3.1 Glycol Filling Procedure without Inner Vessel

This procedure covers filling of an empty hydraulic system with propylene glycol. If filling the pressure vessel with the inner vessel in place, additional protective precautions must be followed as described in procedure 3.2.

This document serves as an operational guidance to glycol filling. These instructions may be modified as the situation or hardware warrants as long as 3 Glycol Handling Procedure is followed in conjunction with filling. There are many paths to the summit, grasshopper.

Valve labels in this instruction assume that the hydraulic cart with an attached pressure vessel are being filled. All that is required for this procedure is an empty hydraulic system with a vacuum port and a filling port. If degassing is to occur, the degassing port should be located at the highest point in the system.

1. Review Procedure 3 "Glycol Handling Procedure" and have it available.

2. Assemble a vacuum pump, vacuum lines, and a fluid trap. Connect to the vacuum port MV-14.

3. Ensure that no pneumatic pressure is applied to the hydraulic cart. Pneumatic pressure should almost never be applied without glycol in the system.

4. Close all external valves to the hydraulic system: MV-12, 13, 14, 15, 16, and 17. Slowly open all internal valves to the hydraulic system: MV-10, 11, and 4 and EV-3.

5. Run the Cart Commissioning tool and begin data logging every 60 seconds. If degassing the glycol, ensure that the hydraulic ram is all the way down. Otherwise place the hydraulic ram at a suitable position for filling while allowing sufficient room for glycol to thermally expand. I'd suggest no more than 80% full.

6. Assemble but do not connect a glycol resevoir (5 gallon bucket or 55 gallon drum), draw hose with a long handled tip valve. A 7/8" wrench is required to connect the draw hose.

7. Follow the "Before Glycol Handling" section of Procedure 3. Set up the work area and don PPE.

8. Turn on the vacuum pump and open the vacuum at MV-14 to the hydraulic volume.

3.1 Glycol Filling Procedure w/o Inner Vessel *Operational Guidance*

9. Connect the glycol fill hose to MV-15. Ensure that the tip valve is closed and dip the valve into the glycol resevoir. Open MV-15 to bring the draw hose into vacuum.

10. If filling a small volume or if the vacuum pump is not connected to the highest port, close off the vacuum at MV-14.

11. Open the draw tip valve and begin glycol filling. Keep the fill tip submerged; make sure not to suck in any air.

12. Observe gas bubbles rise through the glycol using the cameras and adjust the cameras' foci.

13. If glycol flows through MV-14, close MV-14 and turn off the vacuum pump. Release the vacuum to atmospheric pressure. Slowly open MV-14 to release the hydraulic volume to atmospheric pressure. Open MV-15 and begin draining glycol. Once 1L of glycol has drained, close MV-15 and MV-14. Restart the vacuum pump.

14. When you estimate only 2 litres of headspace remain, either:
    a) Prevent spilling glycol by isolating the vacuum pump at MV-14, or
    b) Begin degassing by closing MV-15.

15. (Optional) If degassing, wait for the gas bubbles to reduce in volume. Pinpoint bubbles of boiling glycol will remain. If large bubble continue to be produced, it is indicative of a leak in the chamber. Close MV-14 when degassing is complete and reopen MV-15 to suck in the remaining glycol.

16. Raise the hydraulic ram to a final filling position; no higher than 80% is recommended. Close MV-15.

17. Close the draw hose valve. With paper absorber ready, disconnect the draw hose from MV-15 and raise the hose end high. Reopen the draw hose valve and drain glycol from the hose.

18. Clean up any glycol spillage and glycol residue from off the draw hose. Bag the draw hose for storage.

19. Complete the “After Glycol Handling” section of Procedure 3.