

7.1.59 Regeneration of Cold Turbines “A” Train

1. Purpose

To provide instructions for regenerating the cold turbine “A” train on the RHIC 25 kW helium refrigerator. The procedure is used to warm the turbines and remove moisture. The procedure contains the following sections:

- 5.1 Regeneration of turbine 5A only.
- 5.2 Regeneration of turbine 6A only.
- 5.3 Regeneration of turbines 5A , 6A and heat exchanger HX7A.

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 and in the Cryogenic Valve Log.
- 2.2 Should a problem arise in the process of the procedure, the Shift Supervisor shall report to the Technical Supervisor for instructions before continuing.

3. Prerequisites

- 3.1 Operator shall be familiar with the refrigerator P&ID drawing 3A995009, the physical location of components on the refrigerator, and the refrigerator control pages found on the CRISP control system.
- 3.2 The regeneration skid must be available for use.

4. Precautions

- 4.1 If there is liquid helium in the refrigerator pots, all personnel entering the refrigeration wing of 1005R must be ODH Class 1 qualified, have a Personal Oxygen Monitor (POM) and carry an emergency escape pack, if the refrigerator is operating.

5. Procedure

5.1 Turbine 5A Only

_____ 5.1.1 Date_____.

_____ 5.1.2 Ensure mechanical brakes are installed per [C-A-OPM 7.1.26, “Expander Brake System Installation and Removal.”](#)

_____ 5.1.3 Ensure the following valves are closed:

Process:

H385A_____

H397M_____

Valves to Atmosphere, Relief Header or Pure Helium:

H414M_____

H695M_____

H814M_____

H795M_____

H431M_____

H700M_____

H793M_____

H412M_____

H9184M_____

_____ 5.1.4 Start the regeneration (regen) skid per [C-A OPM 7.1.36, "Regeneration System Normal Operation."](#)

_____ 5.1.5 Ensure that the regulator PR9182M has been replaced with the spool piece.

_____ 5.1.6 Open the following valves:

H430M_____

H812M_____

H393M_____

H390A_____ (Vanes)

H9182M_____

H395M_____

_____ 5.1.7 Close regen manifold bypass valve H9100M.

_____ 5.1.8 Turn on regen skid pre-heater.

_____ 5.1.9 Monitor temperature at TT387H.

_____ 5.1.10 When TT387H reaches 290°K, continue to regenerate for at least one hour. Hygrometer reading must be -30°C to -40°C and improving less than 0.5°C/hour.

_____ 5.1.11 Turn off regen skid pre-heater.

_____ 5.1.12 Open bypass valve H9100M.

_____ 5.1.13 Close the following valves:

H390A_____ (Vanes)	H9182M_____
H812M_____	H393M_____
H395M_____	H430M_____

_____ 5.1.14 Secure the regen skid per [C-A OPM 7.1.36](#).

_____ 5.1.15 Install regulator PR9182M.

_____ 5.1.16 Purge expander 5A per [C-A OPM 7.1.24, "Cold Expander Purge Procedure."](#)

5.2 Turbines 6A Only

_____ 5.2.1 Date_____.

_____ 5.2.2 Ensure mechanical brakes are installed on turbine 6A per [C-A OPM 7.1.26, "Expander Brake System Installation and Removal."](#)

_____ 5.2.3 Ensure the following valves are closed:

Process:

H402A_____

H410M_____

H409M_____

Valves to Atmosphere, Relief Valve Header or Pure Helium:

H393M_____	H700M_____
H793M_____	H795M_____
H431M_____	H695M_____
H814M_____	H395M_____
H9192M_____	

_____ 5.2.4 Start the regeneration (regen) skid per [C-A OPM 7.1.36, "Regeneration System Normal Operation."](#)

_____ 5.2.5 Ensure that regulator PR9190M has been replaced with the spool piece.

_____ 5.2.6 Open the following valves:

H430M_____	H412M_____
H414M_____	H812M_____
H9190M_____	H464A_____ (Vanes)

_____ 5.2.7 Close regen skid bypass valve H9100M.

_____ 5.2.8 Turn on regen skid pre-heater.

_____ 5.2.9 Monitor temperature at TT404H.

_____ 5.2.10 When TT404H reaches 290°K, continue to regenerate for at least one hour. Hygrometer reading must be -30°C to -40°C and improving less than 0.5°C/hour.

_____ 5.2.11 Turn off regen skid pre-heater.

_____ 5.2.12 Open bypass valve H9100M.

_____ 5.2.13 Close the following valves:

H464A_____ (Vanes)	H9190M_____
H812M_____	H414M_____
H412M_____	H430M_____

_____ 5.2.14 Secure the regen skid per [C-A OPM 7.1.36, “Regeneration System Normal Operation.”](#)

_____ 5.2.15 Install regulator PR9190M.

_____ 5.2.16 Purge expanders 6A per [C-A OPM 7.1.24, “Cold Expander Purge Procedure.”](#)

5.3 Turbines 5A, 6A and Heat Exchanger HX7A

_____ 5.3.1 Date_____.

_____ 5.3.2 Ensure that mechanical brakes are installed on turbines per [C-A OPM 7.1.26, “Expander Brake system Installation and Removal.”](#)

_____ 5.3.3 Ensure the following valves are closed:

Process:

H385A_____ H410M_____

H399M_____ H409M_____

Valves to Atmosphere, Relief Header or Pure Helium:

H414M_____ H395M_____

H814M_____ H9190M_____

H431M_____ H700M_____

H793M_____ H795M_____

H9184M_____ H695M_____

_____ 5.3.4 Start the regeneration (regen) skid per [C-A OPM 7.1.36, "Regeneration System Normal Operation."](#)

_____ 5.3.5 Ensure that the regulator PR9182M has been replaced with the spool piece.

_____ 5.3.6 To avoid spinning turbines, ensure pressure in HX7A is approximately equal to pressure in expanders (within 0.5 atm).

_____ 5.3.7 Open process valves H397M_____ and H402A_____ (air line must be jumpered at valve).

_____ 5.3.8 Open the following valves:

H430M_____ H812M_____

H393M_____ H390A_____ (Vanes)

H9182M_____ H464A_____ (Vanes)

H412M_____

_____ 5.3.9 Close regen manifold bypass valve H9100M.

_____ 5.3.10 Turn on regen skid pre-heater.

_____ 5.3.11 Monitor turbine 5A inlet temperature at TT387H.

_____ 5.3.12 When TT387H reaches 290°K, continue to regenerate for at least one hour. Hygrometer reading must be -30°C to -40°C and improving less than 0.5°C/hour.

_____ 5.3.13 Turn off regen skid pre-heater.

_____ 5.3.14 Open bypass valve H9100M.

_____ 5.3.15 Close the following valves:

H464A_____ (Vane)	H9182M_____
H390A_____ (Vane)	H393M_____
H812M_____	H430M_____
H412M_____	

_____ 5.3.16 Install regulator PR9182M.

_____ 5.3.17 Purge expanders 5A, 6A and heat exchanger HX7A per [C-A OPM 7.1.24, "Cold Expander Purge Procedure."](#)

_____ 5.3.18 Close the following process valves:

H402A_____ (return air line to normal)
H397M_____

_____ 5.3.19 Secure regen skid per [C-A OPM 7.1.36, "Regeneration System Normal Operation."](#)

6. **Documentation**

6.1 The check-off lines are for place keeping only. The procedure is not to be initialed or signed, it is not a record.

6.2 The Shift Supervisor, or designee, shall document the completion of the procedure in the Cryogenics Control Room Log.

7. **References**

7.1 [C-A OPM 7.1.26, "Expander Brake System Installation and Removal"](#)

7.2 [C-A OPM 7.1.36, "Regeneration System Normal Operation"](#)

7.3 [C-A OPM 7.1.24, "Cold Expander Purge Procedure"](#)

8. **Attachments**

None