Operate SY Farm Nitrogen DEWAR System

Tank Farm Plant Operating Procedure

GENERAL

USQ # TF-16-1945-S, Rev. 0

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Operate SY Farm Nitrogen DEWAR System

Table 1 - Operating Pressure Specifications

Attachment 1 - System Description and Alarm Operation

Figure 1 - Nitrogen Dewar Supply System Diagram
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions to operate and shut-down SY Farm Nitrogen Dewar Supply System.

1.2 Scope

This procedure involves SY Farm Nitrogen Dewar Supply System.

2.0 INFORMATION

2.1 General Information

Refer to Attachment 1 for system information.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

**WARNING** - Direct contact with either liquid nitrogen or un-insulated equipment containing liquid nitrogen can result in liquid nitrogen burns.

3.1.1 The pneumatic tubing down-stream of valves SY241-WST-V-182 and SY241-WST-V-183 may be pressurized.

3.1.2 Moisture and air can freeze on cold surfaces. This can clog vents and prevent normal operation of system valves.

3.1.3 In the event of a catastrophic loss of liquid nitrogen from the Dewar, contact the Hanford Fire Department for emergency response support. Do not attempt to control loss of fluid from the Dewar.

3.1.4 A qualified electrical worker must be present when opening Nitrogen Distribution Cabinet SY241-WST-PNL-101,
3.2 Equipment Safety

3.2.1 Isolation of valves SY241-WST-V-182 and SY241-WST-V-183 will remove process nitrogen (purge gas) to the Mitigation pump and SY Farm auxiliaries, respectively.

3.3 Radiation and Contamination Control

3.3.1 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.

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

4.0 PREREQUISITES

4.1 Performance Documents

The following documents may be needed to perform this procedure:

- Drawing H-14-020631 Sheet 8
- Drawing H-14-030031 Sheet 15
- TF-OR-WR-ST, ST Weekly Rounds
- GHS-SDS and/or MSDS # 038876.

4.2 Field Preparations

4.2.1 IF directed by Shift Manager/OE, INCREASE nitrogen pressure downstream of valve SY241-WST-PCV-110 to a maximum manifold pressure of 150 psi.

4.2.2 IF a temporary nitrogen supply bottle is being used to supply 10-15 psig to pump column as shown in Figure 1, NOTIFY Shift Manager/OE.
### 5.0 PROCEDURE

#### 5.1 Operation of Nitrogen Distribution System

**NOTE** - Sections 5.1 through 5.4 may be performed in any logical order.

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**WARNING**

Direct contact with either liquid nitrogen or un-insulated equipment containing liquid nitrogen can result in liquid nitrogen burns.

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**NOTE** - The 140 - 160 psig regulation for the distribution manifold is performed by a pressure regulator located between the Dewar Tank (SY241-WST-TK-104) and Nitrogen Distribution Cabinet (SY241-WST-PNL-101). This pressure regulator is vendor supplied and can be adjusted by either the vendor or an operator.

- Section 5.4 provides actions for alarm response.

5.1.1 **IF** opening Nitrogen Distribution Cabinet SY241-WST-PNL-101, **ENSURE** a qualified electrical worker is present.

5.1.2 **POSITION** valves as follows:

<table>
<thead>
<tr>
<th>VALVE</th>
<th>POSITION</th>
<th>VALVE LOCATION</th>
<th>COMPLETE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY241-WST-V-177</td>
<td>CLOSED</td>
<td>Down-stream of Nitrogen Dewar (SY241-WST-TK-104)</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-V-183</td>
<td>CLOSED</td>
<td>Inside Nitrogen Distribution Cabinet (SY241-WST-PNL-101)</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-V-182</td>
<td>CLOSED</td>
<td>Inside Nitrogen Distribution Cabinet (SY241-WST-PNL-101)</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-PCV-110</td>
<td>CLOSED</td>
<td>Inside Nitrogen Distribution Cabinet (SY241-WST-PNL-101)</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-PCV-109</td>
<td>CLOSED</td>
<td>Inside Nitrogen Distribution Cabinet (SY241-WST-PNL-101)</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-V-185</td>
<td>CLOSED</td>
<td>Inside SY-Farm along vent header</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-V-186</td>
<td>CLOSED</td>
<td>Inside SY-Farm along vent header</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-V-187</td>
<td>CLOSED</td>
<td>Inside SY-Farm along vent header</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-V-188</td>
<td>CLOSED</td>
<td>Inside SY-Farm along vent header</td>
<td></td>
</tr>
</tbody>
</table>
5.1 Operation of Nitrogen Distribution System (Cont.)

5.1.3 **CHECK** pressure conditions as follows:

<table>
<thead>
<tr>
<th>PRESSURE INDICATOR LABEL OR BRAND</th>
<th>PRESSURE SPECIFICATION</th>
<th>LOCATION</th>
<th>COMPLETE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY241-WST-PI-123</td>
<td>0 psig</td>
<td>Nitrogen Distribution Cabinet (SY241-WST-PNL-101)</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-PI-122</td>
<td>0 psig</td>
<td>Nitrogen Distribution Cabinet (SY241-WST-PNL-101)</td>
<td></td>
</tr>
<tr>
<td>SY241-WST-PI-121</td>
<td>0 psig</td>
<td>Nitrogen Distribution Cabinet (SY241-WST-PNL-101)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE** - Panelboard SY272-EDS-DP-108 is located inside Motor Control Center building 241-SY-272.

5.1.4 **PLACE** Breaker 27 inside Panelboard SY272-EDS-DP-108 in ON position.

**NOTE** - FU-1 is located inside Nitrogen Distribution Cabinet SY241-WST-PNL-101.

5.1.5 **IF** opening Nitrogen Distribution Cabinet SY241-WST-PNL-101, **ENSURE** a qualified electrical worker is present.

5.1.5.1 **CLOSE** fuse FU-1. (Low Pressure Alarm will activate if manifold pressure is less than 120 psig.)

5.1.5.2 **CONFIRM** audible horn "Low Pressure Alarm" is sounding and red pilot light "Nitrogen Low Pressure" is illuminated.

5.1.6 **PUSH** "Alarm Acknowledge" push button. (The red pilot light "Nitrogen Low Pressure" will continue to illuminate after Alarm Acknowledge button is pushed.)

5.1.6.1 **CONFIRM** audible horn "Low Pressure Alarm" is not sounding and amber pilot light "Alarm Acknowledge" illuminates.
5.1 Operation of Nitrogen Distribution System (Cont.)

5.1.7 IF Dewar is out of service and back-up bottles are utilized, **ENSURE** valve SY241-WST-V-177 is CLOSED.

5.1.8 IF Dewar is in service and back-up bottles are not utilized, **ENSURE** valve SY241-WST-V-177 is OPEN.

5.1.9 **CONFIRM** pressure indicator SY241-WST-PI-123 reads between 140 - 160 psig.

5.1.10 **RECORD** SY241-WST-PI-123 pressure reading on TF-OR-WR-ST.

5.1.11 **CONFIRM** Low Pressure Alarm is reset **AND** **NOTIFY** Shift Manager/OE.

5.1.12 **ADJUST** pressure control valve SY241-WST-PCV-110 until pressure indicator SY241-WST-PI-122 indicates between 95 - 100 psig.

5.1.13 **RECORD** 241-SY-WST-PI-122 pressure reading on TF-OR-WR-01.

5.1.14 **OPEN** valve SY241-WST-V-183.

5.1.15 **OPEN** valve SY241-WST-V-182.

5.1.16 **ADJUST** pressure control valve SY241-WST-PCV-109 until pressure indicator SY241-WST-PI-121 indicates approximately 13 psig (10-15 psig).

5.1.17 **RECORD** SY241-WST-PI-121 pressure reading on TF-OR-WR-01.

**NOTE** - Valves are located on back-up nitrogen bottle rack west of GMS2.

5.1.18 **OPEN** the following valves:

- SY241-WST-V-186
- SY241-WST-V-187
- SY241-WST-V-185.

5.1.19 **PLUG/CAP** unused outlet ports on service manifolds and/or nozzles.
5.2 **Shut-down of Nitrogen Dewar Supply System**

**NOTE** - Sections 5.1 through 5.4 may be performed in any logical order.

5.2.1 **IF** directed by Shift Manager/OE to isolate mixer pump column nitrogen supply, **CLOSE** valve SY241-WST-V-182.

5.2.2 **IF** directed by Shift Manager/OE to isolate SY farm nitrogen manifold (cameras and GMS-2 nitrogen purge), **CLOSE** valve SY241-WST-V-183.

5.2.3 **IF** directed by Shift Manager/OE to completely shut down nitrogen Dewar supply system, **PERFORM** Steps 5.2.3.1 through 5.2.4.2.

5.2.3.1 **OPEN** Breaker 27 in Panelboard SY272-EDS-DP-108 located inside Motor Control Center building 241-SY-272.

5.2.4 **IF** opening Nitrogen Distribution Cabinet SY241-WST-PNL-101, **ENSURE** a qualified electrical worker is present.

5.2.4.1 **OPEN** fuse FU-1 located inside nitrogen distribution cabinet SY241-WST-PNL-101.

5.2.4.2 **CLOSE** valve SY241-WST-V-177 between Dewar and nitrogen distribution cabinet.

5.2.5 **IF** directed by Shift Manager/OE to connect back up nitrogen bottles, **GO TO** Section 5.3.

5.2.6 **REMOVE** plug at end of valve SY241-WST-V-178.

5.2.7 **SLOWLY OPEN** valve SY241-WST-V-178 to allow distribution manifold to depressurize.

5.2.8 **CONFIRM** the following pressure indicators indicate 0 psig:

- SY241-WST-PI-123
- SY241-WST-PI-121
- SY241-WST-PI-122.
5.3 Connection of Back-up Supply Bottles

NOTE - Sections 5.1 through 5.4 may be performed in any logical order.

5.3.1 **SHUTDOWN** nitrogen Dewar supply system per Section 5.2.

NOTE - Valves are located at the 3-bottle rack.

5.3.2 **CLOSE** the following valves:
- SY241-WST-V-181
- SY241-WST-PCV-108
- Nitrogen bottle tank valve 241SY-WST-V-179
- Nitrogen bottle tank valve 241SY-WST-V-180.

NOTE - Acceptable nitrogen bottle pressure is greater than 1000 psig.

5.3.3 **OPEN** both bottle valves to check bottle pressures.

5.3.4 **ROTATE** switchover regulator knob SY241-WST-AOV-101 to either tank (clockwise or counter-clockwise) until knob hits stop.

NOTE - Initial bottle selection for the "IN USE" source is arbitrary. The bottle not being utilized will be considered the "STANDBY" source.

5.3.5 **CHOOSE** one supply side of switchover system to be "IN USE" source and other side to be "STANDBY".

5.3.6 **ADJUST** SY241-WST-PCV-108 until pressure indicator SY241-WST-PI-120 reads between 140 - 150 psig.

**WARNING**

Direct contact with either liquid nitrogen or un-insulated equipment containing liquid nitrogen can result in liquid nitrogen burns.

5.3.7 **SLOWLY OPEN** valve SY241-WST-V-181 (purge line).
### 5.3 Connection of Back-up Supply Bottles (Cont.)

5.3.8 **CONFIRM** SY241-WST-PI-123 reads between 140 - 160 psig.

5.3.9 **OPEN** valve SY241-WST-V-182.

5.3.10 **ENSURE** SY241-WST-PI-121 reads 10-15 psig.

5.3.11 **OPEN** valve SY241-WST-V-183.

5.3.12 **CONFIRM** SY241-WST-PI-122 reads between 95 - 105 psig.

**NOTE** - FU-1 is located inside Nitrogen Distribution Cabinet SY241-WST-PNL-101.

5.3.13 **IF** opening Nitrogen Distribution Cabinet SY241-WST-PNL-101, **ENSURE** a qualified electrical worker is present.

5.3.14 **CLOSE** fuse FU-1.

5.4 Alarm Response

NOTE - The following are possible causes of the alarm condition:

- Nitrogen Dewar has emptied.
- Instrument malfunction.
- Closed valve SY241-WST-V-177 located between Dewar and distribution cabinet.
- Large leak in system may cause manifold pressure to drop below the pressure switch's setpoint.
- Dewar malfunction.

5.4.1 PRESS "Alarm Acknowledge" pushbutton.

5.4.2 CHECK tank contents gauge (differential pressure indicator) SY241-WST-PDI-101 AND RECORD findings.

SY241-WST-PDI-101 reading: ________________________________

5.4.3 CHECK manifold pressure indicator SY241-WST-PI-123 AND RECORD findings.

SY241-WST-PI-123 reading: ________________________________

5.4.4 ENSURE valve SY241-WST-V-177 is OPEN.
5.4 Alarm Response (Cont.)

5.4.5 IF value recorded for Step 5.4.2 is less than 30 IN. H₂O (identified by "Refill" decal) and value recorded for action 5.4.3 is below 120 psig, PERFORM the following:

5.4.5.1 REQUEST Shift Manager/OE NOTIFY Stores Procurement the 500 gallon Dewar requires liquid nitrogen refilling.

5.4.5.2 CONNECT the back-up nitrogen bottles to the nitrogen distribution cabinet per Section 5.3.

NOTE - Alarm automatically resets (at approx. 140 psig) when system is pressurized to operating specifications (145 - 155 psig).

5.4.5.3 CONFIRM back-up nitrogen bottles supply a maximum of 145-155 psig to nitrogen distribution cabinet.

5.4.6 IF value recorded for Step 5.4.2 is greater than 30 IN. H₂O (identified by "Refill" decal) and value recorded for Step 5.4.3 is less than 120 psig, PERFORM the following:

5.4.6.1 REQUEST Shift Manager/OE NOTIFY stores procurement that a Cryogenic Technician and Tank Farms Maintenance personnel are required to troubleshoot failure of nitrogen Dewar.

5.4.6.2 CONNECT back-up nitrogen bottles to nitrogen distribution cabinet per Section 5.3.

NOTE - Alarm automatically resets (at approx. 140 psig) when system is pressurized to operating specifications (145 - 155 psig).

5.4.6.3 CONFIRM back-up nitrogen bottles supply a maximum of 145-155 psig to nitrogen distribution cabinet.
5.5 Records

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

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

**OR**

5.5.1.2 **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>5.1 Operation of Nitrogen Distribution System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 5.1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 5.1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.4 Alarm Response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 5.4.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 5.4.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

__________________________ / __________________ / ______________
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.
## Operate SY Farm Nitrogen DEWAR System

### Table 1 - Operating Pressure Specifications

<table>
<thead>
<tr>
<th>Pressure Indicator Label or Brand</th>
<th>Pressure Specification</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY241-WST-PDI-101</td>
<td>30 - 90 in. H₂O</td>
<td>On Nitrogen Dewar (WST-TK-3150A)</td>
</tr>
<tr>
<td>SY241-WST-PI-123</td>
<td>140 - 160 psig</td>
<td>Nitrogen Distribution Cabinet (SY241-WST-TK-104)</td>
</tr>
<tr>
<td>SY241-WST-PI-122</td>
<td>95 - 105 psig</td>
<td>Nitrogen Distribution Cabinet (SY241-WST-PNL-101)</td>
</tr>
<tr>
<td>SY241-WST-PI-121</td>
<td>10 - 15 psig</td>
<td>Nitrogen Distribution Cabinet (SY241-WST-PNL-101)</td>
</tr>
</tbody>
</table>
Attachment 1 - System Description and Alarm Operation

System Description

1. Nitrogen Dewar - The Linde TM-500 cryogenic storage vessel is capable of storing liquid nitrogen and supplying gaseous or liquid nitrogen. Maximum working pressure of these double-walled vacuum-powder insulated tanks is 250 psig (1725 kPa). Net capacity is 530 gallons (2010 liters) and gross capacity is 570 gallons (2160 liters).

2. Tank-Mounted Vaporizer - The nitrogen Dewar is equipped with a 2000 cfh capacity atmospheric vaporizer. The vaporizer is the medium where the liquid nitrogen is flashed to the gaseous state. This vaporizer is also supplied by the vendor.

3. The Dewar and distribution cabinet are located north of the DACS Trailer. The nitrogen Dewar tank is staged on a concrete foundation with its own vaporizer mounted on the side. The vendor to provide 180-200 psig of pressure has adjusted the Dewar tank. A pressure regulator down-stream of the tanks vaporizer has been provided by the vendor to adjust/regulate the distribution manifold pressure to the 140 - 160-psig requirement. Pressure indicator WST-PI-3151A has been installed to locally monitor the distribution manifold pressure.

4. The distribution manifold then services a line designated to the HMT Mixer Pump (10 - 15 psig) and the other to ancillary equipment (95 - 105 psig) by the way of three in-farm service manifolds and one outlet nozzle.

5. The low-pressure alarm elementary diagram is shown on drawing H-2-821643 Sh.3. The system includes a "Low Pressure Alarm" audible horn, a red "Nitrogen Low Pressure" pilot light, an amber "Alarm Acknowledge" pilot light and an "Alarm Acknowledge" momentary push button switch.

6. The back-up bottle supply will be used in the event the Nitrogen Dewar Supply is or becomes unavailable. The system consists of a Matheson 5230 series "Automatic Switchover" unit. After the primary (IN USE) cylinder is depleted, the regulator switches automatically to the secondary (STANDBY) cylinder. The switchover valve (SY241-WST-AOV-101) simply switches priority.
Alarm Operation

7. When nitrogen gas pressure at the distribution manifold falls below 120 psig (pressure locally monitored by SY241-WST-PI-123), pressure switch SY241-WST-PS-103 will activate alarm circuitry. When system is in alarm state, an audible alarm is activated and the red "Nitrogen Low Pressure" pilot light will illuminate. Alarm will remain in this state until pressure is restored to normal or the "Alarm Acknowledge" button is pressed.

8. If system is in alarm state and pressure is restored to operating specifications (150 psig nominally), the alarm system will automatically reset.

9. If system is in alarm state and the "Alarm Acknowledge" button is pressed, the audible horn will turn off and the amber "Alarm Acknowledge" light will illuminate. The red "Nitrogen Low Pressure" light will continue to illuminate. The system will continue to be in the alarm acknowledge state until system is pressurized to normal. In this state, the acknowledger should follow Section 5.4.

10. During normal operation, the mixer pump column is pressurized to 10-15 psig. This pressure can be monitored from SY101-WST-PIT-422 pressure indicator/transmitter. This instrument provides local gas supply pressure digital display and is located in mixer pump instrument cabinet (input/output cabinet #1 [I/O #1]), located approximately 20 feet south of gas monitoring system (GMS-1) shelter. The nitrogen tubing down-stream of valve SY241-WST-V-182 is dedicated to the 101-SY HMT Mixer Pump. If nitrogen pressure to the mixer pump cannot be maintained between 10-15 psig, notify the Shift Manager/OE of the condition and determine the cause.
Operate SY Farm Nitrogen DEWAR System

Figure 1 - Nitrogen Dewar Supply System Diagram

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