UV-FTIR Stack Monitor Maintenance

Tank Farm Maintenance Procedure

MAINTENANCE

USQ # Routine Maintenance

CHANGE HISTORY ( ≤ LAST 5 REV-MODS )

<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
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<td>A-0</td>
<td>05/10/2018</td>
<td>UV-FTIR Project</td>
<td>New procedure.</td>
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This is a new revision. The First Time Use process as defined in TFC-OPS-OPER-C-13 can be used during the initial performance of this revision.

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Figure 1 – Heater/Air Conditioner Unit

Figure 2 – FLT-705 & FLT-702

Figure 3 - FLT-703 & FLT-704

Figure 4 – FLT 701

Figure 5 – V-712

Figure 6 – Probe Filter

Figure 7 – UV Lamp

Figure 8 – Temperature Controllers

Figure 9 - Cryocooler Detector Module Assembly

Figure 10 – IR Source
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for performing maintenance on Cerex UV-DOAS with FTIR Stack Monitor also known as UV-FTIR Multi-Gas Analyzer.

1.2 Scope

This procedure applies to Cerex UV-FTIR Multi-Gas Analyzer in use at AP Tank Farms.

2.0 INFORMATION

2.1 Terms and Definitions

SV - Set Point Variable
PV - Process Variable
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Allow sufficient time to cool before servicing internal components within the UV-FTIR Main Cabinet.

3.1.2 Job-specific protective equipment requirements should be addressed during the pre-job brief and be in accordance with TFC-ESHQ-S_IS-C-02.

3.1.3 During the performance of this procedure, compliance with the DOE-0336, Hanford Site Lockout/Tagout Procedure is required for some maintenance tasks.

3.2 Equipment Safety

Any waste generated during the performance of this procedure will be managed in compliance with procedure TO-100-052.

3.3 Radiation and Contamination Control

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.

The opening of any potentially contaminated system or component within a Radiological Area requires the presence of an HPT to verify contamination control.

When breaching or opening systems or system components that are currently or previously connected to ventilation systems;

- Continuous HPT Coverage is required
- Pre-job and Post-job surveys are required
- When breaching containment, an absorbent media (masslinn cloth, damp rag, etc.) as a minimum will be used to contain the breach until radiological verifications have been performed
3.0 PRECAUTIONS AND LIMITATIONS (Cont.)

3.4 Industrial Hygiene

Industrial hygiene (IH) sampling and/or monitoring requirements for tank farm entry will be specified in the industrial Hygiene Sampling Plan identified in each farm specific Tank Vapor Information Sheet (TVIS). The TVIS for AP farm is TVIS-AP-001.

3.5 Environmental Compliance

If any hazardous waste is generated during performance of this procedure, consult with Facility/Plant/Area Hazardous Waste Coordinator for Specific instructions to ensure compliance with all environmental standards for disposal.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following supplies may be needed to perform this procedure:
- Sample Filter CID #683614
- Compressor Intake Air Filter, CID #683620
- Air/Oil filter, CID #683623
- Desiccant Media, CID #683624
- Compressor Intake Pre-Filter, CID #685559
- Probe Filter, CID #683625
- Hand Brush
- T Handle Allen Wrenches (7/64, 9/64 & 5/32)
- Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following documents may be needed to perform this procedure:
- DOE-0336, Hanford Site Lockout/Tagout Program
- DOE-0359, Hanford Site Electrical Safety Program
- H-14-020103,Sht. 16, Ventilation Tank Primary System (VTP) O & M System P&ID
- H-14-020103, Sht. 18, Ventilation Tank Primary System (VTP) O & M System P&ID.

4.3 Field Preparation

4.3.1 REQUEST Operations to configure system to allow performance of this procedure.

4.3.2 IF Lockout/Tagout is required, ENSURE lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure.
5.0 PROCEDURE

Special Instructions

The subsections within 5.0 can be worked independently, concurrently, or in parallel with other sections as directed by the field work supervisor with those directions recorded in the Work Record or Comments Section of Data Sheet.

5.1 Main Panel AP241-VTP-ENCL-653

Exterior

5.1.1 INSPECT for signs of debris and signs of damage to exterior enclosure.

5.1.2 INSPECT exterior tube bundles for the following damage:
   - Damage
   - Signs of crimping
   - Cracked insulation.

5.1.3 ENSURE that mounting bolts are securely tightened.

5.1.4 ENSURE no other hardware has come loose.
5.1 Main Panel AP241-VTP-ENCL-653 (Cont.)

Interior

5.1.5 ENSURE lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure before performing this work.

5.1.6 OPEN UV-FTIR Main Panel AP241-VTP-ENCL-653.

5.1.7 INSPECT interior wires for the following:
   - Signs of burnt or cracked insulation
   - Frayed or pinched wires
   - Loose connectors.

5.1.8 ENSURE no other hardware has come loose.

5.1.9 ALLOW sufficient cooling time before servicing internal components.

5.1.10 OPEN Cell Panel (Oven) AP241-VTP-ENCL-653B.
5.1 Main Panel AP241-VTP-ENCL-653 (Cont.)

**Interior (Cont.)**

5.1.11 **INSPECT** wires inside cell for the following:
- Signs of burnt or cracked insulation
- Frayed or pinched wires
- Loose connectors.

5.1.12 **ENSURE** no other hardware has come loose.

5.1.13 **RECORD** work performed on the Data Sheet.

**Air Conditioner Heat Sink Cleaning**

5.1.14 **ENSURE** lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure before performing this work.

5.1.15 **REMOVE** large debris from exterior using hand brush. (Figure 1)

5.1.15.1 **IF** outside screens need to be cleaned, **CLEAN** outside screens.

5.1.16 **OPEN** UV-FTIR Main Panel.

5.1.17 **REMOVE** accumulated dust and debris from the heat sink grill using a small brush.
5.2 Sample Line Filter FLT-701 Replacement

NOTE – Sample Line Filter is located in the Cell Panel (OVEN) AP241-VTP-ENCL-653B.

5.2.1 ENSURE HS-653 is placed in the OFF position.

5.2.2 ENSURE the following valves are in the intermediate position:
   • V-693
   • V-698.

5.2.3 PERFORM monitoring per Sample Plan IHSP-EABO-11001, RC2.

5.2.4 UNSCREW Sample Line Filter housing AND
   REMOVE Filter (Figure 4).

5.2.5 DISPOSE of used filter in accordance with established waste handling procedure.

5.2.6 INSTALL new filter CID # 683614 and Sample Filter housing.

5.2.7 TIGHTEN housing hand tight.

5.2.8 ENSURE V-693 is aligned to the exhauster train in operation AND
   ENSURE V-698 is returned to the NORMAL position.

5.2.9 ENSURE HS-653 is placed in the ON position.

5.2.10 RECORD Sample Line Filter Replacement on Data Sheet.
5.3 **Compressor Inlet Filter FLT-702 Replacement**

NOTE – Compressor Inlet Filter is located in the Main Panel AP241-VTP-ENCL-653 below the UV and IR Analyzer Modules AY-5077I and AY-5077U.

5.3.1 **UNSCREW** Ambient Air Particulate Filter housing AND **REMOVE** Particulate Filter (FLT-702) (Figure 2)

5.3.2 **DISPOSE** of used filter in accordance with established waste handling procedure.

5.3.3 **INSTALL** new particulate filter CID # 683620 and Air Intake Filter housing.

5.3.4 **TIGHTEN** housing hand tight.

5.3.5 **RECORD** Ambient Air Particulate Filter Replacement on Data Sheet.

5.4 **Compressor Exhaust Filter FLT-703 Replacement**

NOTE – Compressor Exhaust Filter is located in the Main Panel AP241-VTP-ENCL-653 below the UV and IR Analyzer Modules AY-5077I and AY-5077U.

5.4.1 **ENSURE** lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure before performing this work.

5.4.2 **ENSURE** pressure is relieved before removing Post air Compressor Particulate Filter housing. (Figure 3)

5.4.3 **UNSCREW** Outlet Air and Oil Filter housing AND **REMOVE** Particulate filter and Oil Filter (FLT-703).

5.4.4 **DISPOSE** of used filter in accordance with established waste handling procedure.

5.4.5 **INSTALL** new particulate filter and Oil filter CID # 683623 and Outlet Air and Oil Filter housing.

5.4.6 **TIGHTEN** housing hand tight.

5.4.7 **RECORD** Post Air Compressor Particulate Filter Replacement on Data Sheet.
5.5 Post Air Compressor Desiccant for Filter FLT-704 Replacement

NOTE – Post Air Compressor Desiccant Filter is located in the Main Panel AP241-VTP-ENCL-653 below the UV and IR Analyzer Modules AY-5077I and AY-5077U.

5.5.1 ENSURE lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure before performing this work.

5.5.2 ENSURE pressure is relieved by manually opening pressure relief valve V-712 before removing Post Air Compressor Desiccant Filter housing.

5.5.3 LOOSEN clamp ring AND

REMOVE Bowl from top of housing on (FLT-704). (Figure 3)

5.5.4 REMOVE used desiccant AND

DISPOSE of used desiccant in accordance with established waste handling procedure.

5.5.5 POUR new non-toxic desiccant media CID #683623 (Wilkerson Part #DRP 14-447/002).

5.5.6 REPLACE desiccant condition indicator CID #685556 (Wilkerson Part #DRP-85-447) into Bowl AND

SHAKE OR TAP to settle desiccant.

5.5.7 ADD OR REMOVE into bowl to 1/8” below inner step.

5.5.8 TIGHTEN housing hand tight.

5.5.9 RECORD Desiccant Replacement on Data Sheet.
5.6 Compressor Air Intake Pre-Filter FLT-705 Replacement

NOTE – Compressor Air Intake Pre-Filter is located outside the Main Panel AP241-VTP-ENCL-653 next to gas inlet ports.

5.6.1 LOOSEN wing nut AND

REMOVE top of housing. (Figure 2)

5.6.2 REMOVE used filter element AND

DISPOSE in accordance with established waste handling procedure.

5.6.3 INSTALL particulate filter element, CID #685559.

5.6.4 INSTALL housing and secure with wing nut.

5.6.5 RECORD Intake Filter Replacement on Data Sheet.
5.7 Blowback Pressure Relief Valve AP241-VTP-V-712 Replacement

NOTE - Blowback Pressure Relief Valve is located in the Main Panel AP-VTP-ENCL-653 below the UV and IR Analyzer Modules AY-507I and AY-507U.

5.7.1 ENSURE lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure before performing this work.

5.7.2 ENSURE pressure is relieved by manually opening pressure relief valve V-712 (Figure 5).

5.7.3 UNSCREW tubing fittings from relief valve V-712.

5.7.4 REMOVE AND REPLACE relief valve, CID #685555.

5.7.5 TIGHTEN 7 in-lbs.

5.7.6 DISPOSE of used relief valve in accordance with established waste handling procedure.

5.7.7 RECORD Blowback Pressure Relief Valve Replacement on Data Sheet.
5.8 Stack Probe Filter Replacement

NOTE – Stack Probe Filters are located in Probe “A” Enclosure FLT-736 and Probe “B” Enclosure FLT-756 of the AP Exhauster.

Special Instructions

Steps 5.8.1 through 5.8.14 may be performed for Enclosure 655 (FLT 736), Enclosure 656 (FLT 756) or both.

5.8.1 PERFORM pre-job radiation and contamination surveys of work area

5.8.2 ENSURE lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure before performing this work.

5.8.3 CONTROL breach area as a Contamination Area (CA) when performing system breach.

5.8.4 PERFORM monitoring per Sample Plan IHSP-EABO-11048, RC3.

5.8.5 OPEN probe filter housing. (Figure 6)

5.8.5.1 CONTROL contamination with absorbent media.

5.8.6 PERFORM contamination survey.

5.8.7 REMOVE filter element from housing (Figure 6).
5.8 Stack Probe Filter Replacement (Cont.)

5.8.8 **TAKE** detailed photographs of used filter for Engineering evaluation **AND PROVIDE**

5.8.9 **INSTALL** new filter element CID #683625 and graphoil gaskets 3PAM-006PK, CID #684233 into housing.

5.8.10 **REINSTALL** probe filter housing cover.

5.8.11 **HAND TIGHTEN** probe filter housing cover knob.

5.8.12 **PERFORM** post-job radiation and contamination survey of the work area.

5.8.13 **DISPOSE** of waste per the Waste Planning Checklist.

5.8.14 **RECORD** Stack Probe Filter Replacement on Data Sheet.
5.9 SOLO SL4896-VRE Temperature Controller Functional Check

NOTE - The functional check observes proper operation of sample cells and both probe assembly and tube bundle temperature controllers. Stack A & B temperature controllers will need to be checked.

5.9.1 RECORD Set Point Variable (SV) reading and Process Variable (PV) readings of sample cells and in-service probe assembly and tube bundle.

5.9.2 PLACE hand switch HS-653 to the OFF position.

5.9.3 WAIT for probe and tube temperature controller to achieve set-point temperature.

5.9.4 RECORD Set Point Variable (SV) readings and Process Variable (PV) readings of off service probe assembly and tube bundle.

5.9.5 CHECK tolerance AND

COMPARE PV to SP.

5.9.6 ENSURE hand switch HS-652 is aligned to the in-service exhauster train position.

5.9.7 PLACE hand switch HS-653 to the ON position.

5.9.8 IF PV and SV readings are within 2% of setpoint value, PROCEED to Section 5.15.

5.9.9 IF readings are not within tolerance specified on Data Sheet, NOTIFY FWS.
5.10 IR Source Replacement and Alignment

NOTE - IR source is Run-to-Failure.

5.10.1 OPEN panel 241AP-VTP-ENCL-653B.

5.10.2 OPEN panel 241AP-VTP-ENCL-653.

5.10.3 ALLOW sufficient cooling time before servicing internal components.

5.10.4 IF lamp is running, PROCEED to step 5.10.14.

5.10.5 IF lamp is not running, CONTINUE to step 5.10.6.

5.10.6 DISCONNECT 24vdc power connector supplying power to IR Module PC.

5.10.7 DISCONNECT Molex connector supplying connector to the IR Source.

5.10.8 LOOSEN two thumb screws attaching IR Source to its housing. (Figure 10)

NOTE - The IR Source should slide out easily.

5.10.9 REPLACE source with new IR Source, CID #683627.

5.10.10 REINSERT AND TIGHTEN thumb screws.

5.10.11 RECONNECT Molex connection that supplies lamp with power.

5.10.12 RECONNECT 24vdc power connector supplying power to IR Module PC.

5.10.13 WAIT approximately 5 minutes at local touch screen display.
5.10 IR Source Replacement and Alignment (Cont.)

5.10.14 PRESS STOP in CMS at local touch screen display.

5.10.14.1 OPEN alignment menu under FTIR tab.

5.10.14.2 CHECK alignment screen for signal strength.

5.10.15 LOOSEN thumb screws, allowing slight movement, holding IR Source (Figure 10).

5.10.15.1 DO NOT REMOVE IR Source.

5.10.15.2 ROTATE source while watching alignment screen.

5.10.15.3 TIGHTEN thumb screws once the maximum signal is obtained.

5.10.16 PRESS OK at local touch screen display to exit alignment mode.

5.10.17 CLOSE panel AP241-VTP-ENCL-653B.

5.10.18 CLOSE panel AP241-CTP-ENCL-653.
5.11 UV Source Replacement

NOTE - The UV source is Run-to-Failure.

5.11.1 CHECK UV source for operability before replacing. (Figure 7)

5.11.1.1 IF light is on, DO NOT REPLACE UV source.

5.11.1.2 IF light is off, REPLACE UV source.

5.11.2 ALLOW sufficient cooling time before servicing internal components.

5.11.3 OPEN panel AP241-VTP-ENCL-653.

5.11.4 OPEN panel AP241-VTP-ENCL-653B.

5.11.5 DISCONNECT 24vdc power connector supplying power to UV Module PC.

5.11.6 DISCONNECT Molex connector supplying power to UV Source.

5.11.7 LOosen two socket head machine screws attaching UV Source to its housing.

NOTE - The UV Source should slide out easily.

5.11.8 REPLACE source with new UV Source supplied by Cerex Monitoring Solutions, CID #683626.

5.11.8.1 DISPOSE of used source in accordance with established waste handling procedure.

5.11.9 REINSERT AND TIGHTEN socket head machine screws.

5.11.10 RECONNECT Molex connection that supplies lamp with power.

5.11.11 RECONNECT 24vdc power connector supplying power to UV Module PC.

5.11.12 WAIT approximate 5 minutes to allow Internal PC to startup.

5.11.13 CONFIRM lamp is illuminated.
5.11 UV Source Replacement (Cont.)

5.11.14 PRESS STOP in CMS at local touch screen display.

5.11.14.1 OPEN alignment menu under UV tab.

5.11.14.2 CHECK alignment screen for signal strength.

5.11.15 LOOSEN thumb screws, allowing slight movement, securing fiber cable. (Figure 7, Picture 2)

5.11.15.1 DO NOT REMOVE fiber cable.

5.11.15.2 ROTATE fiber cable while watching alignment screen.

5.11.15.3 TIGHTEN thumb screws once maximum signal is obtained and greater than 45.0+-5.0.

5.11.16 TO REDUCE signal strength, ADJUST integration on the alignment popup on the UV tab until a signal strength of 45.0+-5.0 is achieved.

5.11.17 PRESS OK to exit alignment mode.

5.11.18 CLOSE panel AP241-VTP-ENCL-653B.

5.11.19 CLOSE panel AP241-VTP-ENCL-653.
5.12 Delete Data on Module AP241-VTP-AY-507I & AP241-VTP-AY-507U Hard Drive

Special Instructions

Contact TFMCS Engineering prior to performing this section.

5.12.1 CONNECT to AP241-VTP-AY-507I from engineering work station.

5.12.2 NAVIGATE to data folder.

5.12.3 VERIFY files to be deleted have been archived in TFMCS historian.

5.12.4 DELETE files for date range.

5.12.5 DISCONNECT from AP241-VTP-AY-507I

5.12.6 CONNECT to AP241-VTP-AY-507U from engineering work station.

5.12.7 NAVIGATE to data folder.

5.12.8 VERIFY files to be deleted have been archived in TFMCS historian.

5.12.9 DELETE files for date range.

5.12.10 DISCONNECT from AP241-VTP-AY-507U.
5.13 Replace Cryocooler Detector Module Assembly

NOTE – Refer to Figure 9 and when performing section 5.13.

5.13.1 CHECK CDM in-service time.

5.13.1.1 IF in-service time is 17,000 hours or more, PROCEED to step 5.13.2.

5.13.1.2 IF in-service time is less than 17,000 hours, PROCEED to section 5.14.

5.13.2 POWER OFF AP Stack Vapor Monitoring System.

5.13.3 DISCONNECT Molex connector supplying power to Cryocooler Detector Module Assembly.

5.13.4 DISCONNECT BNC connector from pre-amplifier module.

5.13.5 USING 9-64” hex driver, REMOVE three 8-32 socket head cap screws securing Cryocooler Detector Monitor Assembly to the IR module base plate.

5.13.6 REMOVE Cryocooler Detector Module Assembly from IR module.

5.13.7 RECORD serial number of Cryocooler removed on Data Sheet.

5.13.8 RECORD serial number of the replacement Cryocooler on Data Sheet.

5.13.9 REPLACE module with spare Cryocooler Module.

5.13.10 CONNECT BNC connector to pre-amplifier module.

5.13.11 CONNECT Molex connector to power supply connector.
5.13 Replace Cryocooler Detector Module Assembly (Cont.)

5.13.12 **RESTORE** power to AP Stack Vapor Monitoring System.

5.13.13 **USING** touch pad screen for IR module perform the following:

5.13.13.1 **NAVIGATE** to CMS application.

5.13.13.2 **PRESS** STOP.

5.13.13.3 **NAVIGATE** to alignment menu in CMS.

5.13.13.4 **LOOSE**n three 8-32 screws allowing slight movement of Cryocooler Detector Module Assembly.

5.13.13.5 **SLIDE** Cryocooler Detector Module Assembly around until maximum signal is achieved **AND**

**TIGHTEN** three 8-32 screws.

5.13.13.6 **RECORD** signal intensity achieved on Data Sheet.

5.13.13.7 **PRESS** RUN in CMS.

5.13.13.8 **CONFIRM** data collection starts by observing scan counter values change on the main CMS screen.

5.13.14 **RETURN** failed module to WSR to send out for repair.
5.14 Restoration

5.14.1 IF any problems were encountered with performance of this procedure, INFORM FWS.

5.14.2 IF not already removed; DISCONNECT AND REMOVE Test Equipment.

5.14.3 RECORD the Test Equipment information and calibration status on Data Sheet.

5.14.4 CHECK equipment restoration by observing COPC measurements are consistent with expected conditions.

5.14.5 NOTIFY Operations that maintenance is complete and system may be returned to desired configuration.

5.15 Acceptance Criteria

Acceptance Criteria has been met when Steps in this procedure have been satisfactorily performed and As-Left values meet the specifications and tolerance(s) per the Data Sheet.

5.16 Review

5.16.1 INFORM FWS test is complete.

5.17 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 Record Inventory and Disposition Schedule (RIDS), is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Figure 1 – Heater/Air Conditioner Unit
Figure 2 – FLT-705 & FLT-702
Figure 3 - FLT-703 & FLT-704
Figure 4 – FLT 701
Figure 5 – V-712
Figure 6 – Probe Filter
Figure 7 – UV Lamp
Figure 8 – Temperature Controllers
Figure 9 - Cryocooler Detector Module Assembly
Figure 10 – IR Source