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C-A OPERATIONS PROCEDURES MANUAL

7.1.2 Compressor Room - Vacuum System Operation

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Hand Processed Changes

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Collider-Accelerator Department Chairman Date

D. Lederle

7.1.2 Compressor Room - Vacuum System Operation

1. Purpose

This procedure covers the operation of the vacuum system, which services the RHIC helium compressor room. The vacuum headers are arranged such that any of the three pumps can be dedicated to the cryogenic purifier and the remaining two pumps service the compressor station. The vacuum system is used for system cleanup and purifier regeneration service. This OPM contains the following procedures relating to the operation of the vacuum skid:

Sections:	5.1	Emergency Shutdown
	5.2	Skid Initialization
	5.3	Startup
	5.4	Shutdown
	5.5	Evacuation of the Vacuum Header
	5.6	Evacuation of the Purifier Header
	5.7	Trouble Shooting Vacuum Pumps

2. Responsibilities

- 2.1 The Shift Supervisor, or an operator designated by the Shift Supervisor, is responsible for conducting this 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 Operators shall become familiar with the vacuum skid P&ID 3A995017, the electrical schematic 3A985000, the physical location of components on the vacuum skid, and the vacuum skid control panel.
- 3.2 The Instrument Gas System must be operational.
- 3.3 The skid is prepared as follows:
 - 3.3.1 The vacuum pumps have been checked for alignment and rotation, the skid has been leak checked, all instrument gas supply valves have been opened, and all electrical disconnects have been energized.
- 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 The computer control mode of the vacuum skid is disconnected, control and indication are local.
- 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 Emergency Shutdown

The vacuum skid is outfitted with an EMERGENCY STOP button mounted on the local control panel. When activated all vacuum isolation valves close and the pump motors stop running. In the event of an emergency, depress the EMERGENCY STOP button.

5.2 Skid Initialization

This procedure is to configure and check out the vacuum skid prior to being operated.

- _____ [1] CONFIRM that the following switches are in the CLOSED position: HS2603, H2604, HS2605, HS2606, HS2607, HS2608, HS2609, HS2610, HS2611, HS2616, and HS2618.
- _____ [2] CONFIRM that the following switches are in the OFF position: HS2600, HS2601, HS2602.
- _____ [3] CONFIRM that each vacuum pump has the proper oil level.
- _____ [4] CONFIRM the gas ballast valves on the top of each vacuum pump are CLOSED.
- _____ [5] RECORD in the Cryogenic Control Room Logbook that the vacuum skid has been initialized.

5.3 Startup

This procedure is for starting vacuum pumps on the vacuum skid. It is assumed the skid has been initialized according to Section 5.2 of this OPM.

- _____ [1] CONFIRM both isolation valves (evacuation and purifier headers) are CLOSED for the pump being started. The isolation valves for each vacuum pump are as follows:
 - P2600 - valves V2601A and V2609A
 - P2601 - valves V2604A and V2608A
 - P2602 - valves V2605A and V2607A.
- _____ [2] START the vacuum pump using the appropriate hand switch on the local control panel.
- _____ [3] Allow the pump to operate for at least 1 minute. If the vacuum gauge for the pump does not come down to 25 microns or less, go to step 5.7 of this OPM (Troubleshooting Vacuum Pumps).
- _____ [4] Open the isolation valve for whichever header (evacuation or purifier) requires the vacuum pump.

Note:

The system is designed such that one pump services the purifier header, and the remaining two service the evacuation header.

5.4 Shutdown

This procedure is for shutting down a vacuum pump after a period of normal operation.

- _____ [1] NOTIFY the Cryogenic Control Room that a vacuum pump is going to be shutdown.
- _____ [2] CLOSE both isolation valves (evacuation and purifier headers) for the pump being shutdown.
- _____ [3] STOP the vacuum pump using its local hand switch on the local control panel.

5.5 Evacuation of the Vacuum Header

This procedure is for evacuating the compressor room's main vacuum header. It is assumed the vacuum pumps are running and the header isolation valves have not yet been opened.

- _____ [1] CONFIRM that the following valves are CLOSED:
- a. 1st stage comp. skid: V2089M - 1 through 10.
 - b. He supply header and buffer tanks: V3056M, H3004M, and H3002M.
 - c. 2nd stage comp. skid: V2189M - 1 through 4.
 - d. Redundant comp.: V2289M.
 - e. Intercooler skid: V2680M, V2681M, V2682M, V2683M, and V3060M.
 - f. Aftercooler skid: V2710M, V2711M, V2712M, V2713M, and V3059M.
 - g. Utility comp.: V2389M.
- _____ [2] OPEN the evacuation header isolation valves for two vacuum pumps (V2604A, V2605A, or V2609A).

5.6 Evacuation of the Purifier Header

This procedure is for evacuating the purifier's main vacuum header. It is assumed the vacuum pumps are running and the header isolation valves have not yet been opened.

- _____ [1] CONFIRM that valve N2427M on the cryogenic purifier skid is CLOSED.
- _____ [2] OPEN the purifier header isolation valve for one vacuum pump (V2601A, V2607A, or V2608A).

Note:

At least one of the three vacuum pumps shall always be dedicated to the cryogenic purifier. This pump must always be in service because the purifier uses the pump to regenerate itself once a day.

5.7 Troubleshooting Vacuum Pumps

This procedure is for determining what might be wrong with a malfunctioning vacuum pump.

- _____ [1] CLOSE both inlet isolation valves (evacuation and purifier headers) for the pump in question and watch its vacuum gauge.
- _____ [2] RUN the pump in question for at least 10 minutes.
- _____ [3] If the vacuum gauge does NOT come down to 25 microns or less, OPEN the gas ballast valve on the vacuum pump. Let the pump run on itself for at least 1 hour in this configuration. This step raises the temperature of the pump, causing any water in the oil to be boiled away.
- _____ [4] CLOSE the gas ballast valve on the pump.
- _____ [5] If the vacuum gauge comes down to 25 microns or less, the pump is operating properly and can be returned to normal service. If the vacuum gauge does NOT come down to 25 microns or less, then the pump requires servicing. See the Supervisor for instructions.

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 [C-A-OPM 1.5, "Electrical Safety Implementation Plan"](#).
- 7.2 [C-A-OPM 1.5.3 "Procedure to Open or Close Breakers and Switches and Connecting/Disconnecting Plugs"](#).
- 7.3 [C-A-OPM 2.36, "Lockout/Tagout for Control of Hazardous Energy"](#).
- 7.4 [SBMS Electrical Safety.](#)
- 7.5 [SBMS Lockout/Tagout \(LOTO\).](#)
- 7.6 P&ID drawing 3A995017 and electrical schematic 3A985000.
- 7.7 BNL Compressor Station Operating Manual Volume I as supplied by Koch Process Systems Inc.

8. **Attachments**

None