

3.2 Glycol Filling Procedure w/ Inner Vessel

Operational Guidance

3.2 Glycol Filling Procedure with Inner Vessel

This procedure covers filling of an empty bubble chamber with degassed propylene glycol. This procedure is to be followed in conjunction with procedure 3, [Glycol Handling Procedure](#).

In addition to the hazards of propylene glycol stated in Procedure 3, there is a grave risk of damaging the inner vessel bellows or cracking the inner vessel glass with this procedure. The technical problem is that when the pressure vessel is evacuated for filling or degassing, the net pressure on the bell jar and bellows can be reversed from 15 psi compression to as >1 psi expansion force. This could cause the bellows to over-extend and be damaged.

1. Review Procedure 3 "[Glycol Handling Procedure](#)" and have it available.
2. Set the NESLAB to control its internal bath temperature to 55°C.
3. The empty pressure vessel should have been leak checked prior to this procedure. Insert the inner vessel and seal the pressure vessel top flange using the appropriate procedures. Ensure that the hydraulic cart is filled with glycol. We cannot fill an empty cart while eliminating air voids using this procedure. Put the hydraulic cart under low pneumatic pressure, around <5psi. Connect the hydraulic cart to the pressure vessel. Keep MV-10 closed.
4. Run the cart Commissioning Tool. Start data logging every 60 seconds. Ensure that the cameras and lighting system are fully operational.
5. Crack MV-14 to equalize the internal pressure with external air pressure, then close MV-14.
6. Use the camera alignment tool to monitor the position of the inner vessel. Register the initial position of the evacuated inner vessel within the pressure vessel at 1 atm. Adjust the index marks to reflect the correct maximum bellows extension
7. Assemble a vacuum pump, vacuum lines, and a fluid trap. Connect to the vacuum port MV-14. Do not activate the pump.
8. Ensure that all valves on the hydraulic system are closed. Open MV-11 while keeping MV-10 closed.
9. Follow the "Before Glycol Handling" section of Procedure 3. Set up the work area and don PPE.

3.2 Glycol Filling Procedure w/ Inner Vessel

Operational Guidance

10. Assemble a glycol reservoir (5 gallon bucket or 55 gallon drum) and a draw hose with a long handled tip valve. Connect the draw hose to MV-15 using a 7/8" wrench. Open the draw hose tip valve and dip it into the glycol reservoir.
11. Double check that the cart's pneumatic system is at low pressure and compressed. Lower the hydraulic ram to force the pneumatic ram near it's top. Slowly open MV-15 and the pneumatic ram force glycol out through the draw hose. Monitor the pneumatic ram position and bubbles coming out of the hose. When all the air is forced out, suck in enough glycol to fill the hydraulic ram, then close MV-15.
12. Lower the hydraulic ram again to bring the pneumatic ram near it's top. Slightly open MV-10 to let the pneumatic ram drain into the pressure vessel. When the pneumatic ram is a 5%, close MV-10. Repeat this step until the hydraulic ram is empty and the pipe to the pressure vessel is filled. Leave MV-10 open at the end.
13. Reopen MV-14 to equalize the air pressure. Close MV-14.
14. Open MV-15 and the draw hose tip.
15. This is where the inner vessel can become damaged. Turn on the vacuum pump and evacuate the volume before MV-14. While monitoring the inner vessel position, slowly crack open MV-14. The inner vessel should remain against it's top stop. Open MV-14 only so far as to prevent the inner vessel from drooping. Be careful. It may take awhile for the sufficient vacuum to be established to droop the inner vessel.
16. While filling, monitor the level of glycol in the reservoir. If the level gets low, close MV-14 and the draw hose tip valve. Transfer the draw hose to another bucket and reopen the tip valve. Repeat step 15.
17. As the inner vessel becomes submerged in glycol, slowly open MV-14 while keeping the inner vessel in position. Eventually, MV-14 should be fully open.
18. When the glycol meniscus can no longer be seen in the cameras, close MV-14.
19. Wait for glycol filling to stop on its own. Close MV-15. While checking the inner vessel position and the hydraulic pressure, raise the hydraulic ram to its top stop. Create a volume for degassing.
20. Degas the glycol. Slowly reopen MV-14. The inner vessel should now be buoyant in glycol and not be in danger of overextending. Continue to degas until the glycol temperature is 40°C and only a few small bubbles of boiling glycol remain. If large bubble are seen coming through the glycol, an undiscovered leak is in the system.

3.2 Glycol Filling Procedure w/ Inner Vessel

Operational Guidance

21. Close MV-14 and draw in the remaining glycol by opening MV-15. When the flow of glycol stops, close MV-15. The vessel is now full.
22. Fully back off the compressed air regulator and drain the pneumatic reservoir. Place a caution tag on the regulator and the pneumatic reservoir drain valve. While monitoring the hydraulic pressure, lower the hydraulic ram and force the pneumatic ram up to 80%.
23. Cool the glycol to 20°C. Cool to a lower temperature for CF₃I filling. Use Procedure 6.2 [Bubble Chamber Temperature Ramp up/down](#).
24. Close the draw hose valve. With paper absorber ready, disconnect the draw hose from KF-25 at MV-15 and raise the hose end high. Reopen the draw hose valve and drain glycol from the hose.
25. Note that MV-4 to AC-2 remains closed until the CF₃I fill.
26. Clean up any glycol spillage and glycol residue from off the draw hose. Bag the draw hose for storage.
27. Complete the “After Glycol Handling” section of Procedure 3.