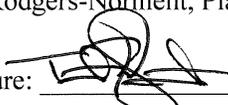
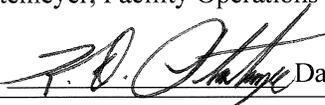




Fluor Federal Services, Inc. Paducah Deactivation Project

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 1 of 30
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0	Initial Release.	ALL	3/03/16
0A	Provide flexibility for setting oil setpoint temperature.	6	<u>3/29/16</u>

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 2 of 30
--------------------------------------	---	---------------------

TABLE OF CONTENTS

1.0	PURPOSE AND SCOPE	3
1.1	Purpose.....	3
1.2	Scope.....	3
2.0	REFERENCES.....	3
2.1	Use References.....	3
2.2	Source References.....	3
3.0	COMMITMENTS.....	3
4.0	PRECAUTIONS AND LIMITATIONS.....	3
4.1	Precautions	3
4.2	Limitations	4
5.0	PREREQUISITES	4
6.0	INSTRUCTIONS.....	5
6.1	Operation of the Lube Oil Skid.....	5
6.2	Compressor Start-up	8
6.3	Operation of Compressors in Low Speed Mode	13
6.4	Operation of Compressors in High Speed Mode	15
6.5	Taking Compressor Off-line	19
6.6	Compressor Shutdown.....	19
7.0	ACCEPTANCE CRITERIA	20
8.0	POST PERFORMANCE WORK ACTIVITIES	20
9.0	RECORDS	20
9.1	Records Generated	20
9.2	Records Disposition	20
	APPENDIX A – ACRONYMS/DEFINITIONS	21
	APPENDIX B – LUBE OIL SKID INFORMATION.....	22
	APPENDIX C – TYPICAL DUAL SPEED P&E STATION LUBE OIL DIAGRAM.....	25
	APPENDIX D - DUAL SPEED P&E VALVE LINE-UP	26
	CP4-OP-0207-F01 – C-335 DSP&E DATA SHEET.....	30

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 3 of 30
--------------------------------------	---	---------------------

1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instruction in the use of the C-335 dual speed purge and evacuation (P&E) station for evacuating cells and equipment.

1.2 Scope

This procedure applies to Facility Operations personnel participating in the use of the dual speed P&E station.

2.0 REFERENCES

2.1 Use References

- CP3-OP-0315, *Breaker Removal and Return to Service*
- CP3-WM-1037, *Generation and Temporary Storage of Waste Materials*
- CP4-OP-1121, *Cascade Valve and Leak Rating Operations*
- Job Hazard Analysis (JHA)-7347, *General Work Evolutions for Operations Controlled Facilities (excluding High Voltage Switchyards)*

2.2 Source References

- CP4-OP-0111, *Cascade Seal Systems*
- KY/D-5137, *Technetium Control and Monitoring Guidelines*

3.0 COMMITMENTS

- CP1-NS-3001, *Technical Safety Requirements for the Department of Energy Paducah Site Deactivation Project*
- Nuclear Criticality Safety Approval CAS-021, *Operation and Shutdown of the Diffusion Cascade*

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Precautions

- 4.1.1 Due to the installation of differential pressure (DP) alarms, operating the Cooling Water control valve on manual may result in a DP alarm. This should be considered any time the system contains R-114 **and** the Cooling Water system has **NOT** been isolated and drained.
- 4.1.2 Adjustments to the coolant setpoint should be made in small incremental changes to prevent DP alarms.
- 4.1.3 Prolonged operation of a centrifugal compressor without gas flow should be avoided. The recycle valve should be open while off line **unless** directed by the Front Line Manager (FLM) **or** in emergency situations.
- 4.1.4 Due to pumps coasting during shutdown, lube oil shall be left on for a **minimum of 10 minutes** after shutdown to assure proper bearing lubrication.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 4 of 30
--------------------------------------	---	---------------------

Note:
 Because of high currents during motor startup, electrical winding temperatures rise quickly. Time is needed for temperatures to stabilize before going from low speed mode to high speed mode.

- 4.1.5 To prevent motor damage, compressors are to be running in low speed mode for a **minimum of 30 minutes before** starting in high speed mode.
- 4.1.6 Compressors should **NOT** be operated in high speed mode with their discharge valve closed.
- 4.1.7 **If** an onstream compressor trips, **then** the associated discharge valve will automatically go to the CLOSE position.

4.2 Limitations

TSR
5.6.9.1

4.2.1 P&E pumps shall **NOT** be used to evacuate any material containing Chlorine Trifluoride/Fluorine (ClF₃/F₂) **unless** combined ClF₃ and F₂ concentration has been confirmed to be **less than 8 mole %** by Laboratory analysis.

TSR
5.6.8.3

4.2.2 P&Es shall **NOT** be used to transfer ClF₃/F₂ from the ClF₃/F₂ receiving volume to the In Situ Chemical Treatment target location.

4.2.3 Dual speed P&E station pressure shall be maintained below **13.5 psia** at all times during operation.

5.0 PREREQUISITES

- 5.1 Review JHA-7347, *General Work Evolutions for Operations Controlled Facilities (excluding High Voltage Switchyards)*.
- 5.2 Confirm a **minimum of one** qualified operator in building during checkout and during operation of the compressor(s), and a **minimum of two** qualified operators in building during starting of compressor(s).
- 5.3 Review Alarm Status Log to ensure alarms are **NOT** disabled and Automatic Data Processing (ADP) alarm points are set to ACTIVE ALARM.
- 5.4 Ensure the following valves are closed and the breaker Caution tagged and open, unless otherwise directed by the FLM:
 - DEB-14
 - DEB-15

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 5 of 30
--------------------------------------	---	---------------------

6.0 INSTRUCTIONS

NOTES:

Additional information on the lube oil skid can be found in Appendix B, *Lube Oil Skid Information*.

The time needed for the oil to heat-up to the desired setpoint could be a duration of two (2) to five (5) hours.

CAUTION:

Bypassing heater set point to attempt to warm oil faster may damage heater.

6.1 Operation of the Lube Oil Skid

Facility Operations Personnel

6.1.1 If starting up lube oil skid, **then** perform the following:

- A.** Ensure upper and lower lube oil tank sightglass valves are OPEN.
- B.** Ensure level in lube oil tank sightglass is above minimum.
- C.** Ensure the following valves are closed:
 - MV-104 (No. 1 Cooler Bypass)
 - MV-204 (No. 2 Cooler Bypass)
 - MV-105 (No. 1 Filter Vent)
 - MV-205 (No. 2 Filter Vent)
- D.** Ensure the following valves are open:
 - SA-2 (Air supply to AV-101)
 - SA-1 (Air supply to AV-201)
 - SA-3 (Air supply to AV-102)
 - SA-4 (Air supply to AV-202)
 - IV-101 (Pump Discharge P1 Isolation Valve)
 - MV-101 (No. 1 Pump Discharge)
 - MV-201 (No. 2 Pump Discharge)
 - IV-102 (DP Filter Inlet Block Valve)
 - IV-103 (DP Filter Outlet Block Valve)
 - IV-104 (No. 1 Cooler Outlet – PI Block Valve)
 - IV-204 (No. 2 Cooler Outlet – PI Block Valve)
 - MV-102 (No. 1 Cooler Inlet)
 - MV-103 (No. 1 Cooler Outlet)

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 6 of 30
--------------------------------------	---	---------------------

- MV-202 (No. 2 Cooler Inlet)
- MV-203 (No. 2 Cooler Outlet)

E. Ensure **one** of the following valve sets are OPEN to align oil through filter:

- FV-101 (No. 1 Filter Inlet) **and** FV-102 (No. 1 Filter Outlet)
- FV-201 (No. 2 Filter Inlet) **and** FV-202 (No. 2 Filter Outlet)

F. Ensure the following breakers/disconnects are in the ON position:

- LUBE OIL SKID breaker at CONTROL CENTER 54A1-1
- Disconnect on LUBE OIL SKID operating panel
- PUMP 1 DISCONNECT
- PUMP 2 DISCONNECT
- COOLER 1 DISCONNECT
- COOLER 2 DISCONNECT

G. Ensure EMERGENCY STOP button on LUBE OIL SKID operating panel is pulled out.

H. Ensure the following on the Human Machine Interface (HMI) are in Auto **unless** directed otherwise by FLM (see Appendix B for more information):

- HX101
- HX201
- P101
- P201

I. Ensure lube oil pressure is set at **25 psig** on SETUP page of HMI.

J. Ensure Oil setpoint on the Oil Heater page of HMI is set to **120°F (unless** otherwise directed by Engineering and FLM) **and** place oil heater selector switch to the ON position.

K. **When** Oil Temp reading on main page of HMI indicates **greater than or equal to 115°F, then** depress Start Circulation button on HMI.

6.1.2 Perform the following **until** lube oil skid is shutdown:

A. Complete CP4-OP-0207-F01, *C-335 DSP&E Data Sheet*, each shift.

B. **If** filter DP is **greater than 10 psia** as read on DPI-101, **then** perform the following:

1. Crack open vent valve (MV-105 or MV-205) on isolated filter.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 7 of 30
--------------------------------------	---	---------------------

2. Crack open outlet valve (FV-102 or FV-202) to vent isolated strainer.
3. **When** oil discharges from vent, **then** close vent valve (MV-105 or MV-205) **and** fully open outlet valve (FV-102 or FV-202).
4. Slowly open isolated filter inlet valve (FV-101 or FV-201) to place filter in service.
5. Isolate previous in service filter by closing the following applicable pair of valves:
 - FV-101 and FV-102
 - FV-201 and FV-202
6. Crack open vent valve (MV-105 or MV-205) on isolated filter **until** oil no longer discharges from vent, **then** close vent valve (MV-105 or MV-205).
7. Open isolated filter basket.

CAUTION:

If inner mesh bag is **NOT** seated in filter basket, **then** debris in oil can bypass filter and cause bearing wear and damage.

8. Replace inner mesh bag **and** ensure seated in filter basket.
9. Dispose of used inner mesh bag according to CP3-WM-1037, *Generation and Temporary Storage of Waste Materials*.
10. Close filter basket.

NOTE:

The Low-Low Oil Level and High Lube Oil Discharge Pressure alarms will cause a shutdown of the lube oil skid.

- 6.1.3** **If** an alarm is received on the HMI, **then** perform the following:
- A. Depress red stripe on top of HMI screen.
 - B. On alarm screen, depress ACK ALL to acknowledge.
 - C. **If** alarm does **NOT** disappear, **then** perform the following:
 1. **If** alarm is Low Lube Oil Level alarm, **then** notify FLM lube oil skid oil tank needs to be filled.
 2. **If** alarm is Lube Oil High Temperature alarm, **then** ensure lube oil heater is off.
 3. **If** alarm is **NOT** expected, **then** contact FLM for further instructions.

NOTE:
 The lube oil skid should be shut down any time the Dual Speed P&E compressors are shut down for longer than an hour.

- 6.1.4** If desired to shut down lube oil skid, **then** perform the following:
- A. Depress Stop Circulation button on the HMI.
 - B. If desired to shut off lube oil heater, **then** place oil heater selector switch on the Oil Heater page of HMI to the OFF position.

NOTE:
 Steps **6.2.1** through **6.2.11** may be performed in any order or in conjunction with each other to facilitate start-up.
 Steps **6.2.1** through **6.2.5** and Step **6.2.11** are performed from the ground floor. Steps **6.2.6** through **6.2.10** are performed from the cell floor. If two qualified operators are available for checkout of the compressor(s), **then** the operators may perform the checkout at each level in conjunction with each other. Steps **6.2.11** through **6.2.20** require two qualified operators to be available to start the compressor(s), one being stationed on the cell floor and the other on the ground floor.

6.2 Compressor Start-up

Facility Operations Personnel

NOTE:
 Breaker racking operations are performed according to CP3-OP-0315, *Breaker Removal and Return to Service*.

- 6.2.1** Ensure motor breakers are racked in **and** relay targets clear for the appropriate compressor(s) at the TRANSFORMER substation(s):

COMPRESSOR NUMBER	RELAY TARGET	BREAKER	TRANSFORMER SUBSTATION
1	51-G 51 A 51 C	NO. 1 "NORTH" P&E BOOSTER HIGH SPEED	53B1
		NO. 1 "NORTH" P&E BOOSTER LOW SPEED	
2	51-G 51-A 51-C	NO. 2 "CENTER" P&E BOOSTER HIGH SPEED	53B1
		NO. 2 "CENTER" P&E BOOSTER LOW SPEED	
3	51-G 51-A 51-C	NO. 3 "SOUTH" P&E BOOSTER HIGH SPEED	52B1
		NO. 3 "SOUTH" P&E BOOSTER LOW SPEED	

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 9 of 30
--------------------------------------	---	---------------------

- 6.2.2** Ensure the following for seal exhaust to compressor(s) as follows:
- A.** Building seal exhaust pressure is **less than or equal to 0.75** as read on chart recorder in Area Control Room (ACR) on the Plant Auxiliary Utility Panel.
 - B.** NO. ♦ P&E Seal exhaust control valve inlet block valve is OPEN.
 - C.** NO. ♦ P&E Seal exhaust control valve outlet block valve is OPEN.
 - D.** NO. ♦ P&E Seal exhaust control valve bypass block valve is CLOSED **unless** directed otherwise by FLM.
- 6.2.3** Perform the following at the old P&E panel:
- A.** Ensure NO. ♦ SEAL EXHAUST PIC set point is **between 33 and 37 divisions (1.7 psia) and** in AUTO.
 - B.** Ensure NO. ♦ COOLANT PIC set point is at a **minimum of 30 divisions and** in AUTO.
 - C.** Ensure a **minimum of 5 psia** is read on CV BUFFER.
 - D.** Open P AND E ♦-FLOOD valve.
 - E.** Ensure *SF Normal P-nut valve is OPEN.
- 6.2.4** Perform the following at P&E panel in ACR:
- A.** Ensure VALVE RW-1 selector switch on ACR control panel is set to OPEN.
 - B.** Confirm **one** of the following:
 - WATER VALVE RW-1 red indicator is illuminated
 - RW-1 Valve indicates open at condenser platform
 - C.** Check No. ♦ P&E Brake Potential light illuminated.
 - 1.** **If** No. ♦ P&E Brake Potential light is extinguished, **then** attempt to relamp.
 - 2.** **If** No. ♦ P&E Brake Potential light is **NOT** illuminated after attempting to relamp, **then** contact FLM for further instructions.
- 6.2.5** Evacuate system to **less than 0.50 psia and** perform a static leak rate according to CP4-OP-1121, *Cascade Valve and Leak Rating Operations*.
- 6.2.6** Visually inspect compressor to be started for the following:
- A.** Compressor components are free of visual defects.
 - B.** Accelerometers are intact on thrust and load bearings.
 - C.** Brake mechanism markings are aligned.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 10 of 30
--------------------------------------	---	----------------------

NOTE:

An example of the typical lube oil system, with valve numbering, for all the dual speed P&E compressors is located in Appendix C, *Typical Dual Speed P&E Station Lube Oil Diagram*.

6.2.7 Ensure the following valves are OPEN:

- DSLO-1, lube oil supply valve
- DSLO-3, shaft bearing lube oil supply valve
- DSLO-4, motor bearing lube oil supply valve

6.2.8 Ensure seal systems associated with No. ♦ compressor are aligned as follows:

- A. Seal feed supply P-nut valve at seal panel is OPEN.
- B. Seal feed choke bypass P-nut valve at seal panel is CLOSED.
- C. Seal feed test connection is aligned for normal operation.
- D. Atmospheric seal feed supply petcock valve at seal panel is OPEN.
- E. Atmospheric seal feed choke bypass P-nut valve at seal panel is CLOSED.
- F. Atmospheric seal feed test connection is aligned for normal operation.
- G. Seal exhaust block valve near seal panel is OPEN.
- H. Seal exhaust test connection is aligned for normal operation.

6.2.9 Ensure the following valves on CV Buffer Zone panel are OPEN:

- C.V. 782
- C.V. 788
- C.V. 795
- C.V. 802
- C.V. 809
- C.V. 812
- C.V. 819
- C.V. 822

6.2.10 Ensure the following for the R-114/Cooling Water system associated with No. ♦ compressor:

- A. R-114/Cooling Water differential panel is valved in by opening the following:
 - V-1A
 - V-1B

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 11 of 30
--------------------------------------	---	----------------------

- V-2A
- V-2B

- B.** NO. ♦ P&E COOLANT DRAIN valve is CLOSED.
- C.** R-114 level is **greater than or equal to 36 inches**.
- D.** The following conditions on C-335 COOLANT MELETRON NO. ♦ P&E BOOSTER:
 - 1.** R-114 to pressure transmitter block valve is OPEN.
 - 2.** R-114 high pressure coolant relay block valve is sealed OPEN.
 - 3.** R-114 high pressure coolant relay has been reset.
- E.** Block valve between R-114 condenser and rupture disc is sealed OPEN.
- F.** The following cooling water block valves are OPEN:
 - * P&E CONDENSER COOLING WATER SUPPLY VALVE
 - * P&E CONDENSER COOLING WATER RETURN TO STORM DRAIN

6.2.11 Ensure lube oil skid is running according to Section **6.1**.

6.2.12 **If either** of the following is illuminated, **then** depress PG-N2 NO. ♦ COMPRESSOR PERMISSIVE START on old P&E panel **until** light is extinguished.

- PG-N2 NO. ♦ COMPRESSOR “EXTREME LO” LUBE OIL PRESSURE LUBE OIL BLOCK VALVE CLOSED on old P&E panel
- NO. ♦ BOOSTER “EXTREME LO” LUBE OIL PRESSURE LUBE OIL BLOCK VALVE CLOSED red light on P&E panel in ACR

NOTE:

Step **6.2.13** may be performed in conjunction with Steps **6.2.14** through **6.2.17**.

6.2.13 Ensure lube oil is supplied to bearings as follows:

- A.** DSLO-1 is fully OPEN **and** lube oil regulator is adjusted to achieve **7.5 to 8.5 psig** as read on DSLO-PI1.
- B.** DSLO-5 and DSLO-6, lube oil Getz fittings, are adjusted to **20 to 40 drops per minute**.
- C.** Flow is observed in the drain line through DSLO-FI3 bulls-eye.

6.2.14 Check VIBRATION MONITORING SYSTEM cabinet for DUAL SPEED P&E PUMP NO. ♦ as follows:

- A.** **If** MONITOR POWER (green light) is extinguished, **then** contact FLM for further instructions.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 12 of 30
--------------------------------------	---	----------------------

- B.** If CELL TRIP HI FREQ or LO FREQ (red light) is illuminated, **then** perform the following:
1. Place toggle switch TRIP SUPPLY to down position, **then** return to up position.
 2. Depress TRIP ENABLE button **and** confirm TRIP ENABLED (amber light) is illuminated.
- C.** If TRIP ENABLED (amber light) is extinguished, **then** perform the following:
1. Place toggle switch TRIP SUPPLY to the up position.
 2. Depress TRIP ENABLE button **until** TRIP ENABLED light illuminates.

6.2.15 If starting No. 1 compressor, **then** perform the following:

- A.** Ensure the following on ACR control panel are in the CLOSE position:
- DEB-6, NO. 1 compressor inlet valve
 - DEB-7, NO. 1 compressor outlet valve
 - DEB-5, NO. 1 compressor bypass outlet valve
- B.** Ensure HV-106(1) (No. 1 compressor recycle valve), on ACR control panel, is adjusted to **30 divisions or less** as read on No. 1 P&E SUCTION 0-5 PI. (The instrumentation is reverse acting. Thirty divisions is the equivalent of 70 percent open.)

6.2.16 If starting No. 2 compressor, **then** perform the following:

- A.** Ensure the following on ACR control panel are in the CLOSE position:
- DEB-9, NO. 2 compressor inlet valve
 - DEB-10, NO. 2 compressor outlet valve
 - DEB-8, NO. 2 compressor bypass outlet valve
- B.** Ensure HV-106(2) (No. 2 compressor recycle valve) on ACR control panel is adjusted to **30 divisions or less** as read on No. 2 P&E SUCTION 0-5 PI. (The instrumentation is reverse acting. Thirty divisions is the equivalent of 70 percent open.)

6.2.17 If starting No. 3 compressor, **then** perform the following:

- A.** Ensure the following on ACR control panel are in the CLOSE position:
- DEB-13, NO. 3 compressor inlet valve
 - DEB-11, NO. 3 compressor outlet valve
 - DEB-10, NO. 2 compressor outlet valve

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 13 of 30
--------------------------------------	---	----------------------

- B. Ensure HV-106(3) (No. 3 compressor recycle valve) on ACR control panel is adjusted to **30 divisions or less** as read on No. 3 P&E SUCTION 0-5 PI. (The instrumentation is reverse acting. Thirty divisions is the equivalent of 70 percent open.)

- 6.2.18 Ensure all unnecessary personnel are clear of the area in which the compressor is to be started.

WARNING:
 During compressor motor start-up, a rotating equipment hazard and the potential for an equipment failure exists. Personnel are advised to stand clear of the compressor motor during start-up.

- 6.2.19 **While** in contact with operator on cell floor, place PUMP ♦-L switch on ACR control panel in START **until** ammeter indication stabilizes, **then** release.
- 6.2.20 Ensure a **minimum** of **one** operator remains in building **while** compressor(s) are running.
- 6.2.21 Monitor started compressor(s) (e.g., pressures, temperatures, oil flows) for a **minimum** of **5 minutes**.
- 6.2.22 Ensure lube oil pressure is **7.5 to 8.5 psig** as read on DSLO-PI1.
- 6.2.23 Confirm a **minimum** of **600 RPM** as read on DUAL SPEED TACHOMETER with TACHOMETER SELECTOR SWITCH in NO. ♦ position on ACR control panel **and/or** that pump motor loads have stabilized.
- 6.2.24 Close P AND E ♦-FLOOD valve.
- 6.2.25 Perform a running leak rate on started compressor(s) pressure for a **minimum of 10 minutes**.
- 6.2.26 **If** started compressor(s) pressure has risen **greater than 0.30 psia/hr**, **then** contact FLM for further instructions.

6.3 Operation of Compressors in Low Speed Mode

Facility Operations Personnel

- 6.3.1 Ensure Section 6.2 has been performed for compressor(s) to be used.
- 6.3.2 Ensure Shift Coordinator has approved evacuation and discharge of material.

NOTE:
 Appendix D, *Dual Speed P&E Valve Line-up*, can be used in obtaining the correct valve line-up for various compressor configurations.

- 6.3.3 Perform applicable lineup from Appendix D, *Dual Speed P&E Valve Line-up*, for desired compressor configuration.
- 6.3.4 Line up discharge header and evacuation route to P&E station according to CP4-OP-1121 **and** document valves to be used as discharge point block valve and system evacuation block valve in Remarks section of CP4-OP-1121-F01, *Valve Line-Up Sheet*.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 14 of 30
--------------------------------------	---	----------------------

6.3.5 Open discharge point block valve identified in Remarks section of the CP4-OP-1121-F01 completed in Step **6.3.4**.

6.3.6 Open system evacuation block valve identified in Remarks section of the CP4-OP-1121-F01 completed in Step **6.3.4**.

6.3.7 Evacuate system as follows:

- A.** **If** evacuating a system that has been charged with ClF_3 and/or F_2 , **then** ensure Laboratory personnel have sampled system **and** confirm results for combined ClF_3 and F_2 concentration is **less than 8 mole %**.

TSR
5.6.9.1

NOTE:

The compressor inlet valve is a 12 inch gate valve and provides poor throttle control. Because of this, it may be required to pinch closed other valves that are open in the flowpath in order to reduce the pressure to the suction valve thereby providing better control of evacuation rate.

- B.** Slowly open/adjust the following compressor inlet valve and any other valves used for control to obtain desired evacuation rate:
- **If** using No. 1 compressor, **and** it is desired to use the trickle valve for greater flow control, **then** HV-145, TRICKLE may be used in lieu of DEB-6, NO. 1 compressor inlet.
 - **If** using No. 1 compressor, **then** DEB-6.
 - **If** using No. 2 compressor **without** No. 1 compressor, **then** DEB-9.
 - **If** using No. 3 compressor **only**, **then** DEB-13.

CAUTION:

Opening HV-106(♦) too quickly can result in motor load exceeding **17 AC AMPERES** which can cause damage to the compressor motor.

- C.** Slowly adjust HV-106(♦), No. ♦ compressor recycle valve, on ACR control panel **until one** of the following occur:

1. Valve is a maximum **80 divisions** as read on HIC-106-♦ (The instrumentation is reverse acting. Eighty divisions is the equivalent of **20 percent** open.),

OR

2. Motor load is stable as read on PUMP ♦-L ammeter.

- D.** Monitor No. ♦ compressor discharge temperature as read on P&E STATION TEMP., PUMP NO. ♦, temperature trendicator.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 15 of 30
--------------------------------------	---	----------------------

- E.** If No. ♦ compressor discharge temperature reaches **385°F**, then perform the following:
1. Place PUMP ♦-L in STOP.
 2. Close the following compressor inlet valve:
 - If using No. 1 compressor, then DEB-6 or HV-145, TRICKLE, as applicable.
 - If using No. 2 compressor without No. 1 compressor, then DEB-9.
 - If using No. 3 compressor only, then DEB-13.
 3. Contact FLM for further instructions.
- F.** If desired to switch P&E discharge points, then perform the following:
1. Close the following compressor inlet valve:
 - If using No. 1 compressor and it is desired to use the trickle valve for greater flow control, then HV-145, TRICKLE may be used in lieu of DEB-6, NO. 1 compressor inlet.
 - If using No. 1 compressor, then DEB-6.
 - If using No. 2 compressor without No. 1 compressor, then DEB-9.
 - If using No. 3 compressor only, then DEB-13.
 2. Open HV-106(♦), No. ♦ compressor recycle valve, to a **minimum** of **50 divisions**.
 3. Line up header to be used for compressor discharge according to CP4-OP-1121 and document valve to be used as discharge point block valve in Remarks section of CP4-OP-1121-F01.
 4. Open discharge point block valve identified in Remarks section of the CP4-OP-1121-F01 completed in Step **6.3.7.F.3**.
 5. Go to Step **6.3.7.B**.

6.4 Operation of Compressors in High Speed Mode

- 6.4.1** Ensure No. ♦ compressor(s) has been running in low speed mode for a **minimum 30 minutes**.
- 6.4.2** Ensure Shift Coordinator has approved evacuation and discharge of material.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 16 of 30
--------------------------------------	---	----------------------

NOTE:

Appendix D, *Dual Speed P&E Valve Line-up*, can be used in obtaining the correct valve line-up for various compressor configurations.

- 6.4.3** If discharge and evacuation routes are **NOT** already aligned, **then** perform the following:
- A.** Perform applicable lineup from Appendix D, *Dual Speed P&E Valve Line-up*, for desired compressor configuration.
 - B.** Line up discharge header **and** evacuation route to P&E station according to CP4-OP-1121 **and** document valves to be used as discharge point block valve and system evacuation block valve in Remarks section of CP4-OP-1121-F01.
 - C.** Open discharge point block valve identified in Remarks section of CP4-OP-1121-F01 completed in Step **6.4.3.B**.
 - D.** Open system evacuation block valve identified in Remarks section of CP4-OP-1121-F01 completed in Step **6.4.3.B**.
- 6.4.4** Ensure the following compressor inlet valve is closed:
- **If** using No. 1 compressor **and** it is desired to use the trickle valve for greater flow control, **then** HV-145, TRICKLE may be used in lieu of DEB-6, NO. 1 compressor inlet.
 - **If** using No. 1 compressor, **then** DEB-6.
 - **If** using No. 2 compressor **without** No. 1 compressor, **then** DEB-9.
 - **If** using No. 3 compressor **only**, **then** DEB-13.
- 6.4.5** Open P AND E ♦-FLOOD valve.

NOTE:

Steps **6.4.6** and **6.4.7** may be performed simultaneously on all pumps needed to be started.

- 6.4.6** Place PUMP ♦-L switch on ACR control panel in STOP.
- 6.4.7** Place PUMP ♦-H switch on ACR control panel in START.
- 6.4.8** Ensure the following compressor outlet valve is open:
- **If** using No. 3 compressor, **then** DEB-11.
 - **If** using No. 2 compressor **without** No. 3 compressor, **then** DEB-8.
 - **If** using No. 1 compressor **only**, **then** DEB-5.
- 6.4.9** **When** RPM stabilizes as read on DUAL SPEED P&E TACHOMETER with TACHOMETER SELECTOR SWITCH in NO. ♦ position on ACR control panel, **or after a minimum of 15 seconds**, **then** close P AND E ♦-FLOOD valve.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 17 of 30
--------------------------------------	---	----------------------

6.4.10 Evacuate system as follows:

- A. **If** evacuating a system that has been charged with ClF_3 and/or F_2 , **then** ensure Laboratory personnel have sampled system **and** confirm results for combined ClF_3 and F_2 concentration is **less than 8 mole %**.

TSR
5.6.9.1

NOTE:

The compressor inlet valve is a 12 inch gate valve and provides poor throttle control. Because of this, it may be required to pinch closed other valves that are open in the flowpath in order to reduce the pressure to the suction valve thereby providing better control of evacuation rate.

- B. Slowly open/adjust the following compressor inlet valve and any other valves used for control to obtain desired evacuation rate:
- **If** using No. 1 compressor **and** it is desired to use the trickle valve for greater flow control, **then** HV-145, TRICKLE may be used in lieu of DEB-6, NO. 1 compressor inlet.
 - **If** using No. 1 compressor, **then** DEB-6.
 - **If** using No. 2 compressor **without** No. 1 compressor, **then** DEB-9.
 - **If** using No. 3 compressor **only**, **then** DEB-13.

CAUTION:

Opening HV-106(♦) too quickly can result in motor load exceeding **47 AC AMPERES** which can cause damage to the compressor motor.

- C. Slowly adjust HV-106(♦), No. ♦ compressor recycle valve, on ACR control panel **until one** of the following occur:
1. Valve is a **maximum 80 divisions** as read on HIC-106-♦ (The instrumentation is reverse acting. Eighty divisions is the equivalent of 20 percent open.),
- OR**
2. Motor load is stable as read on PUMP ♦-H meter.
- D. Monitor No. ♦ compressor discharge temperature as read on P&E STATION TEMP., PUMP NO. ♦, temperature trendicator.
- E. **If** No. ♦ compressor discharge temperature rises at a rate of **30°F or greater** per minute **when** operating above **300°F**, **or** compressor discharge temperature reaches **385°F**, **then** perform the following:
1. Place PUMP ♦-H in STOP.
 2. Close the following compressor inlet valve:
 - **If** using No. 1 compressor, **then** DEB-6 **or** HV-145, TRICKLE, as applicable.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 18 of 30
--------------------------------------	---	----------------------

- **If** using No. 2 compressor **without** No. 1 compressor, **then** DEB-9.
 - **If** using No. 3 compressor **only**, **then** DEB-13.
3. **If** desired to place compressor in low speed mode, **then** perform the following:
- a) **When one** of the following occurs, **then** place PUMP ♦-L switch on ACR control panel in START:
- DUAL SPEED P&E TACHOMETER with TACHOMETER SELECTOR SWITCH in NO. ♦ position on ACR control panel is reading **less than 720 RPM**.
- OR
- If DUAL SPEED P&E TACHOMETER is **NOT** working, **60 to 70 seconds after** pump trip.
- b) Ensure the following compressor outlet valve is OPEN:
- **If** using No. 3 compressor, **then** DEB-11.
 - **If** using No. 2 compressor **without** No. 3 compressor, **then** DEB-8.
 - **If** using No. 1 compressor **only**, **then** DEB-5.
4. Contact FLM for further instructions.

6.4.11 **If** placing compressors back in low speed mode, **then** perform the following:

- A. Close the following compressor inlet valve:
- **If** using No. 1 compressor, **then** DEB-6 or HV-145, TRICKLE, as applicable.
 - **If** using No. 2 compressor **without** No. 1 compressor, **then** DEB-9.
 - **If** using No. 3 compressor **only**, **then** DEB-13.
- B. Open P&E ♦-FLOOD valve.
- C. Place PUMP ♦-H switch on ACR control panel in STOP.
- D. **When one** of the following occurs, **then** place PUMP ♦-L switch on ACR control panel in START:
- DUAL SPEED P&E TACHOMETER with TACHOMETER SELECTOR SWITCH in NO. ♦ position on ACR control panel is reading **less than 720 RPM**.
- OR
- If DUAL SPEED P&E TACHOMETER is **NOT** working, **60 to 70 seconds after** pump trip.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 19 of 30
--------------------------------------	---	----------------------

- E. Ensure the following compressor outlet valve is open:
 - **If** using No. 3 compressor, **then** DEB-11.
 - **If** using No. 2 compressor **without** No. 3 compressor, **then** DEB-8.
 - **If** using No. 1 compressor **only**, **then** DEB-5.
- F. Close P&E ♦-FLOOD valve.

6.5 Taking Compressor Off-line

6.5.1 Close the following compressor inlet valve:

- **If** using No. 1 compressor, **then** DEB-6 or HV-145, TRICKLE, as applicable.
- **If** using No. 2 compressor **without** No. 1 compressor, **then** DEB-9.
- **If** using No. 3 compressor **only**, **then** DEB-13.

6.5.2 Open HV-106(♦), No. ♦ compressor recycle valve, to a **minimum** of **50 divisions**.

6.5.3 **When** directed by FLM, **then** isolate compressor(s) as follows:

- A. Close all valves in OPEN position on Appendix D, *Dual Speed P&E Valve Line-up*, for applicable compressor configuration.
- B. Isolate headers no longer required for use.

6.6 Compressor Shutdown

6.6.1 Ensure Section 6.5 has been completed to take compressor(s) off-line.

6.6.2 Open P AND E ♦-FLOOD valve.

6.6.3 Place PUMP ♦-L or PUMP ♦-H switch, as applicable, in STOP.

6.6.4 **After** a **minimum** of **one minute**, close P AND E ♦-FLOOD valve.

6.6.5 **If** desired to isolate oil to compressor **and** No. ♦ compressor has been tripped for a **minimum** of **10 minutes**, **then** perform the following:

- A. Place NO. ♦ BOOSTER EMERG. SHUT DOWN & CLOSE LUBE OIL BLOCK VALVE switch on ACR control panel in EMERG.
- B. **When** the following illuminate, **then** release NO. ♦ BOOSTER EMERG. SHUT DOWN & CLOSE LUBE OIL BLOCK VALVE switch **and** ensure switch returns to NORMAL:
 - NO. ♦ BOOSTER “LO” LUBE OIL PRESS. amber light
 - NO. ♦ BOOSTER “EXTREME LO” LUBE OIL PRESSURE LUBE OIL BLOCK VALVE CLOSED red light

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 20 of 30
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7.0 ACCEPTANCE CRITERIA

None

8.0 POST PERFORMANCE WORK ACTIVITIES

None

9.0 RECORDS

9.1 Records Generated

The following records may be generated by this procedure:

CP4-OP-0207-F01, *C-335 DSP&E Data Sheet*

9.2 Records Disposition

The records are to be maintained in accordance with CP3-RD-0010, *Records Management Process*.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 21 of 30
--------------------------------------	---	----------------------

Appendix A – Acronyms/Definitions

ACRONYMS

ACR — Area Control Room

ADP — Automatic Data Processing

DP — Differential Pressure

FLM — Front Line Manager

HMI — Human Machine Interface

JHA — Job Hazard Analysis

P&E — Purge and Evacuation

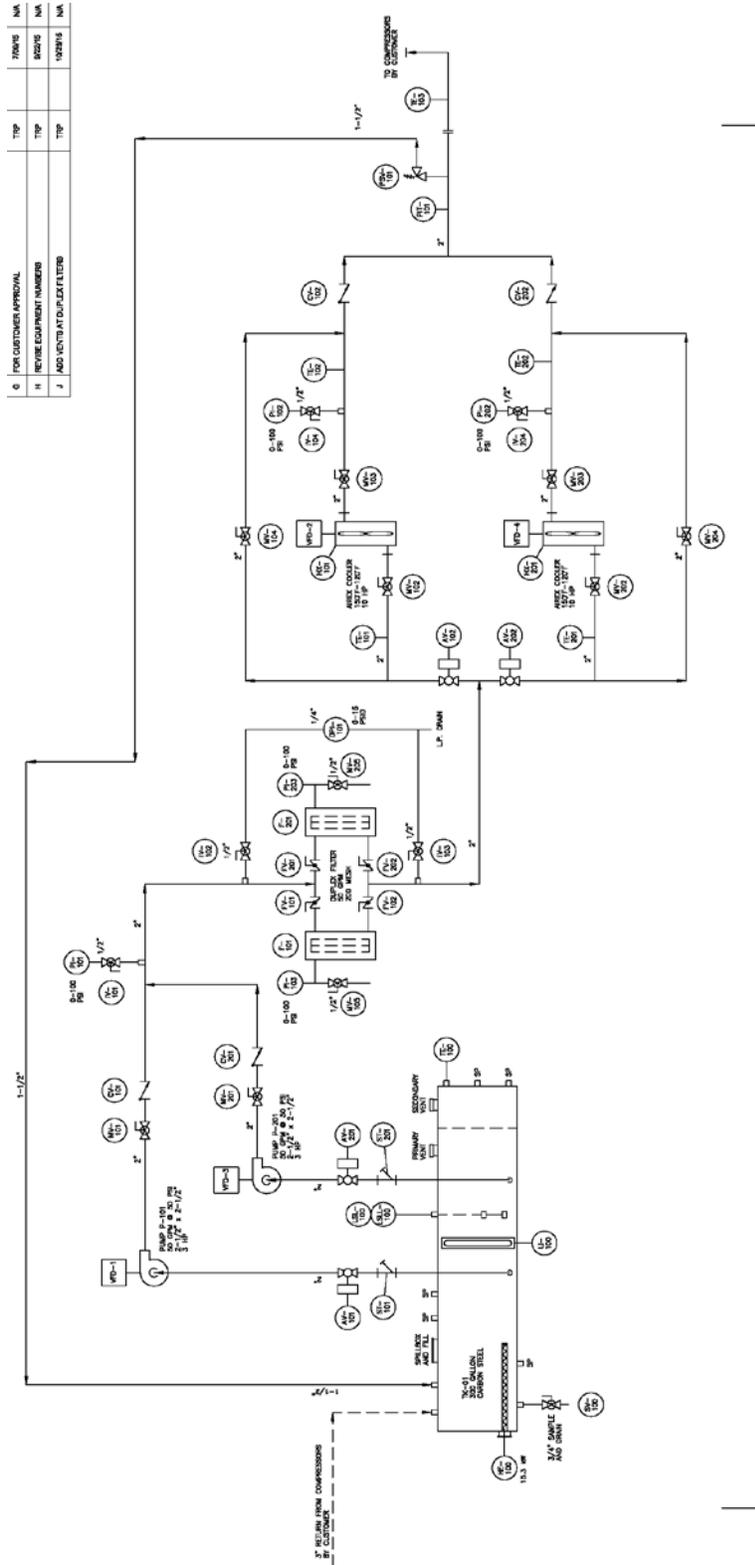
VFD — Variable Frequency Drive

DEFINITIONS

◆ — Denotes compressor number

Leak Rate — A change in pressure over a specified period of time in an isolated section of piping and/or equipment.

Appendix B – Lube Oil Skid Information



I	FOR CUSTOMER APPROVAL	TRP	N/A
H	REVIEW EQUIPMENT NUMBERS	TRP	N/A
J	ADD VENTURI DUCT FILTERS	TRP	N/A

200 GALLON 300 COMPARTMENT

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 23 of 30
--------------------------------------	---	----------------------

Appendix B – Lube Oil Skid Information (continued)

Due to the shutdown of the Cascade building lube oil systems, a different system had to be added to provide lube oil to the DSP&E compressors during operation. The lube oil skid is a platform which has been designed and placed behind the old P&E panel on the ground floor. The system contains a 300 gallon lube oil storage tank with installed heater, two variable frequency drive (VFD) pumps, two filters, and two VFD forced air cooled heat exchangers. The system is controlled through a HMI and is designed to operate automatically to maintain required operating parameters (pressure and temperature).

Normally, the pumps and the fans (for the heat exchangers) will be selected to the Auto position on the HMI. In this configuration, the system will automatically control one pump and one heat exchange and their associated automatic valves. The pump and heat exchanger controlled will be determined from the last ones used. The system automatically selects the pump and heat exchanger opposite the ones that were running last, unless this feature is disabled in the programming (to disable this feature, Engineering will need to be contacted). If for some reason the normally selected pump/heat exchanger is unavailable, the HMI would start the backup pump/fan to maintain operation. The pump speed and heat exchanger fan speed will be automatically controlled by the HMI to maintain the inputted pressure and temperature setpoints. The HMI will also control the lube oil tank heater as necessary to maintain the tank temperature.

In addition to automatic operation, the HMI allows the pumps/fans to be placed in Hand position. This will cause the pump/fan selected to run continuously, regardless of other alignments. In this position, the VFD would operate at a predetermined speed, and automatic control of pressure and temperature would no longer occur. Hand operation can be selected by depressing the desired component button (HX101, HX201, P101, P202) on the HMI home screen and then selecting the desired configuration for the components on its individual HMI screen.

By depressing the Setup button on the HMI home screen, adjustments to the pressure and temperature setpoints can be performed. By depressing the desired parameter to adjust, the desired value can be entered. By depressing the Main button on this screen, the HMI will take you back to the home screen.

The lube oil tank heater is capable of heating the oil to extreme temperatures. Due to this, a heater high limit was installed. The HEATER HIGH LIMIT controller on the LUBE OIL SKID operating panel displays the temperature the heater is running at. If the temperature reaches a predetermined setpoint, the HMI will shut down the heater. If this fails, the HEATER HIGH LIMIT controller will shut down the heater at 185°F. In order to reset the heater high limit, the Reset button on the controller will need to be depressed.

Another safety feature installed on the lube oil skid is an EMERGENCY STOP pushbutton. Depressing this button will shut down all equipment on the skid. Power to the lube oil skid can also be shut down by opening the disconnect switch on the LUBE OIL SKID operating panel or at the power supply.

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 24 of 30
--------------------------------------	---	----------------------

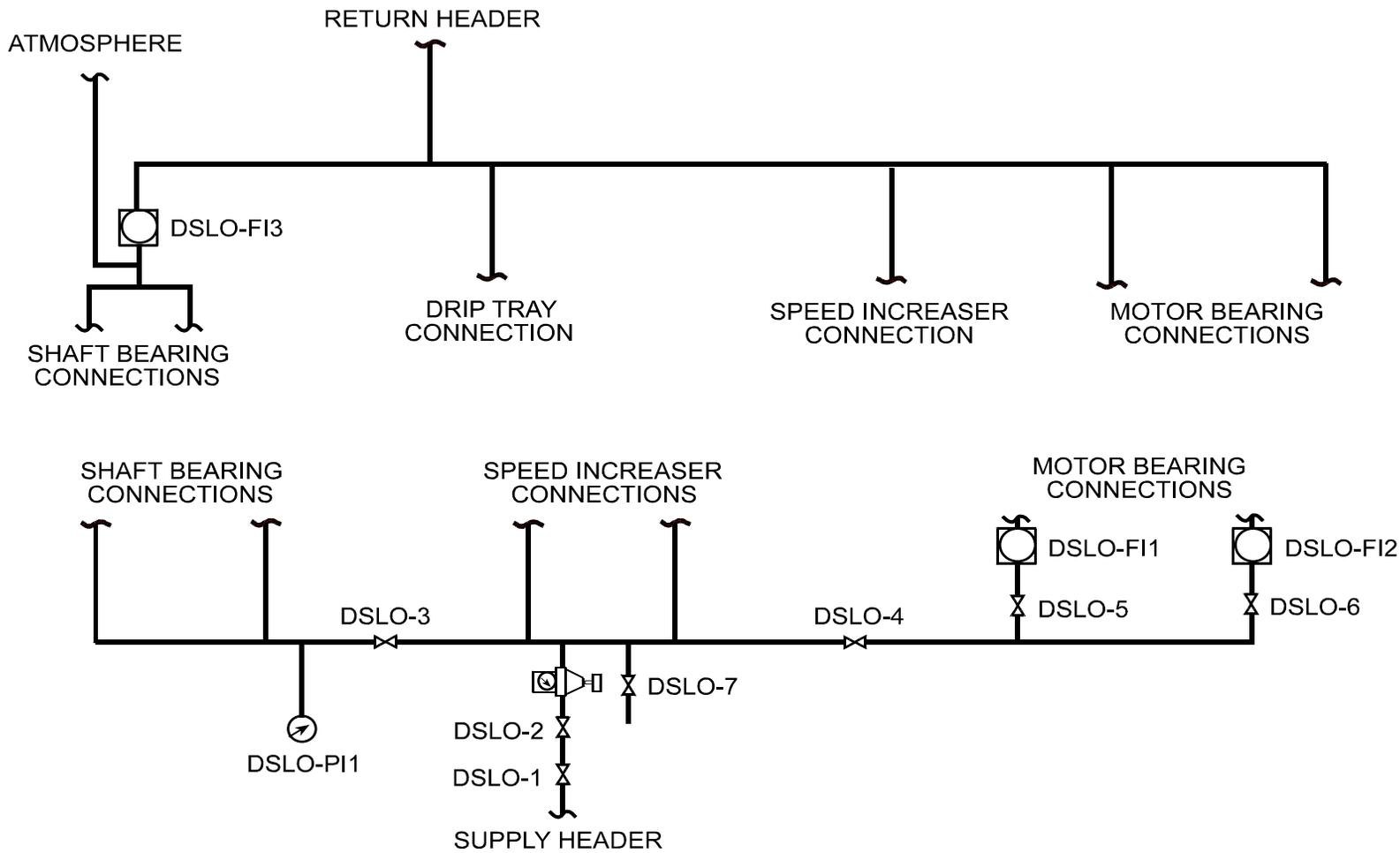
Appendix B – Lube Oil Skid Information (continued)

To start up the lube oil skid, the oil heater should first be energized to heat the oil to the desired setpoint (usually between 115 to 125°F). With oil in the tank heated to the desired temperature, the Start Circulation button on the HMI is depressed to start up the system. In automatic operation, the HMI will cause the applicable pump to start and its associated block valve and the selected heat exchanger automatic block valve to open. The heater in the lube oil tank will operate as necessary to maintain the oil temperature at its setpoint (+/- 5°F). If lube oil line temperature reaches its setpoint, the selected fan will start and maintain the desired operating temperature of the lube oil.

The HMI will display alarms received by the system. The most recent alarm will be displayed on the red bar on the top of the HMI screen. The alarm page can be accessed by depressing the red strip at the top of the page. The system only displays alarms visually – there is no audible indication of an alarm. The following is a list of alarms that can come in on the HMI:

- Low-Low Oil Level
- High Lube Oil Discharge Pressure
- Low Lube Oil Level
- Valve 101 Fault
- Valve 102 Fault
- Valve 201 Fault
- Valve 202 Fault
- VFD1 Fault
- VFD 2 Fault
- VFD 3 Fault
- VFD 4 Fault
- Lube Oil Temperature High

The Low-Low Oil Level and High Lube Oil Discharge Pressure alarms will cause the lube oil skid to shut down.



Appendix C – Typical Dual Speed P&E Station Lube Oil Diagram

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 26 of 30
--------------------------------------	---	----------------------

Appendix D - Dual Speed P&E Valve Line-up

No. 1 Compressor

Valve Number	Valve Description	Position
HV-144	Purge air valve	CLOSE
PV-130	Station inlet control	OPEN
HV-145	TRICKLE	CLOSE
DEB-6	No. 1 compressor inlet	CLOSE
DEB-12	No. 1 compressor bypass	CLOSE
DEB-9	No. 2 compressor inlet	CLOSE
DEB-10	No. 2 compressor outlet	CLOSE
DEB-5	No. 1 compressor bypass outlet	OPEN
DEB-8	No. 2 compressor bypass outlet	CLOSE
DEB-7	No. 1 compressor outlet	CLOSE
DEB-13	No. 3 compressor inlet	CLOSE
DEB-11	No. 3 compressor outlet	CLOSE

NO. 2 COMPRESSOR

Valve Number	Valve Description	Position
HV-144	Purge air valve	CLOSE
PV-130	Station inlet control	OPEN
HV-145	TRICKLE	CLOSE
DEB-6	No. 1 compressor inlet	CLOSE
DEB-12	No. 1 compressor bypass	OPEN
DEB-9	No. 2 compressor inlet	CLOSE
DEB-10	No. 2 compressor outlet	CLOSE
DEB-5	No. 1 compressor bypass outlet	CLOSE
DEB-8	No. 2 compressor bypass outlet	OPEN
DEB-7	No. 1 compressor outlet	CLOSE
DEB-13	No. 3 compressor inlet	CLOSE
DEB-11	No. 3 compressor outlet	CLOSE

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 27 of 30
--------------------------------------	---	----------------------

Appendix D - Dual Speed P&E Valve Line-up (continued)

No. 3 Compressor

Valve Number	Valve Description	Position
HV-144	Purge air valve	CLOSE
PV-130	Station inlet control	OPEN
HV-145	TRICKLE	CLOSE
DEB-6	No. 1 compressor inlet	CLOSE
DEB-12	No. 1 compressor bypass	OPEN
DEB-9	No. 2 compressor inlet	CLOSE
DEB-10	No. 2 compressor outlet	CLOSE
DEB-5	No. 1 compressor bypass outlet	CLOSE
DEB-8	No. 2 compressor bypass outlet	CLOSE
DEB-7	No. 1 compressor outlet	CLOSE
DEB-13	No. 3 compressor inlet	CLOSE
DEB-11	No. 3 compressor outlet	OPEN

NO. 1, 2, AND 3 COMPRESSORS

Valve Number	Valve Description	Position
HV-144	Purge air valve	CLOSE
PV-130	Station inlet control	OPEN
HV-145	TRICKLE	CLOSE
DEB-6	No. 1 compressor inlet	CLOSE
DEB-12	No. 1 compressor bypass	CLOSE
DEB-9	No. 2 compressor inlet	OPEN
DEB-10	No. 2 compressor outlet	OPEN
DEB-5	No. 1 compressor bypass outlet	CLOSE
DEB-8	No. 2 compressor bypass outlet	CLOSE
DEB-7	No. 1 compressor outlet	OPEN
DEB-13	No. 3 compressor inlet	CLOSE
DEB-11	No. 3 compressor outlet	OPEN

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 28 of 30
--------------------------------------	---	----------------------

Appendix D - Dual Speed P&E Valve Line-up (continued)

No. 1 and 2 Compressors

Valve Number	Valve Description	Position
HV-144	Purge air valve	CLOSE
PV-130	Station inlet control	OPEN
HV-145	TRICKLE	CLOSE
DEB-6	No. 1 compressor inlet	CLOSE
DEB-12	No. 1 compressor bypass	CLOSE
DEB-9	No. 2 compressor inlet	OPEN
DEB-10	No. 2 compressor outlet	CLOSE
DEB-5	No. 1 compressor bypass outlet	CLOSE
DEB-8	No. 2 compressor bypass outlet	OPEN
DEB-7	No. 1 compressor outlet	OPEN
DEB-13	No. 3 compressor inlet	CLOSE
DEB-11	No. 3 compressor outlet	CLOSE

NO. 2 AND 3 COMPRESSORS

Valve Number	Valve Description	Position
HV-144	Purge air valve	CLOSE
PV-130	Station inlet control	OPEN
HV-145	TRICKLE	CLOSE
DEB-6	No. 1 compressor inlet	CLOSE
DEB-12	No. 1 compressor bypass	OPEN
DEB-9	No. 2 compressor inlet	CLOSE
DEB-10	No. 2 compressor outlet	OPEN
DEB-5	No. 1 compressor bypass outlet	CLOSE
DEB-8	No. 2 compressor bypass outlet	CLOSE
DEB-7	No. 1 compressor outlet	CLOSE
DEB-13	No. 3 compressor inlet	CLOSE
DEB-11	No. 3 compressor outlet	OPEN

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 29 of 30
--------------------------------------	---	----------------------

Appendix D - Dual Speed P&E Valve Line-up (continued)

No. 1 and 3 Compressors

Valve Number	Valve Description	Position
HV-144	Purge air valve	CLOSE
PV-130	Station inlet control	OPEN
HV-145	TRICKLE	CLOSE
DEB-6	No. 1 compressor inlet	CLOSE
DEB-12	No. 1 compressor bypass	CLOSE
DEB-9	No. 2 compressor inlet	CLOSE
DEB-10	No. 2 compressor outlet	CLOSE
DEB-5	No. 1 compressor bypass outlet	CLOSE
DEB-8	No. 2 compressor bypass outlet	CLOSE
DEB-7	No. 1 compressor outlet	OPEN
DEB-13	No. 3 compressor inlet	OPEN
DEB-11	No. 3 compressor outlet	OPEN

CP4-OP-0207 Rev. 0A	TITLE: Operation of the C-335 Dual Speed Purge and Evacuation Station	Page 30 of 30
--------------------------------------	---	----------------------

CP4-OP-0207-F01 – C-335 DSP&E DATA SHEET

Date: _____

Place (✓) if reading is within range or a circled (X) if reading is not within range.

Lube Oil Skid	1900-0700			0700-1900		
Lube Oil Skid Pressure 20 – 30 psig						
Lube Oil Skid Temp. 115°F – 125°F						
Filter Differential Press. ≤ 10 psi						
DSP&E Pumps	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
Pump Bearing Oil Press. 7.5 – 8.5 psig						
Motor Drip (Comp. End) 20 – 40 drops/min.						
Motor Drip (Motor End) 20 – 40 drops/min.						
Operator (Signature/Badge No.)						
FLM (Signature/Badge No.)						

* Lube Oil Skid Pressure as read from the HMI screen.