Evaporator Systems Infrequent Operation

Tank Farm Plant Operating Procedure Effluent Treatment Facility

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

<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
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<tr>
<td>A-3</td>
<td>06/07/2018</td>
<td>Field walkdown</td>
<td>Correct component ID. Minor formatting.</td>
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<tr>
<td>A-2</td>
<td>03/22/2018</td>
<td>Process Improvement</td>
<td>Update to log book references and records section. Small removal of pump references in Section 1. Added performance documents to section. Update to step 3.2.5. Update to special instructions regarding dashes in procedure. Updated multiple steps within procedure to come into current work process.</td>
</tr>
<tr>
<td>A-1</td>
<td>12/05/2017</td>
<td>Incorporation of PER #WRPS-2016-2182</td>
<td>Incorporation of New RadCon statement</td>
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<td>A-0</td>
<td>06/01/2016</td>
<td>Converting to WRPS Format</td>
<td>New Procedure; Developed from those sections of ETF-PRO-OP-51536 (POP-60I-003) covering infrequent operations of the ETF Evaporator System</td>
</tr>
</tbody>
</table>

Table of Contents

1.0 PURPOSE AND SCOPE........................................................................................................3
   1.1 Purpose........................................................................................................................3
   1.2 Scope..........................................................................................................................3

2.0 INFORMATION......................................................................................................................3
   2.1 Terms and Definitions.................................................................................................3

3.0 PRECAUTIONS AND LIMITATIONS..................................................................................4
   3.1 Personnel Safety.........................................................................................................4
   3.2 Equipment Safety.......................................................................................................4
   3.3 Radiation and Contamination Control.......................................................................4
   3.4 Environmental Compliance .....................................................................................4

4.0 PREREQUISITES ................................................................................................................5
   4.1 Special Tools, Equipment, and Supplies....................................................................5
   4.2 Performance Documents............................................................................................5
   4.3 Field Preparations......................................................................................................5

5.0 PROCEDURE........................................................................................................................6
   5.1 Boiler Layup ...............................................................................................................6
   5.2 Pump 60I-P-06 Toshiba Speed Control ......................................................................8
   5.3 Manual Vapor Compressor Operation ......................................................................9

Type: CONTINUOUS  Document No.: ETF-60I-004  Rev/Mod: A-3  Release Date: 06/07/2018  Page: 1 of 29
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4</td>
<td>Feed/Distillate Heat Exchanger 60I-E-02 Feed Bypass</td>
</tr>
<tr>
<td>5.5</td>
<td>Manual Operation of 60I-P-2</td>
</tr>
<tr>
<td>5.6</td>
<td>Manual Operation of 60I-P-2 and 60I-P-4 Pumps</td>
</tr>
<tr>
<td>5.7</td>
<td>Unplug/Flush Vapor Body Drain Line Using Verification Water</td>
</tr>
<tr>
<td>5.8</td>
<td>Unplug/Flush Concentrate Transfer Line Drain Using Verification Water</td>
</tr>
<tr>
<td>5.9</td>
<td>Run Vapor Compressor without Distillate Injection</td>
</tr>
<tr>
<td>5.10</td>
<td>Add Liquid to Evaporator via Drum Pump</td>
</tr>
<tr>
<td>5.11</td>
<td>Break Loose Concentrate Dump Line Plug</td>
</tr>
<tr>
<td>5.12</td>
<td>Flush Pump 60I-P-4 Concentrate Circulation Loop</td>
</tr>
<tr>
<td>5.13</td>
<td>Drain Concentrate Circulation Pump 60I-P-4</td>
</tr>
<tr>
<td>5.14</td>
<td>Operation without Concentrate Pump 60I-P-4</td>
</tr>
<tr>
<td>5.15</td>
<td>Operate Evaporator with Plugged Concentrate Return Header</td>
</tr>
<tr>
<td>5.16</td>
<td>Records</td>
</tr>
</tbody>
</table>
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides for infrequent operation of the evaporator systems at ETF.

1.2 Scope

Infrequent operation include: boiler layup; 60I-P-06 Toshiba speed control; manual vapor compressor operation; feed/distillate heat exchanger 60I-E-02 feed bypass; manual operation of 60I-P-2 and 60I-P-4 pumps; unplug/flush vapor body drain line using verification water; unplug/flush concentrate transfer line drain using verification water; run vapor compressor without distillate injection; add liquid to evaporator via drum pump; break loose concentrate dump line plug; flush pump 60I-P-4 concentrate circulation loop; drain concentrate circulation pump 60I-P-41; operation without concentrate pump 60I-P-4; operate evaporator with plugged concentrate return header.

2.0 INFORMATION

2.1 Terms and Definitions

- AOV – Air Operated Valve
- CT - Concentrate Tank
- SWRT - Secondary Waste Receiving Tank.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Cotton, leather, or equivalent gloves shall be worn while operating evaporator or boiler components.

3.2 Equipment Safety

3.2.1 Vapor compressor 60I-C-1 is limited to one hour minimum intervals between starts to avoid motor winding overheating.

3.2.2 The vapor compressor must not be restarted until it has completely stopped rotating.

3.2.3 Unusual noise or vibration that occurs while starting the vapor compressor may indicate compressor problems. The compressor will need to be put in HOT STANDBY or SHUTDOWN to investigate cause.

3.2.4 Vapor compressor must be verified drained, via 60I-300, before startup.

3.2.5 The temperature of the vapor compressor discharge must be maintained below the THX-60I137 setpoint of 275F.

3.2.6 The temperature of CT (60J-TK-1A) or [60J-TK-1B] must be maintained at less than 176°F.

3.3 Radiation and Contamination Control

3.3.1 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.

3.3.2 When disconnecting, breaching or opening systems or system components that currently contain or previously contained radioactive material, the following actions apply:
  • HPT coverage is required
  • Pre-job and post-job HPT surveys are required
  • Contamination controls shall be implemented in accordance with ETF-02-001, until radiological verifications have been performed.

3.4 Environmental Compliance

3.4.1 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:

- Long-sleeved shirt
- Bucket for boiler sight glass blowdown
- Portable radio for communication between secondary operator and Control Room
- PPE identified per task-specific JHA (Section 5.10).

4.2 Performance Documents

The following documents may be needed to perform this procedure:

- ETF-45D-001, Vessel Off-Gas Operation
- ETF-60H-001, Verification Operation
- ETF-60I-003, Evaporator System Operation
- ETF-95B-001, Seal Water System Operation
- ETF-95C-001, Cooling Water System Operation
- TFC-OPS-OPER-C-17, Operating Logbooks.

4.3 Field Preparations

4.3.1 PRIOR to performing Section 5.10, Add Liquid to Evaporator via Drum Pump, EVALUATE need to perform a JHA based on chemical reagents or other liquids to be pumped.
5.0 **PROCEDURE**

**Special Instructions**

Tasks in this procedure may be performed concurrently and repeated or out of order unless specifically noted before that task.

Unless otherwise stated, evaporator control is from graphic EVAP.

The use of ( ) and [ ] to offset numbers represents the same valve, different SWRTs; i.e., (A) and [B].

Dash placement in valve numbers is not consistent and may differ dependent on whether the user is looking at the valve in the field or on the MCS. See approved deviations in TFC-ENG-STD-12, Tank Farm Equipment Identification Numbering and Labeling Standard.

When switching from MANUAL to AUTO, control valve setpoints will take on the current process value (i.e., equal to output value) of the controller while the system is in MANUAL. After returning the controller to AUTO, it is necessary to re-enter the NORMAL operating setpoint for AUTO operation.

When local pilot switch is ON, evaporator boiler can be started and stopped locally (push button) or remotely (MCS on graphic EVAP).

5.1 **Boiler Layup**

**Special Instructions**

SOE performs Section 5.1 unless otherwise noted. Special personnel to perform steps within this section will be labeled accordingly.

5.1.1 **ENSURE** boiler has been shut down per ETF-60I-003.

5.1.2 **CHECK** no steam is issuing from V-PI-60I152-B, brass vent valve, on pressure sensor manifold.

5.1.3 **LOCALLY OPEN** the following valves to vent and drain:

- 60I-213, Boiler Blowdown
- 60I-213B, LSLL Drain
- 60I-216, LSL Drain
- 60I-208, Steam Trap Bypass
- 60I-211, Sight Glass Drain (drain to Sump 1 using bucket)

5.1.4 (NCO) **LOCALLY OPEN** 60I-140, steam trap by-pass.
5.1 **Boiler Layup (Cont.)**

5.1.5 (Maint.) **OBTAIN** a bucket or other suitable container **AND**

**PLACE** under 60I-204, steam trap by-pass.

5.1.6 (Maint.) **REMOVE** cap from 60I-204, steam trap bypass, **AND**

**OPEN** 60I-204 to **DRAIN** liquid into bucket.

5.1.7 **WHEN** liquid has finished draining, **REPLACE** cap on 60I-204 steam trap strainer blowdown.

5.1.8 **OBTAIN** a bucket or other suitable container **AND**

**PLACE** under 60I-206, steam trap strainer blowdown.

5.1.9 **REMOVE** cap from 60I-206, steam trap strainer blowdown, **AND**

**DRAIN** liquid into bucket.

5.1.10 **WHEN** liquid has finished draining, **REPLACE** cap on 60I-206 steam trap strainer blowdown.

5.1.11 **PLACE** bucket under strainer for 60I-141 steam trap.

5.1.12 **REMOVE** strainer blowdown plug to drain liquid.

5.1.13 **WHEN** liquid has finished draining, **REPLACE** plug on 60I-141 strainer.

5.1.14 **DUMP** purge water in Sump 1 or sample prep room sink.

5.1.15 (Maint.) **PLACE** evaporator boiler in LAYUP:

5.1.15.1 **REMOVE** lower element assembly.

5.1.15.2 **WASH OUT** vessel with raw water.

5.1.15.3 **DRY** vessel with clean rags.

5.1.15.4 **IF** requested by Engineering, **PLACE** silica gel bags in bottom of vessel.
5.2 Pump 60I-P-06 Toshiba Speed Control

Special Instructions

If local “Panel Control” is selected for Toshiba inverter, then shutoff of 60I-P-06 pump must be done locally. If “Remote Control” is selected, then shutoff of pump will be automatic.

NOTE - The speed of pump 60I-P-06 may be set anywhere between 0 to 80 Hz in “Panel Control” mode. The speed setting has traditionally been set at 40.0 Hz. If excessive pumping time is required to drain inlet silencer, then pump speed may need to be increased.

5.2.1 ENSURE evaporator is not in RUN mode or HOT STANDBY.

5.2.2 IF directed by SOM, SELECT CTRL at inverter keypad (local) until green LED light indicates (flashes) for “Panel Control.”

5.2.3 IF directed by SOM, LOCALLY KEY IN desired pump speed (Hz) AND SELECT WRT.

5.2.4 IF inverter is in local “Panel Control” and

IF shutoff of 60I-P-06 pump is desired, SELECT STOP on inverter keypad (local).

NOTE - The only pump speed currently available in “Remote Control” mode is 40 Hz.

5.2.5 IF “Remote Control” is desired for 60I-P-06, ENSURE 60I-P-06 is stopped AND

SELECT CTRL on inverter keypad (local) until green LED light indicates “Remote Control.”

5.2.6 IF SOM direction provided, RECORD in ETF Control Room Logbook.
5.3 Manual Vapor Compressor Operation

NOTE - Section 5.3 allows periodic start of vapor compressor for troubleshooting start sequence and cycling during extended layup. It is intended to operate vapor compressor for two to three minutes only; longer operations is performed only with Engineering direction.

5.3.1 ENSURE boiler has been shut down per ETF-60I-003.

5.3.2 ENSURE the following valves are CLOSED:
   • 60I-317
   • 60I-202
   • 60I-293
   • 60I-200.
   • 60I-350
   • 60I-351
   • 60I-352
   • 60I-353.

5.3.3 IF no Rad-Catch container is in place, OBTAIN Rad-Catch container AND PLACE under 60I-300.

NOTE - 60I-300 may need to be cycled OPEN/CLOSED to empty Rad-Catch container during silencer training.

5.3.4 DRAIN inlet silencer using 60I-300 valve AND LEAVE 60I-300 valve OPEN.

5.3.5 SET PCV109 (PIC60I109A) in MANUAL at 100% output OPEN.

5.3.6 ENSURE FCV124 (HIC-60I-124) is in MANUAL at 100% OPEN.

5.3.7 ENSURE PCV-60I-152 is CLOSED.

5.3.8 ENSURE 60I-P-07, auxiliary oil pump, is in AUTO.

5.3.9 ENSURE LIC60I108 is in MANUAL/CLOSED.

5.3.10 ENSURE 60I-P-07, auxiliary oil pump, is operating.

5.3.11 ENSURE 60I-P-3, distillate flash tank pump, is in MANUAL/START.

5.3.12 ENSURE 60I-P-06, silencer drain pump, is in MANUAL/START.
5.3 Manual Vapor Compressor Operation (Cont.)

Special Instructions

Vapor compressor must not be allowed to fill with distillate injection water. To prevent this from occurring, vapor compressor must be started promptly after distillate injection water flow is established.

5.3.13 OPEN AOV60I194 in MANUAL/OPEN.

5.3.14 THROTTLE valve 60I-290 to set distillate injection rate to vapor compressor to 1.0 gpm.

5.3.15 ENSURE AOV60I262 is in MANUAL/OPEN.

5.3.16 PLACE 60I-C-1, vapor compressor, in MANUAL.

5.3.17 IMMEDIATELY START vapor compressor for 2 minutes AND SHUTDOWN vapor compressor.

5.3.18 RE-ALIGN system to original configuration or per Process Memo/SOM.

5.3.19 REMOVE any contents of Rad-Catch container in sump or sample prep room sink.

5.4 Feed/Distillate Heat Exchanger 60I-E-02 Feed Bypass

Special Instructions

At SOM direction, feed/distillate heat exchanger may be bypassed on feed side to increase feed rate. Added boiler steam will likely be required to prevent shutdown on low vapor body pressure due to cold feed.

5.4.1 ENSURE evaporator is in RUN and at steady state.

5.4.2 THROTTLE OPEN 60I-156, feed/distillate heat exchanger feed bypass valve.

5.4.3 IF directed by SOM, CLOSE valve 60I-156 to return system to normal configuration.
5.5 **Manual Operation of 60I-P-2**

NOTE - Section 5.5 allows for periodic start of 60I-P-2 during extended layup. It is intended to operate 60I-P-2 for at least 30 minutes per day to prevent any excessive compaction of settled CaSO₄ solids in the evaporator from groundwater processing.

5.5.1 **ENSURE** LIC-60I107, vapor body level, is between 27 and 38%.

5.5.2 **ENSURE** seal water is in operation per ETF-95B-001.

5.5.3 **ENSURE** seal water inlet 60I-264 is OPEN.

5.5.4 **THROTTLE** FIC-60I-805 to establish seal water flow rate of 148 – 152 gph.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Component</th>
<th>Flow Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIC-60I-805</td>
<td>60I-P-2 Recirc Pump Seal Water Return Flow</td>
<td>148 to 152 gph</td>
</tr>
</tbody>
</table>

5.5.5 **PLACE** PCV109 (PIC60I-109A) in MANUAL with output at 100% OPEN.

5.5.6 **CRO PLACE** pump 60I-P-2 in MANUAL/START.

5.5.7 **OPERATE** pump 60I-P-2 for at least 30 minutes per day, or as specified by SOM.

5.5.7.1 **IF** SOM direction provided, **RECORD** in ETF Control Room Logbook.

5.5.8 **CRO PLACE** pump 60I-P-2 in STOP.

5.5.9 **CLOSE** seal water inlet 60I-264.

5.5.10 **CLOSE** FIC-60I-805.
5.6 Manual Operation of 60I-P-2 and 60I-P-4 Pumps

NOTE - Section 5.6 allows for periodic start of 60I-P-2 and P-4 pumps during extended layup. This section is intended to operate 60I-P-2 and P-4 pumps at least 30 minutes per day to prevent any excessive compaction of settled CaSO₄ solids in evaporator.

5.6.1 ENSURE LCV107 (LIC-60I107), evaporator vapor body level, is between 27 and 38%.

5.6.2 ENSURE seal water is in OPERATION.

5.6.3 ENSURE 60I-264 OPEN.

5.6.4 ENSURE cooling water is in OPERATION.

5.6.5 ENSURE water flow rates established as follows, per ETF-95B-001 and ETF-95C-001:

<table>
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<tr>
<th>Indicator</th>
<th>Component</th>
<th>Flow Rate</th>
</tr>
</thead>
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<tr>
<td>FI-95C083</td>
<td>Evaporator Combined Pump Cooling Water</td>
<td>Greater than 3.5 gpm</td>
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<tr>
<td>FI-95C044</td>
<td>Evaporator Vent Gas Cooler Cooling Water</td>
<td>70 to 75 gpm</td>
</tr>
<tr>
<td>FIC-60I-805</td>
<td>60I-P-2 Recirc Pump Seal Water Return Flow</td>
<td>148 to 152 gph</td>
</tr>
</tbody>
</table>

5.6.6 ENSURE pump seal water pressures as follows, per ETF-95B-001:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Component</th>
<th>Pressure, psig</th>
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<tr>
<td>PI-95B-004</td>
<td>Recirculation Pump Seal Water</td>
<td>19 to 25</td>
</tr>
<tr>
<td>PI-95B-015</td>
<td>Concentrate Pump Seal Water</td>
<td>21 to 35</td>
</tr>
</tbody>
</table>

5.6.7 ENSURE the following valves are OPEN:
- 60I-182
- 60I-185
- 60I-179
- 60I-177
- 95B-112.

5.6.8 PLACE valve AOV-60I108 in AUTO.

5.6.9 PLACE PCV109 (PIC-60I-109A) in MANUAL with 100% output (OPEN).
5.6 Manual Operation of 60I-P-2 and 60I-P-4 Pumps (Cont.)

5.6.10 **PLACE** pump 60I-P-2 in MANUAL/START.

5.6.11 **PLACE** pump 60I-P-4 in MANUAL/START.

5.6.12 **OPERATE** the following pumps for at least 30 minutes per day:
- 60I-P-2
- 60I-P-4.

5.6.13 **PLACE** pump 60I-P-2 in STOP.

5.6.14 **PLACE** pump 60I-P-4 in STOP.

5.6.15 **CLOSE** the following valves:
- 60I-264
- 95B-112
- FIC-60I-805.

5.7 Unplug/Flush Vapor Body Drain Line Using Verification Water

5.7.1 **ENSURE** 60I-183, vapor body drain valve, is CLOSED.

5.7.2 **OPEN** 60I-246, verification water flush valve.

5.7.3 **OPEN** 60I-329, verification water flush valve.

5.7.4 **OPEN** 60I-328, vapor body drain valve, for five to ten seconds, **THEN CLOSE**.

5.7.5 **IF** 60I-328, vapor body drain valve, is still plugged, **REPEAT** Step 5.7.4 until 60I-328 is unplugged.

5.7.6 **OPEN** 60I-183, vapor body drain valve, for five to ten seconds, **THEN CLOSE**.

5.7.7 **IF** 60I-183, vapor body drain valve, is still plugged, **REPEAT** Step 5.7.6 until 60I-183 is unplugged.

5.7.8 **CLOSE** 60I-183, vapor body drain valve.

5.7.9 **CLOSE** 60I-329, verification water flush valve.

5.7.10 **MOMENTARILY OPEN** 60I-328, drain valve, **THEN CLOSE**.

5.7.11 **CLOSE** 60I-246, verification water flush valve.
5.8 Unplug/Flush Concentrate Transfer Line Drain Using Verification Water

5.8.1 ENSURE 60I-302, concentrate transfer line drain valve, is CLOSED.

5.8.2 OPEN 60I-246, verification water flush valve.

5.8.3 OPEN 60I-303, verification water flush valve.

5.8.4 OPEN 60I-301, concentrate transfer line drain valve, for five to ten seconds THEN CLOSE.

5.8.5 IF 60I-301, concentrate transfer line drain valve, is still plugged, REPEAT Step 5.8.4 until 60I-301 is unplugged.

Special Instructions

Verification water pressure is approximately 90 psig. It is necessary to keep the pressure indicated at PI-60I134 at less than 25 psi above seal water pressure indicated at PI-95B015 to prevent damaging 60I-P-4 pump mechanical seal. This may require throttling valve 60I-302 during Step 5.8.6.

5.8.6 OPEN valve 60I-302 for five to ten seconds AND PERFORM the following:

5.8.6.1 THROTTLE to keep pressure indicated at PI-60I134 less than 25 psi above seal water pressure indicated at PI-95B015.

5.8.6.2 CLOSE valve.

5.8.7 IF valve 60I-302 is still plugged, REPEAT Step 5.8.6 until 60I-302 is unplugged.

5.8.8 CLOSE 60I-303, verification water flush valve.

5.8.9 MOMENTARILY OPEN 60I-301, drain valve, THEN CLOSE.

5.8.10 CLOSE 60I-246, verification water flush valve.
5.9 Run Vapor Compressor without Distillate Injection

NOTE - Running the vapor compressor without distillate injection will produce a compressed vapor that is higher in temperature and superheated.

- The vapor compressor can be run without distillate injection as long as the compressed vapor temperature high alarm of 275°F (TAHX-60I137) or vapor temperature differential high alarm of 50°F (TDAH-60I139) is not exceeded.

- Removal of distillate injection water will eliminate compressed steam desuperheating. This may decrease heat transfer and, as a result, some loss of evaporator production rate may occur.

5.9.1 ENSURE evaporator is not in RUN mode.

5.9.2 ON graphic EVAP, SET toggle “FSL60I145 DISABLED” to ON.

5.9.3 CLOSE 60I-290, distillate injection valve.

5.9.4 IF re-establishing distillate injection, PERFORM the following:

5.9.4.1 ENSURE evaporator is not in RUN mode.

5.9.4.2 ON graphic EVAP, SET toggle “FSL60I145 DISABLED” to OFF.

5.9.4.3 THROTTLE 60I-290, distillate injection valve, to provide desired flow rate per ETF-60I-003.
5.10 Add Liquid to Evaporator via Drum Pump

Special Instructions

Section 5.10 provides a process for pumping drummed waste supernate into evaporator vapor body; however, it can also be used to pump in chemical reagents or other liquids. Each time pumping is to be done, the need for a task-specific JHA must be evaluated.

Drum pump dead-head discharge pressure must, at all times, be greater than (PI-60I134 + 3 psi) to overcome the static head in the evaporator. If this condition is not met, it is possible for brine to backflow out of the evaporator back into the drum if check valve 60I-158 fails to open.

5.10.1 PLACE the following pumps in MANUAL/OFF:
- 60I-P-1B, SWRT B Pump
- 60I-P-2, Evaporator Recirculation Pump
- 60I-P-4, Evaporator Concentrate Recirculation Pump.

5.10.2 PLACE AOV60I017, SWRT A feed isolation valve, in MANUAL/CLOSED.

5.10.3 PLACE AOV60I016, SWRT B feed isolation valve, in MANUAL/OPEN.

5.10.4 ENSURE 60I-012, SWRT B recirculation valve is CLOSED.

5.10.5 ENSURE SWRT pumps A/B discharge to 60I-006, concentrate tanks valve is CLOSED.

5.10.6 ENSURE 60I-005, SWRT A/B discharge cross-connect valve is CLOSED.

5.10.7 ENSURE 60I-067, SWRT B discharge to sample sink valve is CLOSED.

5.10.8 ENSURE 60I-009, SWRT B recirculation valve is CLOSED.

5.10.9 ENSURE 60I-011, SWRT B pump discharge isolation valve is OPEN.

5.10.10 ENSURE 60I-034, SWRT discharge to evaporator valve is OPEN.

5.10.11 ENSURE 60I-156, feed/distillate heat exchanger bypass valve is OPEN.

5.10.12 PLACE LCV107 (LIC601107), evaporator level control valve, in MANUAL at 100% output OPEN.

5.10.13 ENSURE 60I-021, pipe stub isolation valve, near SWRT B pump discharge is CLOSED.
5.10 Add Liquid to Evaporator via Drum Pump (Cont.)

5.10.14 CLOSE the following evaporator drain valves:
- 60I-183
- 60I-151
- 60I-282.

5.10.15 CONNECT drum pump discharge line to pipe stub at valve 60I-021.

5.10.16 ENSURE only one drum pump discharge hose valve is CLOSED.

5.10.17 IF a task-specific JHA was performed, DON PPE identified per the task-specific JHA.

5.10.18 OPEN valve 60I-021.

5.10.19 PLACE drum pump switch to ON AND PROMPTLY OPEN drum pump hose valve.

5.10.20 WHEN drum is empty, CLOSE one drum pump discharge hose valve AND PROMPTLY PLACE drum pump to OFF.

5.10.21 PLACE drum pump suction in next drum to be pumped.

5.10.22 REPEAT Steps 5.10.18 through 5.10.21 until all drums have been pumped.

5.10.23 CLOSE valve 60I-021.

5.10.24 WHEN pumping has been completed, RETURN valves 60I-009 and 60I-012 to their normal positions.

5.10.25 CLOSE 60I-156, feed/distillate heat exchanger valve.

5.10.26 PLACE the following valves in AUTO:
- AOV-60I016
- AOV-60I017
- LCV-60I107 with setpoint of 40 to 63%.
5.11 Break Loose Concentrate Dump Line Plug

5.11.1 ENSURE concentrate pump 60I-P-4 is ON.

5.11.2 WHEN AOV60I108, concentrate dump valve, opens, RAPIDLY CLOSE AND OPEN concentrate valve 60I-179 four times in succession.

5.11.3 ENSURE valve 60I-179 is OPEN.

5.11.4 IF plug in line has broken free, STOP this procedure.

5.11.5 REPEAT this process per SOM direction.

5.12 Flush Pump 60I-P-4 Concentrate Circulation Loop

5.12.1 ENSURE the following pumps are OFF:
   - 60I-P-2
   - 60I-P-4.

5.12.2 OBTAIN initial vapor body level as indicated by LI-60I107.

5.12.3 ENSURE valve 95B-112 to isolate seal water to 60I-P-4 is CLOSED.

5.12.4 CLOSE valve 60I-182, 60I-P-4 suction isolation.

5.12.5 ENSURE the following valves are CLOSED:
   - 60I-301
   - 60I-302
   - 60I-303
   - 60I-329.

5.12.6 ENSURE 60H-118, verification water valve, is OPEN.

5.12.7 OPEN valve 60I-246.

5.12.8 OPEN 60I-303, verification water valve.
5.12 Flush Pump 60I-P-4 Concentrate Circulation Loop (Cont.)

Special Instructions

Verification water pressure is approximately 90 psig. It is necessary to keep the pressure indicated at PI-60I134 at less than 25 psi to prevent damaging the 60I-P-4 pump mechanical seal. This may require throttling the verification valve 60I-302 during Step 5.12.9.

5.12.9 OPEN 60I-302 AND

THROTTLE to keep the pressure indicated at PI-60I134 at less than 25 psi.

5.12.10 FLUSH loop for three minutes (or as instructed by SOM) AND

PLACE AOV60I108 in MANUAL/OPEN.

5.12.10.1 IF SOM direction provided, RECORD in ETF Control Room Logbook.

5.12.11 CLOSE valve 60I-179 for two minutes, THEN OPEN.

5.12.12 PLACE AOV60I108 to MANUAL/CLOSED.

5.12.13 CLOSE the following valves in the order shown:

- 60I-302
- 60I-303
- 60I-246.

5.12.14 OPEN 60I-182, pump suction valve,

OR

IF 60I-P-4 is requested to be left isolated, LEAVE 60I-182 CLOSED.

5.12.15 OPEN 95B-112, seal water isolation valve,

OR

IF 60I-P-4 is requested to be left isolated, LEAVE 95B-112 CLOSED.
5.13 Drain Concentrate Circulation Pump 60I-P-4

5.13.1 **ENSURE** pump 60I-P-4 is OFF.

5.13.2 **CLOSE** valve 60I-182, 60I-P-4 pump suction isolation.

5.13.3 **ENSURE** valve 95B-112 to isolate seal water to 60I-P-4 is CLOSED.

5.13.4 **CLOSE** 60I-185, pump discharge isolation valve.

5.13.5 **OPEN** the following drain valves:
- 60I-301
- 60I-302.

5.13.6 **RAISE** brine sample tubing above height of 60I-185 **AND**

**SLOWLY OPEN** the following samples valves to vent 60I-P-4 drain piping:
- 60I-318
- 60I-322.

5.13.7 **WHEN** piping has had ample time to drain, **CLOSE** the following samples valves:
- 60I-318
- 60I-322.
5.14 Operation without Concentrate Pump 60I-P-4

Special Instructions

Section 5.14 is based on the following assumptions:
- A piping jumper has been installed in place of pump 60I-P-4 or the failed 60I P-4 is left valved in.
- Software changes allow all modes of evaporator operation with pump 60I-P-4 OFF and concentration dump valve AOV-60I-108 in MANUAL.
- Main recirculation pump 60I-P-2 will provide the motive force for concentrate dump loop recirculation with the following estimated loop flow conditions:
  - Flowrate: 7.5 gpm
  - Line velocity: 2.7 ft/sec (one-inch line)

These conditions are adequate to provide sufficient dumping to concentrate tanks and keep gypsum solids in suspension.

Flushing of the hot (215°F) concentrate recirculation loop with approximately 75 gallons of cold verification water will not damage the pipeline. However, use of this flush is to be minimized and done only at the direction of SOM. Flush can be performed with evaporator in RUN.

Operating AOV60I108 in AUTO with VD34367 (six-hour force dumping) turned on will cause the valve to cycle every six hours.

If AOV60I108 is to be left in MANUAL mode, VD34367 (six-hour force dumping) will have to be turned off to prevent evaporator from going into hot standby and to prevent alarm “EVAPORATOR CYCLE AOV-60I108 FOR GRNDWTER IN TEN MIN” from tripping.

5.14.1 PLACE pump 60I-P-4 in MANUAL/OFF.

5.14.2 IF AOV-60I-108 is to be operated in MANUAL, PLACE AOV-60I-108 in MANUAL AND ON group display 452, TURN OFF six-hour force dumping VD34367.

5.14.3 ENSURE seal water is valved into 60I-P-4 AND OPEN 95B-112.

5.14.4 ENSURE the following 60I-P-4 cooling water valves are CLOSED:
  - 60I-277
  - 60I-278.
5.14 Operation without Concentrate Pump 60I-P-4 (Cont.)

5.14.5 IF instructed by SOM, FLUSH concentrate dump recirculation loop and dump line as follows:

5.14.5.1 ENSURE pump 60I-P-2 is ON.

5.14.5.2 OBTAIN initial vapor body level as indicated by LI-60I107.

5.14.5.3 ENSURE the following flush valves are CLOSED:

- 60I-302
- 60I-303
- 60I-301
- 60I-329.

5.14.5.4 CLOSE 60I-P-4 pump suction valve 60I-182.

5.14.5.5 ENSURE 60H-118, verification water valve, is OPEN.

5.14.5.6 OPEN valve 60I-246.

5.14.5.7 OPEN 60I-303, verification water valve.

5.14.5.8 OPEN flush valve 60I-302.

5.14.5.9 WHEN vapor body level has increased by 3 to 5%, PLACE AOV60I108 in MANUAL/OPEN.

5.14.5.10 CLOSE valve 60I-179 for 30 seconds, THEN OPEN.

5.14.5.11 PLACE AOV60I108 in MANUAL/CLOSED.

5.14.5.12 CLOSE valve 60I-302.

5.14.5.13 OPEN drain valve 60I-301 for fifteen seconds, THEN CLOSE.

5.14.5.14 CLOSE the following valves:

- 60I-303
- 60I-246.

5.14.5.15 OPEN 60I-182, pump suction valve.
5.15 Operate Evaporator with Plugged Concentrate Return Header

Special Instructions

When operating evaporator with plugged concentrate return header, the 60I-P-4 concentrate loop will be isolated until ready for the evaporator dump. Manual batch dumping of the vapor body brine will be performed. A full-evaporator dump or an incremental dump will be performed as directed by SOM or process memo. When performing the incremental dump, the process memo will specify the batch size and the evaporator density at which the batch dumping should be initiated. After each dumping, the concentrate loop will be flushed and isolated.

Section 5.15 is based on the assumption that software changes are made to allow all modes of evaporator operation with pump 60I-P-4 OFF and concentration dump valve AOV60I108 in MANUAL.

When AOV60I108 is in MANUAL mode, VD34367 (six-hour force dumping) will have to be turned OFF to prevent alarm “EVAPORATOR CYCLE AOV-60I108 FOR GRNDWTR IN TEN MIN” from tripping.

Proper Alignment when Operating Evaporator with Plugged Concentrate Return Header

5.15.1 ENSURE 60I-P-4 is in MANUAL/OFF.

5.15.2 ENSURE AOV60I108 is in MANUAL/CLOSED.

5.15.3 ENSURE six-hour force dumping VD34367 on group display 452 is OFF.

5.15.4 ENSURE 60I-P-4 seal water valve 95B-112 CLOSED.

5.15.5 ENSURE the following cooling water valves to 60I-P-4 are OPEN:

- 60I-277
- 60I-278.

5.15.6 ENSURE 60I-179, concentrate return isolation valve, is CLOSED.

5.15.7 ENSURE the following concentrate return 60I-P-4 isolation valves are CLOSED:

- 60I-182
- 60I-185.

5.15.8 ENSURE the following density meter return valves are OPEN:

- 60I-177
- 60I-178.
5.15 Operate Evaporator with Plugged Concentrate Return Header (Cont.)

Proper Alignment when Operating Evaporator with Plugged Concentrate Return Header (Cont.)

5.15.9 IF performing full-evaporator dump, GO TO Step 5.15.10.

OR

IF performing incremental dump, GO TO Step 5.15.34.

Full-Evaporator Dump

NOTE - Pumping evaporator concentrate to CTs requires approximately four hours.

5.15.10 ON graphic EVAP, CHECK evaporator is in SHUTDOWN.

NOTE - Boiler can be left in RUN if evaporator system is expected to be restarted in short time. SOM will make determination on boiler status.

5.15.11 IF evaporator system is not to be restarted in a short time as determined by SOM, ENSURE 60I-B-01 boiler is OFF.

5.15.12 ENSURE adequate concentrate tank space to receive evaporator brine per SOM or process memo.

5.15.13 ON graphic CONC, ENSURE one CT (60J-TK-1A) or [60J-TK-1B] is in RECEIVING and the other is in READY or SHUTDOWN.

5.15.14 PLACE PCV109 (PIC-60I109A) in MANUAL at 100% OPEN.

5.15.15 ENSURE seal water service is ON for pumps 60I-P-2 and 60I-P-4, per ETF-95B-001.

5.15.16 ENSURE the following seal water valves are OPEN:
   • 95B-112
   • 60I-265/60I-264/FIC-60I-805.

5.15.17 PLACE 60I-P-2, recirculation pump, in MANUAL/START.

5.15.18 OPEN the following:
   • 60I-185
   • 60I-182.

5.15.19 PLACE AOV60I108, concentrate dump valve, in MANUAL/OPEN.
5.15 Operate Evaporator with Plugged Concentrate Return Header (Cont.)

Full-Evaporator Dump (Cont.)

5.15.20 **LOCALLY ENSURE** 60I-179, concentrate transfer recirculation line block valve, is CLOSED.

5.15.21 **PLACE** 60I-P-4, concentrate transfer pump, in MANUAL/START.

5.15.22 **CONFIRM** LIC-60I107, vapor body level, is lowering.

5.15.23 **ON** graphic CONC, **CHECK RECEIVING CT (LT-60J001A) [LT-60J001B] level is rising.**

5.15.24 **CONFIRM** the following conditions during this operation:

- CT temperature does not exceed 176°F.
- Evaporator body temperature does not cool at a rate greater than 15°F/hr.

5.15.25 **IF** temperature change in concentrate tank or evaporator exceeds limits, **TEMPORARILY SHUT DOWN 60I-P-4** AND **CLOSE** AOV60I108.

5.15.26 **IF** CT temperature exceeds 125°F, **ISOLATE** tank area with yellow caution tape until temperature drops below 125°F.

5.15.27 **MONITOR** TT-60I111, vapor body temperature, for evaporator cool down rate.

**NOTE** - Pump cavitation is detected by noisy operation (clanging or gravel sounds in pump).

5.15.28 **IF** 60I-P-2 pump cavitates, **PLACE** pump to OFF.

5.15.29 **WHEN** LIC-60I107 indicates 10%, **LOCALLY CHECK** 60I-P-2 shuts down.

5.15.30 **IF** 60I-P-4 pump cavitates, **PLACE** pump to OFF.

5.15.31 **WHEN** PAL 60I123, recirc pump discharge pressure annunciates, **ENSURE** 60I-P-4, concentrate transfer pump, is OFF.

5.15.32 **CLOSE** AOV60I108, concentrate dump valve.

5.15.33 **IMMEDIATELY AFTER** transfer, **GO TO** Step 5.15.48 to flush brine transfer line.
5.15 Operate Evaporator with Plugged Concentrate Return Header (Cont.)

Special Instructions

When performing incremental dump of evaporator, maintain close monitoring of evaporator level during dumping. Do not go over batch size specified in process memo due to concern of 60I-P-2 pump cavitation and excessive pressure swing in the Evaporator vapor body. Listen for sound change at 60I-P-2, which can indicate pump cavitation.

Batch (Incremental) Dumping

5.15.34 ENSURE LCV-60I-107 is in AUTO unless otherwise instructed by SOM.

5.15.35 NOTE initial level LI-60I107.

5.15.36 DETERMINE the expected ending level in the evaporator based on batch size provided in process memo.

5.15.37 ENSURE expected ending level is not below the recommended low level specified in process memo.

5.15.38 IF an increase is necessary, INCREASE setpoint for LCV-60I107 to increase vapor body level.

5.15.39 ENTER desired ending level as new setpoint for LCV-60I107.

5.15.40 ENSURE 95B-112, seal water valve, to 60I-P-4 is OPEN.

5.15.41 ENSURE the following to valve in 60I-P-4 are OPEN:
- 60I-182
- 60I-185.

NOTE - Flow to CT will initiate once AOV60I108 is opened. Turning on 60I-P-4 will increase the flow rate.

5.15.42 PLACE AOV60I108 in MANUAL/OPEN.

5.15.43 TURN ON 60I-P-4.

5.15.44 LISTEN for sound change (indicating pump cavitation) at 60I-P-2.
5.15 Operate Evaporator with Plugged Concentrate Return Header (Cont.)

Batch (Incremental) Dumping (Cont.)

5.15.45 IF indication of pump cavitation is detected, IMMEDIATELY PERFORM the following:

5.15.45.1 TURN OFF 60I-P-4.

5.15.45.2 CLOSE AOV60I108.

5.15.46 WHEN specified level of brine is transferred to CT per process memo, SHUT DOWN 60I-P-4.

5.15.47 CLOSE AOV60I108.

5.15.48 IMMEDIATELY AFTER brine transfer, FLUSH brine transfer line as follows:

5.15.48.1 NOTE initial level in receiving CT.

5.15.48.2 CLOSE 95B-112 to isolate seal water to 60I-P-4.

5.15.48.3 ENSURE following valves are CLOSED:
- 60I-182
- 60I-301
- 60I-302
- 60I-303
- 60I-329.

5.15.48.4 ENSURE 60H-118, verification water valve, is OPEN.

5.15.48.5 OPEN valve 60I-246.
5.15 Operate Evaporator with Plugged Concentrate Return Header (Cont.)

Batch (Incremental) Dumping (Cont.)

Special Instructions

Verification water pressure is approximately 90 psig. It is necessary to keep the pressure indicated at PI-60I134 at less than 25 psi to prevent damaging the 60I-P-4 pump mechanical seal. This may require throttling the verification valve 60I-302 during Step 5.15.48.6.

NOTE - The 60I-P-4 discharge pressure of 25 psig corresponds to 25% at the local indicator for PI-60I134

5.15.48.6 OPEN verification water valve 60I-303.

5.15.48.7 OPEN AOV60I108.

5.15.48.8 OPEN 60I-302 AND THROTTLE to keep the pressure indicated at PI-60I134 to less than 25 psig.

5.15.48.9 FLUSH transfer line to CT until a rise of about 0.5% is noted in CT.

5.15.48.10 OPEN 60I-182.

5.15.48.11 CLOSE the following to flush 60I-P-4 suction line for about 30 seconds:
• AOV60I108
• 60I-185.

THEN IMMEDIATELY CLOSE 60I-302 and 60I-182.

5.15.48.12 CLOSE the following:
• 60I-303
• 60I-246.

5.15.48.13 ENSURE 60I-179 CLOSED.

5.15.48.14 IF evaporator is still in operation, INCREMENTALLY INCREASE LCV-60I-107 set point back to initial value noted in Step 5.15.35.
5.16 Records

The performance of this procedure generates no records.

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