Pressure, inHg	29.011		98.241	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1622

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.01 in-Hg
Speed :	1300 RPM
Load :	565.0 lb-ft
Fuel Flow :	62.7 lb/hr
Brake Power :	139.85 bhp
BSFC :	.448 lb/bhp-hr
Indicated Power :	20.38 kW/cyl
Peak Pressure :	8.851 MPa
Peak Rate of Pressure Rise:	803.7 kPa/deg
Peak Heat Release Rate :	329.1 Joules/deg
Cumulative Heat Release :	3643.51 Joules
Apparent Combustion Efficiency :	69.7 %
Indicated Thermal Efficiency :	36.0 %
Brake Thermal Efficiency :	30.7 %
Ignition Delay :	1.6 degrees
Centroid Phasing :	189.4 degrees
Centroid Magnitude :	49.65 J/degree
Sensitivity :	26.8 degrees
Premixed/Diffusion Ratio :	.05844

880407.130055 AL-17355-F AL-12920-L NH220				9
K1-Exhaust 1, F	1070.2	.933	576.78	.518
K2-Exhaust 2, F	1083.1	.665	583.94	.369
K3-Exhaust 3, F	1075.7	.404	579.83	.225
K4-Exhaust 4, F	1052.5	.402	566.96	.223
K5-Exhaust 5, F	1116.2	1.621	602.36	.901
K6-Exhaust 6, F	1045.5	.583	563.07	.324
K7-Exhaust Common, F	1152.3	1.155	622.40	.642
Dry Bulb Temperature, F	84.067	.413	28.926	.229
Wet Bulb Temperature, F	62.117	.182	16.731	.101
J1-Water In, F	159.16	.069	70.643	.038
J2-Water Out, F	169.36	.057	76.311	.032
J3-Oil Sump, F	207.27	.511	97.370	.284
J4-Fuel Inlet, F	88.305	.064	31.281	.035
J5-Air After Filter, F	99.346	.059	37.415	.033
J6-Intake Manifold, F	100.91	.057	38.285	.032
J7-Fuel Return, F	89.107	.118	31.726	.065
P1-Fuel, PSIG	68.074	.308	469.36	2.122
P2-Oil Gallery, PSIG	46.681	.051	321.86	.355
P6-Ex Common, "H2OG	11.427	.129	2.844	.032
P7-Air Aft Filt, "H2OV	1.293	.191	.322	.048
P8-Blowby, "H2OG	.038	.047	.009	.012
P11-Baro (Vent), "Hg ABS	29.136	.002	98.666	.008
Speed, RPM	1099.9	2.276	1099.9	2.276
Load, Lb-Ft	544.37	2.587	738.07	3.508
Smoke, %	12.752	.466	12.752	.466
Fuel Flow, Lb/Hr	50.918	1.004	23.096	.455
Horsepower	114.01	.709	85.001	.529
Corrected Horsepower	118.29	.736	88.194	.549
BSFC, lb/hp-hr	.447	.010	.272	.006
Corrected BSFC	.430	.010	.262	.006
Relative Humidity	27.511	.348	27.511	.348
Reference Pressure, inHg	29.041		98.344	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1624

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.04 in-Hg
Speed :	1100 RPM
Load :	544.4 lb-ft
Fuel Flow :	50.9 lb/hr
Brake Power :	114.02 bhp
BSFC :	.446 lb/bhp-hr
Indicated Power :	16.43 kW/cyl
Peak Pressure :	8.809 MPa
Peak Rate of Pressure Rise:	769.8 kPa/deg
Peak Heat Release Rate :	324.5 Joules/deg
Cumulative Heat Release :	3432.17 Joules
Apparent Combustion Efficiency :	68.4 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	30.8 %
Ignition Delay :	1.6 degrees
Centroid Phasing :	187.6 degrees
Centroid Magnitude :	49.55 J/degree
Sensitivity :	25.1 degrees
Premixed/Diffusion Ratio :	.06357

CUMMINS NH220 LOG SHEET

TEST NO. 9 FUEL TF-34NJ8588 DATE 4-7-88 PAGE 56

Operator GR&B							
Time	1:30	1:40	2:08	2:10	2:20	2:25	2:45
Test Hour	30min	10min	20min	10min	10min	5min	20min
Speed, RPM	2100	1799	1900	1900	1900	1800	1500
Load, lb-ft	470.2	517.5	369.4	271.3	135.2	44.2	541.3
Fuel Flow, lb/hr	113.6	103.7	55.1	48.6	32.1	18.5	84.4
Exh. Opacity, %	26.0	21.0	5.0	3.0	3.0	2.0	28.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1141	1123	935	694	507	372	1062
Exhaust Cyl. 2	1250	1224	953	788	585	448	1157
Exhaust Cyl. 3	1266	1235	949	787	581	442	1156
Exhaust Cyl. 4	1205	1198	909	741	544	427	1131
Exhaust Cyl. 5	1218	1203	879	723	526	394	1144
Exhaust Cyl. 6	1147	1130	846	691	495	378	1087
Exhaust Common	1251	1247	905	734	530	404	1185
Water In	162	162	165	165	166	167	162
Water Out	170	170	170	168	168	169	172
Oil Sump	217	224	222	217	211	208	210
Fuel	92	93	91	88	88	88	90
Inlet Air	100	99	99	98	97	98	99
Wet Bulb	65.0	65.3	64.9	65.0	65.8	65.2	64.9
Dry Bulb	83.7	88.8	84.0	84.5	84.5	84.0	84.6
PRESSURES, PSIG							
Fuel Pump	140	136.0	69.0	49.0	29.0	18.0	109.0
Oil Gallery	59.0	55.7	56.1	57.2	58.0	58.6	56.0
LOW PRESSURES							
Intake Vac, in.water	4.6	3.4	3.6	3.8	3.9	3.9	2.6
Exh. Comm., in.Water	17.0	20.0	16.5	15.5	13.0	10.5	14.5
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.13	29.12	29.10	29.10	29.10	29.10	29.09

CUMMINS NH220 LOG SHEET

TEST NO. 9 FUEL TF34N2888 DATE 4-7-87 PAGE 57

Operator Grey							
Time	2:55	3:10					
Test Hour	10 min	15 min					
Speed, RPM	1301	1101					
Load, lb–ft	549.7	545.2					
Fuel Flow, lb/hr	79.7	62.7					
Exh. Opacity, %	40.0	42.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1034	999					
Exhaust Cyl. 2	1106	1044					
Exhaust Cyl. 3	1093	1037					
Exhaust Cyl. 4	1081	998					
Exhaust Cyl. 5	1100	1021					
Exhaust Cyl. 6	1064	1013					
Exhaust Common	1131	1031					
Water In	160	159					
Water Out	171	171					
Oil Sump	207	205					
Fuel	91	91					
Inlet Air	99	99					
Wet Bulb	65.0	65.4					
Dry Bulb	85.0	85.1					
PRESSURES, PSIG							
Fuel Pump	96.0	78.0					
Oil Gallery	52.0	46.2					
LOW PRESSURES							
Intake Vac, in.water	2.1	1.6					
Exh. Comm., in.Water	13.0	12.5					
Blowby, in.water	0	0					
Barometer, in.Hg	29.09	29.08					

880407.133204 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	1143.1	1.547	617.26	.860
K2-Exhaust 2, F	1251.8	.593	677.64	.329
K3-Exhaust 3, F	1267.1	.539	686.17	.299
K4-Exhaust 4, F	1205.9	1.376	652.18	.764
K5-Exhaust 5, F	1220.5	1.373	660.28	.763
K6-Exhaust 6, F	1147.1	.964	619.49	.536
K7-Exhaust Common, F	1253.1	1.571	678.41	.873
Dry Bulb Temperature, F	84.092	.266	28.940	.149
Wet Bulb Temperature, F	62.187	.086	16.771	.048
J1-Water In, F	162.74	.190	72.634	.106
J2-Water Out, F	169.80	.163	76.553	.090
J3-Oil Sump, F	215.43	.533	101.91	.296
J4-Fuel Inlet, F	91.542	.030	33.079	.017
J5-Air After Filter, F	98.770	.192	37.095	.106
J6-Intake Manifold, F	99.662	.387	37.590	.215
J7-Fuel Return, F	95.114	.018	35.063	.010
P1-Fuel, PSIG	138.11	.952	952.21	6.567
P2-Oil Gallery, PSIG	58.049	.090	400.24	.618
P6-Ex Common, "H2OG	26.159	.117	6.509	.029
P7-Air Aft Filt, "H2OV	4.491	.203	1.118	.051
P8-Blowby, "H2OG	.030	.048	.007	.012
P11-Baro (Vent), "Hg ABS	29.122	.002	98.616	.006
Speed, RPM	2101.2	3.382	2101.2	3.382
Load, Lb-Ft	473.94	1.805	642.58	2.447
Smoke, %	26.470	.675	26.470	.675
Fuel Flow, Lb/Hr	112.93	1.493	51.226	.677
Horsepower	189.61	.812	141.37	.605
Corrected Horsepower	196.75	.842	146.69	.628
BSFC, lb/hp-hr	.596	.009	.362	.005
Corrected BSFC	.574	.009	.349	.005
Relative Humidity	27.656	.345	27.656	.345
Reference Pressure, inHg	28.791		97.498	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1626

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.79 in-Hg
Speed :	2101 RPM
Load :	473.9 lb-ft
Fuel Flow :	112.9 lb/hr
Brake Power :	189.58 bhp
BSFC :	.596 lb/bhp-hr
Indicated Power :	30.02 kW/cyl
Peak Pressure :	7.342 MPa
Peak Rate of Pressure Rise:	825.1 kPa/deg
Peak Heat Release Rate :	330.6 Joules/deg
Cumulative Heat Release :	3430.55 Joules
Apparent Combustion Efficiency :	61.3 %
Indicated Thermal Efficiency :	30.7 %
Brake Thermal Efficiency :	24.1 %
Ignition Delay :	11.0 degrees
Centroid Phasing :	197.4 degrees
Centroid Magnitude :	67.10 J/degree
Sensitivity :	25.4 degrees
Premixed/Diffusion Ratio :	.43149

880407.134532 AL-17233-F AL-12920-L NH220 9

K1-Exhaust 1, F	1115.9	.739	602.15	.410
K2-Exhaust 2, F	1221.7	1.336	660.96	.742
K3-Exhaust 3, F	1229.9	1.723	665.48	.957
K4-Exhaust 4, F	1191.7	1.162	644.27	.646
K5-Exhaust 5, F	1192.3	1.120	644.59	.622
K6-Exhaust 6, F	1122.7	.957	605.96	.532
K7-Exhaust Common, F	1238.0	1.391	669.99	.773
Dry Bulb Temperature, F	83.981	.479	28.878	.266
Wet Bulb Temperature, F	62.072	.074	16.707	.041
J1-Water In, F	162.73	.185	72.630	.103
J2-Water Out, F	170.77	.151	77.093	.084
J3-Oil Sump, F	224.71	.079	107.06	.044
J4-Fuel Inlet, F	92.561	.104	33.645	.058
J5-Air After Filter, F	99.813	.128	37.674	.071
J6-Intake Manifold, F	101.37	.125	38.538	.069
J7-Fuel Return, F	94.641	.060	34.801	.033
P1-Fuel, PSIG	123.85	.527	853.95	3.634
P2-Oil Gallery, PSIG	55.306	.057	381.32	.394
P6-Ex Common, "H2OG	17.562	.226	4.370	.056
P7-Air Aft Filt, "H2OV	3.636	.615	.905	.153
P8-Blowby, "H2OG	.028	.050	.007	.012
P11-Baro (Vent), "Hg ABS	29.112	.005	98.584	.018
Speed, RPM	1804.3	1.792	1804.3	1.792
Load, Lb-Ft	515.00	1.775	698.24	2.406
Smoke, %	21.727	.388	21.727	.388
Fuel Flow, Lb/Hr	99.229	3.893	45.010	1.766
Horsepower	176.92	.672	131.91	.501
Corrected Horsepower	183.80	.699	137.04	.521
BSFC, lb/hp-hr	.561	.022	.341	.013
Corrected BSFC	.540	.021	.328	.013
Relative Humidity	27.572	.763	27.572	.763
Reference Pressure, inHg	28.844		97.678	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1628

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	1804 RPM
Load :	515.0 lb-ft
Fuel Flow :	99.2 lb/hr
Brake Power :	176.90 bhp
BSFC :	.561 lb/bhp-hr
Indicated Power :	26.59 kW/cyl
Peak Pressure :	7.705 MPa
Peak Rate of Pressure Rise:	1039. kPa/deg
Peak Heat Release Rate :	418.1 Joules/deg
Cumulative Heat Release :	3447.72 Joules
Apparent Combustion Efficiency :	60.2 %
Indicated Thermal Efficiency :	30.9 %
Brake Thermal Efficiency :	25.5 %
Ignition Delay :	10.5 degrees
Centroid Phasing :	195.0 degrees
Centroid Magnitude :	72.50 J/degree
Sensitivity :	23.5 degrees
Premixed/Diffusion Ratio :	.44796

880407.140010 AL-17233-F AL-12920-L NH220 9

K1-Exhaust 1, F	835.82	.910	446.57	.505
K2-Exhaust 2, F	952.20	.750	511.22	.417
K3-Exhaust 3, F	950.18	.888	510.10	.493
K4-Exhaust 4, F	910.30	1.064	487.94	.591
K5-Exhaust 5, F	880.56	.600	471.42	.333
K6-Exhaust 6, F	846.11	.602	452.29	.335
K7-Exhaust Common, F	907.01	.829	486.12	.460
Dry Bulb Temperature, F	85.100	.186	29.500	.103
Wet Bulb Temperature, F	62.635	.032	17.020	.018
J1-Water In, F	165.21	.192	74.005	.107
J2-Water Out, F	169.92	.134	76.622	.074
J3-Oil Sump, F	222.42	.128	105.79	.071
J4-Fuel Inlet, F	91.532	.037	33.073	.021
J5-Air After Filter, F	100.01	.080	37.781	.044
J6-Intake Manifold, F	101.27	.102	38.481	.057
J7-Fuel Return, F	91.442	.041	33.024	.023
P1-Fuel, PSIG	65.947	.569	454.69	3.926
P2-Oil Gallery, PSIG	55.963	.053	385.85	.368
P6-Ex Common, "H2OG	14.551	.221	3.621	.055
P7-Air Aft Filt, "H2OV	3.921	.425	.976	.106
P8-Blowby, "H2OG	.021	.058	.005	.015
P11-Baro (Vent), "Hg ABS	29.105	.004	98.561	.012
Speed, RPM	1802.3	2.580	1802.3	2.580
Load, Lb-Ft	366.27	3.699	496.59	5.015
Smoke, %	5.077	.095	5.077	.095
Fuel Flow, Lb/Hr	67.257	10.649	30.507	4.830
Horsepower	125.69	1.326	93.710	.989
Corrected Horsepower	130.65	1.379	97.409	1.028
BSFC, lb/hp-hr	.536	.087	.326	.053
Corrected BSFC	.515	.084	.313	.051
Relative Humidity	27.021	.298	27.021	.298
Reference Pressure, inHg	28.817		97.585	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1630

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.82 in-Hg
Speed :	1802 RPM
Load :	366.3 lb-ft
Fuel Flow :	67.3 lb/hr
Brake Power :	125.68 bhp
BSFC :	.535 lb/bhp-hr
Indicated Power :	18.82 kW/cyl
Peak Pressure :	6.416 MPa
Peak Rate of Pressure Rise:	605.5 kPa/deg
Peak Heat Release Rate :	265.0 Joules/deg
Cumulative Heat Release :	2407.51 Joules
Apparent Combustion Efficiency :	61.9 %
Indicated Thermal Efficiency :	32.2 %
Brake Thermal Efficiency :	26.8 %
Ignition Delay :	14.8 degrees
Centroid Phasing :	195.3 degrees
Centroid Magnitude :	57.39 J/degree
Sensitivity :	19.5 degrees
Premixed/Diffusion Ratio :	.75802

880407.140844 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	697.87	1.453	369.93	.807
K2-Exhaust 2, F	797.74	1.159	425.41	.644
K3-Exhaust 3, F	792.12	1.319	422.29	.733
K4-Exhaust 4, F	750.45	2.344	399.14	1.302
K5-Exhaust 5, F	729.96	1.750	387.76	.972
K6-Exhaust 6, F	697.14	1.443	369.52	.802
K7-Exhaust Common, F	742.46	1.932	394.70	1.074
Dry Bulb Temperature, F	85.002	.334	29.446	.186
Wet Bulb Temperature, F	62.455	.114	16.919	.063
J1-Water In, F	165.09	.162	73.940	.090
J2-Water Out, F	168.33	.129	75.740	.071
J3-Oil Sump, F	217.97	.372	103.32	.206
J4-Fuel Inlet, F	90.089	.052	32.272	.029
J5-Air After Filter, F	98.017	.029	36.676	.016
J6-Intake Manifold, F	99.312	.067	37.395	.037
J7-Fuel Return, F	89.861	.033	32.145	.018
P1-Fuel, PSIG	46.206	.319	318.58	2.201
P2-Oil Gallery, PSIG	56.918	.160	392.44	1.101
P6-Ex Common, "H2OG	13.341	.186	3.320	.046
P7-Air Aft Filt, "H2OV	3.991	.481	.993	.120
P8-Blowby, "H2OG	.055	.042	.014	.011
P11-Baro (Vent), "Hg ABS	29.103	.004	98.554	.013
Speed, RPM	1802.2	3.188	1802.2	3.188
Load, Lb-Ft	269.75	3.735	365.73	5.064
Smoke, %	4.533	.119	4.533	.119
Fuel Flow, Lb/Hr	48.530	5.146	22.013	2.334
Horsepower	92.562	1.331	69.012	.992
Corrected Horsepower	96.038	1.381	71.603	1.030
BSFC, lb/hp-hr	.524	.055	.319	.033
Corrected BSFC	.505	.053	.307	.032
Relative Humidity	26.741	.743	26.741	.743
Reference Pressure, inHg	28.809		97.560	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1632

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.81 in-Hg
Speed :	1802 RPM
Load :	269.8 lb-ft
Fuel Flow :	48.5 lb/hr
Brake Power :	92.57 bhp
BSFC :	.524 lb/bhp-hr
Indicated Power :	14.49 kW/cyl
Peak Pressure :	5.756 MPa
Peak Rate of Pressure Rise:	469.2 kPa/deg
Peak Heat Release Rate :	233.9 Joules/deg
Cumulative Heat Release :	1854.03 Joules
Apparent Combustion Efficiency :	66.2 %
Indicated Thermal Efficiency :	34.4 %
Brake Thermal Efficiency :	27.3 %
Ignition Delay :	17.2 degrees
Centroid Phasing :	195.4 degrees
Centroid Magnitude :	56.51 J/degree
Sensitivity :	17.2 degrees
Premixed/Diffusion Ratio :	.99755

980407.141719 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	509.93	.914	265.52	.508
K2-Exhaust 2, F	590.98	1.343	310.54	.746
K3-Exhaust 3, F	586.75	1.591	308.19	.884
K4-Exhaust 4, F	551.95	2.202	288.86	1.223
K5-Exhaust 5, F	531.39	1.977	277.44	1.098
K6-Exhaust 6, F	499.31	.941	259.62	.523
K7-Exhaust Common, F	538.11	2.019	281.17	1.122
Dry Bulb Temperature, F	85.383	.528	29.657	.294
Wet Bulb Temperature, F	63.078	.159	17.266	.088
J1-Water In, F	166.70	.075	74.834	.042
J2-Water Out, F	168.34	.092	75.745	.051
J3-Oil Sump, F	212.36	.335	100.20	.186
J4-Fuel Inlet, F	88.837	.105	31.576	.059
J5-Air After Filter, F	97.868	.189	36.594	.105
J6-Intake Manifold, F	99.332	.221	37.407	.123
J7-Fuel Return, F	88.395	.055	31.330	.030
P1-Fuel, PSIG	25.663	.142	176.94	.982
P2-Oil Gallery, PSIG	57.877	.041	399.04	.283
P6-Ex Common, "H2OG	10.472	.137	2.606	.034
P7-Air Aft Filt, "H2OV	4.099	.468	1.020	.117
P8-Blowby, "H2OG	.026	.032	.006	.008
P11-Baro (Vent), "Hg ABS	29.103	.003	98.552	.009
Speed, RPM	1803.1	2.989	1803.1	2.989
Load, Lb-Ft	134.53	4.760	182.40	6.453
Smoke, %	2.772	.080	2.772	.080
Fuel Flow, Lb/Hr	28.574	1.004	12.961	.455
Horsepower	46.190	1.677	34.438	1.250
Corrected Horsepower	47.944	1.741	35.746	1.298
BSFC, lb/hp-hr	.619	.023	.377	.014
Corrected BSFC	.596	.022	.363	.013
Relative Humidity	27.653	.689	27.653	.689
Reference Pressure, inHg	28.801		97.531	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1634

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.80 in-Hg
Speed :	1803 RPM
Load :	134.5 lb-ft
Fuel Flow :	28.6 lb/hr
Brake Power :	46.17 bhp
BSFC :	.619 lb/bhp-hr
Indicated Power :	8.49 kW/cyl
Peak Pressure :	4.555 MPa
Peak Rate of Pressure Rise:	206.7 kPa/deg
Peak Heat Release Rate :	138.4 Joules/deg
Cumulative Heat Release :	1133.16 Joules
Apparent Combustion Efficiency :	68.6 %
Indicated Thermal Efficiency :	34.2 %
Brake Thermal Efficiency :	23.1 %
Ignition Delay :	19.1 degrees
Centroid Phasing :	197.1 degrees
Centroid Magnitude :	39.02 J/degree
Sensitivity :	16.9 degrees
Premixed/Diffusion Ratio :	1.13187

880407.142552 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	376.05	1.190	191.14	.661
K2-Exhaust 2, F	453.39	1.702	234.11	.946
K3-Exhaust 3, F	448.11	1.716	231.17	.953
K4-Exhaust 4, F	431.23	1.919	221.79	1.066
K5-Exhaust 5, F	398.96	1.469	203.87	.816
K6-Exhaust 6, F	380.15	1.903	193.42	1.057
K7-Exhaust Common, F	410.57	2.061	210.31	1.145
Dry Bulb Temperature, F	85.622	.302	29.790	.168
Wet Bulb Temperature, F	62.939	.067	17.188	.037
J1-Water In, F	167.96	.152	75.534	.084
J2-Water Out, F	168.82	.131	76.011	.073
J3-Oil Sump, F	207.50	.145	97.499	.081
J4-Fuel Inlet, F	87.809	.055	31.005	.030
J5-Air After Filter, F	98.694	.030	37.052	.017
J6-Intake Manifold, F	99.565	.032	37.536	.018
J7-Fuel Return, F	88.566	.068	31.426	.038
P1-Fuel, PSIG	14.249	.068	98.242	.470
P2-Oil Gallery, PSIG	58.539	.034	403.62	.233
P6-Ex Common, "H2OG	8.093	.123	2.014	.031
P7-Air Aft Filt, "H2OV	4.128	.498	1.027	.124
P8-Blowby, "H2OG	-.002	.042	-.001	.010
P11-Baro (Vent), "Hg ABS	29.098	.002	98.538	.008
Speed, RPM	1800.2	4.222	1800.2	4.222
Load, Lb-Ft	42.644	2.855	57.818	3.871
Smoke, %	1.833	.037	1.833	.037
Fuel Flow, Lb/Hr	19.841	.880	9.000	.399
Horsepower	14.616	.957	10.897	.714
Corrected Horsepower	15.181	.994	11.318	.741
BSFC, lb/hp-hr	1.362	.092	.828	.056
Corrected BSFC	1.311	.089	.798	.054
Relative Humidity	26.881	.435	26.881	.435
Reference Pressure, inHg	28.795		97.510	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1636

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.80 in-Hg
Speed :	1800 RPM
Load :	42.6 lb-ft
Fuel Flow :	19.8 lb/hr
Brake Power :	14.61 bhp
BSFC :	1.355 lb/bhp-hr
Indicated Power :	4.43 kW/cyl
Peak Pressure :	3.800 MPa
Peak Rate of Pressure Rise:	104.0 kPa/deg
Peak Heat Release Rate :	77.7 Joules/deg
Cumulative Heat Release :	662.292 Joules
Apparent Combustion Efficiency :	57.8 %
Indicated Thermal Efficiency :	25.8 %
Brake Thermal Efficiency :	10.6 %
Ignition Delay :	19.5 degrees
Centroid Phasing :	199.8 degrees
Centroid Magnitude :	24.30 J/degree
Sensitivity :	19.4 degrees
Premixed/Diffusion Ratio :	1.00522

880407.144325 AL-17233-F AL-12920-L NH220 9

K1-Exhaust 1, F	1061.3	1.067	571.84	.593
K2-Exhaust 2, F	1157.8	.703	625.45	.391
K3-Exhaust 3, F	1156.3	.625	624.62	.347
K4-Exhaust 4, F	1130.4	1.348	610.24	.749
K5-Exhaust 5, F	1143.1	1.373	617.27	.763
K6-Exhaust 6, F	1085.3	.710	585.14	.394
K7-Exhaust Common, F	1184.6	.984	640.35	.546
Dry Bulb Temperature, F	84.810	.123	29.339	.068
Wet Bulb Temperature, F	61.934	.104	16.630	.058
J1-Water In, F	162.69	.148	72.606	.082
J2-Water Out, F	171.41	.065	77.448	.036
J3-Oil Sump, F	213.05	.162	100.58	.090
J4-Fuel Inlet, F	90.053	.024	32.252	.013
J5-Air After Filter, F	99.011	.028	37.229	.016
J6-Intake Manifold, F	101.00	.022	38.336	.012
J7-Fuel Return, F	91.428	.018	33.016	.010
P1-Fuel, PSIG	107.00	.514	737.74	3.545
P2-Oil Gallery, PSIG	55.671	.031	383.84	.215
P6-Ex Common, "H2OG	12.486	.276	3.107	.069
P7-Air Aft Filt, "H2OV	2.957	.286	.736	.071
P8-Blowby, "H2OG	.032	.038	.008	.010
P11-Baro (Vent), "Hg ABS	29.090	.002	98.510	.005
Speed, RPM	1500.9	3.289	1500.9	3.289
Load, Lb-Ft	544.60	1.905	738.38	2.583
Smoke, %	27.977	1.194	27.977	1.194
Fuel Flow, Lb/Hr	83.350	3.940	37.807	1.787
Horsepower	155.64	.702	116.04	.524
Corrected Horsepower	161.62	.729	120.50	.544
BSFC, lb/hp-hr	.536	.025	.326	.015
Corrected BSFC	.516	.024	.314	.015
Relative Humidity	25.761	.248	25.761	.248
Reference Pressure, inHg	28.873		97.773	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1638

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.87 in-Hg
Speed :	1501 RPM
Load :	544.6 lb-ft
Fuel Flow :	83.4 lb/hr
Brake Power :	155.64 bhp
BSFC :	.536 lb/bhp-hr
Indicated Power :	22.79 kW/cyl
Peak Pressure :	8.177 MPa
Peak Rate of Pressure Rise:	1268. kPa/deg
Peak Heat Release Rate :	513.6 Joules/deg
Cumulative Heat Release :	3446.76 Joules
Apparent Combustion Efficiency :	59.6 %
Indicated Thermal Efficiency :	31.5 %
Brake Thermal Efficiency :	26.7 %
Ignition Delay :	9.2 degrees
Centroid Phasing :	191.6 degrees
Centroid Magnitude :	85.61 J/degree
Sensitivity :	21.4 degrees
Premixed/Diffusion Ratio :	.43074

880407.145423 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	1033.6	.920	556.43	.511
K2-Exhaust 2, F	1106.0	.559	596.67	.310
K3-Exhaust 3, F	1093.6	1.587	589.79	.881
K4-Exhaust 4, F	1080.3	.894	582.37	.497
K5-Exhaust 5, F	1100.3	1.012	593.50	.562
K6-Exhaust 6, F	1065.3	.582	574.04	.323
K7-Exhaust Common, F	1132.3	.587	611.26	.326
Dry Bulb Temperature, F	85.510	.273	29.728	.152
Wet Bulb Temperature, F	62.275	.053	16.819	.030
J1-Water In, F	160.42	.355	71.344	.197
J2-Water Out, F	170.66	.185	77.032	.103
J3-Oil Sump, F	207.77	.176	97.650	.098
J4-Fuel Inlet, F	90.947	.052	32.748	.029
J5-Air After Filter, F	99.754	.086	37.641	.048
J6-Intake Manifold, F	100.70	.178	38.169	.099
J7-Fuel Return, F	91.935	.057	33.297	.032
P1-Fuel, PSIG	94.874	.477	654.13	3.292
P2-Oil Gallery, PSIG	52.031	.039	358.74	.269
P6-Ex Common, "H2OG	10.520	.114	2.618	.028
P7-Air Aft Filt, "H2OV	2.538	.252	.632	.063
P8-Blowby, "H2OG	-.009	.037	-.002	.009
P11-Baro (Vent), "Hg ABS	29.089	.002	98.505	.008
Speed, RPM	1299.6	2.982	1299.6	2.982
Load, Lb-Ft	549.11	3.109	744.48	4.215
Smoke, %	40.411	1.899	40.411	1.899
Fuel Flow, Lb/Hr	77.744	4.726	35.264	2.144
Horsepower	135.87	1.016	101.30	.757
Corrected Horsepower	141.21	1.056	105.28	.787
BSFC, lb/hp-hr	.572	.033	.348	.020
Corrected BSFC	.550	.032	.335	.020
Relative Humidity	25.423	.420	25.423	.420
Reference Pressure, inHg	28.902		97.873	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1640

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.90 in-Hg
Speed :	1300 RPM
Load :	549.1 lb-ft
Fuel Flow :	77.7 lb/hr
Brake Power :	135.92 bhp
BSFC :	.572 lb/bhp-hr
Indicated Power :	19.82 kW/cyl
Peak Pressure :	8.593 MPa
Peak Rate of Pressure Rise:	1387. kPa/deg
Peak Heat Release Rate :	568.2 Joules/deg
Cumulative Heat Release :	3440.90 Joules
Apparent Combustion Efficiency :	55.3 %
Indicated Thermal Efficiency :	29.4 %
Brake Thermal Efficiency :	25.1 %
Ignition Delay :	8.2 degrees
Centroid Phasing :	190.0 degrees
Centroid Magnitude :	97.95 J/degree
Sensitivity :	20.8 degrees
Premixed/Diffusion Ratio :	.39143

880407.150801 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	989.94	.917	532.19	.510
K2-Exhaust 2, F	1043.5	1.130	561.94	.628
K3-Exhaust 3, F	1034.5	1.206	556.96	.670
K4-Exhaust 4, F	986.47	1.093	530.26	.607
K5-Exhaust 5, F	1024.4	.711	551.33	.395
K6-Exhaust 6, F	1008.6	.410	542.55	.228
K7-Exhaust Common, F	1050.0	.506	565.56	.281
Dry Bulb Temperature, F	86.552	.504	30.307	.280
Wet Bulb Temperature, F	62.816	.154	17.120	.085
J1-Water In, F	159.63	.332	70.904	.184
J2-Water Out, F	170.42	.223	76.902	.124
J3-Oil Sump, F	205.48	.203	96.379	.113
J4-Fuel Inlet, F	90.923	.044	32.735	.025
J5-Air After Filter, F	99.733	.239	37.630	.133
J6-Intake Manifold, F	101.12	.286	38.400	.159
J7-Fuel Return, F	90.523	.044	32.513	.024
P1-Fuel, PSIG	76.450	1.147	527.11	7.907
P2-Oil Gallery, PSIG	46.745	.043	322.30	.296
P6-Ex Common, "H2OG	9.886	.131	2.460	.033
P7-Air Aft Filt, "H2OV	2.085	.106	.519	.026
P8-Blowby, "H2OG	.035	.042	.009	.011
P11-Baro (Vent), "Hg ABS	29.077	.003	98.467	.009
Speed, RPM	1102.2	2.150	1102.2	2.150
Load, Lb-Ft	540.76	2.837	733.17	3.846
Smoke, %	38.805	1.930	38.805	1.930
Fuel Flow, Lb/Hr	64.358	5.866	29.192	2.661
Horsepower	113.48	.505	84.610	.377
Corrected Horsepower	118.01	.526	87.984	.392
BSFC, lb/hp-hr	.567	.052	.345	.032
Corrected BSFC	.545	.050	.332	.030
Relative Humidity	25.023	.510	25.023	.510
Reference Pressure, inHg	28.924		97.947	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1642

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.92 in-Hg
Speed :	1102 RPM
Load :	540.8 lb-ft
Fuel Flow :	64.4 lb/hr
Brake Power :	113.47 bhp
BSFC :	.568 lb/bhp-hr
Indicated Power :	16.28 kW/cyl
Peak Pressure :	8.669 MPa
Peak Rate of Pressure Rise:	1297. kPa/deg
Peak Heat Release Rate :	535.7 Joules/deg
Cumulative Heat Release :	3293.99 Joules
Apparent Combustion Efficiency :	54.1 %
Indicated Thermal Efficiency :	29.1 %
Brake Thermal Efficiency :	25.2 %
Ignition Delay :	7.1 degrees
Centroid Phasing :	187.7 degrees
Centroid Magnitude :	100.5 J/degree
Sensitivity :	19.6 degrees
Premixed/Diffusion Ratio :	.36200

CUMMINS NH220 LOG SHEET

TEST NO. 9 FUEL ___ DATE ___ PAGE 58

BF01V31587

Operator Grey							
Time	11:20	11:35	11:50	12:00	12:15		
Test Hour	30 min	15 min	15 min	10 min	15 min		
Speed, RPM	2099	~~1501~~	1500	1298	1100		
Load, lb–ft	498.6	521.1	562.6	571.1	553.6		
Fuel Flow, lb/hr	89.3	78.8	71.5	63.5	51.5		
Exh. Opacity, %	21.0	17.0	10.0	11.5	10.5		
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1167	1173	1167	1142	1076		
Exhaust Cyl. 2	1281	1260	1225	1188	1085		
Exhaust Cyl. 3	1264	1263	1231	1191	1093		
Exhaust Cyl. 4	1229	1231	1189	1153	1054		
Exhaust Cyl. 5	1251	1263	1241	1215	1120		
Exhaust Cyl. 6	1168	1169	1144	1124	1047		
Exhaust Common	1276	1292	1276	1271	1159		
Water In	163	162	160	160	159		
Water Out	170	170	170	170	169		
Oil Sump	218	227	222	215	209		
Fuel	87	89	89	90	89		
Inlet Air	99	98	98	99	101		
Wet Bulb	58.1	58.0	57.5	57.8	58.8		
Dry Bulb	74.8	76.0	74.9	73.1	76.0		
PRESSURES, PSIG							
Fuel Pump	132.0	118.0	103.0	91.0	70.0		
Oil Gallery	60.9	55.2	53.8	51.2	46.2		
LOW PRESSURES							
Intake Vac, in.water	4.4	3.4	2.5	2.1	1.6		
Exh. Comm., in.Water	22.5	20.0	16.0	15.0	13.0		
Blowby, in.water	0	0	0	0	0		
Barometer, in.Hg	29.15	29.15	29.16	29.16	29.16		

880411.112212 AL-17355-F AL-12920-L NH220				9
K1-Exhaust 1, F	1168.5	1.159	631.41	.644
K2-Exhaust 2, F	1279.9	.633	693.26	.352
K3-Exhaust 3, F	1262.5	.812	683.63	.451
K4-Exhaust 4, F	1228.9	1.354	664.93	.752
K5-Exhaust 5, F	1250.1	.416	676.74	.231
K6-Exhaust 6, F	1166.7	.520	630.36	.289
K7-Exhaust Common, F	1275.5	1.187	690.83	.660
Dry Bulb Temperature, F	74.088	.305	23.382	.170
Wet Bulb Temperature, F	55.192	.045	12.885	.025
J1-Water In, F	163.96	.074	73.312	.041
J2-Water Out, F	170.26	.067	76.811	.037
J3-Oil Sump, F	217.41	.501	103.00	.279
J4-Fuel Inlet, F	86.245	.083	30.136	.046
J5-Air After Filter, F	97.777	.167	36.543	.093
J6-Intake Manifold, F	103.50	.141	39.724	.079
J7-Fuel Return, F	91.728	.179	33.182	.099
P1-Fuel, PSIG	130.87	1.291	902.33	8.898
P2-Oil Gallery, PSIG	59.050	.125	407.13	.863
P6-Ex Common, "H2OG	25.824	.281	6.426	.070
P7-Air Aft Filt, "H2OV	4.272	.380	1.063	.095
P8-Blowby, "H2OG	.005	.038	.001	.009
P11-Baro (Vent), "Hg ABS	29.156	.003	98.733	.009
Speed, RPM	2099.0	3.618	2099.0	3.618
Load, Lb-Ft	480.10	6.439	650.92	8.730
Smoke, %	23.637	1.153	23.637	1.153
Fuel Flow, Lb/Hr	89.031	.898	40.384	.407
Horsepower	191.88	2.377	143.06	1.772
Corrected Horsepower	198.05	2.454	147.66	1.830
BSFC, lb/hp-hr	.464	.010	.282	.006
Corrected BSFC	.450	.009	.274	.006
Relative Humidity	27.613	.674	27.613	.674
Reference Pressure, inHg	28.842		97.669	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1644

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.84 in-Hg
Speed :	2099 RPM
Load :	480.1 lb-ft
Fuel Flow :	89.0 lb/hr
Brake Power :	191.88 bhp
BSFC :	.464 lb/bhp-hr
Indicated Power :	29.42 kW/cyl
Peak Pressure :	7.297 MPa
Peak Rate of Pressure Rise:	573.7 kPa/deg
Peak Heat Release Rate :	206.1 Joules/deg
Cumulative Heat Release :	3396.44 Joules
Apparent Combustion Efficiency :	73.9 %
Indicated Thermal Efficiency :	36.6 %
Brake Thermal Efficiency :	29.7 %
Ignition Delay :	5.8 degrees
Centroid Phasing :	197.0 degrees
Centroid Magnitude :	42.85 J/degree
Sensitivity :	30.1 degrees
Premixed/Diffusion Ratio :	.19288

880411.113808 AL-17355-F AL-12920-L NH220				9
K1-Exhaust 1, F	1177.2	1.264	636.22	.702
K2-Exhaust 2, F	1264.0	1.377	684.43	.765
K3-Exhaust 3, F	1268.6	2.243	686.98	1.246
K4-Exhaust 4, F	1233.7	.801	667.60	.445
K5-Exhaust 5, F	1268.4	1.366	686.87	.759
K6-Exhaust 6, F	1174.8	.729	634.91	.405
K7-Exhaust Common, F	1298.9	1.343	703.83	.746
Dry Bulb Temperature, F	73.421	.709	23.012	.394
Wet Bulb Temperature, F	54.644	.098	12.580	.054
J1-Water In, F	162.59	.193	72.551	.107
J2-Water Out, F	170.26	.201	76.809	.112
J3-Oil Sump, F	227.18	.148	108.43	.082
J4-Fuel Inlet, F	89.088	.054	31.715	.030
J5-Air After Filter, F	100.91	.757	38.283	.421
J6-Intake Manifold, F	106.83	.966	41.572	.536
J7-Fuel Return, F	93.657	.154	34.254	.085
P1-Fuel, PSIG	116.72	.894	804.75	6.163
P2-Oil Gallery, PSIG	55.458	.021	382.37	.146
P6-Ex Common, "H2OG	17.925	.189	4.460	.047
P7-Air Aft Filt, "H2OV	3.079	.572	.766	.142
P8-Blowby, "H2OG	.012	.036	.003	.009
P11-Baro (Vent), "Hg ABS	29.159	.005	98.743	.016
Speed, RPM	1800.2	4.065	1800.2	4.065
Load, Lb-Ft	521.55	4.769	707.12	6.466
Smoke, %	17.168	.289	17.168	.289
Fuel Flow, Lb/Hr	78.712	.167	35.703	.076
Horsepower	178.77	1.970	133.28	1.469
Corrected Horsepower	184.97	2.038	137.91	1.520
BSFC, lb/hp-hr	.440	.005	.268	.003
Corrected BSFC	.426	.005	.259	.003
Relative Humidity	27.369	1.366	27.369	1.366
Reference Pressure, inHg	28.932		97.976	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1646

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.93 in-Hg
Speed :	1800 RPM
Load :	521.6 lb-ft
Fuel Flow :	78.7 lb/hr
Brake Power :	178.77 bhp
BSFC :	.440 lb/bhp-hr
Indicated Power :	26.50 kW/cyl
Peak Pressure :	7.826 MPa
Peak Rate of Pressure Rise:	630.8 kPa/deg
Peak Heat Release Rate :	233.4 Joules/deg
Cumulative Heat Release :	3486.16 Joules
Apparent Combustion Efficiency :	73.6 %
Indicated Thermal Efficiency :	37.3 %
Brake Thermal Efficiency :	31.3 %
Ignition Delay :	4.8 degrees
Centroid Phasing :	194.2 degrees
Centroid Magnitude :	39.90 J/degree
Sensitivity :	28.5 degrees
Premixed/Diffusion Ratio :	.16804

880411.114908 AL-17355-F AL-12920-L NH220 9

K1-Exhaust 1, F	1166.8	.837	630.47	.465
K2-Exhaust 2, F	1225.3	.762	662.96	.423
K3-Exhaust 3, F	1230.7	.644	665.95	.358
K4-Exhaust 4, F	1188.4	.406	642.45	.226
K5-Exhaust 5, F	1243.1	.692	672.84	.385
K6-Exhaust 6, F	1145.1	.657	618.41	.365
K7-Exhaust Common, F	1277.3	.948	691.85	.527
Dry Bulb Temperature, F	74.308	.365	23.504	.203
Wet Bulb Temperature, F	54.791	.134	12.662	.075
J1-Water In, F	160.84	.259	71.577	.144
J2-Water Out, F	169.92	.179	76.623	.100
J3-Oil Sump, F	221.80	.273	105.44	.151
J4-Fuel Inlet, F	89.596	.069	31.998	.038
J5-Air After Filter, F	99.355	.154	37.419	.085
J6-Intake Manifold, F	104.27	.163	40.152	.091
J7-Fuel Return, F	92.336	.082	33.520	.045
P1-Fuel, PSIG	100.56	1.199	693.34	8.264
P2-Oil Gallery, PSIG	53.746	.038	370.57	.263
P6-Ex Common, "H2OG	13.491	.170	3.357	.042
P7-Air Aft Filt, "H2OV	2.380	.241	.592	.060
P8-Blowby, "H2OG	.006	.029	.001	.007
P11-Baro (Vent), "Hg ABS	29.159	.002	98.745	.006
Speed, RPM	1499.5	2.420	1499.5	2.420
Load, Lb-Ft	565.48	1.783	766.69	2.417
Smoke, %	11.414	.453	11.414	.453
Fuel Flow, Lb/Hr	70.615	.508	32.030	.230
Horsepower	161.45	.633	120.37	.472
Corrected Horsepower	166.79	.654	124.35	.488
BSFC, lb/hp-hr	.437	.004	.266	.002
Corrected BSFC	.423	.004	.258	.002
Relative Humidity	25.884	.588	25.884	.588
Reference Pressure, inHg	28.984		98.152	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1648

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.98 in-Hg
Speed :	1500 RPM
Load :	565.5 lb-ft
Fuel Flow :	70.6 lb/hr
Brake Power :	161.51 bhp
BSFC :	.437 lb/bhp-hr
Indicated Power :	23.29 kW/cyl
Peak Pressure :	8.491 MPa
Peak Rate of Pressure Rise:	750.2 kPa/deg
Peak Heat Release Rate :	296.1 Joules/deg
Cumulative Heat Release :	3617.01 Joules
Apparent Combustion Efficiency :	70.9 %
Indicated Thermal Efficiency :	36.5 %
Brake Thermal Efficiency :	31.5 %
Ignition Delay :	2.2 degrees
Centroid Phasing :	191.1 degrees
Centroid Magnitude :	45.26 J/degree
Sensitivity :	27.9 degrees
Premixed/Diffusion Ratio :	.07893

880411.120308 AL-17355-F AL-12920-L NH220				9
K1-Exhaust 1, F	1140.5	2.315	615.84	1.286
K2-Exhaust 2, F	1188.6	.634	642.54	.352
K3-Exhaust 3, F	1190.8	.745	643.80	.414
K4-Exhaust 4, F	1152.5	1.006	622.52	.559
K5-Exhaust 5, F	1214.7	.491	657.03	.273
K6-Exhaust 6, F	1123.4	.759	606.34	.422
K7-Exhaust Common, F	1270.3	.689	687.93	.383
Dry Bulb Temperature, F	74.144	.303	23.413	.169
Wet Bulb Temperature, F	55.153	.073	12.863	.041
J1-Water In, F	160.70	.166	71.499	.092
J2-Water Out, F	170.63	.188	77.014	.104
J3-Oil Sump, F	216.10	.101	102.28	.056
J4-Fuel Inlet, F	90.446	.066	32.470	.036
J5-Air After Filter, F	99.603	.128	37.557	.071
J6-Intake Manifold, F	104.03	.132	40.018	.073
J7-Fuel Return, F	93.157	.090	33.976	.050
P1-Fuel, PSIG	89.120	.365	614.46	2.517
P2-Oil Gallery, PSIG	51.470	.036	354.88	.247
P6-Ex Common, "H2OG	12.914	.110	3.214	.027
P7-Air Aft Filt, "H2OV	1.546	.223	.385	.055
P8-Blowby, "H2OG	.027	.053	.007	.013
P11-Baro (Vent), "Hg ABS	29.160	.002	98.746	.006
Speed, RPM	1299.3	1.488	1299.3	1.488
Load, Lb-Ft	572.44	2.251	776.12	3.052
Smoke, %	12.659	.657	12.659	.657
Fuel Flow, Lb/Hr	63.883	.258	28.977	.117
Horsepower	141.62	.616	105.59	.459
Corrected Horsepower	146.39	.637	109.14	.475
BSFC, lb/hp-hr	.451	.003	.274	.002
Corrected BSFC	.436	.003	.265	.002
Relative Humidity	27.361	.604	27.361	.604
Reference Pressure, inHg	29.046		98.361	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1650

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.05 in-Hg
Speed :	1299 RPM
Load :	572.4 lb-ft
Fuel Flow :	63.9 lb/hr
Brake Power :	141.57 bhp
BSFC :	.451 lb/bhp-hr
Indicated Power :	20.60 kW/cyl
Peak Pressure :	8.929 MPa
Peak Rate of Pressure Rise:	822.2 kPa/deg
Peak Heat Release Rate :	339.4 Joules/deg
Cumulative Heat Release :	3645.74 Joules
Apparent Combustion Efficiency :	68.4 %
Indicated Thermal Efficiency :	35.7 %
Brake Thermal Efficiency :	30.5 %
Ignition Delay :	1.9 degrees
Centroid Phasing :	188.5 degrees
Centroid Magnitude :	51.44 J/degree
Sensitivity :	25.6 degrees
Premixed/Diffusion Ratio :	.07393

880411.121441 AL-17355-F AL-12920-L NH220				9
K1-Exhaust 1, F	1081.3	.836	582.93	.464
K2-Exhaust 2, F	1090.8	.578	588.24	.321
K3-Exhaust 3, F	1096.7	.835	591.49	.464
K4-Exhaust 4, F	1060.3	.859	571.26	.477
K5-Exhaust 5, F	1124.7	1.344	607.04	.746
K6-Exhaust 6, F	1049.7	1.302	565.38	.723
K7-Exhaust Common, F	1163.6	1.237	628.64	.687
Dry Bulb Temperature, F	75.441	.473	24.134	.263
Wet Bulb Temperature, F	55.980	.050	13.322	.028
J1-Water In, F	159.57	.375	70.870	.209
J2-Water Out, F	169.78	.236	76.546	.131
J3-Oil Sump, F	211.39	.398	99.659	.221
J4-Fuel Inlet, F	89.359	.114	31.866	.064
J5-Air After Filter, F	100.76	.093	38.198	.052
J6-Intake Manifold, F	105.04	.037	40.576	.021
J7-Fuel Return, F	90.171	.065	32.317	.036
P1-Fuel, PSIG	68.044	.358	469.15	2.468
P2-Oil Gallery, PSIG	46.429	.086	320.11	.590
P6-Ex Common, "H2OG	10.884	.112	2.708	.028
P7-Air Aft Filt, "H2OV	1.163	.184	.289	.046
P8-Blowby, "H2OG	.022	.045	.005	.011
P11-Baro (Vent), "Hg ABS	29.157	.003	98.736	.009
Speed, RPM	1100.0	1.794	1100.0	1.794
Load, Lb-Ft	553.74	2.585	750.77	3.505
Smoke, %	12.402	.726	12.402	.726
Fuel Flow, Lb/Hr	52.452	.479	23.792	.217
Horsepower	115.98	.624	86.469	.465
Corrected Horsepower	120.05	.646	89.507	.481
BSFC, lb/hp-hr	.452	.005	.275	.003
Corrected BSFC	.437	.005	.266	.003
Relative Humidity	27.130	.907	27.130	.907
Reference Pressure, inHg	29.071		98.447	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1652

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.07 in-Hg
Speed :	1100 RPM
Load :	553.7 lb-ft
Fuel Flow :	52.5 lb/hr
Brake Power :	115.97 bhp
BSFC :	.453 lb/bhp-hr
Indicated Power :	16.51 kW/cyl
Peak Pressure :	8.785 MPa
Peak Rate of Pressure Rise:	742.8 kPa/deg
Peak Heat Release Rate :	309.7 Joules/deg
Cumulative Heat Release :	3437.74 Joules
Apparent Combustion Efficiency :	66.4 %
Indicated Thermal Efficiency :	34.8 %
Brake Thermal Efficiency :	30.4 %
Ignition Delay :	1.6 degrees
Centroid Phasing :	187.6 degrees
Centroid Magnitude :	48.13 J/degree
Sensitivity :	25.0 degrees
Premixed/Diffusion Ratio :	.06505

CUMMINS NH220 LOG SHEET

TEST NO. 9 FUEL ____ DATE 4-12-88 PAGE 58

TF34N28J88

Operator GREG							
Time	9:45	9:55	10:10	10:20	10:30	10:35	10:50
Test Hour	30 min	10 min	15 min	10 min	10 min	5 min	15 min
Speed, RPM	2100	1800	1600	1800	1800	1800	1499
Load, lb–ft	472.8	520.2	368.5	273.7	135.4	44.2	554.8
Fuel Flow, lb/hr	112.2	105.0	46.9	42.9	34.4	20.4	92.6
Exh. Opacity, %	22.0	24.0	6.0	4.0	1.0	1.0	34.0
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1107	1113	826	680	491	362	1073
Exhaust Cyl. 2	1224	1220	937	772	560	428	1164
Exhaust Cyl. 3	1247	1234	937	768	555	428	1166
Exhaust Cyl. 4	1178	1182	897	722	522	414	1125
Exhaust Cyl. 5	1170	1179	868	711	504	376	1140
Exhaust Cyl. 6	1110	1116	836	676	475	347	1087
Exhaust Common	1209	1228	894	716	508	387	1185
Water In	162	161	164	167	168	169	162
Water Out	169	169	169	170	169	169	171
Oil Sump	226	227	222	217	211	208	212
Fuel	89	90	91	91	89	87	90
Inlet Air	99	103	99.0	98	98	99	102
Wet Bulb	59.9	60.8	62.1	59.8	61.0	60.2	59.8
Dry Bulb	80.0	81.1	83.0	78.9	80.9	80.0	80.2
PRESSURES, PSIG							
Fuel Pump	137.0	126.0	67.0	48.0	26.0	17.0	110.0
Oil Gallery	57.9	55.1	56.1	56.1	58.0	58.8	56.9
LOW PRESSURES							
Intake Vac, in.water	4.9	3.6	4.0	4.0	4.1	4.2	2.9
Exh. Comm., in.Water	17.0	18.5	16.0	15.0	12.0	10.0	14.0
Blowby, in.water	0	0	0	0	0	0	0
Barometer, in.Hg	29.11	29.12	29.17	29.12	29.13	29.13	29.12

CUMMINS NH220 LOG SHEET

TEST NO. 9 FUEL TF34N28588 DATE 4-12-88 PAGE 60

Operator Greg							
Time	11:05	11:15					
Test Hour	15 min	10 min					
Speed, RPM	1300	1100					
Load, lb–ft	5448	5432					
Fuel Flow, lb/hr	75.9	80.6					
Exh. Opacity, %	44.0	52.0					
TEMPERATURES, DEG. F							
Exhaust Cyl. 1	1038	997					
Exhaust Cyl. 2	1110	1046					
Exhaust Cyl. 3	1090	1034					
Exhaust Cyl. 4	1050	975					
Exhaust Cyl. 5	1083	1011					
Exhaust Cyl. 6	1054	1011					
Exhaust Common	1103	1042					
Water In	160	160					
Water Out	170	171					
Oil Sump	213	209					
Fuel	92	92					
Inlet Air	99	100					
Wet Bulb	60.1	60.8					
Dry Bulb	81.1	82.2					
PRESSURES, PSIG							
Fuel Pump	96.0	79.0					
Oil Gallery	53.0	47.0					
LOW PRESSURES							
Intake Vac, in.water	2.4	1.9					
Exh. Comm., in.Water	12.5	12.0					
Blowby, in.water	0	0					
Barometer, in.Hg	29.12	29.12					

880412.094748 AL-17233-F AL-12920-L NH220 9

K1-Exhaust 1, F	1106.7	.641	597.05	.356
K2-Exhaust 2, F	1224.2	.393	662.31	.218
K3-Exhaust 3, F	1248.6	.789	675.89	.438
K4-Exhaust 4, F	1178.3	.657	636.83	.365
K5-Exhaust 5, F	1171.0	1.564	632.76	.869
K6-Exhaust 6, F	1109.6	.737	598.69	.410
K7-Exhaust Common, F	1210.3	.825	654.59	.458
Dry Bulb Temperature, F	72.455	.377	22.475	.209
Wet Bulb Temperature, F	54.286	.057	12.381	.032
J1-Water In, F	162.78	.201	72.655	.112
J2-Water Out, F	169.16	.193	76.201	.107
J3-Oil Sump, F	226.22	.215	107.90	.120
J4-Fuel Inlet, F	88.799	.089	31.555	.049
J5-Air After Filter, F	98.106	.144	36.725	.080
J6-Intake Manifold, F	102.61	.349	39.226	.194
J7-Fuel Return, F	93.686	.187	34.270	.104
P1-Fuel, PSIG	136.81	1.043	943.27	7.193
P2-Oil Gallery, PSIG	57.108	.055	393.74	.379
P6-Ex Common, "H2OG	26.547	.179	6.606	.045
P7-Air Aft Filt, "H2OV	4.396	.165	1.094	.041
P8-Blowby, "H2OG	.000	.036	.000	.009
P11-Baro (Vent), "Hg ABS	29.117	.004	98.602	.014
Speed, RPM	2100.8	3.062	2100.8	3.062
Load, Lb-Ft	471.01	4.106	638.60	5.567
Smoke, %	22.631	.508	22.631	.508
Fuel Flow, Lb/Hr	112.49	1.169	51.026	.530
Horsepower	188.40	1.610	140.47	1.201
Corrected Horsepower	194.74	1.665	145.19	1.241
BSFC, lb/hp-hr	.597	.008	.363	.005
Corrected BSFC	.578	.008	.351	.005
Relative Humidity	28.423	.772	28.423	.772
Reference Pressure, inHg	28.794		97.507	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1654

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.79 in-Hg
Speed :	2101 RPM
Load :	471.0 lb-ft
Fuel Flow :	112.5 lb/hr
Brake Power :	188.42 bhp
BSFC :	.597 lb/bhp-hr
Indicated Power :	30.21 kW/cyl
Peak Pressure :	7.108 MPa
Peak Rate of Pressure Rise:	768.4 kPa/deg
Peak Heat Release Rate :	318.7 Joules/deg
Cumulative Heat Release :	3404.73 Joules
Apparent Combustion Efficiency :	61.1 %
Indicated Thermal Efficiency :	31.0 %
Brake Thermal Efficiency :	24.0 %
Ignition Delay :	13.0 degrees
Centroid Phasing :	197.0 degrees
Centroid Magnitude :	61.28 J/degree
Sensitivity :	23.0 degrees
Premixed/Diffusion Ratio :	.56375

880412.095727 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	1112.0	1.166	599.99	.648
K2-Exhaust 2, F	1218.3	.493	659.05	.274
K3-Exhaust 3, F	1229.6	1.255	665.35	.697
K4-Exhaust 4, F	1178.1	1.197	636.70	.665
K5-Exhaust 5, F	1177.3	.623	636.30	.346
K6-Exhaust 6, F	1114.7	2.112	601.50	1.173
K7-Exhaust Common, F	1225.3	.995	662.97	.553
Dry Bulb Temperature, F	74.412	.643	23.562	.357
Wet Bulb Temperature, F	55.259	.104	12.921	.058
J1-Water In, F	162.01	.197	72.229	.110
J2-Water Out, F	169.50	.120	76.391	.067
J3-Oil Sump, F	227.50	.126	108.61	.070
J4-Fuel Inlet, F	89.743	.042	32.079	.024
J5-Air After Filter, F	102.89	.555	39.383	.308
J6-Intake Manifold, F	106.67	.465	41.481	.259
J7-Fuel Return, F	93.376	.195	34.098	.108
P1-Fuel, PSIG	125.31	1.030	863.99	7.100
P2-Oil Gallery, PSIG	55.331	.025	381.50	.173
P6-Ex Common, "H2OG	18.653	.188	4.642	.047
P7-Air Aft Filt, "H2OV	3.411	.348	.849	.087
P8-Blowby, "H2OG	.037	.073	.009	.018
P11-Baro (Vent), "Hg ABS	29.116	.004	98.598	.014
Speed, RPM	1800.0	2.889	1800.0	2.889
Load, Lb-Ft	520.78	2.502	706.08	3.393
Smoke, %	26.054	1.540	26.054	1.540
Fuel Flow, Lb/Hr	102.35	1.131	46.426	.513
Horsepower	178.48	.834	133.07	.622
Corrected Horsepower	185.31	.866	138.16	.646
BSFC, lb/hp-hr	.573	.005	.349	.003
Corrected BSFC	.552	.005	.336	.003
Relative Humidity	27.158	1.194	27.158	1.194
Reference Pressure, inHg	28.865		97.749	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1656

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.87 in-Hg
Speed :	1800 RPM
Load :	520.8 lb-ft
Fuel Flow :	102.4 lb/hr
Brake Power :	178.49 bhp
BSFC :	.574 lb/bhp-hr
Indicated Power :	27.17 kW/cyl
Peak Pressure :	7.535 MPa
Peak Rate of Pressure Rise:	990.7 kPa/deg
Peak Heat Release Rate :	404.7 Joules/deg
Cumulative Heat Release :	3504.18 Joules
Apparent Combustion Efficiency :	59.2 %
Indicated Thermal Efficiency :	30.6 %
Brake Thermal Efficiency :	25.0 %
Ignition Delay :	11.4 degrees
Centroid Phasing :	195.2 degrees
Centroid Magnitude :	70.70 J/degree
Sensitivity :	22.8 degrees
Premixed/Diffusion Ratio :	.50193

880412.101050 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	826.64	.677	441.47	.376
K2-Exhaust 2, F	939.06	1.288	503.92	.715
K3-Exhaust 3, F	936.99	.776	502.77	.431
K4-Exhaust 4, F	896.99	.351	480.55	.195
K5-Exhaust 5, F	867.74	.604	464.30	.336
K6-Exhaust 6, F	835.71	.468	446.50	.260
K7-Exhaust Common, F	894.26	.260	479.03	.145
Dry Bulb Temperature, F	77.870	.715	25.484	.397
Wet Bulb Temperature, F	56.973	.165	13.874	.091
J1-Water In, F	164.98	.168	73.875	.094
J2-Water Out, F	169.24	.144	76.245	.080
J3-Oil Sump, F	222.10	.181	105.61	.100
J4-Fuel Inlet, F	90.702	.057	32.612	.031
J5-Air After Filter, F	98.731	.221	37.073	.123
J6-Intake Manifold, F	102.03	.158	38.904	.088
J7-Fuel Return, F	91.420	.139	33.011	.077
P1-Fuel, PSIG	65.592	.379	452.24	2.611
P2-Oil Gallery, PSIG	56.329	.098	388.38	.678
P6-Ex Common, "H2OG	16.167	.114	4.023	.028
P7-Air Aft Filt, "H2OV	3.381	.592	.841	.147
P8-Blowby, "H2OG	.015	.058	.004	.014
P11-Baro (Vent), "Hg ABS	29.120	.004	98.610	.014
Speed, RPM	1799.4	2.736	1799.4	2.736
Load, Lb-Ft	370.49	3.210	502.31	4.352
Smoke, %	6.533	.360	6.533	.360
Fuel Flow, Lb/Hr	65.244	13.792	29.594	6.256
Horsepower	126.94	1.245	94.642	.928
Corrected Horsepower	131.33	1.288	97.919	.960
BSFC, lb/hp-hr	.514	.109	.313	.066
Corrected BSFC	.497	.105	.302	.064
Relative Humidity	25.152	1.010	25.152	1.010
Reference Pressure, inHg	28.871		97.768	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1658

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.87 in-Hg
Speed :	1799 RPM
Load :	370.5 lb-ft
Fuel Flow :	65.2 lb/hr
Brake Power :	126.91 bhp
BSFC :	.514 lb/bhp-hr
Indicated Power :	19.61 kW/cyl
Peak Pressure :	6.457 MPa
Peak Rate of Pressure Rise:	589.2 kPa/deg
Peak Heat Release Rate :	265.3 Joules/deg
Cumulative Heat Release :	2510.46 Joules
Apparent Combustion Efficiency :	66.5 %
Indicated Thermal Efficiency :	34.7 %
Brake Thermal Efficiency :	27.9 %
Ignition Delay :	14.9 degrees
Centroid Phasing :	194.5 degrees
Centroid Magnitude :	59.85 J/degree
Sensitivity :	18.6 degrees
Premixed/Diffusion Ratio :	.80503

880412.102134 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	682.94	.521	361.63	.289
K2-Exhaust 2, F	777.81	.792	414.34	.440
K3-Exhaust 3, F	770.38	.645	410.21	.359
K4-Exhaust 4, F	726.61	1.340	385.89	.744
K5-Exhaust 5, F	713.09	.821	378.39	.456
K6-Exhaust 6, F	677.56	.648	358.64	.360
K7-Exhaust Common, F	719.79	1.056	382.11	.587
Dry Bulb Temperature, F	75.908	.123	24.393	.068
Wet Bulb Temperature, F	56.239	.032	13.466	.018
J1-Water In, F	166.94	.103	74.968	.057
J2-Water Out, F	169.64	.051	76.465	.028
J3-Oil Sump, F	217.04	.233	102.80	.129
J4-Fuel Inlet, F	89.642	.074	32.023	.041
J5-Air After Filter, F	98.119	.106	36.733	.059
J6-Intake Manifold, F	101.47	.041	38.592	.023
J7-Fuel Return, F	88.615	.050	31.453	.028
P1-Fuel, PSIG	44.682	.170	308.07	1.173
P2-Oil Gallery, PSIG	57.306	.156	395.11	1.079
P6-Ex Common, "H2OG	14.890	.226	3.705	.056
P7-Air Aft Filt, "H2OV	3.535	.334	.880	.083
P8-Blowby, "H2OG	.041	.041	.010	.010
P11-Baro (Vent), "Hg ABS	29.124	.003	98.624	.011
Speed, RPM	1801.0	4.108	1801.0	4.108
Load, Lb-Ft	278.04	3.361	376.97	4.557
Smoke, %	5.240	.256	5.240	.256
Fuel Flow, Lb/Hr	50.006	7.627	22.682	3.459
Horsepower	95.345	1.229	71.087	.916
Corrected Horsepower	98.584	1.271	73.501	.948
BSFC, lb/hp-hr	.524	.078	.319	.048
Corrected BSFC	.507	.076	.308	.046
Relative Humidity	26.948	.292	26.948	.292
Reference Pressure, inHg	28.864		97.743	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1660

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.86 in-Hg
Speed :	1801 RPM
Load :	278.0 lb-ft
Fuel Flow :	50.0 lb/hr
Brake Power :	95.33 bhp
BSFC :	.524 lb/bhp-hr
Indicated Power :	14.76 kW/cyl
Peak Pressure :	5.657 MPa
Peak Rate of Pressure Rise:	415.8 kPa/deg
Peak Heat Release Rate :	222.5 Joules/deg
Cumulative Heat Release :	1900.29 Joules
Apparent Combustion Efficiency :	65.8 %
Indicated Thermal Efficiency :	34.0 %
Brake Thermal Efficiency :	27.3 %
Ignition Delay :	17.0 degrees
Centroid Phasing :	194.6 degrees
Centroid Magnitude :	56.65 J/degree
Sensitivity :	16.6 degrees
Premixed/Diffusion Ratio :	1.02593

880412.103100 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	491.79	.618	255.44	.343
K2-Exhaust 2, F	562.27	.771	294.59	.428
K3-Exhaust 3, F	558.33	1.364	292.41	.758
K4-Exhaust 4, F	525.62	1.689	274.23	.938
K5-Exhaust 5, F	505.45	1.392	263.03	.773
K6-Exhaust 6, F	476.69	.516	247.05	.287
K7-Exhaust Common, F	511.03	1.364	266.13	.758
Dry Bulb Temperature, F	75.411	.231	24.117	.128
Wet Bulb Temperature, F	55.717	.064	13.176	.036
J1-Water In, F	167.27	.170	75.149	.095
J2-Water Out, F	168.48	.155	75.823	.086
J3-Oil Sump, F	211.78	.152	99.877	.084
J4-Fuel Inlet, F	88.267	.088	31.259	.049
J5-Air After Filter, F	97.820	.148	36.567	.082
J6-Intake Manifold, F	101.22	.051	38.455	.028
J7-Fuel Return, F	85.672	.099	29.818	.055
P1-Fuel, PSIG	23.559	.130	162.44	.896
P2-Oil Gallery, PSIG	58.359	.044	402.37	.302
P6-Ex Common, "H2OG	11.893	.196	2.959	.049
P7-Air Aft Filt, "H2OV	3.623	.302	.901	.075
P8-Blowby, "H2OG	-.003	.050	-.001	.013
P11-Baro (Vent), "Hg ABS	29.127	.003	98.634	.011
Speed, RPM	1798.9	3.033	1798.9	3.033
Load, Lb-Ft	131.72	7.037	178.59	9.540
Smoke, %	1.851	.118	1.851	.118
Fuel Flow, Lb/Hr	30.473	3.426	13.822	1.554
Horsepower	45.120	2.477	33.640	1.847
Corrected Horsepower	46.621	2.560	34.759	1.909
BSFC, lb/hp-hr	.678	.094	.413	.057
Corrected BSFC	.657	.091	.399	.055
Relative Humidity	26.409	.386	26.409	.386
Reference Pressure, inHg	28.860		97.732	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1662

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.86 in-Hg
Speed :	1799 RPM
Load :	131.7 lb-ft
Fuel Flow :	30.5 lb/hr
Brake Power :	45.11 bhp
BSFC :	.676 lb/bhp-hr
Indicated Power :	8.52 kW/cyl
Peak Pressure :	4.424 MPa
Peak Rate of Pressure Rise:	179.6 kPa/deg
Peak Heat Release Rate :	133.0 Joules/deg
Cumulative Heat Release :	1158.03 Joules
Apparent Combustion Efficiency :	65.6 %
Indicated Thermal Efficiency :	32.2 %
Brake Thermal Efficiency :	21.2 %
Ignition Delay :	18.6 degrees
Centroid Phasing :	196.4 degrees
Centroid Magnitude :	38.13 J/degree
Sensitivity :	16.8 degrees
Premixed/Diffusion Ratio :	1.10818

880412.103814 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	363.40	.318	184.11	.177
K2-Exhaust 2, F	432.68	1.319	222.60	.733
K3-Exhaust 3, F	432.54	.936	222.52	.520
K4-Exhaust 4, F	418.13	1.590	214.52	.883
K5-Exhaust 5, F	379.64	1.141	193.13	.634
K6-Exhaust 6, F	348.46	.557	175.81	.309
K7-Exhaust Common, F	391.39	1.427	199.66	.793
Dry Bulb Temperature, F	74.116	.105	23.398	.058
Wet Bulb Temperature, F	54.911	.020	12.728	.011
J1-Water In, F	168.59	.161	75.885	.090
J2-Water Out, F	169.10	.164	76.166	.091
J3-Oil Sump, F	208.48	.097	98.045	.054
J4-Fuel Inlet, F	86.741	.091	30.411	.051
J5-Air After Filter, F	98.226	.056	36.792	.031
J6-Intake Manifold, F	102.32	.155	39.068	.086
J7-Fuel Return, F	82.258	.151	27.921	.084
P1-Fuel, PSIG	13.220	.075	91.147	.520
P2-Oil Gallery, PSIG	58.757	.059	405.11	.409
P6-Ex Common, "H2OG	9.819	.115	2.443	.029
P7-Air Aft Filt, "H2OV	3.613	.508	.899	.126
P8-Blowby, "H2OG	-.002	.043	-.000	.011
P11-Baro (Vent), "Hg ABS	29.126	.005	98.632	.017
Speed, RPM	1799.8	2.806	1799.8	2.806
Load, Lb-Ft	44.310	2.682	60.076	3.637
Smoke, %	1.416	.103	1.416	.103
Fuel Flow, Lb/Hr	21.783	2.113	9.880	.959
Horsepower	15.184	.909	11.321	.678
Corrected Horsepower	15.691	.939	11.699	.700
BSFC, lb/hp-hr	1.444	.203	.878	.123
Corrected BSFC	1.397	.196	.850	.119
Relative Humidity	26.691	.220	26.691	.220
Reference Pressure, inHg	28.860		97.733	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1664

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	541.0 degrees
Reference Pressure :	28.86 in-Hg
Speed :	1800 RPM
Load :	44.3 lb-ft
Fuel Flow :	21.8 lb/hr
Brake Power :	15.19 bhp
BSFC :	1.436 lb/bhp-hr
Indicated Power :	4.68 kW/cyl
Peak Pressure :	3.807 MPa
Peak Rate of Pressure Rise:	108.4 kPa/deg
Peak Heat Release Rate :	76.6 Joules/deg
Cumulative Heat Release :	708.251 Joules
Apparent Combustion Efficiency :	56.2 %
Indicated Thermal Efficiency :	24.7 %
Brake Thermal Efficiency :	10.0 %
Ignition Delay :	18.1 degrees
Centroid Phasing :	197.9 degrees
Centroid Magnitude :	23.43 J/degree
Sensitivity :	18.8 degrees
Premixed/Diffusion Ratio :	.96262

880412.105321 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	1072.3	.875	577.97	.486
K2-Exhaust 2, F	1164.4	1.293	629.09	.718
K3-Exhaust 3, F	1160.5	2.729	626.95	1.516
K4-Exhaust 4, F	1116.6	1.779	602.58	.989
K5-Exhaust 5, F	1137.2	1.493	613.99	.829
K6-Exhaust 6, F	1085.2	.480	585.09	.267
K7-Exhaust Common, F	1180.3	1.563	637.93	.868
Dry Bulb Temperature, F	75.350	.215	24.084	.120
Wet Bulb Temperature, F	55.231	.063	12.906	.035
J1-Water In, F	162.40	.084	72.446	.047
J2-Water Out, F	170.79	.050	77.106	.028
J3-Oil Sump, F	211.63	.127	99.794	.071
J4-Fuel Inlet, F	89.408	.091	31.893	.051
J5-Air After Filter, F	101.33	.069	38.518	.038
J6-Intake Manifold, F	106.12	.063	41.176	.035
J7-Fuel Return, F	94.446	.037	34.692	.021
P1-Fuel, PSIG	107.23	.740	739.31	5.099
P2-Oil Gallery, PSIG	56.528	.032	389.75	.220
P6-Ex Common, "H2OG	14.167	.182	3.525	.045
P7-Air Aft Filt, "H2OV	2.171	.223	.540	.056
P8-Blowby, "H2OG	.014	.031	.003	.008
P11-Baro (Vent), "Hg ABS	29.121	.001	98.614	.005
Speed, RPM	1500.8	2.609	1500.8	2.609
Load, Lb-Ft	555.06	3.534	752.55	4.792
Smoke, %	32.823	1.823	32.823	1.823
Fuel Flow, Lb/Hr	91.824	5.190	41.650	2.354
Horsepower	158.62	.957	118.26	.714
Corrected Horsepower	164.37	.992	122.55	.739
BSFC, lb/hp-hr	.579	.035	.352	.021
Corrected BSFC	.559	.034	.340	.021
Relative Humidity	25.073	.362	25.073	.362
Reference Pressure, inHg	28.961		98.073	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1666

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	28.96 in-Hg
Speed :	1501 RPM
Load :	555.1 lb-ft
Fuel Flow :	91.8 lb/hr
Brake Power :	158.65 bhp
BSFC :	.579 lb/bhp-hr
Indicated Power :	23.47 kW/cyl
Peak Pressure :	8.112 MPa
Peak Rate of Pressure Rise:	1204. kPa/deg
Peak Heat Release Rate :	486.8 Joules/deg
Cumulative Heat Release :	3558.58 Joules
Apparent Combustion Efficiency :	55.9 %
Indicated Thermal Efficiency :	29.5 %
Brake Thermal Efficiency :	24.8 %
Ignition Delay :	9.5 degrees
Centroid Phasing :	192.0 degrees
Centroid Magnitude :	80.81 J/degree
Sensitivity :	21.5 degrees
Premixed/Diffusion Ratio :	.43990

880412.110526 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	1044.6	.770	562.55	.428
K2-Exhaust 2, F	1110.4	1.229	599.12	.683
K3-Exhaust 3, F	1089.9	2.151	587.71	1.195
K4-Exhaust 4, F	1061.1	1.156	571.70	.642
K5-Exhaust 5, F	1088.1	.710	586.70	.395
K6-Exhaust 6, F	1054.8	.820	568.22	.456
K7-Exhaust Common, F	1111.1	.891	599.50	.495
Dry Bulb Temperature, F	76.709	.231	24.838	.128
Wet Bulb Temperature, F	55.826	.033	13.236	.018
J1-Water In, F	160.20	.110	71.224	.061
J2-Water Out, F	170.10	.085	76.721	.047
J3-Oil Sump, F	212.65	.155	100.36	.086
J4-Fuel Inlet, F	91.748	.087	33.193	.049
J5-Air After Filter, F	102.14	.081	38.965	.045
J6-Intake Manifold, F	106.92	.052	41.625	.029
J7-Fuel Return, F	94.326	.098	34.625	.054
P1-Fuel, PSIG	93.781	.294	646.60	2.028
P2-Oil Gallery, PSIG	53.099	.012	366.10	.082
P6-Ex Common, "H2OG	12.367	.116	3.077	.029
P7-Air Aft Filt, "H2OV	1.686	.151	.420	.038
P8-Blowby, "H2OG	.035	.032	.009	.008
P11-Baro (Vent), "Hg ABS	29.122	.003	98.617	.009
Speed, RPM	1297.9	2.317	1297.9	2.317
Load, Lb-Ft	554.59	4.442	751.92	6.023
Smoke, %	46.987	2.381	46.987	2.381
Fuel Flow, Lb/Hr	77.213	6.537	35.023	2.965
Horsepower	137.06	1.289	102.19	.961
Corrected Horsepower	142.13	1.337	105.97	.997
BSFC, lb/hp-hr	.563	.045	.343	.027
Corrected BSFC	.543	.043	.330	.026
Relative Humidity	24.101	.466	24.101	.466
Reference Pressure, inHg	28.998		98.197	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1668

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.00 in-Hg
Speed :	1298 RPM
Load :	554.6 lb-ft
Fuel Flow :	77.2 lb/hr
Brake Power :	137.07 bhp
BSFC :	.563 lb/bhp-hr
Indicated Power :	20.72 kW/cyl
Peak Pressure :	8.539 MPa
Peak Rate of Pressure Rise:	1333. kPa/deg
Peak Heat Release Rate :	544.0 Joules/deg
Cumulative Heat Release :	3597.46 Joules
Apparent Combustion Efficiency :	58.1 %
Indicated Thermal Efficiency :	30.9 %
Brake Thermal Efficiency :	25.4 %
Ignition Delay :	8.5 degrees
Centroid Phasing :	190.3 degrees
Centroid Magnitude :	92.07 J/degree
Sensitivity :	20.8 degrees
Premixed/Diffusion Ratio :	.40957

880412.111802 AL-17233-F AL-12920-L NH220				9
K1-Exhaust 1, F	998.42	.671	536.90	.373
K2-Exhaust 2, F	1044.8	.930	562.65	.517
K3-Exhaust 3, F	1030.3	1.176	554.60	.654
K4-Exhaust 4, F	974.54	1.158	523.63	.643
K5-Exhaust 5, F	1012.0	.710	544.45	.395
K6-Exhaust 6, F	1011.1	.683	543.93	.380
K7-Exhaust Common, F	1040.6	.543	560.31	.302
Dry Bulb Temperature, F	77.353	.159	25.196	.088
Wet Bulb Temperature, F	55.929	.043	13.294	.024
J1-Water In, F	160.39	.214	71.328	.119
J2-Water Out, F	170.93	.130	77.184	.072
J3-Oil Sump, F	208.98	.195	98.324	.109
J4-Fuel Inlet, F	92.078	.044	33.376	.024
J5-Air After Filter, F	100.06	.083	37.814	.046
J6-Intake Manifold, F	104.47	.063	40.263	.035
J7-Fuel Return, F	93.317	.068	34.065	.038
P1-Fuel, PSIG	76.612	.608	528.22	4.192
P2-Oil Gallery, PSIG	47.065	.034	324.50	.233
P6-Ex Common, "H2OG	11.813	.083	2.940	.021
P7-Air Aft Filt, "H2OV	1.316	.203	.328	.050
P8-Blowby, "H2OG	.045	.028	.011	.007
P11-Baro (Vent), "Hg ABS	29.118	.002	98.604	.008
Speed, RPM	1101.7	2.293	1101.7	2.293
Load, Lb-Ft	546.98	4.099	741.60	5.557
Smoke, %	50.469	2.120	50.469	2.120
Fuel Flow, Lb/Hr	76.535	8.954	34.716	4.062
Horsepower	114.74	.799	85.544	.596
Corrected Horsepower	118.76	.827	88.547	.617
BSFC, lb/hp-hr	.667	.077	.406	.047
Corrected BSFC	.644	.074	.392	.045
Relative Humidity	23.154	.371	23.154	.371
Reference Pressure, inHg	29.021		98.276	

NAVY HIGH SPEED DIESEL - CUMMINS NH220G FILE : CN1670

Bore :	130.2 mm
Stroke :	152.4 mm
Displacement :	12169.7 cc
Compression Ratio :	15.5 to 1
Injection Timing :	19 BTDC
Crankangle Offset :	181.0 degrees
Reference Pressure :	29.02 in-Hg
Speed :	1102 RPM
Load :	547.0 lb-ft
Fuel Flow :	76.5 lb/hr
Brake Power :	114.77 bhp
BSFC :	.667 lb/bhp-hr
Indicated Power :	16.93 kW/cyl
Peak Pressure :	8.696 MPa
Peak Rate of Pressure Rise:	1270. kPa/deg
Peak Heat Release Rate :	525.6 Joules/deg
Cumulative Heat Release :	3394.87 Joules
Apparent Combustion Efficiency :	47.0 %
Indicated Thermal Efficiency :	25.5 %
Brake Thermal Efficiency :	21.5 %
Ignition Delay :	6.9 degrees
Centroid Phasing :	186.6 degrees
Centroid Magnitude :	97.19 J/degree
Sensitivity :	18.7 degrees
Premixed/Diffusion Ratio :	.36906