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SMD Operations Procedures Manual

8.1.3.16 OPERATION OF NASH REFRIGERATION PUMPS

Text Pages 1 through 6
Attachments 3

Hand Processed Changes

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Approved: [Signature on File](#)
SMD Division Head Date

Preparer(s): M. Bornstein

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1.0 Purpose and Scope

Operation of the NASH refrigeration pumps in automatic mode from the pump room. The procedure does not describe manual operation. Should the need for manual operation arise, that need shall be reviewed by the division's cognizant electrical engineer & screened for hazards by the appropriate personnel.

2.0 Responsibilities

The lead technician responsible for the operation of the pump system is also responsible for conducting this procedure and the completion of the system crash test checklist.

3.0 Prerequisites

None

4.0 Precautions

4.1 The crash button system shall be tested on a six-month interval. Operations shall not proceed unless testing is current. The test method is described in Section 5.1.

4.2 Hearing protection is required when in the pump room during operation.

4.3 Equipment operation can impact the environment. Report any fluid leaks to the Building Manager. If the leak has the potential to impact the environment, report the leak immediately to extension 2222.

4.4 Oxygen Deficiency Hazard (ODH-0) is only in effect when the NASH Pump is operating. No Unauthorized Personnel allowed during operation of compressor. If compressor is operating and personnel must enter area, ODH training and a personal oxygen monitor is required before entering.

NOTE

Training: TQ-ODH Oxygen Deficiency Hazard Class 0. Areas are posted with warning signs for ODH-0

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5.0 Procedure

5.1 Crash System Test

WARNING

This section requires entry to the pump room. See Section 4.4 for entry requirements

WARNING

Ensure that PPE in accordance with hazard categorization is worn during breaker operation

- 5.1.1 Turn on the main breaker, Circuit Breaker #1 on panel MCA, located in the pump room (Building 948).
- 5.1.2 Verify that the power on lights are illuminated, both the one on the main 480 V panel, and on the controller panel.
- 5.1.3 Activate Touch Control Panel (TCP) by touching on the screen
- 5.1.4 Open Lab View program “Nash Control” on the TCP
- 5.1.5 Activate “208 TRX Contactor ON” switch to ON position.
- 5.1.6 Activate “Motor Power Enable” switch to ON position.
- 5.1.7 On Control Panel, press red push button “Motors Enable”. “Motors Enabled” red light should be lit.
- 5.1.8 Push the crash button located on the control panel. This should result in a system crash, the crash light on the small panel should illuminate and “Motors Enabled” red light should turn off.
- 5.1.9 Activate “Motor Power Enable” switch to ON position.
- 5.1.10 On Control Panel, press red push button “Motors Enable”. “Motors Enabled” red light should be lit.
- 5.1.11 Push the crash button located on the vertical pipe located on the skid. This should also crash the system.

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- 5.1.12 Activate “Motor Power Enable” switch to ON position.
- 5.1.13 On Control Panel, press red push button “Motors Enable”. “Motors Enabled” red light should be lit.
- 5.1.14 Push the crash button located on the Vertical Dewar Control Rack. This should also crash the system.
- 5.1.15 Complete the Crash System Test Log Sheet.

5.2 Machine State Sequence

NOTE

An illuminated indicator light means the item has been energized.

For heaters, it means the control circuit is powered, and the actual heater power is under UE800 thermostatic control.

For the inlet valve, it indicates an open state.

The crash indicator means power has been removed from all pump skid components.

- 5.2.1 Before and at initial power-up, all machine elements are off. The inlet valve, which is fail closed, is closed, and remains closed during power up. The bypass valve, which is fail open, remains open during power up.
- 5.2.2 At the first state, the shaft seal fluid heater is enabled. This allows the seal fluid to be brought up to the initial operating temperature before the fluid pump is turned on.
- 5.2.3 When the fluid temperature condition is satisfied, the seal fluid pump will turn on. Also at this time, the inlet valve located at the top of the pump skid will open.
- 5.2.4 When the pressure of the seal fluid is above the Nash pump turn on threshold, the Nash pump will turn on.
- 5.2.5 When interstage pressure of 70 milli-torr is reached, the Roots blower seal fluid solenoid valve will be energized, sending seal fluid to the Roots. After a delay of 1 second, the Roots booster pump will energize. Since the Roots blower is spinning in response to gas flow drawn by the Nash, lubrication of the Roots pump must be maintained while the Nash is running.

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- 5.2.6 After another 5 second time delay, the active control of the bypass valve is enabled.
- 5.2.7 After another 5 second delay, the helium heater is enabled, maintaining the inlet gas temperature above the set-point of the UE800 control.

NOTE

The inlet pressure to the pump system is controlled by using the bypass valve to alter the amount of spoiling gas flow around the pumps.

NOTE

The system is not capable of controlling pressures above 200 mm. This results from the gas flow restriction of the bypass loop.

- 5.3 Auto Operation from TCP in Nash Room

WARNING

This section requires entry to the pump room. See Section 4.4 for entry requirements

- 5.3.1 Activate TCP by touching on the screen. See Attachment 2
- 5.3.2 Open Lab View program “Nash Control” on the TCP
- 5.3.3 Activate “208 TRX Contactor ON” switch to ON position.
- 5.3.4 Activate “Oil Heater Enable” switch to ON position.
- 5.3.5 Activate “Enable He Heater” switch to ON position.
- 5.3.6 Activate “Motor Power Enable” switch to ON position.
- 5.3.7 Press “Fault Reset” to clear faults, if any.
- 5.3.8 On Control Panel, press red push button “Motors Enable”. “Motors Enabled”. Red light should be lit.
- 5.3.9 On TCP verify “Stand By” light is lit

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- 5.3.10 Verify “State Num” is 0
- 5.3.11 Verify “Main Auto/Man” switch is in Auto
- 5.3.12 Verify “Inter Stage Pressure Threshold” is set to 70 milli-torr.
- 5.3.13 Verify “Oil Pressure Threshold” is set to 20PSIG
- 5.3.14 Verify “Oil Temperature Set Point” is set to 30°C.
- 5.3.15 Verify “Water Flow” is 30GPM ±5GPM
- 5.3.16 Verify gate valve is open at the top of Dewar 2.
- 5.3.17 On TCP press yellow button “Auto Sequence Start”
- 5.3.18 When operations are complete, press “Auto Sequence Stop”

NOTE

When Stop is selected, the sequence described in Section 5.2 will occur in reverse.

6.0 Documentation

- 6.1 Crash System Test Log Sheet
- 6.2 Post Test Log Sheet at pumping station.

7.0 References

- 7.1 Operation and Maintenance Manual for the Pump Station

8.0 Attachments

- 1. Crash System Test Log Sheet
- 2. LabVIEW Interface
- 3. Pump Room Power Reset Panel

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Attachment 2

LabVIEW Control Panel

The LabVIEW Control Panel is divided into several functional sections:

- POWER CONTROL:** Includes status indicators for 208V TRX CONTACTOR ON (ON/OFF), MOTOR POWER ENABLE (ON/OFF), OIL HEATER ENABLE (ON/OFF), 208V AC ON (green dot), Crashed (red dot), NASH Fuse Fault, BOOSTER Fuse Fault, 208V AC Phase Fault, Motors Pwr Enabled, Water Flow Fault, 480V AC Phase Fault, and a Program Stop button.
- SPOILER VALVE CONTROL:** Features Spoiler Vlv Ctrl Enable (ON/OFF), Suction Pressure Set Point (351.1 mTorr), Suction Pressure At Nash Inlet (352.1 mTorr), Suction Pressure At Ht Ex (339.6 mTorr), Spoiler Vlv Auto/Man (Man/Auto), Man Valve Pos S.P. % (0), Spoiler Vlv Curr (0.01997), Spoiler Vlv Pos (0-100 scale), PID gains (Kc: 1.000, Ti: 0.010, Td: 0.000), Spoiler Valve PID output range (output high: 100.00, output low: 0.00), Int Stage Press Threshold (70.00 mm Hg), and INTERSTAGE PRESSURE (68 mm Hg).
- AUTO OPERATION:** Contains FAULT RESET (RESET), AUTO SEQUENCE START (NASH START), AUTO SEQUENCE ABORT, AUTO SEQUENCE STOP (NASH STOP), START SEQ ON, ABORT SEQ ON, STOP SEQ ON, MAIN AUTO/MAN (MAN/AUTO), and STANDBY (green bar).
- MANUAL OPERATION:** Includes OIL CIRC PUMP ON/OFF, BOOSTER SOLENOID ON/OFF, HELIUM HEATER (ON/OFF), NASH PUMP ON/OFF, BOOSTER PUMP ON/OFF, SUC INLET VALVE (Open/Close), and DISCHARGE VALVE (Open/Close).
- INDICATORS:** Shows Front Panel Start/Stop/Reset (green dots), He Temp Hi/Limit (red dot), Oil Temp Hi Limit (green dot), Recirc Pump ON (green dot), NASH Pump ON (green dot), BOOSTER Pump ON (green dot), Inlet Valve Open/Closed (green/red dots), and Vent Valve Open/Closed (green/red dots). A data table at the bottom provides real-time values for Oil Temp SP (30), Oil Temp (24.6147), Seal Oil Diff Press (0), He Temp (0.23433), Oil Flow GPM (0), Oil Press Threshold PSIG (20), Water Flow (37.6558), and oil pressure PSIG (21).

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Attachment 3

Pump Room Power Reset Panel

