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C-A OPERATIONS PROCEDURES MANUAL

7.1.26 Expander Brake System Installation and Removal

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Hand Processed Changes

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Approved: _____ *Signature on File* _____
Collider-Accelerator Department Chairman Date

D. Lederle

7.1.26 Expander Brake System Installation and Removal

1. Purpose

This procedure provides the criteria to determine when to install the Expander Braking System and the instructions for installation and removal. This procedure will most likely be performed during operation when an expander is either entered into service or removed from service.

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 in the process of installing or removing an expander braking system, the shift supervisor shall report to the technical supervisor for instructions before continuing.

3. Prerequisites

- 3.1 When the expander brakes are not in use, they shall be stored in the storage container mounted above the specific expander.
- 3.2 The expander must be offline and the oil system shut down while installing or removing the braking system.

4. Precautions

- 4.1 Do not adjust clutch mechanism. The clutches have been preset for 15-inch lb torque value. This value must not be adjusted.
- 4.2 Each braking assembly is specifically matched to an expander. Each braking assembly has an identifying mark on it. Be sure that the proper braking assembly is matched with the proper expander.

5. Procedure

Caution:

The expander braking system was designed to prevent the turbine from spinning during the purge procedure. It will not prevent spinning during venting of high pressure from the turbine cavities, unless the venting of expander cavities (to atmosphere or return via manual valves) is carefully done.

5.1 Ensure valves closed and pressure readings of less than 4 atm on desired expanders as follows:

5.1.1 Expanders 1A/2A

Inlet valve – H328A
Pressure Transducers - PT332H

5.1.2 Expanders 3A/4A

Inlet Valve – H352A
Outlet Valve – H380A
Pressure Transducer – PT356H

5.1.3 Expanders 1B/2B

Inlet Valve – H728A
Pressure Transducer – PT732H

5.1.4 Expanders 3B/4B

Inlet Valve – H752A
Outlet Valve – H780A
Pressure Transducer – PT756H

5.1.5 Expanders 5A/6A

Inlet Valves – H385A and H402A
Outlet Valve – H410M
Transducers –
EX5A – PT393H and PT389H
EX6A – PT404H and PT408H

5.1.6 Expanders 5B/6B

Inlet Valves – H785A and H802A

Outlet Valve – H810M

Pressure Transducers –

EX5B – PT793H and PT789H

EX6B – PT804H and PT808H

5.2 Installation of Braking System

5.2.1 Ensure that the oil system for the specific expander is not operating.

5.2.2 Ensure that the above listed inlet and outlet valves are closed for the specific expander. Ensure pressure in the expander cavities is less than 4 atm, as indicated by the pressure transducers listed above.

5.2.3 Locate the proper braking assembly for the specific expander.

Note:

Be sure the o-ring and o-ring holder are inside the vacuum cover in the proper orientation. Do not allow the o-ring to slide inside the vacuum seal opening.

5.2.4 With the “top” marking facing up, insert the shaft slowly through the vacuum o-ring seal, metal retainer and cap.

5.2.5 Slowly open the manual ball valve that the shaft will pass through.

5.2.6 Continue to insert the shaft through the ball valve, lining up the threaded rods into aluminum plate on brake assembly with top facing up.

5.2.7 Turn shaft slightly and insert until shaft engages with cap screw inside expander. Aluminum plate must be flush against the double nuts on the threaded rods for shaft to be fully engaged.

5.2.8 Install and tighten four 5/16-24 nuts on threaded rods to fasten braking system in place.

5.2.9 Tighten the vacuum seal cap.

5.2.10 Install PVC brake cover.

5.2.11 Document in logbook the installation of brake system in specific expander.

5.3 Removal of Braking System

5.3.1 Ensure that the above listed inlet and outlet valves are closed for the specific expander. Ensure the pressure in the expander cavities is less than 4 atm, as indicated by the pressure transducers listed above.

5.3.2 Remove the PVC brake cover.

5.3.3 Remove the four 5/16-24 nuts from the threaded rods.

5.3.4 Loosen the vacuum seal cap.

5.3.5 Slowly start to remove the brake assembly from threaded rods. When the brake assembly clears the manual valve, close the manual valve.

5.3.6 Place the brake system in the storage tube mounted above specific expander.

5.3.7 Remove the handle from the manual valve and install PVC cover over manual valve.

5.3.8 Document in logbook the removal of brake system from specific expander.

6. **Documentation**

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

7. **References**

7.1 Drawing 3A995009, 25 KW Refrigerator P&ID

7.2 Drawing 3A995074, Warm Expanders 1 – 4 System Schematic

7.3 Drawing 3A995075, Cold Expanders 5 and 6 System Schematic

8. **Attachments**

None