

7.1.41 Warm Turbines “B” Train Initialization

1. Purpose

To provide instruction on preparing the turbines for start up, this includes the start up of the oil skids.

2. Responsibilities

- 2.1 The Shift Supervisor, or an Operator designated by the Shift Supervisor, is responsible for conducting the procedure and providing documentation in the Cryogenic Control Room Log.
- 2.2 Should a problem arise during the turbine initialization, the Shift Supervisor will report to the Technical Supervisor for instructions before continuing.

3. Prerequisites

- 3.1 Turbines have been regenerated.
- 3.2 Turbines have been purged per [C-A-OPM 7.1.27, “Expander Purge Procedure.”](#)
- 3.3 Seal gas compressor running per [C-A-OPM 7.1.23, “Seal Gas Compressor Startup.”](#)
- 3.4 All personnel working on any electrical system or equipment in the C-AD shall be familiar with BNL [SBMS Electrical Safety](#), BNL [SBMS Lockout/Tagout \(LO/TO\)](#), [C-A-OPM 1.5, “Electrical Safety Implementation Plan”](#), [C-A-OPM 1.5.3 “Procedure to Open or Close Breakers and Switches and Connecting/Disconnecting Plugs”](#), [C-A-OPM 2.36, “Lockout/Tagout for Control of Hazardous Energy”](#). C-AD will provide on-site/work specific training to individuals in the electrical safety aspects of their job functions and assignments.

4. Precautions

- 4.1 If there is liquid helium in the refrigerator pots, all personnel entering the refrigeration wing of Bldg. 1005R must be ODH Class 1 qualified, have a Personal Oxygen Monitor (POM) and carry an emergency escape pack.
- 4.2 Hearing protection shall be worn when the compressors are in operation.
- 4.3 Approved eye protection and safety shoes shall be worn at all times.

5. Procedure

- _____ 5.1 Ensure the turbine inlet valves H728A_____ and H752A_____ are closed.

_____ 5.2 Ensure the turbine outlet valve H780A_____ is closed.

_____ 5.3 Ensure the interstage valve H738M_____ is open.

Note:
The procedure assumes that both turbine inlet filters are clean. If a filter is not clean, that filter shall remain isolated.

_____ 5.4 If placing inlet filter “A” online, complete the following:

5.4.1 Open outlet valve H9125M_____ and inlet valve H9122M_____.

5.4.2 Close “B” filter outlet valve H9132M_____ and open inlet valve H9130M_____ as a sign that “B” filter is ready for service.

_____ 5.5 If placing “B” inlet filter online, complete the following:

5.5.1 Open outlet valve H9132M_____ and inlet valve H9130M_____.

5.5.2 Close “A” filter outlet valve H9125M_____ and open inlet valve H9122M_____ as a sign that “A” filter is ready for service.

_____ 5.6 Unless otherwise instructed, do not adjust expander brake needle valves E780M, E784M, E975M & E979M. They are used for fine control of the turbine speed and are normally set to the correct position.

_____ 5.7 Align turbine 1/2 oil sump to the seal gas compressor by opening valve H1201M.

_____ 5.8 Align turbine 1B/2B drainer gas return by opening valves H1204M_____, H1202M_____, H1205M_____, and H1203M_____.

_____ 5.9 Align turbine 3/4 oil sump to the seal gas compressor by opening valve H1221M.

_____ 5.10 Align turbine 3B/4B drainer gas return by opening valves H1224M_____, H1222M_____, H1225M_____, and H1223M_____.

_____ 5.11 Ensure the following isolation valves located near the turbine 1B/2B pod are open:

E793M_____	E786M_____
H1208M_____	E788M_____
H1209M_____	E779M_____
H1211M_____	E794M_____
E787M_____	E785M_____

_____ 5.12 Ensure the following isolation valves located near turbine 3B/4B pod are open:

E984M_____	E987M_____
H1228M_____	E872M_____
H1229M_____	E884M_____
H1231M_____	E879M_____
E887M_____	E883M_____

_____ 5.13 Remove mechanical brake assemblies from turbines 1B, 2B, 3B and 4B as per [C-A-OPM 7.1.26 “Expander Brake System Installation and Removal.”](#)

_____ 5.14 Ensure 120 VAC circuit breakers #33_____ and #41_____ in panel RP-2 (located next to CB3 and CB5 calorimeter local control panels) are closed.

_____ 5.15 Ensure the following 480 VAC circuit breakers (panel located on east wall of lower level) are closed:

Subsection C:

Breaker #6_____ Turbine Oil System #1, Pump #1.

Subsection D:

Breaker #4_____ Turbine Oil System #1, Pump #2

Breaker #5_____ Turbine Oil System #2, Pump #1

Subsection E:

Breaker #1_____ Turbine Oil System #2, Pump #2

_____ 5.16 Open turbine oil skid 1/2 control air supply valve A199M_____ and adjust turbine 1B/2B air regulator PR9316A to 30 psig_____.

_____ 5.17 Ensure the following valves at turbine 1B/2B oil skid are closed:

E738M_____	E790M_____
E735M_____	E792M_____
E767M_____	E777M_____
E766M_____	

_____ 5.18 Ensure the cooling water return valve W908M_____ and supply valve W902M_____ for turbine 1/2 oil skid are open.

_____ 5.19 Ensure the following valves located on turbine 1B/2B oil skid are open:

W954M_____	E743M_____
W952M_____	E734M_____
E3532M_____	E768M_____
E3533M_____	E789M_____
E763M_____	H10519M_____

_____ 5.20 Open turbine oil skid 3/4 control air supply valve A201M_____ and adjust turbine 3B/4B air regulator PR9323A to 30 psig_____.

_____ 5.21 Ensure the following valves at turbine 3B/4B oil skid are closed:

E831M_____	E867M_____
E829M_____	E875M_____
E876M_____	E871M_____
E868M_____	

_____ 5.22 Ensure the cooling water supply valve W903M_____ and return valve W918M_____ for turbine 3/4 oil skid are open.

_____ 5.23 Ensure the following valves located on turbine 3/4 oil skid are open:

W964M_____	E835M_____
W962M_____	E869M_____
E3534M_____	E873M_____
E3535M_____	H10649M_____
E864M_____	
E828M_____	

_____ 5.24 Ensure the following vent valves for turbines 1B/2B and 3B/4B are closed:

H9166M_____	H9172M_____
H9168M*_____	H9174M*_____
H773M_____	H778M_____
H400M*_____	H427M*_____

*If found open, investigate and be suspect of air contamination.

_____ 5.25 On turbine 1B/2B oil skid, depress “Lamp Test” button to ensure all lamps work.

_____ 5.26 On turbine 3B/4B oil skid, depress “Lamp Test” button to ensure all lamps work.

_____ 5.27 On turbine 1B/2B oil skid, start seal gas flow and oil pump as follows:
5.27.1 Depress “Annunciator Acknowledge” button_____.

5.27.2 Set seal gas pressure to approximately 200 psig by adjusting seal gas differential pressure regulator. Verify seal gas flow in flow meter ____.

5.27.3 On “A” train control panel select primary oil pump by placing “Pump Select” switch to “No. 1” or “No. 2” ____.

Caution:
To prevent oil migration, do not send oil to the expander unless immediate expander startup is anticipated.

Note:
If turbine train “A” is operating, it will be necessary to jog the switch in the following step to avoid starving “A” train of oil.

5.27.4 Send oil to expander by placing “Lube Oil Selector” switch to “Unit 1B1/1B2” ____.

5.27.5 Verify all faults cleared and “Expander Ready” light is lit ____.

5.27.6 Ensure “Local/Computer switch is in “computer” ____.

____ 5.28 On turbine 3B/4B oil skid, start seal gas flow and oil pump as follows:

5.28.1 Depress “Annunciator Acknowledge” button ____.

5.28.2 Set seal gas pressure to approximately 200 psig by adjusting seal gas differential pressure regulator. Verify seal gas flow in flow meter ____.

5.28.3 On “A” train control panel select primary oil pump by placing “Pump Select” switch to “No. 1” or “No. 2” ____.

Caution:
To prevent oil migration, do not send oil to the expander unless immediate expander startup is anticipated.

Note:
If turbine train “A” is operating, it will be necessary to jog the switch in the following step to avoid starving “A” train of oil.

5.28.4 Send oil to expander by placing “Lube Oil Selector” switch to “Unit 2B1/2B2” ____.

5.28.5 Verify all faults cleared and “Expander Ready” Light is lit ____.

5.28.6 Ensure “Local/Computer switch is in “computer” ____.

Caution:

1. To prevent overspeed of turbines the system pressure must be less than 7 atm prior to turbine start up.
2. Following turbine start up, back wheel pressure must be greater than drainer pressure. This will prevent oil migration

6. Documentation

- 6.1 The check off lines on the procedure are for the place keeping only. The procedure is not to be initialed or signed, it is not a record.
- 6.2 The Shift Supervisor shall document the completion of the procedure in the Cryogenics Control Room Log.

7. References

- 7.1 [C-A-OPM 7.1.23, "Seal Gas Compressor Startup"](#).
- 7.2 [C-A-OPM 7.1.26, "Expander Brake System Installation and Removal"](#).
- 7.3 [C-A-OPM 7.1.27, "Expander Purge Procedure"](#).
- 7.4 Drawing 3A995009, 25KW Helium Refrigerator P&ID.
- 7.5 Drawing 3A995704, Warm Expanders 1 through 4 System Schematic (Pages 1-4).
- 7.6 [C-A-OPM 1.5, "Electrical Safety Implementation Plan"](#).
- 7.7 [C-A-OPM 1.5.3 "Procedure to Open or Close Breakers and Switches and Connecting/Disconnecting Plugs"](#).
- 7.8 [C-A-OPM 2.36, "Lockout/Tagout for Control of Hazardous Energy"](#).
- 7.9 [SBMS Electrical Safety](#).
- 7.10 [SBMS Lockout/Tagout \(LOTO\)](#).

8. Attachments

None