Perform Tank Farm Material Balance During Evaporator Operations

Tank Farm Plant Operating Procedure

242-A Evaporator

USQ # EV-17-1796-S, Rev. 1

CHANGE HISTORY (LAST 5 REV-MODS)

<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-4</td>
<td>01/29/2018</td>
<td>Operations request</td>
<td>Page 4 struck out 2.2.3 The 242-A Control Operator is responsible for performing the Tank Farm material balance calculations. Added Second Engineering signature to checklist 1</td>
</tr>
<tr>
<td>N-3</td>
<td>12/07/2017</td>
<td>WRPS-PER-2017-1808</td>
<td>Deleted reference performance documents since already part of this Continuous Use procedure. Updated Records Section. Updated signature blocks in Data Sheet and Checklists.</td>
</tr>
<tr>
<td>N-2</td>
<td>11/08/2017</td>
<td>Engineering Organization requirement</td>
<td>Engineering is adding an internal requirement to have a second Engineering review when Re-Baselining for Out of Specification MBD.</td>
</tr>
<tr>
<td>N-1</td>
<td>06/20/2016</td>
<td>Clarifications about MBD in procedure, terms in procedure and on data sheets</td>
<td>Removal of unnecessary terms in 2.1, spelled out Material Balance Discrepancy (MBD) in 2.2, Added NOTE to 5.1, added &quot;gallons&quot; to data sheets where applicable.</td>
</tr>
<tr>
<td>N-0</td>
<td>06/01/2016</td>
<td>Periodic review comment resolution</td>
<td>Removal of the automated MBD instructions from the procedure</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
  2.2 General Information ......................................................................................................................... 4

3.0 PRECAUTIONS AND LIMITATIONS .......................................................................................... 5
  3.1 Personnel Safety ................................................................................................................................. 5
  3.2 Radiation and Contamination Control ............................................................................................... 5
  3.3 Limits ............................................................................................................................................ 5

4.0 PREREQUISITES .......................................................................................................................... 5
  4.1 Performance Documents ................................................................................................................... 5

5.0 PROCEDURE ............................................................................................................................... 6
  5.1 Calculate Tank Farm Material Balance ............................................................................................ 6
  5.2 Records ............................................................................................................................................ 8

Type CONTINUOUS Document No. TO-600-101 Rev/Mod N-4 Release Date 01/29/2018 Page 1 of 12
Perform Tank Farm Material Balance During Evaporator Operations

Data Sheet 1 - Daily Baseline ........................................................................................................................................ 9
Data Sheet 2 - Routine Material Balance .................................................................................................................. 10
Data Sheet 3 - Intermediate Transfer Material Balance Following Totalizer Reset .............................................. 11
Checklist 1 – Re-Baselining for Out of Specification MBD ...................................................................................... 12
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for obtaining the material balance for Tank Farms manually.

1.2 Scope

This procedure applies to the 242-A Evaporator, Tank 241-AW-102, the current Evaporator Slurry Receiver Tank (or Tanks), and any additional source tanks that transfer waste to Tank 241-AW-102 during an Evaporator campaign.

2.0 INFORMATION

2.1 Terms and Definitions

CDCM - Configurator Display Control Module: The Display unit on the D/3 where all process and display databases are built and maintained.

DCM0 - Display Control Module 0

Feed Tank - The feed tank for this procedure is identified as Tank 241-AW-102, only.

MCS - Monitor Control System: D/3 computerized control that monitors and controls processes, and components at the 242-A Evaporator.

OCM0 - Operator Control Module 0

OCM1 - Operator Control Module 1

Slurry Tank - Any tank that that receives slurry during the 242-A Evaporator campaign, other than Tank 241-AW-102

Source Tank - Any tank that transfer’s supernatant to tank 241-AW-102 for routing to 242-A Evaporator.

WVR - Waste Volume Reduction: The volume of free space gained in the double-shell tanks.
2.2 General Information

2.2.1 No quality assurance verifications are required by this procedure.

2.2.2 When operations are ongoing in the 242-A building, a tank farm material balance is required just before the feed transfer starts and every 4 hours after, not to exceed 4.5 hours. 8 hours is the frequency established for material balance monitoring per HNF-IP-1266.

2.2.3 When performing Tank Farm Material Balance Discrepancy MBD calculations, a new set of initial readings are taken just before the campaign is started. The computer will create the baseline values of the totalizers after each reset period has been completed. The calculations can be performed at any time except between 0055 and 0200 because the totalizers are resetting during that period.

2.2.4 The computer takes the totalizer readings of each totalizer just before the “Reset” and stores these values.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

Hazards identified for the performance of this procedure are covered under the General Hazards Analysis.

3.2 Radiation and Contamination Control

3.2.1 When performed without a work package, this procedure is limited to radiological areas and work activities permitted by a general radiological work permit.

3.2.2 When work is performed in or when work will result in a high contamination, high radiation, or an airborne radioactivity area, an approved work package must be developed which is reviewed by Radiological Control per ALARA work planning procedure TFC-ESHQ-RP_RWP-C-03.

3.3 Limits

Some steps in this procedure implement Defense in Depth controls as described in RPP-13033, Tank Farms Documented Safety Analysis.

Operating Specification Documents

OSD-T-151-00007, Operating Specifications for the Double-Shell Storage Tanks

4.0 PREREQUISITES

4.1 Performance Documents

The following documents may be needed to perform this procedure:

5.0 PROCEDURE

5.1 Calculate Tank Farm Material Balance

NOTE - When performing Tank Farm Material Balance Discrepancy (MBD) calculations, a new set of initial readings are taken just before the campaign is started. The computer will create the baseline values of the totalizers after each reset period has been completed. The calculations can be performed at any time except between 0055 and 0200 because the totalizers are resetting during that period.

5.1.1 IF performing initial campaign baseline data or if directed to reset material balance, COMPLETE Data Sheet 1 - Daily Baseline.

5.1.2 IF performing routine material balance (not 0200 hour readings), GO TO 5.1.4.

5.1.3 IF performing routine material balance (0200 hour readings), GO TO 5.1.5.

Routine Material Balance – Non 0200 Hour Readings

5.1.4 COMPLETE Data Sheet 2 - Routine Material Balance.

5.1.4.1 IF MBD is outside the range of -5000 to +5000 gallons GO TO 5.1.7.

Material Balance – 0200 Hour Readings

5.1.5 COMPLETE Data Sheet 3 - Intermediate Transfer Material Balance Following Totalizer Reset.

5.1.5.1 IF MBD is outside the range of -5000 to +5000 gallons GO TO 5.1.7.

NOTE - 0200 Material Balance uses baseline data from the previous day. Once MBD is calculated, Data Sheet 1 will be completed using 0200 Material Balance current data. This will become the baseline for the rest of the day’s readings after the 0200 reading.

5.1.6 COMPLETE Data Sheet 1 - Daily Baseline.
5.1 Calculate Tank Farm Material Balance (Cont.)

Material Balance Out of Range

5.1.7 NOTIFY Shift Manager.

5.1.8 NOTIFY Central Shift Manager the MBD has been exceeded.

5.1.9 SHUTDOWN transfers to and from 242-A Evaporator.

5.1.10 REQUEST Shift Manager and Engineering COMPLETE Checklist 1 – Re-Base-lining for Out of Specification MBD.

5.1.11 IF Engineering authorizes the resetting of the MBD, GO TO 5.1.1.
### 5.2 Records

5.2.1 **PERFORM** the following for records identified within this procedure.

5.2.1.1 **RECORD** the number of times the record was generated in applicable column.

**OR**

**PLACE** a check mark (√) in the N/A column.

5.2.1.2 **SUBMIT** the package to the central shift office.

<table>
<thead>
<tr>
<th>Records Submittal Checklist</th>
<th>Number of times completed</th>
<th>N/A (√)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Sheets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Sheet 1 - Daily Baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Sheet 2 - Routine Material Balance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Sheet 3 - Intermediate Transfer Material Balance Following Totalizer Reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Checklist</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checklist 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FWS/OE/Shift Manager **SEND** the completed records to the Central Shift Office for records retention.

_________________________ / ______________________ / __________

Signature  Print (First and Last)  Date

FWS/OE/Shift Manager
## Data Sheet 1 - Daily Baseline

<table>
<thead>
<tr>
<th>TIME AND DATE:</th>
<th>Baseline Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>AW-102 LIQUID LEVEL (DST inches)</td>
<td>A&lt;sub&gt;n&lt;/sub&gt;=</td>
</tr>
<tr>
<td>SLURRY TANK&lt;sup&gt;1&lt;/sup&gt; LIQUID LEVEL (DST inches)</td>
<td>B&lt;sub&gt;n&lt;/sub&gt;=</td>
</tr>
<tr>
<td>SOURCE TANK&lt;sup&gt;1&lt;/sup&gt; LIQUID LEVEL (DST inches)</td>
<td>C&lt;sub&gt;n&lt;/sub&gt;=</td>
</tr>
<tr>
<td>TANK ID #:</td>
<td></td>
</tr>
<tr>
<td>TANK ID #:</td>
<td></td>
</tr>
<tr>
<td>FQI-CA1-4 (G15, F10) Slurry Totalizer (gallons)</td>
<td>D&lt;sub&gt;n&lt;/sub&gt;=</td>
</tr>
<tr>
<td>FQI-PB1-W (G12, F6) PB1 Seal Water Totalizer (gallons)</td>
<td>E&lt;sub&gt;n&lt;/sub&gt;=</td>
</tr>
<tr>
<td>FQI-PB2-W (G15, F6) PB2 Seal Water Totalizer (gallons)</td>
<td>F&lt;sub&gt;n&lt;/sub&gt;=</td>
</tr>
<tr>
<td>FQI-RW-1 (G15, F39) Raw Water Totalizer (gallons)</td>
<td>G&lt;sub&gt;n&lt;/sub&gt;=</td>
</tr>
<tr>
<td>FQI-CA1-W (G15, F39) Pot Flush Totalizer (gallons)</td>
<td>H&lt;sub&gt;n&lt;/sub&gt;=</td>
</tr>
<tr>
<td>FQI-CA1-1 (G301, F0) Feed Totalizer (gallons)</td>
<td>I&lt;sub&gt;n&lt;/sub&gt;=</td>
</tr>
</tbody>
</table>

---

**Signature** / **Print (First & Last)** / **Date**

**Operator**

---

**Signature** / **Print (First & Last)** / **Date**

**Shift Manager Review**

---

Tank liquid levels minimum / maximum cannot exceed OSD-T-151-00007 or Waste Compatibility Assessment, whichever is more restrictive.

<sup>1</sup>If the Source Tank is the same as the Slurry Tank, Data should be entered for the Slurry Tank and the Source Tank Data Fields are marked N/A.
### Perform Tank Farm Material Balance During Evaporator Operations

**Data Sheet 2 - Routine Material Balance**

<table>
<thead>
<tr>
<th>Time and Date:</th>
<th>Current Reading</th>
<th>Baseline Reading</th>
<th>Totals (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AW-102 LIQUID LEVEL (DST inches)</td>
<td>( A_c = )</td>
<td>( A_b = )</td>
<td>((A_c - A_b) \times 2750 = A_T)</td>
</tr>
<tr>
<td>SLURRY TANK(^2) LIQUID LEVEL (DST inches) TANK ID #:</td>
<td>( B_c = )</td>
<td>( B_b = )</td>
<td>((B_c - B_b) \times 2750 = B_T)</td>
</tr>
<tr>
<td>SOURCE TANK(^2) LIQUID LEVEL (DST inches) TANK ID #:</td>
<td>( C_c = )</td>
<td>( C_b = )</td>
<td>((C_c - C_b) \times 2750 = C_T)</td>
</tr>
<tr>
<td>FQI-CA1-4 (G15, F10) Slurry Totalizer (gallons)</td>
<td>( D_c = )</td>
<td>( D_b = )</td>
<td>((D_c - D_b) \times 10 = D_T)</td>
</tr>
<tr>
<td>FQI-PB1-W (G12, F6) PB1 Seal Water Totalizer (gallons)</td>
<td>( E_c = )</td>
<td>( E_b = )</td>
<td>((E_c - E_b) = E_T)</td>
</tr>
<tr>
<td>FQI-PB2-W (G15, F6) PB2 Seal Water Totalizer (gallons)</td>
<td>( F_c = )</td>
<td>( F_b = )</td>
<td>((F_c - F_b) = F_T)</td>
</tr>
<tr>
<td>FQI-RW-1 (G15, F39) Raw Water Totalizer (gallons)</td>
<td>( G_c = )</td>
<td>( G_b = )</td>
<td>((G_c - G_b) = G_T)</td>
</tr>
<tr>
<td>FQI-CA1-W (G15, F39) Pot Flush Totalizer (gallons)</td>
<td>( H_c = )</td>
<td>( H_b = )</td>
<td>((H_c - H_b) = H_T)</td>
</tr>
<tr>
<td>FQI-CA1-1 (G301, F0) Feed Totalizer (gallons)</td>
<td>( I_c = )</td>
<td>( I_b = )</td>
<td>((I_c - I_b) \times 10 = I_T)</td>
</tr>
<tr>
<td>Unmetered Additions(^3)</td>
<td>( J_T = )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ D_T + E_T + F_T + J_T + G_T - H_T - I_T - A_T - B_T - C_T = MBD^1 \]

---

**Signature**  
Operator  
Print (First & Last)  
Date

---

**Signature**  
Shift Manager Review  
Print (First & Last)  
Date

---

\(^1\)MBD must be within the range of -5000 to +5000 gallons  
\(^2\)If the Source Tank is the same as the Slurry Tank, Data should be entered for the Slurry Tank and the Source Tank Data Fields are marked N/A.  
\(^3\)Other unmetered water additions from the facility to Tank Farms, including dump of C-A-1, weir box overflow and miscellaneous water additions/flushes.
Perform Tank Farm Material Balance During Evaporator Operations

Data Sheet 3 - Intermediate Transfer Material Balance Following Totalizer Reset

<table>
<thead>
<tr>
<th>TIME AND DATE: (Appx. 0200)</th>
<th>PR-CR-1 Printer Totals</th>
<th>Current Reading</th>
<th>Baseline Reading¹</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>AW-102 LIQUID LEVEL (DST inches)</td>
<td>A_C = A_B =</td>
<td>(A_C – A_B) (*)2750 = A_T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLURRY TANK³ LIQUID LEVEL (DST inches)</td>
<td>B_C = B_B =</td>
<td>(B_C – B_B) (*)2750 = B_T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOURCE TANK³ LIQUID LEVEL (DST inches)</td>
<td>C_C = C_B =</td>
<td>(C_C – C_B) (*)2750 = C_T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FQI-CA1-4 (G15, F10) Slurry Totalizer (gallons)</td>
<td>D_P = D_C = D_B =</td>
<td>(D_P + D_C - D_B)*10 = D_T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FQI-PB1-W (G12, F6) PB1 Seal Water Totalizer (gallons)</td>
<td>E_P = E_C = E_B =</td>
<td>E_P + E_C - E_B = E_T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FQI-PB2-W (G15, F6) PB2 Seal Water Totalizer (gallons)</td>
<td>F_P = F_C = F_B =</td>
<td>F_P + F_C - F_B = F_T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FQI-RW-1 (G15, F39) Raw Water Totalizer (gallons)</td>
<td>G_P = G_C = G_B =</td>
<td>G_P + G_C - G_B = G_T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FQI-CA1-W (G15, F39) Pot Flush Totalizer (gallons)</td>
<td>H_P = H_C = H_B =</td>
<td>H_P + H_C - H_B = H_T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FQI-CA1-1 (G301, F0) Feed Totalizer (gallons)</td>
<td>I_P = I_C = I_B =</td>
<td>(I_P + I_C - I_B)*10 = I_T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmetered Additions¹</td>
<td>J_T</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
\begin{align*}
D_T + E_T + F_T + J_T + G_T - H_T - I_T - A_T - B_T - C_T &= MBD^2 \\
\end{align*}
\]

Signature / Print (First & Last) / Date

Signature / Print (First & Last) / Date

¹(Prior Days Data Sheet 1 Reading)
²MBD must be within the range of -5000 to +5000 gallons
³If the Source Tank is the same as the Slurry Tank, Data should be entered for the Slurry Tank and the Source Tank Data Fields are marked N/A.
⁴Other unmetered water additions from the facility to Tank Farms, including dump of C-A-1, weir box overflow and miscellaneous water additions/flushes.
## Checklist 1 – Re-Baselining for Out of Specification MBD

<table>
<thead>
<tr>
<th>REVIEW</th>
<th>CONSIDERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>DETERMINE</strong> liquid level instruments for all tanks on direct and physically connected path are functioning properly</td>
</tr>
<tr>
<td></td>
<td><strong>REVIEW</strong> liquid levels for all tanks inter-connected to direct transfer line</td>
</tr>
<tr>
<td></td>
<td><strong>REVIEW</strong> status of transfer line encasement and structure leak detectors that are inter-connected to and part of direct transfer line</td>
</tr>
<tr>
<td></td>
<td><strong>DETERMINE</strong> if any liquid could have been added to either sending or receiving tank from another source (drains, snow-melt, rain, water flush, line hold-up)</td>
</tr>
<tr>
<td></td>
<td><strong>REVIEW</strong> Radiological Monitoring Plan survey results</td>
</tr>
<tr>
<td></td>
<td><strong>REVIEW</strong> waste tank history, WCA, and past transfer data for any other potential MBD sources (i.e., gas retention, solids)</td>
</tr>
</tbody>
</table>

---

**Signature / Print (First & Last) / Date**

**Shift Manager**

**TECHNICAL BASIS FOR RE-BASELINING MBD:**

---

**ACTIONS TAKEN TO EVALUATE MBD: (TFC-ENG-CHEM-D-44)**

---

**Signature / Print (First & Last) / Date**

**Engineer**

---

**Signature / Print (First & Last) / Date**

**Engineer**