

AD-A049 325

AERONAUTICAL RESEARCH LABS MELBOURNE (AUSTRALIA)
A SIMPLE WATER TRAP FOR USE IN A FLUE GAS SAMPLING SYSTEM.(U)
OCT 77 F W SKIDMORE, D DYETT
ARL/MECH-ENG-TM-386

F/G 21/2

UNCLASSIFIED

NL

| OF |
AD
A049325



END
DATE
FILMED
3-78
DDC

UNCLASSIFIED

ARL-Mech-Eng
Tech-Memo-386

AR-000-856

AD A 0 49325



12

DEPARTMENT OF DEFENCE
DEFENCE SCIENCE AND TECHNOLOGY ORGANISATION
AERONAUTICAL RESEARCH LABORATORIES
MELBOURNE, VICTORIA

Mechanical Engineering Technical Memorandum 386

AD NO. —
JDC FILE COPY.

A SIMPLE WATER TRAP FOR
USE IN A FLUE GAS SAMPLING SYSTEM.

F.W. Skidmore and D. Dyett

APPROVED FOR PUBLIC RELEASE



DDC
RECEIVED
FEB 7 1978
RECEIVED

[Handwritten signature]
D

© COMMONWEALTH OF AUSTRALIA 1977

COPY No 12

OCTOBER 1977

UNCLASSIFIED

008650

THE UNITED STATES NATIONAL
TECHNICAL INFORMATION SERVICE
IS AUTHORISED TO
REPRODUCE AND SELL THIS REPORT

APPROVED
FOR PUBLIC RELEASE

WTIC	White Section	<input checked="" type="checkbox"/>
DDI	Dist Section	<input type="checkbox"/>
UNCLASSIFIED		<input type="checkbox"/>
IDENTIFICATION		
BY		
DISSEMINATION/AVAILABILITY CODES		
CLASS. AVAIL. NO. OR SPECIAL		
A		

AR-000-856

DEPARTMENT OF DEFENCE

DEFENCE SCIENCE AND TECHNOLOGY ORGANISATION.

AERONAUTICAL RESEARCH LABORATORIES ✓

9 Mechanical Engineering Technical Memorandum 386. ✓

6 A SIMPLE WATER TRAP FOR USE IN A FLUE GAS SAMPLING SYSTEM.

12 8p.

10 F.W./Skidmore and D./Dyett

11 Oct 77

14 ARL/MECH-ENG-TM-386
SUMMARY

This memorandum describes a simple water trap designed to remove condensed water from a flue gas sampling system prior to drying. The water trap was used during Naval boiler trials and found to operate satisfactorily.

POSTAL ADDRESS: Chief Superintendent, Aeronautical Research Laboratories,
P.O. Box 4331, Melbourne, Victoria, 3001, Australia.

DDC
RECEIVED
FEB 1 1978
RECEIVED

008 650

DOCUMENT CONTROL DATA SHEET

Security classification of this page: UNCLASSIFIED

1. DOCUMENT NUMBERS

- a. AR Number: AR-000-856
- b. Document Series and Number:
Mechanical Engineering Technical
Memorandum 386.
- c. Report Number:
ARL/MECH-ENG-TECH-MEMO-386.

2. SECURITY CLASSIFICATION

- a. Complete document:
UNCLASSIFIED
- b. Title in isolation:
UNCLASSIFIED
- c. Summary in isolation:
UNCLASSIFIED

3. TITLE:

A Simple Water Trap for Use in a Flue Gas Analysis
Sampling System.

4. PERSONAL AUTHORS:

F.W. Skidmore and
D. Dyett

5. DOCUMENT DATE:

October 1977.

7. CORPORATE AUTHOR:

Aeronautical Research
Laboratories.

6. Type of Report and Period
Covered:

8. REFERENCE NUMBERS:

- a. Task: NAV 76/34
Element A-3
- b. Sponsoring Agency:
1211/54/870 DMED

9. COST CODE:

43 2760

10. INPRINT:

Aeronautical Research
Laboratories.

11. COMPUTER PROGRAM:

Title and Language:

12. RELEASE LIMITATIONS (of the document):

Approved for Public Release.

12-0. OVERSEAS: NO P.R. 1 A B C D E

13. ANNOUNCEMENT LIMITATIONS (of the information on this page):

No Limitations

14. DESCRIPTORS:

Flue Gases
Gas Sampling
Gas Analysis
Water Trap

15. COSATI CODES:

2102
1402

16. ABSTRACT:

This memorandum describes a simple water trap designed to remove condensed water from a flue gas sampling system prior to drying. The water trap was used during Naval boiler trials and found to operate satisfactorily.

CONTENTS

PAGE NO.

1. INTRODUCTION	1
2. THE WATER TRAP	1
3. WATER TRAP TESTS	2
4. MODIFICATIONS	2
5. CONCLUSIONS	2

FIGURES 1 and 2.

DISTRIBUTION

DOCUMENT CONTROL DATA

1. INTRODUCTION

Following conversion of boiler systems of some RAN ships to burn Dieso fuel in place of Furnace Fuel Oil, A.R.L. has assisted by measuring the performance of boilers and propulsion machinery. To enable the determination of the percentage of excess air and carbon monoxide in the flue gas from the boilers it is necessary to extract a gas sample from the stack and pass it to several gas analysers. It became obvious after early trials that one of the main problems in the gas sampling system was the large amount of condensed water in the sample. As the gas analysers demand a dry gas input, small calcium chloride dryers are fitted before each instrument; these however were found to be unable to cope with the quantity of water in the raw flue gas sample.

To help overcome this problem a simple self purging water trap has been designed and built to extract the bulk of the condensed water in the sample. The water trap was subjected to bench tests and then fitted to a gas sampling system during steaming trials on a naval vessel.

This memorandum describes the principles and operation of the device.

2. THE WATER TRAP

The water trap, shown in cross-section in figure 1 and photographed in figure 2, consists of a glass cylinder with a brass top and bottom held by tie bolts. A cork float, waterproofed with an epoxy adhesive, is connected to a stainless steel release valve.

The gas sample enters a hole in the float via a droptube and exhausts through a tube located at the top of the trap. Water which accumulates in the bottom of the trap periodically raises the float and lifts the release valve to vent the water. A stop is provided to prevent the release valve from falling out of its recess during transportation; a manual valve is provided to drain the trap completely.

3. WATER TRAP TESTS

The trap was bench tested at angles of tilt of up to 30 degrees, using a simulated raw gas sample at a flow rate of approximately 27 litres per minute. The presence of condensed water was simulated by injecting water upstream of the trap; at these conditions the device was found to operate correctly. The trap was then connected to an exhaust gas sampling system on a naval vessel and was found to operate satisfactorily during a two day period of trials.

4. MODIFICATIONS

It is suggested that for future traps the following modifications be carried out to make the device most robust.

- a) Replace the glass cylinders with a metal cylinder and provide a sight glass for water level checks.
- b) Replace the cork float with either a plastic or corrosion resistant hollow metal float.

5. CONCLUSIONS

The water trap described in this memorandum satisfactorily removed most of the condensed water in the sampling system tested. Modifications to improve robustness would be desirable. As nearly all liquid water is removed from the gas sample, greatly improved life of the dessicant tubes required to remove water vapour has been achieved.

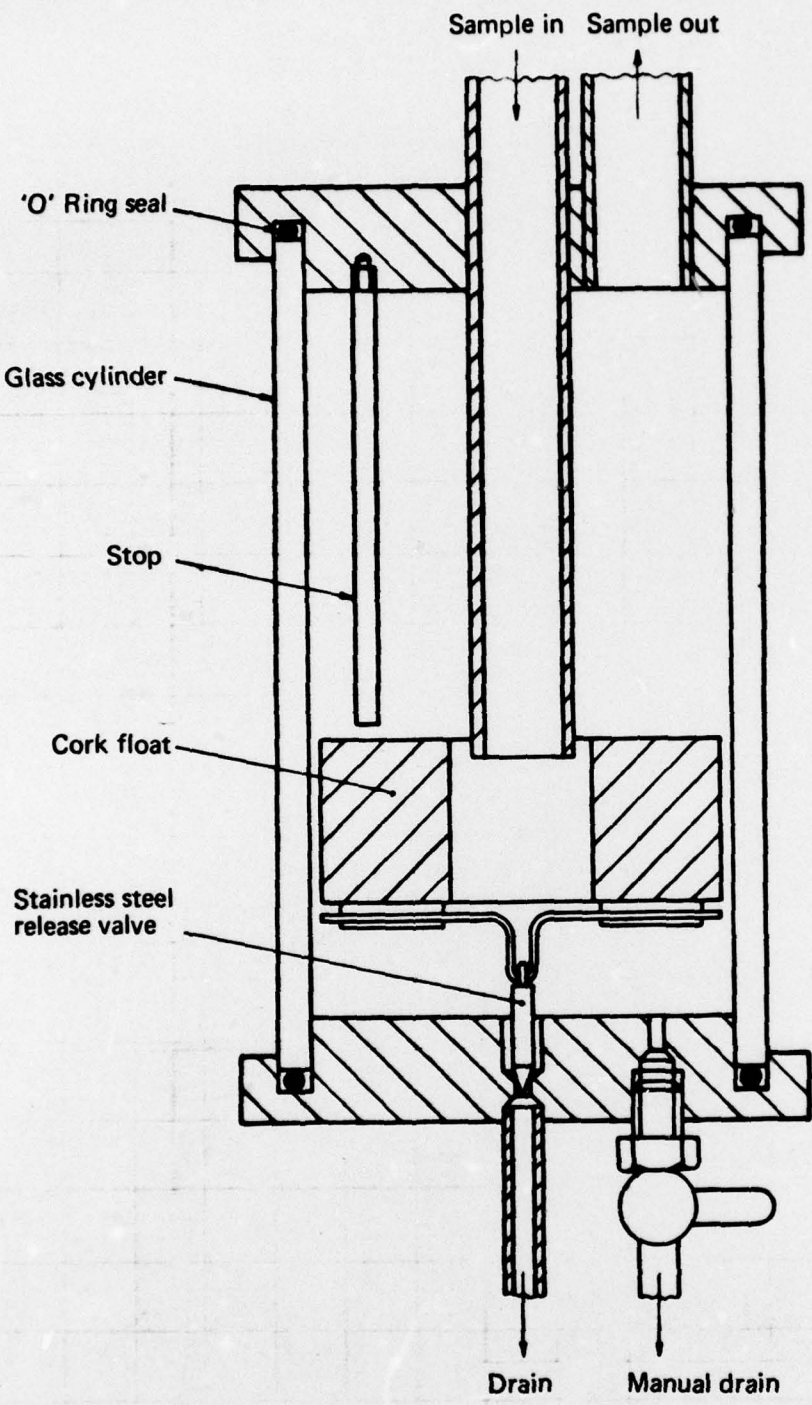


FIG. 1. CROSS SECTION OF WATER TRAP

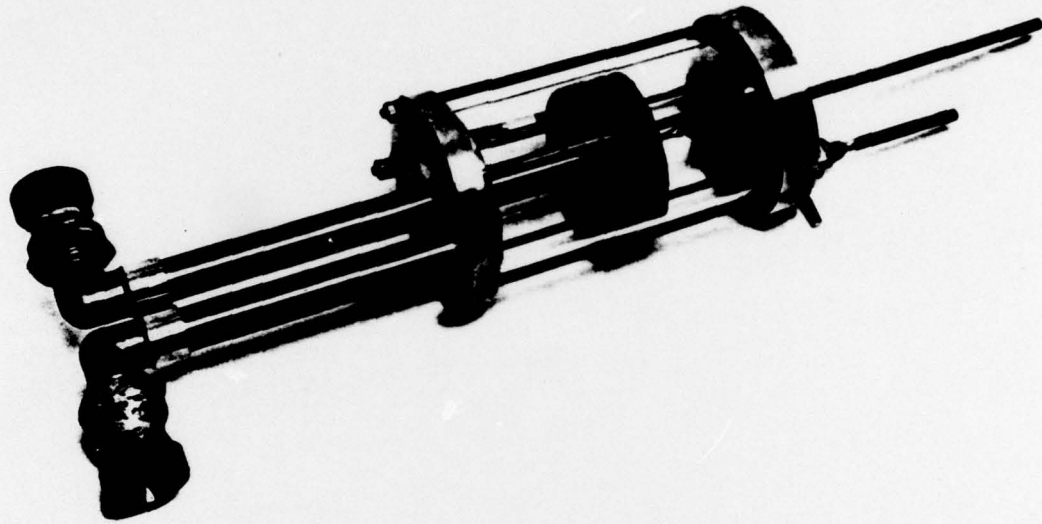


FIG. 2. ASSEMBLED WATER TRAP

DISTRIBUTION

	<u>COPY NO.</u>
AUSTRALIA	
DEPARTMENT OF DEFENCE	
<u>Central Office</u>	
Chief Defence Scientist	1
Executive Controller, ADSS	2
Superintendent, Defence Science Administration	3
Defence Library	4
J.I.O.	5
Assistant Secretary, DISB	6-20
<u>Aeronautical Research Laboratories</u>	
Chief Superintendent	21
Superintendent, Mechanical Engineering	22
Mechanical Engineering Divisional File	23
F.W. Skidmore	24
D. Dyett	25
R.E. Pavia	26
Library	27
<u>Materials Research Laboratories</u>	
Library	28
<u>Weapons Research Establishment</u>	
Library	29
<u>Central Studies Establishment</u>	
Library	30
<u>RAN Research Laboratory</u>	
Superintendent	31
<u>NAVY OFFICE</u>	
Navy Scientific Adviser	32
Mr. W. Hibbert, DMED Canberra	33
Williamstown Naval Dockyards, Mr. P. Siccita	34
Garden Island Dockyard, Senior Engineer, Mechanical, (Mr. P. Murdie)	35
Cockatoo Island Dockyard, General Overseer and Superintendent of Inspection (Mr. I. Jenkins)	36
SPARES	37 - 44