

Job Hazard Analysis Form

Job Title: ArgoNeuT Cryostat Filling

Date of Analysis: April 16, 2009

Reviewed By (optional):

Approved By (Supervisor/Task Manager):

Job Location: MINOS Hall

Job Description:

The ArgoNeuT cryostat will be filled with liquid argon using a succession of several 160 or 180 liter dewars. Dewars will be connected to a TRIGON argon filter, which will be connected to a fill line located on the neck of the cryostat. The internal fill height will be monitored simultaneously by an Arlyn scale located underneath the cryostat, and an argon level-meter located in the neck of the cryostat.

Personal Protective Equipment:

- Face shield
- Cryogenic Apron
- Cryogenic Gloves

Equipment Required for Job:

- wheeled cart, dsigned for moving dewars

Work Plan History Information: (List any lessons learned from this job, tips from previous jobs.)

The operators performing the filling should be aware of the hazards listed in the following table, and the necessary procedures to mitigate these hazards.

		Hazard Analysis
STEP	HAZARD	PRECAUTIONS/SAFETY/PROCEDURE
Move Dewar	Dewar Tipping Over	Secure dewar Use dewar cart to move dewar If dewar falls or is damaged, open vent valve (NOT LIQUID VALVE) to relieve pressure Follow JHA for lowering/raising dewars with crane
Attach/Disconnect Dewar	Burns	Wear Cryo gloves/apron/mask Required Training for operators: General Cryogenic Safety FN000115/CR/00
to Cryostat Fill Line (MV-55-Ar)	Spilling Liquid	close dewar liquid valve before attaching/disconnecting
	Contamination	Check valves prior to beginning fill.
Fill	ODH	The ArgoNeuT system is hooked into a vent line that runs outside of the MINOS hall to the surface. The system is also equipped with 2 ODH monitors. Inform other MINOS occupants before filling. Only two dewars maximum, including empties, in MINOS No dewars permitted in elevators or escape tunnel
	Overpressure	Monitor pressure gauges during filling.

My supervisor has reviewed this hazard analysis with me and I understand the hazards and required precautionary actions. I will follow the requirements of this hazard analysis or notify my supervisor if I am unable to do so. I understand that there are Environmental, Safety and Health Professionals on staff if I need further assistance or clarification.

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Filling Procedure

The cryostat filling system will be arranged as depicted in Figure 1. The following steps should be taken to fill the system:

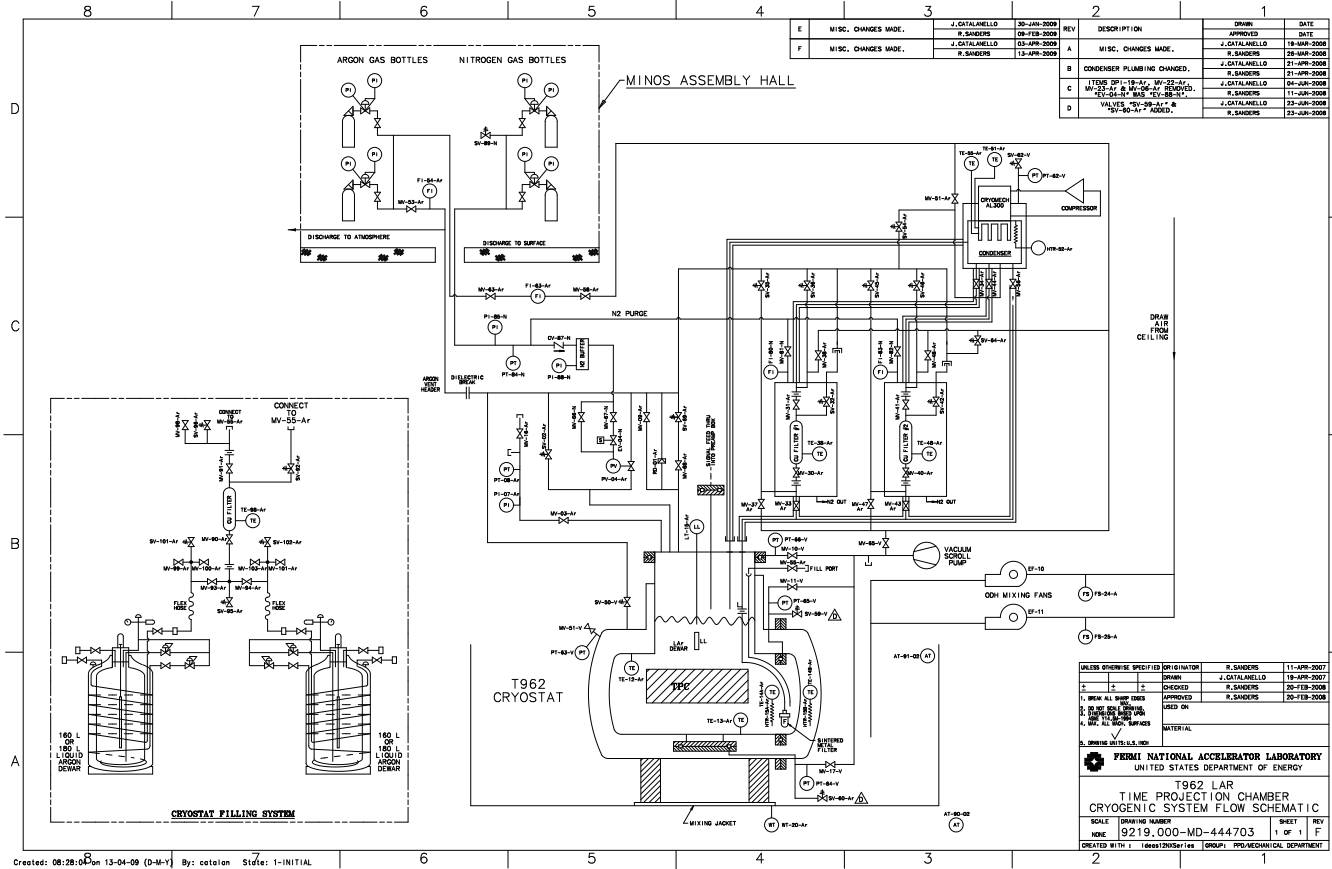


Figure 1: ArgoNeuT Recirculation System

1. Bring 160 L or 180 L liquid argon dewars underground into MINOS using the crane through the open shaft following the appropriate JHA. There should be no more than two portable liquid argon dewars (including empties) underground at one time. Remove empty dewars before bringing full dewars under ground. For ODH reasons, no portable dewars are permitted to be in into the escape tunnel, the elevators, or the elevator foyers
2. Set up the fill line and portable dewar as shown by flow schematic 9219.000-MD-444703. Connect the fill line to MV-55-Ar on the cryostat neck. At

this time MV-55-Ar and the liquid withdraw valves on both portable dewars need to be closed.

3. Purify the fill line by vacuum pumping and back filling with clean argon gas through valves MV-100-Ar, MV-101-Ar and MV-98-Ar. During this process MV-93-Ar and MV-94-Ar should be open. This process should be repeated 3 times or as needed to remove air from piping. During this process, if the copper filter is already clean keep MV-90-Ar and MV-91-Ar closed. Otherwise open MV-90-Ar and/or MV-91-Ar , during this process, to remove air from the copper filter.
4. When done cleaning the fill line, close MV-100-Ar, MV-101-Ar and MV-98-Ar.
5. Check to see if cryostat pressure is below 5 psig. Proceed if cryostat pressure is below 5 psig and the cryocooler is running.
6. Check to see that both dewar liquid withdraw valves are closed. Make sure that MV-99-Ar, MV-100-Ar, MV-101-Ar, MV-103-Ar and MV-98-Ar are all closed. Then open MV-90-Ar and MV-91-Ar. Open MV-55-Ar, on the neck of the cryostat.
7. It is preferred but not required to fill from one dewar at a time. When the dewar in use is empty, it is isolated and liquid is drawn from the other dewar, while the empty dewar is changed out with a full dewar.
8. To start filling from a full dewar, first make sure the appropriate manifold valve (MV-93-Ar or MV-94-Ar) is closed to isolate the empty dewar; then open the manifold valve for the full dewar. Then slowly open the dewar liquid withdraw valve for that dewar. Watch cryostat pressure and close down if pressure cryostat pressure goes above 5 psig. As the fill line cools down, the flow rate will increase and adjustments may need to be made.
9. The manual valve MV-09-Ar can be opened to lower cryostat pressure. On the CMore panel put the automatic vent valve PV-04-Ar into automatic mode to control pressure. It is highly desirable to keep the cryostat pressure below 10 psi.
10. When the dewar in use is empty, close its shutoff valve. Then close the manifold isolation valve (either MV-93-Ar or MV-94-Ar). Disconnect the flex hose from the dewar. Put a small argon gas purge through MV-100-Ar or MV-101-Ar to keep air out of the unconnected flex hose. The end of the flex hose can be loosely capped to help keep air out of it. Remove the empty dewar to the surface before bringing down another full dewar.
11. To connect a full dewar to the fill manifold, first connect the flex hose to its liquid withdraw port. check that the manifold isolation valve (MV-93-Ar or MV-94-Ar) is still closed. Through MV-100-Ar or MV-101-Ar vacuum pump and back fill with

argon gas the flex hose for the full dewar; repeat three times total. Close MV-100-Ar or MV-101-Ar. This dewar is now ready to be used

12. If the filling operation is complete, close MV-55-Ar. Then open MV-98-Ar to release pressure. After pressure is relieved, close MV-91-Ar to keep from exposing the copper filter to air. Then disconnect the fill line from MV-55-Ar. This procedure is then over.