Leak Detection Wells, Annulus Leak Detection Systems

T S R Compliance

Tank Farm Plant Operating Procedure

SURVEILLANCE

USQ # TF-18-1416-S, Rev. 0

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>
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<tbody>
<tr>
<td>I-4</td>
<td>10/09/2018</td>
<td>TF-Automation/DSA Changes</td>
<td>Modified Steps 5.1.3 and 5.2.2. Changed the word &quot;ENRAF&quot; to &quot;Enraf.&quot;. Modified title of the Comments page at the end of procedure.</td>
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<tr>
<td>I-3</td>
<td>08/30/2017</td>
<td>TF-PER-17-1176 and Field modifications</td>
<td>Delete section for follow-up actions to CAM alarms. Update General Information section describing field components and configuration.</td>
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<tr>
<td>I-2</td>
<td>09/19/2016</td>
<td>Procedure updates for MLA</td>
<td>Added white label program wording, updated records section to comply with STD-01, updated performance docs to include RPP-PLAN-60074, Added steps 5.3.3 and 5.3.4 to address AY-102 annulus level changes.</td>
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<tr>
<td>I-0</td>
<td>04/28/2015</td>
<td>Periodic Review</td>
<td>Update Environmental Compliance reference and language. Add instruction to record and directions from Shift Manage on Comments Sheet.</td>
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for surveillance of leak detection wells and annulus leak detection systems located in 241-AN, AP, AW, AX, AY, AZ, and SY waste storage tanks.

1.2 Scope

This procedure involves surveillance of the following tank leak detection systems:

- Leak detection wells
- Annulus leak detection system instruments located in annulus tanks for AN, AP, AW, AY, AZ, and SY tank farms:
- Enraf leak detection
- Annulus CAMs.
2.0 INFORMATION

2.1 General Information

2.1.1 Transmitters for pressure, weight factor, and specific gravity convert hydrostatic pressure differences (across dip tubes) into pneumatic signals. Pneumatic signals are transmitted to pressure switch rack in instrument building and activate respective weight factor alarm switches. These alarm switches convert pneumatic signals to electrical signals that energize annunciators on Instrument Building panelboards.

2.1.2 A grid of drain channels is in the concrete foundation of each AN, AP, AW, AX, AY, AZ, and SY farm tank. The channels collect at one point from which a drain line connects to related leak detection well.

2.1.3 Weight factor and specific gravity monitoring systems consist of three small pipes (known as dip tubes) inserted into a leak detection well. During operation, compressed air purges are supplied to dip tubes at a controlled rate; differential pressure is measured and converted to liquid level or specific gravity.

2.1.4 Annulus leak detection systems are installed in AN, AP, AW, AY, AZ and SY annulus tanks and are connected to annunciator alarms in 271 AP, 271 AW and 271 SY instrument building. All DST annulus leak detectors alarm at TMACS. The annulus leak detectors do not annunciate locally in AP, AN, AY, or AZ farms.

NOTE - Regulatory requirements under the Resource Conservation and Recovery Act and Washington Administrative Code (WAC), Chapter 173-303 do not recognize Continuous Air Monitors (CAMs) as part of a compliant leak detection system.

2.1.5 Annulus CAMs are installed on annulus exhaust of some double-shell tanks. An annulus tank CAM alarm may signify a high annulus airborne radiation reading and may indicate a primary tank leak has occurred.

2.1.6 An OPERABLE DST leak detection system consists of three annulus leak detector probes and at least one primary tank surface level monitor as defined in the Environmental Compliance Section.
2.1 General Information (Cont.)

2.1.7 The following leak detection well monitor readout instruments are installed in the DST Farms or Drucks are used:

- Weight factor instruments are out of service for AX Tank Farm. Leak detection well readings may be taken with a zip cord or with a Druck.
- Weight factor indicators for 241-AY-102 leak detection pit reads from 0 to 100 inches. Weight factor indicator reports to TFMCS and has a local reading.
- 241-AY-101 and 241-AZ-101/102 weight factor gauge is not in service. Levels are obtained by zip cord readings or Druck.
- 241-SY weight factor readings are recorded by Druck.
- Liquid level indicators for each AN well are obtained by zip cord or Druck.
- Levels are obtained from the AW Instrument Panel in the Instrument Building, except, AW-104, which is taken by zip cord or Druck.
- Liquid level indicators for each AP well are taken by Druck.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Non-electrical worker accessing electrical enclosures must ensure the following:
- The enclosure must have a white label indicating that it has been evaluated
- The work activity within the enclosure does not involve
  - Reaching around or moving electrical equipment
  - Contacting electrical connectors/connections
  - By-passing protective shielding/barriers.

3.1.1.1 Stop and notify management if these conditions cannot be met, or if discrepancies exist (e.g. conflicting or missing labels, missing or damaged protective barriers).

3.1.2 Industrial hygiene sampling and/or monitoring requirements will be specified in applicable Industrial Hygiene Sample Plan, latest revision.

3.2 Radiation and Contamination Control

3.2.1 When this procedure is worked in radiological areas, an approved radiological work permit (RWP) is required. If radiological conditions or work performed falls outside the scope of the RWP, all work activities must be discontinued until a new or revised RWP has been issued in accordance with TFC-ESHQ-RP_RWP-C-03.

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 Environmental Compliance

3.3.1 40CFR265.193(c)(3) requires that tank secondary containment systems be provided with a leak-detection system that is designed and operated so that it will detect failure of either primary or secondary containment structure of release of dangerous waste or accumulated in secondary containment system within 24 hours, or at earliest practicable time if owner or operator can demonstrate to the department that existing detection technologies or site conditions will not allow detections of a release within 24 hours.

3.3.2 Changes in leak detection status (i.e., time leak detection equipment removed from or returned to service, and reason for removal from service) must be logged in Shift Managers logbook to meet requirements of 40CFR265.73, Operating Record.

3.3.3 The Environmental representative shall verify that the following are completed per OSD-T-151-00031:

3.3.3.1 Washington State Department of Ecology is notified of the outage and/or use of any alternate leak detection systems.

3.3.3.2 Alternate leak detection requirements during the outage are documented in a letter/internal memo from the Environmental Compliance manager to the Senior Level 1 manager of Production Operations.

3.3.3.3 Ecology is notified of Out-of-Service (OOS) conditions, with a schedule from 3.3.4.2a, extending beyond 90 days.

3.3.4 Operations shall:

3.3.4.1 For outages greater than 24 hours and requiring alternative leak detection, implement monitoring requirements per internal memo generated in 3.3.3.2.

NOTE - OSD-T-151-00031 required leak detection systems shall be restored to service as soon as possible.

3.3.4.2 Track the leak detection system or device outage on the TSR/Environmental Equipment OOS section of the TOC Daily Report with an initial “Required by Date” not to exceed 90 days.

a. Prepare a recovery plan representing returning the leak detection system, or device, back to service as soon as possible should the OOS condition reach 90 days. Provide the recovery plan schedule to the Environmental Representative for completion of 3.3.3.3.
### 3.3 Environmental Compliance (Cont.)

3.3.5 Per Settlement Agreement and Stipulated Order of Dismissal (Department of Energy, et al. v. Ecology, PCHB No. 98-249; PCHB No. 98-250) referred to as "Settlement Agreement" each double shell tank (DST) on the Hanford site will be equipped and operated with a complete continuous Leak Detection System by December 31, 1999. A continuous Leak Detection System for each of twenty eight (28) double-shell tanks on the Hanford site shall be composed of three (3) operating annulus leak detector probes and at least one in-tank surface level monitor installed within the primary tank. Annulus leak detector probes shall be placed as equidistantly as possible within the annulus of each double-shell tank. Each adjustable annulus leak detector probe shall be set within 1/4 inch from the annulus floor with allowance for normal engineering tolerances. An annulus leak detector probe shall be a conductivity type probe, or equal or better device (such as an Enraf).

Leak Detection System on each DST may be supplemented by operation of an annulus ventilation system Continuous Air Monitor (CAM), with an alarm setpoint less than or equal to 3,000 counts per minute.

### 3.4 Limits

- **HNF-SD-WM-TSR-006, Tank Farm Technical Safety Requirements**
- **LCO 3.5, DST Annulus Flammable Gas Control**
- **Operating Specifications Document (OSD)**
  - OSD-T-151-00007, Operating Specifications for the Double Shell Storage Tanks
  - OSD-T-151-00031, Operating Specifications for Tank Farm Leak Detection and Single Shell Tank Intrusion Detection
- **HNF-IP-1266, Tank Farms Operations Administrative Controls**
  - Appendix A – TSR Parameters, Limits, and Setpoints
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:
- Radio

4.2 Performance Documents

The following documents may be needed to perform this procedure:
- TF-REC-001, Response to Environmental Condition
- TF-OR-DR-AN, AN Daily Rounds
- TF-OR-DR-AZ, AZ Daily Rounds
- TF-OR-DR-ST, ST Daily Rounds
- TF-OR-DR-EV, EV Daily Rounds
- TO-100-052, Perform Waste Generation, Segregation, Accumulation, and Clean-up
- 6-LDD-485, ENRAF Series 854 Annulus Leak Detection Gauges Calibration and Maintenance
- Status reports for AN, AP, AW, AX, AY, AZ, and SY Tank Farms.

The following drawings are provided for additional information:
- H-14-020501, Waste Storage Tank Annulus System (WSTA) O&M System P&ID (AN Farm)
- H-14-020502, Waste Storage Tank Annulus System (WSTA) O&M System P&ID (AW Farm)
- H-14-020503, Sheets 3 and 5, Waste Storage Tank Annulus System (WSTA) O&M System P&ID (AP Farm)
- H-14-020506, Waste Storage Tank Annulus System (WSTA) O&M System P&ID (AY Farm)
- H-14-020806, Sheet 5, Waste Transfer System (WT) O&M System P&ID (AY Farm)
- H-14-020507, Waste Storage Tank Annulus System (WSTA) O&M System P&ID (AZ Farm)
- H-14-020807, Sheet 4, Waste Transfer System (WT) O&M System P&ID (AZ Farm)
- H-14-020531, Waste Storage Tank Annulus System (WSTA) O&M System P&ID (SY Farm)
- RPP-PLAN-60610, Tank 241-AY-102 Contingency Plan - Operations Phase
- RPP-PLAN-60074, Tank 241-AY-102 Monitoring Plan.
5.0 PROCEDURE

5.1 Obtain Leak Detection Well Readings

5.1.1 ENSURE all measurement equipment is functioning or operating properly.

5.1.2 REPORT any discrepancies to Shift Manager.

5.1.3 MEASURE leak detection well levels (if not automated; e.g. AY-02) using the weight factor dip tube's high leg. The medium leg can be used but requires the addition 10 inches to the reading.

5.1.4 RECORD readings on Operator rounds.

5.1.5 IF a leak detection well weight factor increase exceeds limits listed in the Operator Rounds, NOTIFY Shift Manager. (OSD-T-151-00007)
5.1 Obtain Leak Detection Well Readings (Cont.)

5.1.6 ENSURE the following leak detection pit dip tube rotameters are set at listed air flow rates:

<table>
<thead>
<tr>
<th>TANK FARM</th>
<th>LEAK DETECTION PIT</th>
<th>ROTAMETER</th>
<th>FLOW RATE (CUBIC FEET PER HOUR)</th>
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<tr>
<td>AW Farm</td>
<td>01C</td>
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</table>
5.2 Obtain Annulus Enraf Readings

NOTE - Enraf gauge operation is based on displacement (buoyancy). A liquid leak from the primary waste storage tank into the annulus tank will cause a change in buoyancy of displacer to occur. At 0.25 inches of liquid in annulus tank displacer will rise sufficiently to activate high level alarm at tank farm instrument building and TMACS. (Refer to Figure 1 and Figure 2.)

- Some Enraf Liquid Crystal Displays (LCDs) are:
  "- - - I1" = Operation
  "- - - DM" = DIP mode
  "- - - FL" = Failure or maintenance mode
  "- - - TG" = Test mode
  "- - - H" = High level alarm

- “Display message”"- - - CA" or "- - - LT" indicates displacer is rising; that is not permitted without HPT support.

5.2.1 READ annulus level readings from LCD AND RECORD in remarks section on appropriate Operator rounds.

5.2.1.1 IF LCD shows an "H" on lower line or LCD indicates a level greater than 0.24 inches, IMMEDIATELY NOTIFY Shift Manager that annulus leak detector is alarming AND PERFORM actions as specified by applicable alarm response procedure.

5.2.1.2 IF LCD indicates other than "- - - I1", CHECK LCD AND INFORM Shift Manager.

5.2.2 IF AY-102 annulus level is greater than 15.00 inches, NOTIFY Shift Manager that LCO 3.5 controls apply. (LCO 3.5, per HNFP-IP-1266, Appendix A)

5.2.3 IF AY-102 annulus level changes by +0.25” or more in previous 24 hours NOTIFY Shift Manager to respond per TF-REC-001.

5.2.4 IF AY-102 annulus level changes by -0.50” or more in previous 24 hours NOTIFY Shift Manager to respond per TF-REC-001.
5.3 Records

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

5.3.1.1 **IF** Comments Page 1 is filled out, **RECORD** the number of times the record was generated in applicable column

**OR**

**IF** Comments Page 1 is not used, **PLACE** a check mark (√) in the N/A column.

5.3.1.2 **SUBMIT** the package for verification of completed records.

<table>
<thead>
<tr>
<th>Records Submittal Checklist</th>
<th>Number of times completed</th>
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<tr>
<td><strong>Comments</strong></td>
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<tr>
<td>Comments Page 1 – Record of Instructions Given</td>
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</table>

**FWS/OE/Shift Manager SEND** the completed records with Records Submittal Checklist attached to the Central Shift Office for records retention.

________________________________________/________________________________________/______________

Signature                  Print (First and Last)  Date

FWS/OE/Shift Manager

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 - Enraf Annulus Leak Detector

ENRAF SERIES 854 ATG
SIGHT GLASS
PRESSURE PORT
BALL VALVE
RISER
WASH PORT
256.34
Figure 2 - Enraf Annulus Leak Detector Display

ALARMS
HH = High High Alarm
LL = Low Low Alarm
H  = High Alarm
L  = Low Alarm
-  = Normal Operation

LEVEL TYPE
INN = INNAGE
INC = COMP INNAGE
ULL = ULLAGE

LEVEL

UNITS
in = Inch

Example of ENRAF display in normal operation

LIMIT SWITCHES
C = Motor Limit Switch Reached
- = Normal Operation

DISPLACER
= Displacer Goes Up
= Displacer Goes Down

OPERATIONAL STATUS
DM = DIP Mode
FL = SPU Failure or MAINT. Mode
I 1 = Interface 1 Mode
I 2 = Interface 2 Mode
I 3 = Interface 3 Mode
TG = Test Gauge
Leak Detection Wells, Annulus Leak Detection Systems

Table 1 - AN, AP, AW, AY, AZ, and SY Farm Enrafs

<table>
<thead>
<tr>
<th>ANNULUS LEAK DETECTORS</th>
<th>TMACS LABEL WITH RISER LOCATION</th>
<th>ANNULUS LEAK DETECTORS</th>
<th>TMACS LABEL WITH RISER LOCATION</th>
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## Table 1 - AN, AP, AW, AY, AZ, and SY Farm Enrafs (Cont.)

<table>
<thead>
<tr>
<th>ANNULUS LEAK DETECTORS</th>
<th>TMACS LABEL WITH RISER LOCATION</th>
<th>ANNULUS LEAK DETECTORS</th>
<th>TMACS LABEL WITH RISER LOCATION</th>
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</tbody>
</table>

Note - The annulus Enraf displacers are in contact with the bottom of the annulus. They are set to read 0.15 inches in that position because that is how much liquid would be required to register an increase.
### Comments Page 1 – Record of Instructions Given

<table>
<thead>
<tr>
<th>Date</th>
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<th>Initials</th>
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Sign | Print (First and Last) | Date