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C-A OPERATIONS PROCEDURES MANUAL

7.1.40 Warm Turbines “A” Train Initialization

Text Pages 2 through 8

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
_____	_____	_____	_____
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Approved: _____ *Signature on File* _____
Collider-Accelerator Department Chairman Date

L. Tenreiro

7.1.40 Warm Turbines “A” Train Initialization

1. Purpose

- 1.1 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 H328A_____ and H352A_____ are closed.

_____ 5.2 Ensure the turbine outlet valve H380A_____ is closed.

_____ 5.3 Ensure the interstage valve H338M_____ 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 H9139M_____ and inlet valve H9136M_____.

5.4.2 Close “B” filter outlet valve H9146M_____ and open inlet valve H9144M_____ 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 H9146M_____ and inlet valve H9144M_____.

5.5.2 Close “A” filter outlet valve H9139M_____ and open inlet valve H9136M_____ as a sign that “A” filter is ready for service.

_____ 5.6 Unless otherwise instructed, do not adjust expander brake needle valves E702M, E707M, E798M and E802M. 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 1A/2A drainer gas return by opening valves H1202M_____, H1204M_____, H1203M_____, and H1205M_____.

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

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

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

E893M_____	E699M_____
E710M_____	E704M_____
H1206M_____	E705M_____
H1207M_____	E706M_____
H1210M_____	E711M_____

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

E859M_____	E891M_____
H1226M_____	E806M_____
H1227M_____	E805M_____
H1230M_____	E799M_____
E804M_____	E801M_____

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

_____ 5.14 Ensure 120 VAC circuit breakers #35_____ and #39_____ 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 1/2 oil skid control air supply valve A199M_____ and adjust turbine 1A/2A air regulator PR9315A to 30 psig_____.

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

E738M_____	E727M_____
E735M_____	E725M_____
E728M_____	

_____ 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 1A/2A oil skid are open:

W953M_____	E743M_____
W951M_____	E1006M_____
E737M_____	E729M_____
E3532M_____	E713M_____
E3533M_____	H10518M_____
E734M_____	

_____ 5.20 Open turbine 3/4 oil skid control air supply valve A201M_____ and adjust turbine 3A/4A air regulator PR9322A to 30 psig_____.

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

E831M_____	E813M_____
E829M_____	E816M_____
E817M_____	E812M_____
E825M_____	

_____ 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:

W963M_____	E835M_____
W961M_____	E826M_____
E3534M_____	E814M_____
E3535M_____	H10648M_____
E833M_____	
E828M_____	

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

H9169M_____	H9175M_____
H9171M*_____	H9177M*_____
H373M_____	H378M_____
H400M*_____	H427M*_____

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

- _____ 5.25 On turbine 1A/2A oil skid, depress “Lamp Test” button to ensure all lamps work.
- _____ 5.26 On turbine 3A/4A oil skid, depress “Lamp Test” button to ensure all lamps work.
- _____ 5.27 On turbine 1A/2A 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 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 “B” is operating, it will be necessary to jog the switch in the following step to avoid starving “B” train of oil.

- 5.27.4 Send oil to expander by placing “Lube Oil Selector” switch to “Unit 1A1/1A2”_____.
- 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 3A/4A 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 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 “B” is operating, it will be necessary to jog the switch in the following step to avoid starving “B” train of oil.

5.28.4 Send oil to expander by placing “Lube Oil Selector” switch to “Unit 2A1/2A2” ____.

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