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C-A OPERATIONS PROCEDURES MANUAL

7.1.31 Insulating Vacuum System #3 for Cold Boxes 3 and 4

Text Pages 2 through 5

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

D. Lederle

7.1.31 Insulating Vacuum System #3 for Cold Boxes 3 and 4

1. Purpose

This procedure provides instructions for the operation of vacuum skid 3 for the insulating vacuum of cold boxes 3 and 4 of the RHIC 25 kW helium refrigerator. Vacuum skid 3 consists of two sets of Kinney fore pumps, 3-E515 and 3-E565, two sets of Varian diffusion pumps, 3-E511 and 3-E561, interconnecting piping, valves, instrumentation and control. Under normal operation, 3-E511 and 3-E515 are dedicated for cold box 3. 3-E561 and 3-E565 are dedicated for cold box 4.

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 Logbook.
- 2.2 Should a problem arise during the completion of this procedure, the Shift Supervisor shall contact the Technical Supervisor for instructions before continuing.

3. Prerequisites

- 3.1 The operator shall become familiar with the Vacuum System #1, #2 & #3 P&I D drawing 3A995011.
- 3.2 The diffusion pumps are mounted on the 10-inch penetration on the cold boxes. The fore pumps, the control panel and the rest of the vacuum skid are located on the lower level of the refrigerator building. The operator shall familiarize himself with the locations of the hardware.
- 3.3 The control panel consists of control switches, vacuum gages and the status for the control valves, the slide valves, the fore pumps and the diffusion pumps. The operator shall familiarize himself with the function of the control panel.
- 3.4 The operator shall become familiar with the operation of the Kinney KTC-60 compound vacuum pump and the Varian diffusion pump.
- 3.5 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 General safety precautions on the operation of cryogenic system.
- 4.2 The bottom of the diffusion pump will be very hot. The operator shall not touch it.
- 4.3 The Diffusion Pump have high temperatures alarms which are initiated by the following instruments:
 - Diffusion Pump 3-E511 High Temperature 3-TSH511
 - Diffusion Pump 3-E561 High Temperature 3-TSH561

5. Procedure

5.1 Check the Oil

- _____ [1] Check the oil level from the sight glass of the diffusion pumps and sight glass of the fore pumps.
- _____ [2] If level is too low, report to the supervisor for adding oil. Record in logbook.
- _____ [3] If oil is milky, report to the supervisor for changing pump oil. Record in logbook.

5.2 Service Utilities

- _____ [1] Open the two (2) water inlet valves 3-W528M and 3-W578M and the two (2) outlet valves 3-W527M and 3-W577M to cool the two baffles, 3-E531 and 3-E581, and the two diffusion pumps, 3-E511 and 3-E561. Adjust flow rates to 15 gallons per hour for both 3-FI-528W and 3-FI-578W.
- _____ [2] Check air pressure from gage located upstream of 3-A523M. Instrument air shall be between 80 and 100 psig. Open air supply valves 3-A523M, 3-A529M and 3-A579M on the skid.
- _____ [3] Supply electric power from circuit 2 of the Main Distribution Panel to motor control center MCC. The switch is located on the south wall across the walk way from vacuum skid 1 in the lower level of the refrigerator building.
- _____ [4] Supply power to the motors of fore pumps 3-E515 and 3-E565, and to diffusion pumps 3-E561 and 3-E511 from the electric feed from the main distribution panel located on the east side on the lower level of the refrigerator building.

- _____ [5] Turn on the vacuum skid 3 circuit breakers 24, 26 and 28 on the RP-2 panel located near local instrumentation panel 2.

5.3 Operating the Vacuum Skid

5.3.1 Initial Valve Positions

- _____ [1] Open the isolation valves 3-V513M and 3-V563M for fore pumps 3-E515 and 3-E565.
- _____ [2] Crack open isolation valves 3-V508M and 3-V558M.
- _____ [3] Close the isolation valve 3-V526M.

5.3.2 Turn On the Control Switch

- _____ [1] The operation of the vacuum skid is automatic and one control switch 3-HS500 starts the cold box 3 system and a second control switch 3-HS550 starts the cold box 4 system. The control sources are located on the lower part of the control panel for vacuum skid 3 and each cold box can be pumped down independently.
- _____ [2] By turning on the control switch 3-HS500 for cold box 3 and 3-HS550 for cold box 4, automatic valves 3-V509A, 3-V510A, 3-V559A and 3-V560A will be closed and the fore pumps 3-E515 and 3-E565 will be turned on.
- _____ [3] After approximately two minutes time delay, the control logic will open 3-V509A and 3-V510A for cold box 3, and 3-V559A and 3-V560A for cold box 4, and start to pump down the vacuum space.
- _____ [4] During the initial roughing stage, gradually open 3-V508M and 3-V558M while listening to the sound from the fore pumps to avoid overloading the pumps.
- _____ [5] Check the level and condition of the pump oil on the sight glass of the fore pump.
- _____ [6] If the oil becomes milky, the operator should open the ballast valve to remove water vapor contained in the pump oil. Wait for 30 minutes and close the ballast valve.
- _____ [7] Repeat step 5 and 6 if necessary. Should the condition of the oil not improve, then the operator shall report to the supervision for changing pump oil.

- _____ [8] Fully open 3-V508M for cold box 3 and 3-V558M for cold box 4 when the vacuum reaches 100 Torr.
- _____ [9] When the vacuum decreases to the set point (about 2 miliTorr) of vacuum gage 3PI-501V for cold box 3 and 3PI-551V for cold box 4, valves 3-V509A and 3-V559A will be closed.
- _____ [10] Slide valves 3-V504A and 3-V554A will be open and the diffusion pump will be turned on for final stage of pump down. Both slide valves can be opened or closed with toggle switches located inside the control panel.
- _____ [11] If the cold box vacuum 3PI-501V and 3PI-502V for cold box 3 and 3PI-552V and 3PI-551V for cold box 4, do not improve over expected time period, the operator should report to the supervisor for suitable action.

6. **Documentation**

- 6.1 The check-off lines on the procedure 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 Drawing 3A995011
- 7.2 [C-A-OPM 1.5, "Electrical Safety Implementation Plan"](#).
- 7.3 [C-A-OPM 1.5.3 "Procedure to Open or Close Breakers and Switches and Connecting/Disconnecting Plugs"](#).
- 7.4 [C-A-OPM 2.36, "Lockout/Tagout for Control of Hazardous Energy"](#).
- 7.5 [SBMS Electrical Safety](#).
- 7.6 [SBMS Lockout/Tagout \(LOTO\)](#).

8. **Attachments**

None