Lockout & Maintenance Procedure for Utility Vacuum & Insulation Vacuum Rough Pumps at D-Zero

Written: R. Barger 12/14/01

Reviewed & Approved: _____ __/__/__

1.0 EQUIPMENT LOCATION: D-Zero Assembly Building, Pump Room.

2.0 EQUIPMENT DESCRIPTION: Two Edwards model E2M-275 two stage mechanical vacuum pumps; one for the Utility Vacuum header, and one for the Insulation Vacuum header. Power disconnects are located against the Pump Room North wall and labeled: (I.V.) Mechanical Pump 1, and: (U.V.) Mechanical Pump 2.

3.0 SCOPE OF WORK:

3.1 Oil and filter changes and pump maintenance work only. No disassembly of inlet isolation valves PV-704-V, MV-705-UV or piping components beyond.

3.2 Work requiring removal of any motor or pump cover plates or flanges increases the hazard exposure from Equipment Damage to potential Personnel Injury. Lockout / Tagout steps shall be strictly followed.

3.3 Work involving disassembly of wetted parts connected to the glycol system must also address LOTO requirements of the glycol cooling system pump circuit isolation, as well as environmental precautions.

4.0 AUTHORIZED PERSONS: All D-Zero Cryogenic Operating Crew and supervisors, with current LOTO Level II training, are authorized to perform this procedure.

5.0 NOTIFICATIONS: In addition to affected personnel, the following personnel shall be notified **prior** to initiating this procedure:

A) D-Zero Operations Group Leader: Russ Rucinski x 2888 page:630-218-3927
Home phone:815-393-3238

or

B) D-zero Cryo Operators Supervisor : Jim Fagan x 2932 page: 630-218-9121
Home phone: 630-620-4459

6.0 SOURCES OF HAZARDOUS ENERGY:

6.1 High voltage electrical power may be present: 480VAC /3ph/60Hz. Controlled from the disconnect / breaker panel on Pump Room north wall and labeled for I.V. or U.V. Mechanical pumps.

6.2 Negative pressure energy from connecting lines having significantly large vacuum volume (~300' of 4" or 6" pipe plus the volume of whichever cryostat jackets are on line.) Controlled by isolation valves: PV-704-V (I.V.) or MV-705-UV (U.V.).

6.3 Rotating Machinery. Controlled by disconnect / breakers (see 6.1)

6.4 Pressurized Glycol / water coolant up to 45 psig. Isolated by inlet & outlet ball valves at the pump (only necessary if the pumps glycol circuit is to be worked on.)

7.0 LOCKOUT / TAGOUT CONTINUITY:

7.1 U.V. Pump: After the electrical disconnect and isolation valve (MV-705-UV) for the pump are placed in the lockout positions, a lockout device shall be placed on the valve handle and secured with a lock. The key to this lock shall be captured on the ring portion of the group lockout device placed on the U.V. Mechanical Pump disconnect / breaker.

or

7.2 I.V. Pump: After the electrical disconnect and isolation valve (PV-704-V) for the pump are placed in the lockout positions, Instrument air to PV-704-V actuator shall be valved off at the air isolation valve, the ¼" line to the actuator air inlet disconnected at the actuator solenoid, and the inlet port capped and tagged out. A group lockout device shall be placed on the I.V. Mechanical Pump disconnect / breaker.

7.3 Each authorized employee to work on the job shall secure his lock and tag to the group lockout device.

7.4 When the task extends past the end of shift and is handed over to the next crew to continue, **the relieving crew must affix their locks & tags before the exiting crew remove theirs,** such that at no time is the group lockout device without a lock & tag.

7.5 When the task extends past the end of shift, but is **not** handed over to the next crew, personnel involved in the job shall leave their locks & tags on until they return and complete the job.

7.6 Prior to removing their locks & tags, the crew which finishes the job shall inspect the equipment and the work done on it, to verify that the equipment has been returned to a safe operating condition. This inspection shall also include checks that:

- All tools, materials and debris have been removed.
- All machine guards and power enclosures have been correctly re-installed.
- All drains and vents are closed, and fill caps on and properly tightened.
- Fluid levels are correct.
- Individuals on the notification list above, and other affected workers have been notified of intent to return the equipment to operational status.

8.0 PREREQUISITE ACTIONS:

8.1 Planning and Coordination:

8.1.1 Meet with system users to coordinate equipment shutdown to minimize interference with operations.

8.1.2 Meet with authorized persons who will be performing the work to review this procedure and plan the job tasks. This would include a Job Hazard Analysis covering hazards beyond the scope of this LOTO procedure.

8.2 Performance Documents:

- Lockout Procedure (this document)
- MSDS for HE-200 Vacuum Pump Oil -#6384
- Edwards Operating & Service Manual #03-A346-01-882
- Dec 1979
- Edwards Instructions Manual #03-A366-01-880 April 1981

8.3 Prepare Supplies, Tools & Equipment

- PPE (consult MSDS)
- Fluids, seals, filters, parts, etc.
- Waste containers, spill control materials, wipers
- Tools & special fittings, hoses

8.4 Disable Digital Alarms related to the Mechanical vacuum pumps.

8.5 Shutdown Equipment:

SPECIAL NOTE

The order of oil changes is Utility rough pump first, *then* Insulation vacuum rough pump. This ensures that when the Insulation pump is taken offline, the Utility rougher with clean oil can take its place temporarily without fear of backstreaming contaminants into the clean I.V. header from the oil.

8.5.1 **ISOLATE** all items being pumped by Utility Vacuum Header.

8.5.2 **CLOSE** MV-705-UV

8.5.3 **SHUTDOWN** U.V. Mechanical Pump.

8.5.4 **LOCKOUT** U.V. Mechanical Pump per 7.1 & 7.3.

8.5.5 **VERIFY** lockout by attempting to restart pump in HAND position locally. (It should not start, if it does, shut it off and call an electrician before proceeding any further!)

9.0 PERFORM MAINTENANCE ON U.V. PUMP

9.1.1 Rig drain lines, pan and carboy to drain old oil from pump case and exhaust coalescer case. Fluid quantity for one pump= approx. 5 gallons.

9.1.2 Perform oil change, exhaust coalescer case drain, and any associated maintenance per Edwards manuals.

9.1.3 Perform inspection of finished work per Section 7.6 above.

9.1.4 Remove locks & tags from U.V. Mechanical pump .

9.1.5 Start U.V. pump; check for fluid level, unusual sounds, vibrations, smells, etc.

9.1.6 Check pump performance at TG-718-UV, if time permits, allow to pump overnight before opening MV-705-UV.

10.0 SWITCHOVER

10.1 **VERIFY** that PV-707-UV is closed.

10.2 **OPEN** MV-705-UV.

10.3 **CHECK** that TG-718-UV reads no greater than TG-740-V.

10.4 **OPEN** PV-706-V, TG-740-V should not rise, if it does, close PV-706V, and check UV side for leaks.

10.5 **CLOSE** PV-704-V, note that TG-740-V may rise slightly with only one pump, but should not be significantly worse that when running with The IV pump only. *Insulation Vacuum system is now running on the U.V. Mechanical Pump. Do not attempt to use the U.V. system to pump anything else!*

10.6 **SHUTDOWN** the I.V. Pump.

10.7 **LOCKOUT** the I.V. Mechanical Pump and PV-704-V per section 7.2 & 7.3 .

10.8 **VERIFY** lockout by attempting to restart pump in HAND position locally. (It should not start, if it does, shut it off and call an electrician before proceeding any further!)

11.0 PERFORM MAINTENANCE ON I.V. PUMP

11.1 Rig drain lines, pan and carboy to drain old oil from pump case and exhaust coalescer case. Fluid quantity for one pump= approx. 5 gallons.

11.2 Perform oil change, exhaust coalescer case drain, and any associated maintenance per Edwards manuals.

11.3 Perform inspection of finished work per Section 7.6 above.

11.4 Remove locks & tags from I.V. Mechanical pump, and restore instrument air to PV-704-V actuator solenoid.

11.5 Start I.V. pump; check for fluid level, unusual sounds, vibrations, smells, etc.

11.6 Check pump performance at TG-719-V, if time permits, allow to pump overnight before opening PV-704-V.

12.0 RETURN TO NORMAL OPERATION

12.1 **CHECK** that TG-719-UV reads no greater than TG-740-V.

12.2 **OPEN** PV-704-V, TG-740-V should not rise, if it does, close PV-704V, and check pump side for leaks.

12.3 **CLOSE** PV-706-V, note that TG-740-V may rise slightly with only one pump, but should not be significantly worse that when running with the UV pump only. *Insulation Vacuum system is now running in normal configuration on the I.V. Mechanical Pump. The U.V. system may now be used to pump auxiliary systems after PV-707-UV is opened.*

13.0 POST PERFORMANCE ACTIVITY

13.1 Return lockout locks to the LOTO station and close out the entries for them in the LOTO log.

13.2 Re-enable any alarms which were disabled for the two vacuum systems.

13.3 Make Return-to-Operational-Status entry in the Operations Log.

13.4 Enter itemized details of work performed and parts replaced in the I.V. & U.V. Mechanical Pump sections of the Utility Log.

13.5 Dispose of waste fluids and materials in accordance with applicable rules.