Vapor Compressor System 60I

Tank Farm Maintenance Procedure
Effluent Treatment Facility

USQ Not Required – ETF is a < Hazard Category 3 Radiological Facility

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1.0 INTRODUCTION

1.1 Purpose

This procedure provides instructions for inspection and maintenance of the Vapor Compressor System 60I.

1.2 Scope

This procedure applies to the vapor compressor and associated equipment including:

- Vapor compressor, 60I-C-01, model 1821 RGS-JV roots dresser Whispair™ rotary lobe blower
- Speed reducer, Lufkin model S127CH parallel shaft, serial no. 10218
- Couplings, motor-to-gear (Falk Steelflex® size 1100T10); gear-to-compressor (Falk Steelflex size 1120T31)
- Lube oil cooler, compressor; 60I-C-01C, American Standard® model HCF heat exchanger
- Lube oil filter, compressor; HILCO® hyflow duplex, HILCO #518-150-1D
- Lube oil filter, gear reducer; Lufkin #M-3230.

2.0 INFORMATION

None.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Lock and tag protects personnel from the unexpected release of hazardous energy or materials. Under these circumstances, lock and tag is required in accordance with procedure DOE-0336, Hanford Site Lockout/Tagout Procedure.

3.2 Radiation and Contamination Control

3.2.1 Work in radiological areas will be performed using a radiological work permit following review by Radiological Control per ALARA Work Planning procedure, TFC-ESHQ-RP_RWP-C-03.

3.3 Environmental Protection

3.3.1 In the event of a spill/leak/release, notify the SOM/FWS and respond per ETF-ERP-85B-003, Emergency Spill or Release at ETF.
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:

- Mobil DTE™ heavy ISO 100 for roots compressor, 19.5 gallons
- ExxonMobil Mobilgear™ 600 XP220 gear lube or equivalent for Lufkin gear reducer, 9.0 gallons
- Waste oil container(s)
- Oil drain hose (approx. 20 feet) and fitting(s) for connection to 1-inch NPT-M nipple
- Oil filter cartridges and gaskets for roots compressor:
  - Two filter (one per side), HILCO No. PL-518-10-C (Cat ID 556828)
  - Two gasket (one per side), HILCO No. FB-875-5 (Cat ID 556824)
  - Two seal washer (one per side), HILCO No. 0412-03-001 (Cat ID 663982).
- Oil filter cartridge and gaskets for gear reducer:
  - 40 micron, Lufkin part no. E7079408
  - O-ring – 4 ½ x 4 ¾ x ⅛, Lufkin part no. E9048348 (Cat ID 685138 or 667930).
- Gasket for gear reducer inspection cover, Lufkin part no. AP073935 (Cat ID 667934)
- Vapor compressor expansion joint gaskets: black neoprene ⅛ inch thick, approximately four square yards
- Chevron SRI #2 for coupling lubricant and motor bearings
- Grease gun
- Grease fitting, ¼-inch NPT-M
- Two pencil zinscs, ½-inch PT, 1-¾ inch long, ITT standard part no. 3-386-9-04-101-02
- One vapor compressor gearbox (sump) cover plate gasket, part no. 25-949-011 (Cat ID 556822)
- Protective gear per RWP
- See PM data sheet for specific materials required for performance of each PM.
4.2 Performance Documents

The following documents may be needed to perform this procedure:

- DOE-0336, Hanford Site Lockout/Tagout Procedure.

4.3 Field Preparations

4.3.1 (Operations) CONFIGURE system or equipment to allow performance of this procedure.

4.3.2 BEFORE taking lubricants into radiological areas or removing/draining lubricants from equipment in radiological areas, NOTIFY HPT.
5.0 PROCEDURE

Special Instructions

Sections of this procedure may be performed in any logical order, out of sequence, or in parallel depending on the inspection (monthly, quarterly, semi-annual, or annual).

5.1 Monthly (30 Day) Maintenance

NOTE - Frequencies and associated hours for maintenance and inspection activities identified below are based on manufacturers’ recommendations. Actual frequencies may be adjusted based on operating cycles, experience, and machinery history as it is developed.

Gear Reducer

5.1.1 OBTAIN oil sample from bottom of gear reducer AND VISUALLY INSPECT for contamination.

5.1.2 RECORD observations on PM Data Sheet.

5.1.3 IF oil shows any signs that may indicate abnormal gear wear, NOTIFY responsible engineer for further direction AND RECORD direction on PM Data Sheet.

NOTE – Oil does not need to be added if oil is being changed as part of the semi-annual maintenance.

5.1.4 CHECK oil level of gear reducer AND IF oil is low, ADD oil to \( \frac{1}{2} \) mark.

5.1.5 RECORD the following on PM Data Sheet:

- Amount of oil added
- As-left level.
5.1 Monthly (30 Day) Maintenance (Cont.)

Vapor Compressor

5.1.6 OBTAIN oil sample from compressor AND VISUALLY INSPECT for contamination.

5.1.7 RECORD observations on PM Data Sheet.

5.1.8 IF oil shows any signs that may indicate abnormal compressor wear, NOTIFY responsible engineer for further direction AND RECORD direction on PM Data Sheet.

NOTE – Oil does not need to be added if oil is being changed as part of the semi-annual maintenance.

5.1.9 CHECK oil level of gear reducer AND IF oil is low, ADD oil to ½ mark.

5.1.10 RECORD the following on PM Data Sheet:
• Amount of oil added
• As-left level.

5.1.11 INSPECT compressor and associated equipment/piping for the following:
• General condition
• Leaks
• Possible problems.

5.1.12 RECORD observations on PM Data Sheet.

5.1.13 IF performing monthly maintenance only, GO TO Section 5.6.
5.2 Quarterly (92 Day) Maintenance

**Vapor Compressor**

5.2.1 APPLY lock and tag per DOE-0336.

5.2.2 SHUT DOWN auxiliary oil pump 60I-P-7.

5.2.3 CONNECT drain hose to oil drain valve AND DRAIN oil (expected volume is 19 to 20 gallons).

5.2.4 REPLACE in-service oil filter cartridges in duplex filter.

5.2.5 IF seal washer needs to be replaced, REPLACE seal washer.

NOTE – Oil does not need to be added if oil is being changed as part of the annual maintenance.

5.2.6 IF performing this section as part of Annual (365 Day) maintenance, GO TO Section 5.3.

5.2.7 CHECK oil level of gear reducer AND

IF oil is low, ADD oil to $\frac{1}{2}$ mark.

5.2.8 WHEN vapor compressor is returned to normal operation, REFILL new oil through breather pipe to $\frac{1}{2}$ mark.

5.2.9 IF performing quarterly maintenance only, GO TO Section 5.6.
5.3 Annual (365 Day) Maintenance

Vapor Compressor

5.3.1 APPLY lock and tag per DOE-0336.

5.3.2 SHUT DOWN auxiliary oil pump 60I-P-7.

5.3.3 REMOVE gear-to-compressor coupling guard.

5.3.4 REMOVE compressor oil sump cover plate.

5.3.5 INSPECT oil sump AND RECORD observations on PM Data Sheet.

5.3.6 CLEAN oil sump and strainer screen connected to oil suction line as determined by craft.

5.3.7 REINSTALL oil sump cover using new gasket if needed.

5.3.8 ADD new oil to \( \frac{1}{2} \) mark on vapor compressor oil level.
5.3 Annual (365 Day) Maintenance (Cont.)

**Gear Reducer**

5.3.9 **DRAIN** oil from gear reducer (expected volume is approximately nine gallons).
5.3.10 **FLUSH** with small amount of new oil until discharge runs clean.
5.3.11 **REMOVE** inspection cover AND
**INSPECT** interior gears for signs of abnormal wear.
5.3.12 **RECORD** observations on PM Data Sheet.
5.3.13 **IF** there is any indication of abnormal wear on gears, **NOTIFY** FWS for direction AND
**RECORD** FWS direction on PM Data Sheet.
5.3.14 **REPLACE** oil filter cartridge.
5.3.15 **REPLACE** inspection cover using new gasket, if needed.
5.3.16 **ADD** new oil to $\frac{1}{2}$ mark.

**Couplings, Motor-to-Gear, and Gear-to-Compressor**

NOTE - Steps 5.3.17 through 5.3.21 are to be completed for each coupling.
5.3.17 **REMOVE** coupling guard.
5.3.18 **REMOVE** both pipe plugs AND
**INSERT** grease fitting in one hole.
5.3.19 **FILL** with grease until grease starts to come out of other hole.
5.3.20 **REMOVE** grease fitting AND
**REINSTALL** both pipe plugs.
5.3.21 **REINSTALL** coupling guard.
5.3.22 **REPEAT** steps 5.3.17 through 5.3.21 for each coupling AND
**RECORD** completion on PM Data Sheet.
5.3 **Annual (365 Day) Maintenance (Cont.)**

**Motor Lubrication**

5.3.23 **CLEAN** grease or dirt around the following:
- Grease inlet plug
- Drain pipe.

5.3.24 **REMOVE** the following:
- Grease drain pipe
- Plug.

5.3.25 **ADD** grease to inlet until small amount of grease is forced out drain.

5.3.26 **CLEAN** off any excess grease.

5.3.27 **REMOVE** lock and tag per DOE-0336.

5.3.28 **RUN** motor for \( \frac{1}{2} \) hour.

5.3.29 **APPLY** lock and tag per DOE-0336.

5.3.30 **STOP** motor **AND**

**CLEAN** expelled grease from drain hole.

5.3.31 **CLEAN** old grease from drain pipe **AND**

**REPLACE** drain pipe and plug.

5.3.32 **IF** performing annual maintenance only, **GO TO** Section 5.6.

**Return to Normal Operation**

5.3.33 **WHEN** vapor compressor is returned to normal operation, **REFILL** new oil through breather pipe to \( \frac{1}{2} \) mark.
5.4 Task on Demand Maintenance

**Vapor Compressor**

NOTE - The following steps should be accomplished after oil has been drained and before reinstallation of sump cover to ensure any dropped tools can be readily retrieved.

5.4.1 APPLY lock and tag per DOE-0336.

5.4.2 SHUT DOWN auxiliary oil pump 60I-P-7.

5.4.3 REMOVE inlet and outlet expansion joints to perform inspection.

5.4.4 INSPECT internals of compressor for signs of the following AND RECORD observations on PM Data Sheet:
   - Wear
   - Erosion
   - Corrosion
   - Scale build-up.

**Special Instructions**

There are two front and two back clearances in each revolution. Refer to Figure 1 for a visual explanation of these dimensions. Wedges, as shown in Figure 1, or manual restraint, must be used to prevent shaft rotation while measuring clearances.

5.4.5 INSTALL wedges,

   OR

5.4.6 MEASURE clearances as listed on work record AND RECORD as-found dimensions on PM Data Sheet.

5.4.7 IF any clearances are outside expected range, NOTIFY FWS for direction AND RECORD FWS direction on PM Data Sheet.

5.4.8 REMOVE any installed temporary restraints.
5.4 Task on Demand Maintenance (Cont.)

5.4.9 **INSPECT** the following to ensure no tools or materials remain in compressor:
- Internals
- Sump.

5.4.10 **RECORD** inspection results on PM Data Sheet.

5.4.11 **IF** replacements gaskets are unavailable, **CUT** the following from $\frac{1}{8}$-inch neoprene gasket material:
- Two full-face gaskets for compressor side of each bellow
- Two partial-face (inside bolt circle) gaskets for silencer side of each bellow.

5.4.12 **USE** new gaskets **AND** **REINSTALL** expansion joints.

5.4.12.1 **EVENLY TIGHTEN** fasteners to maintain flange faces parallel until gaskets are slightly extruded.

**Lube Oil Cooler**

5.4.13 **CLOSE** cooling water supply and return valves.

**NOTE** - Lube oil cooler can be drained via drain valve at PI-60I-149 or by removing plugs on end of cooler.

5.4.14 **DRAIN** cooling water from lube oil cooler.

5.4.15 **REMOVE** pipe plugs (two) located on end of cooler opposite cooling water inlet/outlet lines.

**NOTE** - Thread sealant is not to be used when threading zinc corrosion eliminators in plugs or when replacing plugs in lube oil cooler.

5.4.16 **INSPECT** zinc corrosion eliminators and scrap to bright finish,

**OR**

**IF** less than 50% original size, **REPLACE**.

5.4.17 **IF** zinc corrosion eliminators were cleaned or replaced, **RECORD** on PM Data Sheet.
5.4 Task on Demand Maintenance (Cont.)

5.4.18 REINSTALL plugs with zinc corrosion eliminators in cooler.

5.4.19 OPEN cooling water isolation valves AND FILL cooler.

5.4.20 CHECK for leaks AND REPAIR found leaks.

5.4.21 IF performing annual maintenance only, GO TO Section 5.6.

5.5 Maintenance and Inspections During Layup

NOTE - Performance of Section 5.5 is recommended monthly during layup.

5.5.1 APPLY lock and tag per DOE-0336.

5.5.2 REMOVE vapor compressor-to-gear reducer coupling guard.

5.5.3 ROTATE coupling 1-⅞ turns using strap wrench or similar tool that will not damage coupling.

5.5.4 NOTE any abnormal conditions.

5.5.5 IF abnormal conditions are observed, CONTACT FWS for directions.

5.6 Restoration

5.6.1 RESTORE to as-found conditions.

5.6.2 INFORM SOM test is complete and instrument/equipment/system may be returned to service.

5.6.3 IF lock and tag was installed, REQUEST its removal.
5.7 Acceptance Criteria

5.7.1 ENSURE lock and tag is removed.

5.7.2 OPERATE vapor compressor.

5.7.3 WHEN vapor compressor is operating, or has been operated, INSPECT the following for evidence of leakage:
- Sump cover gasket
- Drain plugs
- Any other joint disturbed by this procedure.

5.7.4 INITIATE action required to correct any leakage.

5.8 Review

5.8.1 INFORM FWS test is complete.

5.8.2 (FWS) REVIEW AND ENSURE the following:
- Completed data sheets meet the acceptance criteria
- Comments sections are filled out appropriately
- Work requests needed as a result of this procedure are identified and generated
- Work request number(s) of any work documents generated as a result of this procedure, are recorded in the Comments/Remarks section of the data sheet.

5.9 Records

This procedure is performed within a work package, as such, the procedure in its entirety will be maintained as a record per the Work Control process.

The record custodian identified in the Company Level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Figure 1 - Front and Back Clearance

FRONTS
Feeler
Blade

Wedge

0 - 90

BACKS