

FINAL SUBMITTAL

ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

LIMITED ENERGY STUDY

OPTION 1: ANCILLARY FACILITIES

WATERVLIET ARSENAL

WATERVLIET, NEW YORK

VOLUME III

SITE SURVEY FORMS--PRODUCTION FACILITIES

CONTRACT NO. DACA65-91-C-0072

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS  
NORFOLK, VIRGINIA

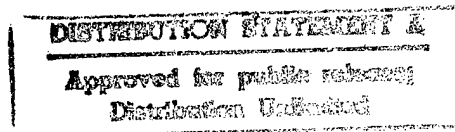
PREPARED BY:

ENERGY AND ENVIRONMENTAL SERVICES DEPARTMENT  
REYNOLDS, SMITH AND HILLS, INC.  
P.O. BOX 4850  
JACKSONVILLE, FLORIDA 32201

RS&H PROJECT NO. 2900379002

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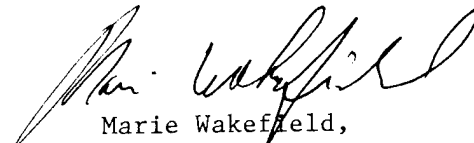


DEPARTMENT OF THE ARMY  
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS  
P.O. BOX 9005  
CHAMPAIGN, ILLINOIS 61826-9005

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Marie Wakefield,  
Librarian Engineering

VOLUME III

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PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: \_\_\_\_\_

DATE: 2/17/91

Building Number: 120; Process Area: Inbriefing

Notes & Comments: \_\_\_\_\_

Inbriefing

Attendees

Paul Hutchins

RS&H

Bill Todd

RS&H

Bob Plass

WVA (energy data)

Bill Face

WVA (En. Coord)

Trimp Uppal

WVA (Prod. En. Coord)

John Sadak

WVA (Chief EPE&S)

Discussed schedule - SOW - bldgs to be surveyed  
reviewed data delivered by B. Face

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/20/91

Building Number: 120; Process Area: N. Gas Fuel Switch

Notes & Comments: \_\_\_\_\_

Bill Face has been discussing potential for a natural gas line from the western side of the installation which would enter the installation near bldg. 146, follow the fence line southward to the main boiler plant in bldg. 136

POC - Jim Sullivan (518) 270-3413

Elec. Engr. POC - George Bielkiewicz  
(Bēl kā' witz)

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: \_\_\_\_\_

DATE: 6/21/91

Building Number: 10 ; Process Area: Exit Briefing

Notes & Comments: \_\_\_\_\_

Exit Briefing

Attendees

Paul Hutchins

Bill Todd

Carlos Warren

Bill Face

Trippy Uppal

COL John Neuman

Discussed SOW - Project schedule - expected results

Neuman - was interested in implementing projects

BUILDING DATA - WATERVLIET ARSENAL

SURVEY BY: C. WARREN

DATE: 6/19/91

Building Number: 20; Process Area: MINOR COMPONENT FINISHING

Process Area Contact: \_\_\_\_\_; Phone Extension: \_\_\_\_\_

Process Description: FINISHING OF SMALL COMPONENTS &

BREACH BLOCKS

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

List of Process Equipment:

- (1) NUMEROUS SMALL MILLING MACHINES, LATHES, ETC
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_
- (4) \_\_\_\_\_
- (5) \_\_\_\_\_
- (6) \_\_\_\_\_

Expected Changes To Equipment Or Schedule: NONE

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>BLDG 20</u>	<u>FLUOR.</u>	<u>864</u>	<u>2</u>	<u>80</u>	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

HVAC System Type(s)

Controls

HVAC Control Setpoints: Temperature: \_\_\_\_\_ (F); Rel. Humidity: \_\_\_\_\_ %

Measured Conditions: D.B. Temp.: \_\_\_\_\_ (F); W.B. Temp.: \_\_\_\_\_ (F)

BUILDING DATA - WATERVLIET ARSENAL

SURVEY BY: C. Warren

DATE: 6/19/91

Building Number: 25; Process Area: MINOR COMPONENT FINISHING

Process Area Contact: \_\_\_\_\_; Phone Extension: \_\_\_\_\_

Process Description: Finishing of small components

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

List of Process Equipment:

- (1) Numerous small lathes, mills, etc.
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_
- (4) \_\_\_\_\_
- (5) \_\_\_\_\_
- (6) \_\_\_\_\_

Expected Changes To Equipment Or Schedule: None

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>Bldg 25</u>	<u>FLUOR</u>	<u>1400</u>	<u>2</u>	<u>220</u>	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

HVAC System Type(s) \_\_\_\_\_ Controls \_\_\_\_\_

HVAC Control Setpoints: Temperature: \_\_\_\_\_ (F); Rel. Humidity: \_\_\_\_\_ %

Measured Conditions: D.B. Temp.: \_\_\_\_\_ (F); W.B. Temp.: \_\_\_\_\_ (F)

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BUILDING DATA - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/18/91

Building Number: 35; Process Area: \_\_\_\_\_

Process Area Contact: Timpy Uppal; Phone Extension: 5257

Process Description: Gun tube and breech mechanism machine and plate operations

Schedule: Shifts/day: 2-3; Hours/Shift: 8; Days/Week: 5

List of Process Equipment:

- (1) Various machine tools
- (2) Tube plating tanks
- (3) Wellman furnace
- (4) Small parts plating tanks
- (5) Heat treat for small parts
- (6) \_\_\_\_\_

Expected Changes To Equipment Or Schedule: One of three gun tube plating areas to be discontinued (8" area)

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>Major Shop</u>	<u>HPS/MV</u>	<u>550</u>	<u>1</u>	<u>460</u>		<u>40-70</u>
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

HVAC System Type(s)

Controls

Steam unit htrs TSTAT

HVAC Control Setpoints: Temperature: \_\_\_\_\_ (F); Rel. Humidity: \_\_\_\_\_ %

Measured Conditions: D.B. Temp.: N/A (F); W.B. Temp.: \_\_\_\_\_ (F)

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: \_\_\_\_\_

Building Number: 35 ; Process Area: Tube machining

Notes & Comments: Jack Henry

	HR/PIECE	
- Spotting	1	tube truing
- Outside finish	7	O.D. turning
Press	1	correct bends
Lathe	1.5	end cut off
Lathe		thread cut
Milling	1	breech
Milling	2	ends
Mill & Drill	5	boreight keyway
Sectoring	2.5	remove threads
Mill	1	extractor pockets
Mill	1	thermal shroud & evacuator
Drill	1	evacuation holes
Rough hone	1	size & uniform ID
Grind	8	bore chamber
Bench finish	6	hand tools
Hone extruder	1	
Demag. tube	1/3	
Polish hone	1	
Inspection	1/2	
Chrome plate		
O.D. Grind	4	



PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/18/91

Building Number: 36 ; Process Area: Tube Plating

Notes & Comments: \_\_\_\_\_

<u>Typical rectifier</u>		<u>in</u>	<u>out</u>
		460V AC	9V DC
		182 A	10KA
		3 ph	-
			90kw

<u>Electro-Polish</u>		<u>Electro Polish</u>	
<u>in</u>	<u>out</u>	<u>in</u>	<u>out</u>
460V AC	18V DC	460V AC	18V DC
612 A	20KA	307 A	10KA
3 Ph		3 ph	
	360kw		180kw

Pit Area

Scrubber pump - S-A 15hp Eff = 86.5

Chem circ pumps S-A 30hp 33.5a - Chronic Acid

Elec. Polish S-A 10hp 13a Eff = 86.5

Caustic USEM 7.5hp 11.1a

\* Hot Glycol Recirc USEM 15hp 19.2a Eff = 84.0

Vertical mount

\* Cold Glycol Recirc S-A 10hp 47.5A Vertical Mount

Mill and chemical Duty Quality

\* Run continuously 8760 h/yr.

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/18/91

Building Number: 35; Process Area: Tube Plating

Notes & Comments: 120mm-WV 12657 / 8" WV 11920 / med WV 12050

• Three plating areas - 120mm, Med. tube, 8" tube  
The 8" tube area is being discontinued

<u>Tank type</u>	<u>120mm</u>	<u>8"</u>	<u>Med</u>	<u>surface condition</u>
Electro - clean	2	1	1	clean
Polish	2	1	1	splash guard
Chrome plate	2	1	2	crowded
Electro purification	2	1	2	clean

<u>Opn. times</u>	<u>18volts</u>	
	<u>hrs</u>	<u>Amps</u>
Electro clean	1/2	1K
Polish	1/3	6K
Chrome plate	6	6K

• After plating, tubes are heat treated in  
Wellman furnaces. There are two, each capable  
of heating 6 tubes at a time. Rated at 1275 kw  
Takes about 1 hr to ramp to about 425°F. Power  
use oscillates with an average of 1kw for 6-8hrs

• Rinse tanks are aerated with compressed air  
Wellman Furnaces - WV 12586

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/18/91

Building Number: 35; Process Area: Tube Plating

Notes & Comments: \_\_\_\_\_

Additional energy users in this area are:

Fluid circulation pumps

Pit exhaust fan

Fume exhaust fan (around tanks)

Cooling tower / chiller for tank  
temperature control

Chrome Plate Area - 24h/d 365 d/yr.

Med Tube Ventilation - 29,000 cfm

fume exhaust - 60 hp

pit exhaust - 15 hp

120 mm Ventilation - 42,000 cfm

Make up is used to keep slightly positive bldg  
pressure.

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/19/91

Building Number: 35; Process Area: Small Parts Plating

Notes & Comments: Kirk Van Loan X5966

Four Lines:

#		Temp (F)
1	Chrome plate and black oxide	130/265, 295
2	Nickel plate and cadmium plate	130/80
3	Anodize and hard coat anodize	75/29
4	Magnesium phosphate	205F

No power used in line #4 and black oxide

Other power during plating:

1	2.5 amps/in <sup>2</sup>	1 hr → '1000"	20 min
2 N	1/2 amp/in <sup>2</sup>	1/2 hr → '1000"	10-30 min
C	0.069 amp/in <sup>2</sup>	1 hr → '1000"	30 min

Shifts/day

1 - 3 shifts/day

2 - 2 "

3 - 1/2 to 1

4 - 2 to 3

Cerivation is required

7 cleaner cure tanks

and 4 anodizer tanks

Tried plastic balls to decrease heat loss but had problems with balls getting trapped in parts with cavities. Also was used for masking repair parts

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/19/91

Building Number: 35; Process Area: Small parts Plating

Notes & Comments: \_\_\_\_\_

would get transferred from tank to tank

Tanks are exhausted 24 h/day, 7 da/wk

Fan ID	Line#	TANK 1	Supply
PEF 103	1	3, 7, 8, 9, 11, 15, 16, 21, 22, 23, 24	103
106	1	14	↓
107	1	19	
104	1	28, 29, 30	
105	1	31, 32, 33 (bilateral exhaust)	
101	2	3, 5, 13, 16	
102	2	19, 20, 21, 30, 31	102
108	3	2, 3, 4-14	104
109	3	19, 20, 25, 26 (all bilateral)	
110	4	4, 5	} all bilateral
111	4	6, 7, 8, 9, 11	
112	4	10	

Cyanide Scrubber runs continuously 50hp bla

PROCESS DATA NOTES - WATERVLIED ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/19/91

Building Number: 35; Process Area: Small Parts Plating

Notes & Comments: \_\_\_\_\_

Small Parts Mechanical Room Data (all 460v)

Cooling tower fans (?) (2) GE 40 hp 50A run 24h/d, 5d/w

PEF112 Westinghouse 10hp 13.2A Eff = 88.5

PEF102 Siemens-Allis 40hp 46.5A Eff = 91.0

PEF104 Similar to PEF 102

Cooling tower pumps (2) GE 10hp 18.7a Eff = 85.5

PEF 105 GE 60hp 74.5a

PSF 103 U.S. Elec. Motor 10hp 13.9a

PEF 109 Similar to PEF 105

PEF 101 S-A 25hp 30.4a Eff = 86.5

PEF 106/107 Small

PSF 101 817 cfm S.P. = 6" 1.2 hp

PSF 102 2231 cfm S.P. = 6" 2 hp

29 Rectifiers

L1 S 28-32 36 kw Opn: 5.2V 70 DCA

L2 S 13, 19, 20, 21, 30, 31 12 kw ea

L3 S 25, 26 187.5 kw

L3 S 19, 20 40 kw

L1 S 33 (3 cells) 24 kw ea

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/19/91

Building Number: 35; Process Area: Small Part Heat Treat

Notes & Comments: Many heat furnaces

The follow run 24h/da from Midnight Sunday to 8pm Fri:

- Indothermic Gas Generator WV 12214 58a 480V  
Heats natural gas and air mixture in presence of a catalyst to produce a "clean" methane  
1900°F 175 cfh (For high temp. heat treat)
- Carburizer Furnace<sup>(3)</sup> Lindberg 1550°F WV 8574  
600V 30a - uses "clean" methane atmosphere
- Heat Treat Furnace - Lindberg 1575°F - WV 12360  
uses "clean" methane
- Small Heat Treat - 45kW

New Ion Nitrider WV 12582 - Nitrate cooler + heat treat  
~1000°F 36hr/run 460V 7500A max  
Observed 438V 100ADC  
Run once every 2 wks - 16 breach blocks/run

Old Ion-Nitrider - WV 12059 Run 2 times/week  
8 breach blocks/run 40hrs/run 1000°F

Vacuum Furnace - (2) WV 12506 180kW One is used  
2 hrs/run 2/shift

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/19/91

Building Number: 35; Process Area: Small Parts Heat Treat

Notes & Comments: \_\_\_\_\_

• Temper Furnaces (4) - Used after heat treat  
1-6 hrs/run 90kw ea

• Induction Harden Furnace - 1 used, 1 run/wk

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/18/91

Building Number: 35; Process Area: FMS

Notes & Comments: FMS Flexible Manufacturing System

- Completely automated manufacturing system

- Used for machining small parts, breech blocks, etc.

BUILDING DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd

DATE: 6-18-91

Building Number: 110; Process Area: Preservation & Packaging

Process Area Contact: Tony Mantica; Phone Extension: 5291

Process Description: Tubes are painted and dried.

Finished cannons are packaged for shipment to the customers.

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

List of Process Equipment:

(1) Paint Booth (WV 12515)

(2) Dry Booth (WV 12515)

(3) Packaging is a manual operation

(4) \_\_\_\_\_

(5) \_\_\_\_\_

(6) \_\_\_\_\_

Expected Changes To Equipment Or Schedule: None

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>Painting</u>	<u>FL</u>	<u>13</u>	<u>4</u>	<u>40</u>	<u>Panel sw.</u>	<u>30</u>
<u>Drying</u>	<u>Inc.</u>	<u>4</u>	<u>1</u>	<u>200</u>	<u>Panel sw.</u>	<u>10</u>
<u>Packaging</u>	<u>HPS &amp; MH</u>	<u>36</u>	<u>2</u>	<u>300</u>	<u>1sw/8fix.</u>	<u>30</u>

HVAC System Type(s)

Controls

Steam Unit Heaters

Thermostats

HVAC Control Setpoints: Temperature: NA (F); Rel. Humidity:     %

Measured Conditions: D.B. Temp.: NA (F); W.B. Temp.:     (F)

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-19-91

Building Number: 110; Process Area: Preservation & Packaging

Description of Equipment: Paint Booth (WV 12515)

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 4 hrs - 1st, 8 hrs - 2nd

Equipment O & M Schedule: N/A

Age / General Condition: 4 years old - good condition

Specifications: Mfg: Vector Ind.; Model No.: WV 12515

Production Rate: 80 - 100 (parts, lbs) per Month (hr, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes No; HP: \_\_\_\_\_; Voltage: \_\_\_\_\_

Pneumatic Drive: Yes No; Compressor I.D. No.: \_\_\_\_\_  
*for respirator*

Air Input: \_\_\_\_\_ CFM @ 85 psi (g)

Hydraulic Drive: Yes No; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ <sup>natural gas</sup> (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Control Panel - Switches

Auxiliary Equipment: intake, exhaust and combustion fans  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: Space heat during winter only  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-19-91

Building Number: 110; Process Area: Preservation

Description of Equipment: Drying Booth (WV 12515)

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 2 hours - 2nd shift

Equipment O & M Schedule: N/A

Age / General Condition: 4 years old - good condition

Specifications: Mfg: Vector Ind.; Model No.: WV 12515

Production Rate: ~ 15 (parts, ~~lbs~~) per Month (~~hr~~, Day)

Room Temperature or Humidity Control Required: ~ 110°F

Electric Motor Drive: Yes No; HP: \_\_\_\_\_; Voltage: \_\_\_\_\_

Pneumatic Drive: Yes No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes No; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes No; ~~H.W.~~ Nat. Gas or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: 110 (F) ~~(R)~~

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Control Panel - Switches

Auxiliary Equipment: circulation, exhaust and combustion fans  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: Space heat during winter only  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd

DATE: 6-18-91

Building Number: 110; Process Area: Preservation & Packaging

Notes & Comments: \_\_\_\_\_

Gun tubes (105 mm, 120 mm and 155 mm) and breech mechanisms are brought in from the inspection process in Building 35. These pieces are painted, dried, packaged and loaded for shipment in the south end of Building 110.

The production rate is about 80 to 100 tubes per month. Depending on the production schedule they will paint 6 to 20 pieces at a time.

The paint booth operates approximately 8 to 12 hours per day - about 4 hours on the first shift and 8 hours on the second shift.

The paint booth has 2 intake fans (F1 & F2), 2 exhaust fans (F3 & F4) and 2 combustion fans (F8 & F9). The intake flow is 75,000 cfm at 0.15 inches H<sub>2</sub>O. The exhaust flow is 66,000 cfm at 0.75 inches of H<sub>2</sub>O. The humidity inside the booth was 75.2 % (not being controlled). The make up air temperature was 76 °F (controlled only during the winter). The respirator air pressure was 85 psig. All controls and gages are located on a control-panel between the paint and drying booths.

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd

DATE: 6-19-91

Building Number: 110 ; Process Area: Preservation & Packaging

Notes & Comments: \_\_\_\_\_

The drying booth operates approximately 2 hours per day - usually on the second shift - but it was operating on the first shift during the site survey. During the winter the dry booth is also used to heat the tubes prior to painting (they are heated for approximately 1 hour).

The drying booth has a circulation fan (F5), an exhaust fan (F6) and a combustion fan (F7). The temperature is maintained at about 110°F with steam or natural gas heat. The intake flow is 60,000 cfm and the exhaust flow is 78,000 cfm.

All of the controls and gages for the paint and dry booths are located on a control panel between the booths. All lights and fans are usually turned off when the booths are not in use.

The system was designed and installed in 1987 by:  
Vector Industrial Services  
900 Old Liverpool Rd.  
Liverpool, NY 13088  
Project No. 859-32



BUILDING DATA - WATERVLIET ARSENAL

SURVEY BY: C. WARREN

DATE: 6/18/91

Building Number: 125; Process Area: WELD SHOP

Process Area Contact: CHUCK MATHESON; Phone Extension: 5878

Process Description: WELD & FABRICATION SHOPS - PRODUCTION AND SERVICE FOR ARSENAL

Schedule: Shifts/day: <sup>2 WELDING</sup> 1 EAB; Hours/Shift: 8; Days/Week: 5

List of Process Equipment:

- (1) 3 ELECTRIC FURNACES FOR MATERIAL HEATING
- (2) NUMEROUS WELDING MACHINES
- (3) FABRICATION EQUIPMENT (ROLLERS, PRESSES, SHEARS, MILLS, ETC)
- (4) \_\_\_\_\_
- (5) \_\_\_\_\_
- (6) \_\_\_\_\_

Expected Changes To Equipment Or Schedule: NONE

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>PROCESS</u>	<u>HPS</u>	<u>160</u>	<u>1</u>	<u>400(?)</u>		<u>50-70</u>
<u>MACHINE TASK</u>	<u>FLUOR</u>	<u>?</u>	<u>1-2</u>	<u>40</u>		<u>70</u>
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

HVAC System Type(s)

Controls

HVAC Control Setpoints: Temperature: \_\_\_\_\_ (F); Rel. Humidity: \_\_\_\_\_ %

Measured Conditions: D.B. Temp.: \_\_\_\_\_ (F); W.B. Temp.: \_\_\_\_\_ (F)

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: CSW

DATE: 6/19

Building Number: 125; Process Area: Weld Shop

Notes & Comments: Furnaces -

# 1 Lindberg Elect Furnace. Model 41-MT-463-14-ECP

Serial # 858430

480 V 3 $\phi$  75 kW

1400 $^{\circ}$ F Max Temp

Mfg 6-86

Fan 22,000 CFM @ 600 RPM

Ask about strip recorder.

# 2 Lindberg Model 41-MT-6146-ECP

Serial # 858928

480V 3 $\phi$  453 AMPS

1400 $^{\circ}$ F Max Temp

Retrofit 6-86

3 zones

2nd shift operation  
when possible  
217 kW

# 3 Lindberg Model 11-MT-464-14

Serial # 858929

480 V 3 $\phi$  123 kW

1400 $^{\circ}$ F max

Mfg 5-86

Fan 22,000 CFM @ 600 RPM

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: BW

DATE: 6/18

Building Number: 125; Process Area: Weld Shop

Notes & Comments: Welding Machines

① Arc Welder to Linder 650 F83N-39537 67  $\emptyset$  CV  
 In ~~400~~<sup>230</sup> V 3  $\phi$  ~~80~~<sup>108</sup> A Out - 44 VDC 650 A

② Lincoln R3R #300  
 230 V 3  $\phi$  56 A Output varies V & A  
 70 VDC @ 0 A 67  $\emptyset$  CV

③ Lincoln DC-400 20 V @ 150-200 A  
 230 V 3  $\phi$  76 A 57  $\emptyset$  CV

④ Linder VI-252 CV Output 44  $\emptyset$  CV # II  
 230 V - 30 A 37 VDC @ 250 A

⑤ Hobart MEGA-MIG 450 RVS 57  $\emptyset$  CV  
 230 V - 71 A 38 VDC @ 450 A

⑥ Hobart MEGA-FLEX 450 RVS 57  $\emptyset$  CV 100% DC II  
 230 V - 71 A 38 VDC @ 450 A

⑦ LITEC PCM150 ?

⑧ Hobart ULTRA-ARC 350 (?)

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: CSW

DATE: \_\_\_\_\_

Building Number: 125; Process Area: \_\_\_\_\_

Notes & Comments: Welding Machines P 2

#

(9) Lincoln R3R-300 11  
 230 V / 56 A 300 A @ 32 V 60% D.C.  
 67 OCV

(10) Booth (?)

(11) THERMAL DYNAMICS PS 30 A  
 230 / 34 A 300 A @ 32 V 60%  
 Open circuit 80V OCV

(12) Hobart 300 S 11  
 230 / 88 A 300 A @ 32 V  
 75 V OCV

~~(12) Hobart 500 S~~

(13) AIRCO 5DCR-24-A WV 11318  
 230 / 62 A 35 VDC @ 500 A 100%

**BUILDING DATA - WATERVLIET ARSENAL**

SURVEY BY: W. T. Todd

DATE: 6-18-91

Building Number: 135 ; Process Area: Rotary Forge

Process Area Contact: Al Tageway ; Phone Extension: 5271

Process Description: Steel preform material is heated to 2200°F, Forged to 105 mm, 120 mm or 155 mm, the ends are cut off and then forgings are air cooled.

Schedule: Shifts/day: 3 ; Hours/Shift: 8 ; Days/Week: 5

List of Process Equipment:

- (1) Cheston Furnaces (4 ea.) (WV 11760)
- (2) Tocco Furnaces (5 ea.) (WV 12591)
- (3) Rotary Forge (WV 11700)
- (4) Abrasive Hot Saw (WV 12441)
- (5) Band Saw (WV 12173)
- (6) \_\_\_\_\_

Expected Changes To Equipment Or Schedule: Tocco Furnaces are replacing Cheston Furnaces.

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>Forge</u>	<u>HPS</u>	<u>50</u>	<u>1</u>	<u>400</u>	<u>Mult. Sw.</u>	<u>50</u>
<u>Tocco</u>	<u>FL</u>	<u>10</u>	<u>2</u>	<u>40</u>	<u>Switch</u>	<u>60</u>
_____	_____	_____	_____	_____	_____	_____

Only 50% of the HPS lights were on during survey

HVAC System Type(s)

Controls

Exhaust Fans (roof & wall)                      Switches  
Steam unit heaters                                      Thermostats

HVAC Control Setpoints: Temperature: NA (F); Rel. Humidity:    %

Measured Conditions: D.B. Temp.: NA (F); W.B. Temp.:    (F)

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-18-91

Building Number: 135; Process Area: Rotary Forge

Description of Equipment: Cheston Furnace - induction  
Furnaces (4) used to heat the preform prior to forging

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 2 1/2 hrs per tube

Equipment O & M Schedule: N/A

Age / General Condition: Two of the 4 are not working

Specifications: Mfg: Cheston; ~~Model~~ No.: WV 11760

Production Rate: 75 to 100 (parts, lbs) per Month (hr, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes No; HP: 96.5 (<sup>total for 15 motors</sup>); Voltage: \_\_\_\_\_

Pneumatic Drive: Yes No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes No; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: 1500 to 2100° (F) ~~(F)~~

Electric Input: 900 max (KW) Watts

Process Cooling: Yes No; ~~Chiller I.D. No.:~~ Cooling Tower

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: Cooling tower, roller drives  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: Space heat during winter  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: Tocco Furnaces  
are replacing the Cheston Furnaces

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-18-91

Building Number: 135; Process Area: Rotary Forge

Description of Equipment: Tocco furnaces (5) - induction  
Furnaces used to heat the preform prior to forging

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 1 1/2 hrs per tube

Equipment O & M Schedule: N/A

Age / General Condition: New - still being tested

Specifications: Mfg: Tocco; Model No.: WV 12591

Production Rate: 75 to 100 (parts) lbs per Month (hr, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive:  Yes  No; HP: \_\_\_\_\_; Voltage: \_\_\_\_\_

Pneumatic Drive:  Yes  No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive:  Yes  No; Pump I.D. No.: \_\_\_\_\_

Process Heat:  Yes  No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: 900 to 1800 Amps (KW, Watts)

Process Cooling:  Yes  No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: Cooling tower, roller drives  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: Space heat during winter  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: Currently testing -  
these will replace cheston furnaces soon

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd DATE: 6-18-91

Building Number: 135 ; Process Area: Rotary Forge

Description of Equipment: Rotary Forge - automatically forges the hot preForm into 105, 120 and 155mm tubes.

Schedule: Shifts/day: 3 ; Hours/Shift: 8 ; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 15-20 min. per tube

Equipment O & M Schedule: \_\_\_\_\_

Age / General Condition: 8 yrs old - good condition

Specifications: Mfg: \_\_\_\_\_ ; Model No.: WV 11700

Production Rate: 75 to 100 (parts, lbs) per Month (hr, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes No ; HP: 3191 <sup>(total for 46 motors)</sup> ; Voltage: \_\_\_\_\_

Pneumatic Drive: Yes No ; Compressor I.D. No.: WV 11700

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes No ; Pump I.D. No.: WV 11700

Process Heat: Yes No ; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm) ; Temp.: \_\_\_\_\_ (F,C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes No ; Chiller I.D. No.: Cooling Tower

Input: \_\_\_\_\_ gpm ; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: Cooling tower, Air compressor, VFD pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: Space heat during winter  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd DATE: 6-18-91

Building Number: 135; Process Area: Rotary Forge

Description of Equipment: Abrasive Hot Saw - cuts off both ends of the gun tube after Forging

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 3-4 min. per tube

Equipment O & M Schedule: N/A

Age / General Condition: good condition

Specifications: Mfg: \_\_\_\_\_; ~~Model~~ No.: WV 12441

Production Rate: 75-100 (parts, lbs) per Month (~~hr~~, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes No; HP: \_\_\_\_\_; Voltage: \_\_\_\_\_

Pneumatic Drive: Yes No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes No; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F,C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: automatic

Auxiliary Equipment: Cyclone separator, roller drives  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: NA  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-18-91

Building Number: 135; Process Area: Rotary Forge

Description of Equipment: Band Saw - Used to cut ends off Forged tubes when Abrasive Hot Saw is not used

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: \_\_\_\_\_

Equipment O & M Schedule: N/A

Age / General Condition: Fairly old - good condition

Specifications: Mfg: Marvel <sup>Series</sup> 25; ~~Model~~ No.: WV 12173

Production Rate: 75-100 (parts, lbs) per Month (~~hr, Day~~)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes ~~No~~; HP: 15; Voltage: \_\_\_\_\_

Pneumatic Drive: Yes ~~No~~; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes ~~No~~; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes ~~No~~; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes ~~No~~; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Manual

Auxiliary Equipment: 1/2 HP drive motor  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: N/A  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: Being replaced by Abrasive Hot Saw - Is now used as backup

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd

DATE: 6-20-91

Building Number: 135 ; Process Area: Rotary Forge

Notes & Comments: Rotary Forge Process Flow

1. PreForm (thick steel tube) - raw material
2. Heated in Cheston or Tocco Induction Furnace
3. Formed to 105, 120 or 155 mm tube on Rotary Forge
4. Ends are cut off by Abrasive Hot Saw or Band Saw
5. Tubes are ambient air cooled on racks

Forge operates at about 200 strokes/min.

There are 4 Cheston Furnaces - two are operational. The cycle time for each preform in the Cheston Furnace is about 2 1/2 hours.

Tocco Furnaces are replacing the Cheston Furnaces. There are 5 of these that draw 1800 amps (max) each for 20 min and 900 Amps for another 1 hour and 20 min. per preform. A new AC substation was installed for the Tocco Furnaces. The preform is heated to 2200 °F in about 1 1/2 hours. The Tocco Rep. is Mike Joy - Ph # 216/441-1141 - Offices are in Cleveland, OH. Input Voltage is 13200. They are currently running about 75 to 100 tubes per month through the Furnaces and forge.

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd

DATE: 6-20-91

Building Number: 135 ; Process Area: Rotary Forge

Notes & Comments: \_\_\_\_\_

The forged tube is air cooled first if the band saw is used to cut off the ends.

Building 135 Exhaust Systems

Rotary Forge : 9 roof exh. fans - 2 operating  
2 wall " " - None operating

Swage : 2 roof exh. fans - 1 operating  
3 wall exh. fans - 2 operating

Machining : 3 roof exh. fans - None operating  
2 wall " " - " "

Rotary Forge has an air compressor and a cooling tower (east wall) with variable frequency drive.

Cooling Tower : BAC, Model# VSI-150-2B, Ser# 741298  
5 hp pump motor  
25-40 hp fan motor (estimate)

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd

DATE: 6-20-91

Building Number: 135; Process Area: Rotary Forge

Notes & Comments: \_\_\_\_\_

Property Records Data:

WV 11760 - Cheston Furnace

1500 - 2100 °F temperature range

900 kW max. per station

Motors: 1-40hp, 1-20hp, 2-10hp, 3-3hp,  
6-1hp and 2-3/4hp.

WV 12173 - Marvel Band Saw

1-15 hp motor & 1-1/2 hp motor

BUILDING DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd

DATE: 6-18-91

Building Number: 135; Process Area: Continuous Heat Treat

Process Area Contact: Butch Matthews <sup>or John Green</sup>; Phone Extension: \_\_\_\_\_

Process Description: After the tubes are forged they are heat treated (heated-quenched-heated) to achieve the required grain structure and material properties.

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

List of Process Equipment:

- (1) Austenitizing Furnace (Natural Gas) (WV 11770)
- (2) Water Quench (WV 11770)
- (3) Tempering Furnace (Nat. Gas) (WV 11770)
- (4) Tempering Furnace (Electric) (WV 11770)
- (5) \_\_\_\_\_
- (6) \_\_\_\_\_

Expected Changes To Equipment Or Schedule: None

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>Heat Treat</u>	<u>HPS</u>	<u>50</u>	<u>1</u>	<u>400</u>	<u>Mult. Sw.</u>	<u>50</u>
<u>Only 50% of these lights were on during survey</u>						

HVAC System Type(s)

Controls

Exhaust fans (roof) Switches  
Steam unit heaters Thermostats

HVAC Control Setpoints: Temperature: NA (F); Rel. Humidity:    %

Measured Conditions: D.B. Temp.: NA (F); W.B. Temp.:    (F)

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-18-91

Building Number: 135; Process Area: Continuous Heat Treat

Description of Equipment: After Forging the tubes are heat treated by Austenitizing, quenching and tempering.

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 8 hrs / shift

Equipment O & M Schedule: N/A

Age / General Condition: good condition

Specifications: Mfg: Selas; Model No.: WV 11770

Production Rate: 75 - 100 (parts, lbs) per Month (hr, Day)

Room Temperature or Humidity Control Required: Heating

Electric Motor Drive:  Yes No; HP: \_\_\_\_\_; Voltage: \_\_\_\_\_

Pneumatic Drive:  Yes No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive:  Yes No; Pump I.D. No.: \_\_\_\_\_

Process Heat:  Yes No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling:  Yes No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: Cooling tower, pumps, exh. fans & conveyor pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: Space heating during winter  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd

DATE: 6-18-91

Building Number: 135; Process Area: Continuous Heat Treat

Notes & Comments: 4 stage, 300 ft. long, system manufact.  
by Selas.

Throughput: 105 mm \* 8 tubes/shift \* 7.5 hrs/tube

155 mm \* 4 " " \* 11+ " "

120 mm \* 3 " " \* 15 " "

Heat treat system operates 24 hours per day,  
5 days per week - starts up Sundays about 12  
midnight - start running tubes at about 6:30 am.

The 4 stages are:

1. Austenitizing
2. Quench
3. Tempering
4. Tempering

1. Austenitizing - natural gas Fired

Furnace temp ~ 1650°F (reading from control panel)

Tube temp ~ 1550°F " " " "

Has 18 rollers that are water cooled (~ 4 gpm each)

Exhausted to the roof by 30 hp fan (w/tempering<sup>3</sup>)

Has 20 hp air compressor

Possible heat recovery potential for ex. gases

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd

DATE: 6-18-91

Building Number: 135; Process Area: Continuous Heat Treat

Notes & Comments: Heat treat (continued)

2. Quench - with Water

2550 to 2700 Gpm

Uses cooling tower (WV 1172?) at South wall

2 cells - east and west

West tower not operating

East tower - reading from control panel

Ambiant air temp. = 87.2 °F db

Process outlet = 96.1 °F

Process inlet = 102.9 °F

Pan Water = 88.7 °F

2 <sup>spray</sup> pumps, 5hp <sup>m1 & m2</sup> each, one is backup

2 Fan motors, M3 & M4

3. Tempering - natural gas fired - Zones 1 - 4

30 hp air circulating fan

Exhausted with same fan as Austen. Furnace

Control Panel Readings: oven temp. ~ 1020 °F

Forging temp ~ 1010 °F

4. Tempering - electric heat - Zones 5 & 6

Temperature reading for oven ~ 1020 °F

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd

DATE: 6-18-91

Building Number: 135 ; Process Area: Continuous Heat Treat

Notes & Comments: \_\_\_\_\_

After the final tempering process the tubes are ambient air cooled on racks. When cooled a test slice is cut from the tube and subjected to material property (including Brinell hardness) tests.

Property Records Data :

WV11770 - Selas Furnace

Quench pump, 1400 gpm, 45'-50' head, 25 hp motor

Conveyor cooling water - 70 gpm

Cooling tower, 6-10 kw immersion heaters

2-3 hp spray motors

Motors: 2-30hp, 2-25hp (pumps), 1-20hp & 1-10hp

3200 gpm pump w/ 100 hp motor

650 gpm pump w/ 25 hp motor

3400 cfm compressor w/ 30 hp motor

1700 cfm compressor w/ 30 hp motor

50 gallon hydraulic unit w/ 10 hp motor

1 hp motor for each cone (conveyor) drive

BUILDING DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd

DATE: 6-18-91

Building Number: 135; Process Area: Swage

Process Area Contact: Dave Nord; Phone Extension: 5176

Process Description: After the tubes are forged, heat treated and machined - the center is swaged (work hardened) and the tube is heated to relieve the stresses.

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

List of Process Equipment:

- (1) 105 mm Swage, 115 ton pressure (WV 12520)
- (2) 120 mm Swage, 275 ton pressure (WV 10277)
- (3) 155 mm Swage, 175 ton pressure (WV 10199)
- (4) Vertical Furnace, 8 tube capacity (WV 12006)
- (5) Vertical furnace, 5 tube capacity (WV 12007)
- (6) Vertical Furnace, 8 tube capacity (WV 12008)

Expected Changes To Equipment Or Schedule: Recently changed furnace operation - now 11 pm to 11 am.

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>Swage</u>	<u>HPS</u>	<u>39</u>	<u>1</u>	<u>400</u>	<u>Multi-sw.</u>	<u>50</u>
<u>Only 50% of these lights were on during survey</u>						

HVAC System Type(s)

Controls

Exhaust Fans (wall) Switches

Steam unit heaters Thermostats

HVAC Control Setpoints: Temperature: NA (F); Rel. Humidity:    %

Measured Conditions: D.B. Temp.: NA (F); W.B. Temp.:    (F)

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-18-91

Building Number: 135; Process Area: Swage

Description of Equipment: 105mm Surge-work hardens inside of gun tube after it is machined for the first time

Schedule: Shifts/day: 1; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: \_\_\_\_\_

Equipment O & M Schedule: N/A

Age / General Condition: Good condition

Specifications: Mfg: N/A; Model No.: WV 12520

Production Rate: 3 - 8 (parts, lbs) per hr, (Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes No; HP: 47.5 (total for 2 motors); Voltage: \_\_\_\_\_

Pneumatic Drive: Yes No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes No; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F,C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: Electric heated phosphate cleaning Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: possible load - phosphate tank Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd DATE: 6-18-91

Building Number: 135 ; Process Area: Swage

Description of Equipment: 120mm Swage - work hardens inside of gun tube after the first machining operations

Schedule: Shifts/day: 1 ; Hours/Shift: 8 ; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: \_\_\_\_\_

Equipment O & M Schedule: N/A

Age / General Condition: Good condition

Specifications: Mfg: N/A ; ~~Model~~ No.: WV 10277

Production Rate: 3 - 8 (parts) lbs per hr, (Day)

Room Temperature or Humidity Control Required: NO

Electric Motor Drive: (Yes) No ; HP: 400.5 <sup>(total for 5 motors)</sup> ; Voltage: \_\_\_\_\_

Pneumatic Drive: Yes (No) ; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: (Yes) No ; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes (No) ; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr,gpm) ; Temp.: \_\_\_\_\_ (F,C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes (No) ; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm ; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: Electric heated phosphate cleaning Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: Cleaning tank is possible load  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-18-91

Building Number: 135; Process Area: Swage

Description of Equipment: 155mm Swage - work hardens inside of tube after the first machining operation

Schedule: Shifts/day: 1; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: \_\_\_\_\_

Equipment O & M Schedule: N/A

Age / General Condition: Good condition

Specifications: Mfg: N/A; Model No.: WV 10199

Production Rate: 3 - 8 (parts, ~~lbs~~) per 1 (hr, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes ~~No~~; HP: 307.5; <sup>(total for 5 motors)</sup> Voltage: \_\_\_\_\_

Pneumatic Drive: ~~Yes~~ No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes ~~No~~; Pump I.D. No.: \_\_\_\_\_

Process Heat: ~~Yes~~ No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: ~~Yes~~ No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: Electric heated phosphate cleaning tank  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: Cleaning tank is possible load  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd DATE: 6-18-91

Building Number: 135; Process Area: Swage

Description of Equipment: 8 tube, pit type Furnace (2 of these)  
78" dia x 480" deep - relieves stresses from swage

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 12 hrs/day (4 tubes)

Equipment O & M Schedule: NA

Age / General Condition: good condition

Specifications: Mfg: NA; Model No.: WV 12008  
WV 12006

Production Rate: ~ 4 (parts, lbs) per 12 (hr, Day)

Room Temperature or Humidity Control Required: \_\_\_\_\_

Electric Motor Drive:  Yes  No; HP: 7-1/2 hp motors; Voltage: 460

Pneumatic Drive:  Yes  No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive:  Yes  No; Pump I.D. No.: \_\_\_\_\_

Process Heat:  Yes  No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F,C)

Electric Input: \_\_\_\_\_ 469 (KW, ~~Watts~~)  
480V

Process Cooling:  Yes  No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Manual

Auxiliary Equipment: 7 circulating fans  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: possible load  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: Recently changed  
hours of operation - now runs 11pm to 11am

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-18-91

Building Number: 135; Process Area: Swage

Description of Equipment: 5 tube, pit type Furnace, 93" diameter x 864" deep - relieves stresses from swage

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: not frequently used

Equipment O & M Schedule: NA

Age / General Condition: good condition

Specifications: Mfg: NA; ~~Model~~ No.: WV 12007

Production Rate: NA (parts, lbs) per \_\_\_\_\_ (hr, Day)

Room Temperature or Humidity Control Required: \_\_\_\_\_

Electric Motor Drive:  No; HP: 12 - 1/2 <sup>hp motors</sup>; Voltage: 480v

Pneumatic Drive:  Yes  No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive:  Yes  No; Pump I.D. No.: \_\_\_\_\_

Process Heat:  No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F,C)

Electric Input: 942  (KW) Watts

Process Cooling:  Yes  No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: manual

Auxiliary Equipment: 12 circulating fans  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: NA  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

PROCESS DATA NOTES - WATERVLIIET ARSENAL

SURVEY BY: W. T. Todd

DATE: 6-18-91

Building Number: 135; Process Area: Swage

Notes & Comments: \_\_\_\_\_

- Process Flow:
1. Scrub inside of tube
  2. Grease inside of tube
  3. Swage
  4. Verticle Pit Type Furnace
  5. Ambient air cooled → inspected

1. Scrubbed with phosphate solution from ~100 gallon tank. Tank is heated by 5 electric elements to ~160°F or 170°F. Solution is recirculated after use. Operates 1 shift / 5 days @ 3 to 8 tubes/day.

2. Greased in same area as cleaned.

3. Swage: 3 of these - one for each size tube

105 mm (WV 12520), 115 tons pressure
120 mm (WV 10277), 275 " "
155 mm (WV 10199), 175 " "

4. Verticle pit type Furnace: 3 of these.

2ea. 8 Tube capacity (WV 12006) ~38 ft long

7 heating zones

1ea. 5 Tube capacity (WV 12007) ~72 ft long

12 heating zones - this one not used often

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd

DATE: 6-18-91

Building Number: 135; Process Area: Swage

Notes & Comments: Continued

Verticle Furnaces operate at  $\sim 675^{\circ}\text{F}$ . It takes about 3 hours to achieve that temperature and then it is maintained for another 8 hours. Usually run one Furnace per day with about 4 tubes in it. The new operating hours are 11pm to 11am.

Induction ring heaters: Only used every few years. 500 hp synchronous motor and 350 kw DC generator powers the induction coils. The coils are water cooled

Property Records Data:

WV 12006 - Pit type Furnace, 7- $\frac{1}{2}$  hp motors, 460v,  
78" Diameter x 480" deep, 469 kw, 480v

WV 12007 - Pit type Furnace, 12- $\frac{1}{2}$  hp motors, 480v,  
93" Diameter x 864" deep, 942 kw, 480v

WV 12008 - Pit type Furnace, same specs. as WV12006

**BUILDING DATA - WATERVLIET ARSENAL**

SURVEY BY: W. T. Todd

DATE: 6-19-91

Building Number: 135 ; Process Area: Machine & Inspection

Process Area Contact: Karl Cummins ; Phone Extension: 4271

Process Description: The gun tubes are machined and inspected after the continuous heat treat process and after the swage process.

Schedule: Shifts/day: 3 ; Hours/Shift: 8 ; Days/Week: 5

List of Process Equipment:

- (1) Press (WV 12270 & 9390)
- (2) Lathe (WV 12111 & 12260)
- (3) Guided Bore (WV 12177 & 11190)
- (4) Hone (WV 11640)
- (5) Chamber (WV 12289)
- (6) \_\_\_\_\_

Expected Changes To Equipment Or Schedule: None

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>Machine</u>	<u>HPS</u>	<u>142</u>	<u>1</u>	<u>400</u>	<u>Multi.Sw.</u>	<u>50</u>
<u>Machine</u>	<u>FL</u>	<u>7</u>	<u>4</u>	<u>40</u>	<u>Switch</u>	<u>50</u>

21 of the HPS lamps were not on during survey.

HVAC System Type(s)

Controls

Exhaust Fans (roof & wall)                      Switches  
Steam unit heaters                                      Thermostats

HVAC Control Setpoints: Temperature: NA (F); Rel. Humidity:     %

Measured Conditions: D.B. Temp.: NA (F); W.B. Temp.:     (F)

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-19-91

Building Number: 135; Process Area: Machining

Description of Equipment: Press (3 of these) used to straiten tubes (Before swage)

Schedule: Shifts/day: 2; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: ~1 hr per tube

Equipment O & M Schedule: NA

Age / General Condition: good condition

Specifications: Mfg: NA; Model No.: WV 12270

Production Rate: 26 (parts, lbs) per wk (~~hr, Day~~)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes No; HP: 85.3 (<sup>total for 11 motors</sup>); Voltage: \_\_\_\_\_

Pneumatic Drive: Yes No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes No; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F,C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Manual

Auxiliary Equipment: None  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: NA  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-19-91

Building Number: 135; Process Area: Machining

Description of Equipment: RD+D Hollow Spindle Lathe (5 ea.)  
(before swage)

Schedule: Shifts/day: 2; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 2 hrs per tube

Equipment O & M Schedule: NA

Age / General Condition: good condition

Specifications: Mfg: NA; Model No.: WV 12111

Production Rate: 26 (parts, lbs) per Week (hr, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes No; HP: 56.4 (total for 7 motors); Voltage: \_\_\_\_\_

Pneumatic Drive: Yes No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi (a, g)

Hydraulic Drive: Yes No; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: \_\_\_\_\_  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: NA  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd DATE: 6-19-91

Building Number: 135; Process Area: Machining

Description of Equipment: Engine Lathe for turning - 2 operations per tube (8 engine lathes available) (before swage)

Schedule: Shifts/day: 2; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 4 hrs per tube

Equipment O & M Schedule: NA

Age / General Condition: good condition

Specifications: Mfg: NA; Model No.: WV 12260

Production Rate: 26 (parts, lbs) per Week (~~hr~~, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes No; HP: ~128 (<sup>total for 22 motors</sup>); Voltage: \_\_\_\_\_

Pneumatic Drive: Yes No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes No; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F,C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: \_\_\_\_\_  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: NA  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd DATE: 6-19-91

Building Number: 135; Process Area: Machining

Description of Equipment: Guided bore lathe (6 each)  
performs 2 operations (Before swage)

Schedule: Shifts/day: 2; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 4 hours per tube

Equipment O & M Schedule: NA

Age / General Condition: good condition

Specifications: Mfg: NA; Model No.: WV 12177

Production Rate: 26 (parts, lbs) per Week (hr, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: (Yes) No; HP: 175.8 <sup>(total for 14 motors)</sup>; Voltage: \_\_\_\_\_

Pneumatic Drive: Yes (No); Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes (No); Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes (No); H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: (Yes) No; Chiller I.D. No.: WV 12177

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: small air cooled chiller  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: None  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd DATE: 6-19-91

Building Number: 135; Process Area: Machining

Description of Equipment: Hone (4 each) (before Swage)

Schedule: Shifts/day: 2; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 2 hrs per tube

Equipment O & M Schedule: NA

Age / General Condition: good condition

Specifications: Mfg: NA; Model No.: WV 11640

Production Rate: 26 (parts, lbs) per Week (~~hr, Day~~)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: (Yes) No; HP: ~115.3 <sup>(total For 10 motors)</sup>; Voltage: \_\_\_\_\_

Pneumatic Drive: Yes (No); Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes (No); Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes (No); H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes (No); Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: \_\_\_\_\_  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: None  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd DATE: 6-19-91

Building Number: 135; Process Area: Machining

Description of Equipment: Press to straiten tubes after  
swage process (1 each)

Schedule: Shifts/day: 2; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 1 hr per tube

Equipment O & M Schedule: NA

Age / General Condition: Fair condition

Specifications: Mfg: NA; Model No.: WV 9390

Production Rate: 26 (parts, lbs) per Week (hr, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive:  Yes  No; HP: ~39.5 (<sup>total for 9 motors</sup>); Voltage: \_\_\_\_\_

Pneumatic Drive:  Yes  No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive:  Yes  No; Pump I.D. No.: \_\_\_\_\_

Process Heat:  Yes  No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling:  Yes  No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Manual

Auxiliary Equipment: N/A  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: None  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd DATE: 6-19-91

Building Number: 135; Process Area: Machining

Description of Equipment: Guided Bore Lathe (2 each)  
(after swage process)

Schedule: Shifts/day: 2; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 2 hrs per tube

Equipment O & M Schedule: NA

Age / General Condition: good condition

Specifications: Mfg: NA; Model No.: WV 11190

Production Rate: 26 (parts, ~~lbs~~) per week (~~hr~~, Day)

Room Temperature or Humidity Control Required: No

Electric Motor Drive: Yes ~~No~~; HP: ~108.5; Voltage: (total for 10 motors)

Pneumatic Drive: Yes ~~No~~; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes ~~No~~; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes ~~No~~; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes ~~No~~; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: \_\_\_\_\_  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: NA  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

EQUIPMENT DATA - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd DATE: 6-19-91

Building Number: 135; Process Area: Machining

Description of Equipment: Hollow spindle lathe (4 each) for Chamber process (After swage)

Schedule: Shifts/day: 2; Hours/Shift: 8; Days/Week: 5

Peacetime Actual Operating Hours Per Shift: 2 hrs per tube

Equipment O & M Schedule: NA

Age / General Condition: good

Specifications: Mfg: NA; Model No.: WV 12289

Production Rate: 26 (parts, ~~lbs~~) per Week (~~hr~~, ~~Day~~)

Room Temperature or Humidity Control Required: \_\_\_\_\_

Electric Motor Drive: Yes  No; HP: ~61.3 (<sup>total for 15 motors</sup>); Voltage: \_\_\_\_\_

Pneumatic Drive: Yes  No; Compressor I.D. No.: \_\_\_\_\_

Air Input: \_\_\_\_\_ CFM @ \_\_\_\_\_ psi(a,g)

Hydraulic Drive: Yes  No; Pump I.D. No.: \_\_\_\_\_

Process Heat: Yes  No; H.W. or Steam from Boiler #: \_\_\_\_\_

Input: \_\_\_\_\_ (#/hr, gpm); Temp.: \_\_\_\_\_ (F, C)

Electric Input: \_\_\_\_\_ (KW, Watts)

Process Cooling: Yes  No; Chiller I.D. No.: \_\_\_\_\_

Input: \_\_\_\_\_ gpm; CHW Temp: \_\_\_\_\_ (S) \_\_\_\_\_ (R)

Process Control System: Automatic

Auxiliary Equipment: \_\_\_\_\_  
Pumps, fans, heaters, blowers, etc

Heat Recovery/Solar Potential: NA  
Accessibility, heat load nearby

Expected Changes To Equipment Or Schedule: None

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W.T. Todd

DATE: 6-19-91

Building Number: 135; Process Area: Machining

Notes & Comments: \_\_\_\_\_

Processes about 26 tubes per week

18-120 mm tubes

5 - 105 mm "

3 - 155 mm "

Process Flow

1. tubes from heat treat / air cooled

2. Press (WV 12270), 3 machines available

3. RD+D Hollow Spindle lathe (WV 12111), 5 machines

1 operation - 2 hours total

4. Turning lathe (WV 12260), 8 machines

2 operations - 4 hours total

5. Boring lathe (WV 12500, 12177, 12178), 6 machines

2 operations - 4 hours total

6. Hone (WV 11640), 4 machines

1 operation - 2 hours total

7. Inspection → Swage → Furnace → inspection

8. Press (WV 9390) 1 machine

1 operation - 1 hour total

9. Boring Lathe (WV 11190 & 12502), 2 machines

1 operation - 2 hours total

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: W. T. Todd

DATE: 6-19-91

Building Number: 135; Process Area: Machining

Notes & Comments: \_\_\_\_\_

Process Flow - continued

10. Hone (same machines as process # 6)

1 operation - 1 hour

11. Chamber (WV 12289), 4 machines

1 operation - 2 hours

12. Tubes to Building 35

Machining is a 2 shift / 5 day operation  
+ the second shift has a smaller crew.

Property Records Data:

WV 12111 - Hollow spindle lathe; motors 1-50hp, 2-2hp,  
1-1.5hp, 1-1/2hp, 1-1/4hp & 1-1/6hp

WV 12174 - Marvel Band Saw; 1-15hp & 1-1/2hp motor

WV 12177 - Guided Bore Lathe; 1-75hp, 1-40, 2-20,  
1-7.5, 1-5, 1-3, 2-1.5, 1-3/4, 2-1/2, 1-1/4 + 1-1/3

WV 12260 - Engine Lathe; 1-62kw, 3-2.2kw, 1-1/3kw, 4-5.8kw,  
2-0.16kw, 1-2.3kw, 2-1.1kw, 1-0.14kw, 1-0.75kw,  
1-3kw, 1-0.23kw, 4-0.11kw



BOILER DATA - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/20/91

Building Number: 136 ; Boiler I.D. No.: #3

Service Area or Loads: Entire Plant

Boiler Specifications: Type: Water tube, field-erected

Mfg. & Model No.: Union Iron Works

Capacity: 110,000 #/hr; Operating Pressure: 135 psi @ g

Fuel(s) Type Used: #6 / N.G. ; Input: \_\_\_\_\_

Steam produced: \_\_\_\_\_/hour; Temperature: \_\_\_\_\_ (F)

Hot water produced: - Gal/(hr, min); Temp.: \_\_\_\_\_ (F)

Stack Gas Temperature: \_\_\_\_\_ (F, C); Excess Air % \_\_\_\_\_

Boiler Efficiency: \_\_\_\_\_ %; Source: See data sheets

Burner Type: Coen, steam atomizing, dual fuel

Operation Schedule: Daily: 24h/da ; Annual: Sept-May

Percent Loaded: Summer: 0 ; Fall/Spring: 30 ; Winter: 75

Is Boiler Plant Capacity Adequate: Yes

Control System: O<sub>2</sub> trim

Maintenance Schedule: Summer

O & M Log Available:  Yes No ; Copies Obtained:  Yes No

Feed Water Preheated:  Yes No ; Chemical Treatment:  Yes No

Auxiliary Equipment: Combustion air preheat with flue gas  
(Pumps, Economizer, Scrubber, Soot Blower, Heat Recovery, Etc.)

Is Heat Recovery Possible: already exists

Condensate Return: Estimate %: 70 ; From: boiler logs

General Condition/Comments: Very good

BUILDING DATA - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins DATE: 6/20/91

Building Number: 136; Process Area: Boiler Plant

Process Area Contact: Rich Frank; Phone Extension: 5924

Process Description: Boiler Plant - operates only during heating season Sept - May

Schedule: Shifts/day: 3; Hours/Shift: 8; Days/Week: 7

List of Process Equipment: 5 BOILERS

- (1) 35,000 #/hr
- (2) " "
- (3) 110,000 "
- (4) " "
- (5) 25,000 "
- (6)

Expected Changes To Equipment Or Schedule: Boilers #1 and 2 are to be removed

Process Area Lighting Systems:

Area	Type	# Fix.	Lamp/Fix	Watts	Controls	Ft. Cd.
<u>N/A</u>						

HVAC System Type(s)

Controls

N/A

HVAC Control Setpoints: Temperature: N/A (F); Rel. Humidity:  %

Measured Conditions: D.B. Temp.: N/A (F); W.B. Temp.:  (F)

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: P. Hutchins

DATE: 6/20/91

Building Number: 136; Process Area: Boiler Plant

Notes & Comments: \_\_\_\_\_

- Boiler #3 has been recently fitted with a new burner - dual fuel, and 10:1 turn-down ratio. This change should allow this single boiler to handle the plant alone with #4 as a back up. Boiler #5 would be used only on extremely cold days.
- The only non space heat load is handled by a small natural gas boiler in Bldg. 35
- Boiler efficiency is calculated daily as a ratio of steam produced and oil used. It varies generally from 75% to 85%.
- Boiler #3 has variable speed drive on FD and ID fans
- Both NIMO recommendations ( $O_2$  trim and USD) are implemented on Boiler #3

20, 25, 35, 110, 125, 135

MOTORS LISTING

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: © Warren

DATE: \_\_\_\_\_

Building Number: \_\_\_\_\_; Process Area: Motors > 5 HP

Notes & Comments: \_\_\_\_\_

Compressors -

Cooling Towers -

Exhaust/Ventilation Fans -

Pumps (Circulation)

EXHAUST FANS > 5 HP

Bldg 25	Roof	5 HP	220 V	14 A	1750 RPM
	Roof	"	"	"	"
	Roof	"	"	"	"

Bldg 35 Basement 10 HP 220V 26.3A 1740 RPM

Bldg 135 Slurk Pit 10 HP 220V 25.6A 1750 RPM

High Bay S End 5 HP 230V 14.4A 1730 RPM (2)

So Side 125? B/Ly 110 Roof? (2) Pit(?)

COMPRESSORS

Bldg 25 Joy 7.5 HP 585 RPM GE Motor

Bldg 35 " " "

Bldg 110 N Bay Section GE Synch. 125 HP

Bldg 110 S Bay Section GE Synch 125 HP

Bldg 110 Fire Tower Wagner 7.5 HP 1750 RPM

Bldg 125 <sup>Bay A</sup> Joy 7.5 HP 585 RPM GE MOTOR

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: C. Warren

DATE: \_\_\_\_\_

Building Number: \_\_\_\_\_; Process Area: Motors > 5HP

Notes & Comments: \_\_\_\_\_

RETURN PUMPS

<u>BLDG</u>	<u>LOCATION</u>	<u>HP</u>	<u>MFG</u>
20	SW Corner	7.5	GE (2)
25	"	"	" (2)
35	Chrome Pit	5	<del>GE</del>
110	E. Side	5	GE
110	N. Tunnel Bay	5	GE (2)

Cooling Tower Bldg 134 - services 135(?)

Bldg 135

WV 12591 Cooling Tower - Tocco Furnaces

Cooling Tower W Side(?) Rotary Forge WV #?  
11700?

Heaters(?)

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: CSW

DATE: \_\_\_\_\_

Building Number: 35; Process Area: Plating Area Motors

Notes & Comments: \_\_\_\_\_

Ventilation Fans	WV 12110	Small parts
	WV 12050	Medium
	WV 11860	8" line
	<u>WV 12657</u>	

Motor List

WV 12110 Minor Component Plating System

<u>EQUIP</u>	<u>HP</u>	<u>EQUIP</u>	<u>HP</u>
Sump	5	(3) Holding Tank Pumps	10 ea
Blower	20	(3) " " "	7.5 ea
(2) Blowers	30 ea	Exhaust Fan	1.5
(2) Blowers	25 ea	" "	2.0
Fume Exhaust	10	(2) { Fume Scrubber } ea	1.0
(4) Pumps	1 ea	{ Blower " }	5.0
(5) Filter Pumps	3/4 ea	Fume Scrubber	5.0
(2) Pumps	10 ea	Blower	60
(2) Pumps	1.5 ea	{ Fume Scrubber }	3.0
(2) Pumps	inaccessible	{ Blower }	40
Exhauster	inaccessible	Fume Scrub	3.0
Chillers - 5 deg	125	Blower	60
backup	125	F.S. & Blower	1.0/10
1.5 deg	125	Fume Exhauster	25
(2) 45 deg	50 ea	" "	40
45 deg backup	50	Blower	10
Hold Tank Pumps	1.5	(3) Pumps	10 ea
(2) " " "	2.0 ea	(3) Pumps	40 ea
Blower	15	68 Blower	3

PROCESS DATA NOTES - WATERVLIET ARSENAL

SURVEY BY: CSW

DATE: 6/19

Building Number: 35; Process Area: Plating <sup>line</sup> Area Motors

Notes & Comments: Motor lists

WV 11860

<u>Equip</u>	<u>HP</u>
2	10 ea
5	5 ea

WV 12050

Pit Med. Tube Chrome Plating

<u>EQUIP</u>	<u>HP</u>
5	20 ea
1	15
<del>2</del>	<del>1.5 ea</del>
3	40 ea
1	7 ea
2	20 ea
2	5 ea
2	7.5 ea
2	3 ea
5	20 ea
4	5 ea
<del>1</del>	<del>1/2</del>
1	7.5
1	15
1	60
2	3 ea