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C-A OPERATIONS PROCEDURES MANUAL

7.1.28 Compressor Room - Cryogenic Purifier Operation

Text Pages 1 through 15

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

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

M. Sardzinski

7.1.28 Compressor Room – Cryogenic Purifier Operation

1. Purpose

This procedure covers the operation of the cryogenic purifier. This OPM contains the following sections relating to the operation of the purifier:

Sections:
- 5.1 Emergency Shutdown
- 5.2 Initialization
- 5.3 Normal Operation
- 5.4 Switching Heat Exchangers
- 5.5 Defrosting Heat Exchanger HX2400 [HX2401]
- 5.6 Switching Adsorbers
- 5.7 Regeneration of Adsorber Beds AD2400 [AD2401]
- 5.8 Valve Tables
- Flow Chart: Guidelines on when to change over purifier sides.

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 this procedure, the Shift Supervisor shall report to the Technical Supervisor for instructions before continuing.

3. Prerequisites

3.1 Operator shall become familiar with Drwg. 3A9055018, Cryogenic Purifier P&ID Drwg. 3A995032, RHIC Helium Compressor System Block Diagram and the physical location of components on the skid.

3.2 The skid has been prepared as follows:

Ensure that the liquid nitrogen dewar has an adequate supply, the instrument gas system is operating, all instrument gas supply valves have been opened, and all electrical disconnects have been energized.

3.3 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 There are two temperature sensors for each location. The lower numbered sensors (TE2460 – TE2477) go to local chart recorder UIR2480. The corresponding higher numbered sensors (TE2480 – TE2497) go to the control computer. In most steps, only the sensor associated with the computer is listed. Because the sensor numbers correspond, the chart recorder sensors can easily be determined.

4.2 The control computer reads in ^{o}K, the chart recorder reads in ^{o}C.

4.3 Hearing protection shall be worn when the compressors are in operation.

4.4 Approved eye protection and safety shoes shall be worn at all times.

5. Procedure

Note:
The purifier can be operated in two modes, LOCAL or COMPUTER. The operator can select which mode by operating the selector switch on the purifier panel.

5.1 Emergency Shutdown - Normal Shutdown

At any time the cryogenic purifier can be shut down. The system's design incorporates pressure relieving devices for all trapped volumes.

_____ 5.1.1 In the event of an **emergency** or to shut down the cryogenic purifier, STOP the helium flow by CLOSING the helium supply and return valves H2401A, H2402A, H2415A, and H2416A. Then STOP the nitrogen supply by CLOSING valve N2425A.

_____ 5.1.2 Return all valves to their normal initial position according to table 5.9.1 Initial Valve Settings and shut off all heaters.

_____ 5.1.3 Allow the purifier to warm up. The relief valves are sized to handle the expected volume of gas.

5.2 Initialization

This section is to configure the cryogenic purifier prior to being operated. It should be performed after an extended down time where all skid internals have warmed to ambient temperatures.

_____ 5.2.1 CONFIRM that all valves are in their initial positions according to Table 5.9.1 Initial Valve Settings.

> **Note:**
> In this section, numbers without [ ] apply to adsorber bed AD2400, numbers in [ ] apply to adsorber bed AD2401. Steps 3 through 9 should be performed on one adsorber bed at a time.

_____ 5.2.2 Prepare one of the adsorber beds by CLOSING the following valves:

N2428A	[N2429A]	Liquid nitrogen supply
H2412A	[H2418A]	Dust filter outlet
H2408A	[H2409A]	Adsorber bed inlet

_____ 5.2.3 For the same adsorber bed as in step 3 (AD2400 or [AD2401]), OPEN The following valves:

N2452A	[N2453A]	Nitrogen inlet
N2455A	[N2454A]	Nitrogen outlet

> **Note:**
> Valve N2450A supplies nitrogen gas from the instrument nitrogen system at 100 psig. This valve is used during normal operations.
> Valve N2460M supplies nitrogen gas from the compressor building LN_2 dewar at 100 psig. Use of this valve also supplies 100 psig nitrogen gas to the instrument nitrogen system. This valve is not normally used during shutdowns when the nitrogen compressor is off. Nitrogen gas for the cold box purge is normally supplied from the LN_2 dewar, but can be supplied from the instrument nitrogen system.

_____ 5.2.4 Start flowing gaseous nitrogen through the adsorber bed by SETTING valve controller HIC2450 or by throttling valve N2460M for a flow of approximately 55 g/sec (as read on computer) on FE2403.

_____ 5.2.5 SELECT "MODE-1" on heater HTR2400 (corresponding to TSH2477). Exit temperature at TE2477 should be 410°K on computer).

_____ 5.2.6 HEAT adsorber bed AD2400 [AD2401] until the adsorber exit temperature TE2494 [TE2496] reaches 395 to 400°K (122°C to 127°C). Maintain the nitrogen flow at this temperature for 5 to 6 hours.

_____ 5.2.7 TURN OFF heater HTR2400. Maintain nitrogen flow to cool off the heater for at least 10 minutes.

_____ 5.2.8 EVACUATE the bed to the best possible vacuum by CLOSING valves N2452A [N2453A] and N2455A [N2454A] and OPENING H2494A

[H2493A]. CONFIRM that valve N2427M is OPEN and at least two vacuum pumps are dedicated to the purifier vacuum header.

_____ 5.2.9 While adsorber bed AD2400 [AD2401] is being evacuated, REPEAT steps 3 through 9 for the remaining adsorber bed which has not been regenerated.

_____ 5.2.10 EVACUATE both beds to the best possible vacuum (then evacuate 2 hours more), by CLOSING valves N2452A, N2453A, N2454A, N2455A, and OPENING valves H2493A and H2494A.

_____ 5.2.11 CLOSE the nitrogen purge supply valve N2450A or N2460M.

_____ 5.2.12 OPEN valves H2405A, H2406A, H2408A, H2409A, H2412A, H2418A, H2465A, H2466A, H2493A, H2494A, and N2495M.

_____ 5.2.13 EVACUATE the purifier's internal's to 500 microns.

_____ 5.2.14 STOP evacuation by CLOSING valves H2465A, H2466A, H2493A, H2494A, and N2495M.

_____ 5.2.15 OPEN valves H2401A, H2402A, H2405A, H2406A, H2408A, H2409A, H2412A, H2418A, and back fill the purifier with pure dry helium from gas storage system using valve H3016A. Valve H3016A is controlled from the RHIC gas management panel located in 1005H.

_____ 5.2.16 OPEN nitrogen vent valves N2437A and N2438A.

_____ 5.2.17 Fill LN_2 separator S2446 to a level of 50-70% by using level indicating controller LIC2425. Controller is located on the purifier panel. This controller modulates valve N2425A.

_____ 5.2.18 ADMIT LN_2 into the jacket of AD2400 by OPENING valves N2430A and N2428A.

_____ 5.2.19 After approximately two hours, OPEN N2431A and N2429A and start to cooldown of AD2401.

_____ 5.2.20 After approximately one day, AD2400, AD2401, HX2403, HX2400, HX2401, and HX2402 should be sufficiently cooled. When TE2460 and TE2480 are approximately $16^{o}C$ ($289^{o}K$), the cryogenic adsorber is ready for gas cleanup operations. Cooling can be accelerated by injecting gaseous nitrogen into GI2456 using valve N2440A. The injector increases the amount of cold nitrogen vapor flowing to the heat exchanger.

_____ 5.2.21 RECORD in the compressor room's main log book that the purifier has been initialized.

5.3 Normal Operation

This section is for operating the cryogenic purifier in a normal operating mode. The system must be initialized according to section 5.2 of this OPM, or has been operating normally.

_____ 5.3.1 If section 5.2 of this OPM has just been performed, skip to step 5.3.7.

_____ 5.3.2 CONFIRM that all valves are in their initial positions according to Table 5.9.1 Initial Valve Settings.

_____ 5.3.3 CONFIRM that the nitrogen vent valves N2437A and N2438A are OPEN.

_____ 5.3.4 CONFIRM that the LN_2 separator S2446 is filled to a level between 50-70% and valve N2425A is maintaining the nitrogen level.

Note:
When the nitrogen gas being driven off the adsorber bed jacket is above 100°K (173°C), it should be vented to the atmosphere and not sent through HX2402.

_____ 5.3.5 To vent nitrogen gas open valve N2432A [N2433A] and close valve N2430A [N2431A].

_____ 5.3.6 ADMIT LN_2 into the jacket of AD2400 by OPENING valve N2428A.

_____ 5.3.7 Adsorber bed AD2400 is ready for service when TE2494 is less than 120^oK (-153^oC).

_____ 5.3.8 When temperature of adsorber jacket is less than 100°K (-173°C), open valve N2430A [N2431A] and close valve N2432A [N2433A].

_____ 5.3.9 While the adsorber bed is cooling, the heat exchanger will also be cooling. Heat exchanger HX2400 is ready for use when TE2480 is less than 260^oK (-13^oC). The process can be accelerate by a combination of the following steps:

5.3.9.1 The flow of cold nitrogen gas through HX2400 can be increased by stopping the flow through HX2401 by CLOSING valve N2437A.

5.3.9.2 The flow of cold nitrogen gas through the entire system can be increased by modulating valve N2440A. This valve injects warm gas into liquid nitrogen thus increasing the flow of cold gaseous nitrogen.

_____ 5.3.10 WAIT until the system meets the temperature limits of steps 5.3.7 and 5.3.8 above.

_____ 5.3.11 BRING the purge helium on line by OPENING valves H2401A, H2405A, H2408A, H2412A, and H2416A.

_____ 5.3.12 ISOLATE adsorber bed AD2401 and heat exchanger HX2401 by CLOSING valves H2402A, H2406A, H2409A, H2418A, and H2415A.

_____ 5.3.13 In order to work effectively the helium pressure within the purifier must remain constant at 5 to 10 atm. Use flow controller HIC2404 to establish a constant pressure in the purifier by modulating valve H2403A.

_____ 5.3.14 If the helium flow rate exceeds 250 g/sec, throttle the flow to 250 g/sec using valve H2403A. If the flow rate is less than 100 g/sec, nitrogen can be used to inject into GI2456 via valve N2440A.

_____ 5.3.15 Check the impurity level of the helium gas supply to the purifier.

5.3.15.1 If the nitrogen level is greater than 50 ppm, the cycle life of the adsorber bed will be less than the designed period. It also may affect the continuous operation of the purifier.

5.3.15.2 If the moisture level is greater than -40°C, the cycle life of the heat exchanger will be less than the designed period. It may also affect the continuous operation of the purifier.

_____ 5.3.16 If HX2401 has been used and is contaminated, place HX2400 on line and start DEFROSTING HX2401 in accordance with this OPM.

_____ 5.3.17 WAIT ten minutes for the purifier's temperature to equalize.

_____ 5.3.18 ADJUST valve H2417A until TE2484 is equal to 180°K (-93°C). OPENING the valve lowers the temperature at TE2484.

_____ 5.3.19 The system is now in a steady state purifying mode.

_____ 5.3.20 When efficiency decreases as determined by delta pressure across purifier and the gas purity monitors, switch and DEFROST heat exchanger in accordance with this OPM.

Note:
The heat exchanger span of operation can be extended by up to 24 hours by modulating H2417A to get more cooling to HX2400. Consult the Technical Supervisor, or the Shift Supervisor, before implementing this operation.

5.4 Switching Heat Exchangers

_____ 5.4.1 COOL the heat exchanger by OPENING N2438A [N2437A]. Since the other non-defrosted heat exchanger is on line, nitrogen vapor will flow through both heat exchangers.

_____ 5.4.2 One hour before the time to switch the heat exchanger, CLOSE valve N2437A [N2438A]. This will stop the nitrogen flow though the heat exchanger on line and divert full nitrogen vapor flow through the defrosted heat exchanger.

_____ 5.4.3 Wait until the nitrogen exhaust reads 260°K (-13°C) on TE2480. The process can be accelerate by injecting nitrogen into GI2456 via valve N2440A.

_____ 5.4.4 When the heat exchanger's temperature reaches an acceptable level, OPEN the following valves and put the exchanger ON LINE:

H2416A	[H2415A]	Purified helium outlet
H2405A	[H2406A]	Snow filter outlet
H2401A	[H2402A]	Contaminated helium inlet

_____ 5.4.5 Record in the main log book which heat exchanger has been placed on line.

5.5 Defrosting Heat Exchanger HX2400 [HX2401]

This section is for defrosting either of the heat exchanger in the cryogenic purifier. The operator should use the unmarked numbers for defrosting HX2400 and the numbers in [ ] for defrosting HX2401.

Note:
Before switching a heat exchanger off line, confirm that the other heat exchanger is on line and operating at design temperature. Design temperature is defined as less than 180°K (-93°C) on TE2484 for HX2400 [TE2486 for HX2401].

_____ 5.5.1 Take the heat exchanger to be defrosted OFF LINE by CLOSING the following valves:

N2438A	[N2437A]	Nitrogen outlet
H2416A	[H2415A]	Purified helium outlet
H2405A	[H2406A]	Snow filter outlet
H2401A	[H2402A]	Contaminated helium inlet

_____ 5.5.2 OPEN the following valves:

N2480A	[N2459A]	Nitrogen vent
N2457A	[N2458A]	Nitrogen purge supply

Note:

Valve N2450A supplies nitrogen gas from the instrument nitrogen system at 100 psig. This valve is used during normal operations.
Valve N2460M supplies nitrogen gas from the compressor building LN_2 dewar at 100 psig. Use of this valve also supplies 100 psig nitrogen gas to the instrument nitrogen system. This valve is not normally used.
Nitrogen gas for the cold box purge is normally supplied from the LN_2 dewar, but can be supplied from the instrument nitrogen system.

_____ 5.5.3 Using controller HIC2450 or manual valve N2460, SET the nitrogen flow rate at FE2403 to 40g/sec.

_____ 5.5.4 Turn on heater HTR2442 [HTR2443]. The heater is on a 2-hour timer, once the heat goes off, turn it back on again, keep it on during the defrost cycle.

_____ 5.5.5 When TI2482 reaches 275K, OPEN the following drain valves every twenty minutes for one minute:

H2474A	[H2473A]	Snow filter drain
H2471A	[H2472A]	Heat exchanger drain

_____ 5.5.6 When no more condensate is drained, continue to RUN the defrost cycle for three to four hours.

_____ 5.5.7 When the defrost cycle is completed, turn off HTR2442 [HTR2443].

_____ 5.5.8 Stop nitrogen flow by closing control valve N2450A or N2460M.

_____ 5.5.9 CLOSE the following valves:

N2457A	[N2458A]	Nitrogen purge supply
N2480A	[N2459A]	Nitrogen vent
H2474A	[H2473A]	Snow filter drain
H2471A	[H2472A]	Snow filter drain

_____ 5.5.10 EVACUATE the heat exchanger to the best achievable vacuum, then evacuate for another 2 hours, using the evacuation header and valve H2466A [H2465A].

_____ 5.5.11 Back fill the heat exchanger with clean helium. Close valve N2427M to isolate the vacuum skid. Ensure that H2466A [H2465A] is open. SLOWLY OPEN valve N2411M to back fill the heat exchanger. Once the pressure has equalized, close H2466A [H2465A].

_____ 5.5.12 RECORD in the main log book and in the purifier log that the heat exchanger has been defrosted.

_____ 5.5.13 Leave valve H2405A [H2406A] open as a sign that the heat exchanger has been regenerated.

5.6 Switching Adsorbers

> **Note:**
> When the nitrogen gas being driven off the adsorber bed jacket is above 100°K (-173°C) it should be vented to the atmosphere and not sent through HX2402.

_____ 5.6.1 To vent nitrogen gas, open valve N2432A [N2433A] and close valve N2430A [N2431A].

_____ ADMIT LN_2 into the jacket of AD2400 [AD2401] by OPENING valve N2428A [N2429A].

_____ 5.6.2 When the adsorber bed's temperature TE2494 [TE2496] is less than 120°K, H2412A [H2418A] can be OPENED to put the bed ON LINE.

_____ 5.6.3 When temperature of adsorber jacket is less than 100°K (-173 C), open valve N2430A [N2431A] and close valve N2432A [N2433A].

_____ 5.6.4 Recod in the main log book which adsorber has been placed on line.

5.7 Regenerating the Adsorber Bed AD2400 [AD2401]

This section is for regenerating either of the adsorber beds in the cryogenic purifier. The operator should use the unmarked numbers for regenerating AD2400 and the numbers in [ ] for regenerating AD2401.

Note:
Before switching an adsorber bed off line, confirm that the other adsorber bed is on line and operating at its design temperature. Design temperature is defined as less than 120°K (-153°C) on TE2494 for AD2400 [TE2496 for AD2401].

_____ 5.7.1 Take the adsorber bed to be regenerated OFF LINE by CLOSING the following valves:

N2428A	[N2429A]	Liquid nitrogen supply
H2412A	[H2418A]	Adsorber bed outlet
H2408A	[H2409A]	Adsorber bed inlet

_____ 5.7.2 OPEN the following Valves:

N2455A	[N2454A]	Nitrogen vent
N2452A	[N2453A]	Nitrogen purge supply

Note:
Valve N2450A supplies nitrogen gas from the instrument nitrogen system at 100 psig. This valve is used during normal operations.
Valve N2460M supplies nitrogen gas from the compressor building LN_2 dewar at 100 psig. Use of this valve also supplies 100 psig nitrogen gas to the instrument nitrogen system. This valve is not normally used.
Nitrogen gas for the cold box purge is normally supplied from the LN_2 dewar, but can be supplied from the instrument nitrogen system.

_____ 5.7.3 Using controller HIC2450 or manual valve N2460M, SET the purge nitrogen flow rate at FE2403 to 40 g/sec as read on computer.

_____ 5.7.4 SELECT "MODE-2" (the selector switch is on the purifier panel), on heater HTR2400 (this corresponds to TSH2498). Exit temperature at TE2477 should be 107°C (380°K).

_____ 5.7.5 Turn on heater HTR2400.

_____ 5.7.6 Heat the bed AD2400 [AD2401] for at least two more hours after the temperature TE2494 [TE2496] reaches 340°K (67°C).

_____ 5.7.7 Turn off the heater HTR2400. Wait 10 mins. to cool off the heater element before proceeding to the next step.

_____ 5.7.8 Stop nitrogen flow, by closing control valve N2450A or N2460M.

_____ 5.7.9 CLOSE the following valves:

N2452A	[N2453A]	Nitrogen purge supply
N2455A	[N2454A]	Nitrogen vent

_____ 5.7.10 EVACUATE the adsorber bed exchanger to approximately 500 microns using the evacuation header and valve H2494A [H2493A]. Open H2427M.

_____ 5.7.11 CLOSE H2427M to isolate the vacuum skid.

_____ 5.7.12 BACKFILL the adsorber bed with clean helium. Ensure that H2494A [H2493A] is open. SLOWLY OPEN valve N2411M to backfill the adsorber. Once the pressure has equalized, close H2494A [H2493A] and secure the vacuum skid.

_____ 5.7.13 RECORD in the main and purifier logbooks that the adsorber bed has been regenerated.

_____ 5.7.14 Open valve H2408A [H2409A] as a sign that the adsorber has been regenerated.

5.9 Valve Tables

Table 5.9.1 - Initial Valve Configuration

VALVE#	POSITION	DESCRIPTION	P&ID LOCATION
Automatic Valves - Top Row of Switches			
H2401A	CLOSE	HX2400 Upstream Isolation	B16
H2402A	CLOSE	HX2401 Upstream Isolation	A16
H2405A	CLOSE	HX2400 Downstream Isolation	F17
H2406A	CLOSE	HX2401 Downstream Isolation	F15
H2408A	CLOSE	AD2400 Upstream Isolation	G10
H2409A	CLOSE	AD2401 Upstream Isolation	G10
H2412A	CLOSE	AD2400 Downstream Isolation	C10
H2415A	CLOSE	HX2401 Outlet Isolation	B17
H2416A	CLOSE	HX2400 Outlet Isolation	C17
H2418A	CLOSE	AD2401Downstream Isolation	C9
N2428A	CLOSE	AD2400 LN2 Supply	C7
N2429A	CLOSE	AD2401 LN2 Supply	C5
N2430A	OPEN	AD2400 GN2 Discharge	F7
N2431A	OPEN	AD2401 GN2 Discharge	F5

VALVE#	POSITION	DESCRIPTION	P&ID LOCATION
Automatic Valves - Middle Row of Switches			
N2432A	CLOSE	AD2400 GN2 Vent	F7
N2433A	CLOSE	AD2401 GN2 Vent	F5
N2437A	CLOSE	HX2401 GN2 Isolation	C17
N2438A	CLOSE	HX2400 GN2 Isolation	D17
N2452A	CLOSE	AD2400 GN2 Regen Supply	G4
N2453A	CLOSE	AD2401 GN2 Regen Supply	G4
N2454A	CLOSE	AD2401 Regen Vent	B3
N2455A	CLOSE	AD2400 Regen Vent	C3
N2457A	CLOSE	SF2400 GN2 Regen Supply	E17
N2458A	CLOSE	SF2401 GN2 Regen Supply	E14
N2459A	CLOSE	HX2401 Regen Vent	C14
H2465A	CLOSE	HX2401 Evacuation	B16
H2466A	CLOSE	HX2400 Evacuation	A16
H2471A	CLOSE	HX2400 Drain	C16
Automatic Valves - Bottom Row of Switches			
H2472A	CLOSE	HX2401 Drain	C13
H2473A	CLOSE	SF2401 Drain	G15
H2474A	CLOSE	SF2400 Drain	G17
N2480A	CLOSE	HX2400 Regen Vent	C15
H2493A	CLOSE	AD2401 Evacuation	A4
H2494A	CLOSE	AD2400 Evacuation	A6

VALVE#	POSITION	DESCRIPTION	P&ID LOCATION
Automatic Control Valves			
H2403A	CLOSE`	Purifier Pressure (HIC2403 or 2404)	C20
H2417A	CLOSE	HX2402 Bypass (HIC2417)	H11
N2425A	CLOSE	LN2 Supply (LIC2425)	D8
N2440A	CLOSE	GI2456 GN2 Supply (FIC201)	G8
N2450A	CLOSE	GN2 Supply (HIC2450)	G2
Manual Valves			
H2410M	OPEN	Purge Return Sample	A19
H2422M	OPEN	PT2422 Isolation	C16
H2423M	OPEN	PT2423 Isolation	B16
H2425M	OPEN	PT2425 Isolation	D13
H2435M	OPEN	PT2435 Isolation	D14
H2439M	OPEN	PT2439 Isolation	D12
H2440M	OPEN	PT2440 Isolation	D11
H2441M	OPEN	PT2441 Isolation	F10
H2452M	CLOSE	Purge Return Sample	B19
H2453M	CLOSE	Purge Supply Sample	C19
H2455M	CLOSE	PA2400 Isolation	B19

VALVE#	POSITION	DESCRIPTION	P&ID LOCATION
H2456M	CLOSE	MA2400 Isolation	B19
H2463M	CLOSE	Refrigerator Supply Sample	B19
H2467M	OPEN	PT2447 Isolation	D19
H2468M	OPEN	HIC2404 Signal	E19
H2469M	CLOSE	HIC2403 Signal	E19
H2475M	CLOSE	HX2402 Drain	C12
H2481M	CLOSE	Purge Supply Sample	C19
N2411M	CLOSE	Purge Supply Evacuate	C18
N2413M	CLOSE	GN2 Out Evacuate	D20
N2414M	CLOSE	Purge Return Evacuate	B17
N2415M	OPEN	HIC2404 Supply	E20
N2427M	OPEN	Evacuate Isolation	B2
N2442M	OPEN	PT2446 Isolation	E8
N2451M	OPEN	HTR2400 Upstream Isolation	G3
N2456M	OPEN	HTR2400 Downstream Isolation	G4
N2469M	OPEN	PT 2438 Isolation	D18
N2477M	OPEN	Coldbox Purge Out	D3
N2482M	CLOSE	AR2403 Vent	G2
N2483M	CLOSE	AR2402 Vent	G1
N2484M	CLOSE	Coldbox Purge Supply	E2
N2485M	CLOSE	Coldbox Purge Supply	E3
N2486M	CLOSE	Coldbox Purge Supply	E3
N2487M	CLOSE	Coldbox Purge Supply	E3
N2488M	CLOSE	Coldbox Purge Supply	F2
N2495M	CLOSE	HX2401 and 2402 Evacuate	A11

VALVE#	POSITION	DESCRIPTION	P&ID LOCATION
DP Cell Valves (OPEN two supply valves, and CLOSE single bypass)			
H2419M	OCO	DPT2419 Isolation	F17
H2436M	OCO	DPT2434 Isolation	E15
H2482M	OCO	DPT2482 Isolation	F11
H2497M	OCO	DPT2497 Isolation	D10
H2498M	OCO	FT2400 Isolation	C17
N2424M	OCO	FT2401 Isolation	D18
N2445M	OCO	FT2403 Isolation	G2
N2446M	OCO	LT2425 Isolation	E8

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 shall document the completion of the procedure in the Cryogenics Control Room Log.

7. References

7.1 P&ID 3A995032, RHIC Helium Compressor System Block Diagram.

7.2 P&ID 3A995018, Cryogenic Purifier.

7.3 BNL Compressor Station Operating Manual Volume I as supplied by Koch Process Systems Inc.

7.4 C-A-OPM 1.5, "Electrical Safety Implementation Plan".

7.5 C-A-OPM 1.5.3 "Procedure to Open or Close Breakers and Switches and Connecting/Disconnecting Plugs".

7.6 C-A-OPM 2.36, "Lockout/Tagout for Control of Hazardous Energy".

7.7 SBMS Electrical Safety.

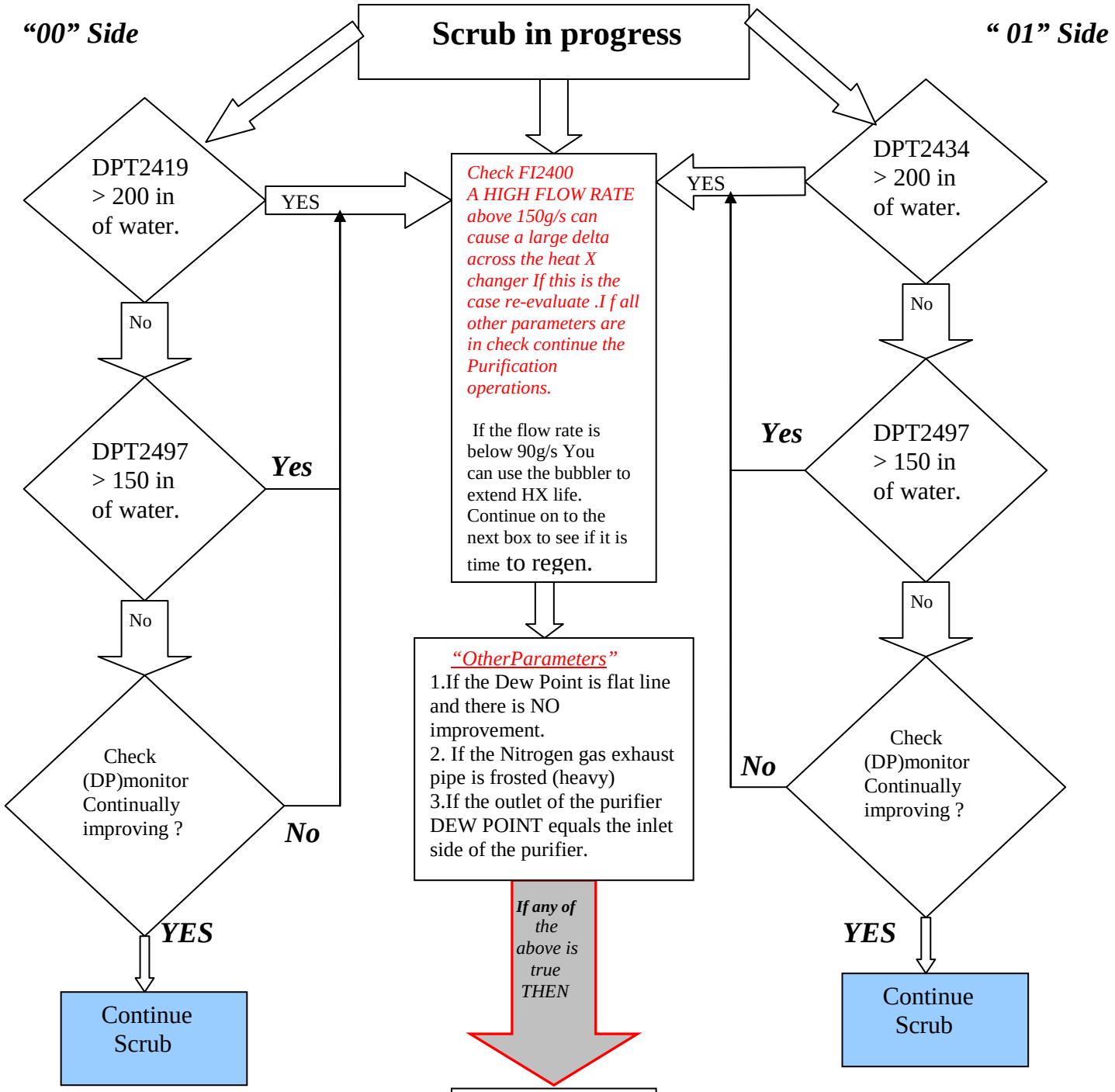
7.8 SBMS Lockout/Tagout (LOTO).

8. Attachments

8.1 AA Operator guidelines on when to change over purifier sides.

Attachment AA

Guidelines on when to change over " purifier sides"



Note: This is only a guide to help the operator in purifier operations. Contact the Technical Supervisor or Group Leader for Operations for further consultation.