LAr Filter Regeneration Procedure

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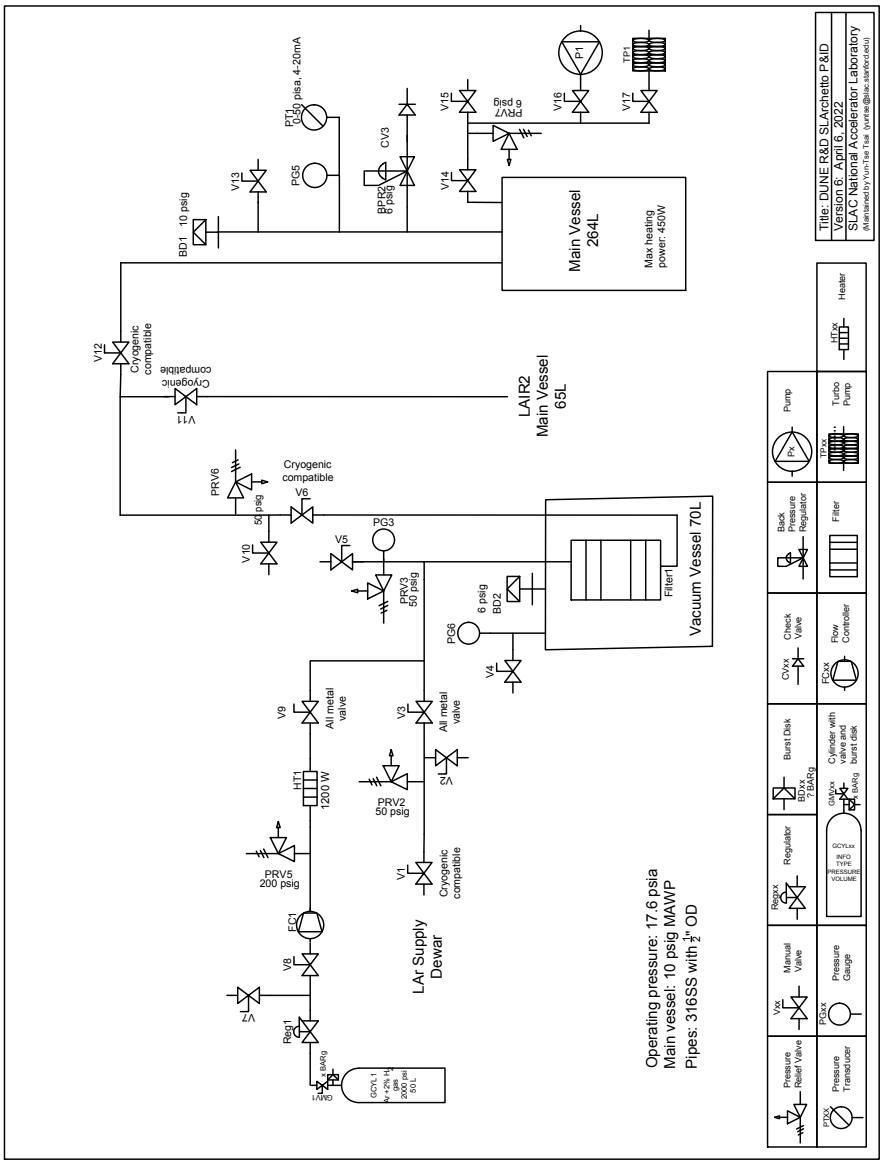
Notes:

- P&ID is attached in the end of this list
- The weight for the all metal valve, V9, is 4 pounds
- The tube upstream V9 is not leak tight (mainly the connections to the flowmeter). Therefore keep V9 closed when we need to isolate the LAr filter
- The gas flow has to be greater than 130 scfm (marked on the flowmeter) to prevent the heater from getting too hot
- We should keep the gas flow (Ar or 2%H_2+Ar) between 130 and 400 scfm (label on the flowmeter), but preferably at 400 scfm (the upper range of the flowmeter)
- Maintain the catalyst temperature between about 170°C and 225°C
- Do NOT exceed 225°C, even though 250°C may be tolerated
- If we keep the gas flow at 400 scfm, a gas bottle should be finished in about an hour
- If seeing smoke or smelling something unusual, shut down the variac power supply (heater) and investigate.

Checklist	What to Do and Detailed Description
Preparation	
3 bottle of ultra high purity Ar gas (TBC)	
5 bottles of Ar+2%H_2 gas (TBC)	
Tubes connecting the heater and the LAr filter wrapped with aluminum foils for thermal insulation	
V4 connected to the scroll pump	Prepare to evacuate the vacuum vessel
V4 open, scroll pump on	Evacuate the vacuum vessel
V3, V5, V6, V7, V8, V9, V10, V11, V12 closed	
Exhausting gas line connected and humidity meter hooked	
Preheating with Ar gas	
V3, V5, V6, V7, V8, V9, V10, V11, V12 closed	
PG6 at 0 psi	
Variac power supply off. Voltage set at 0	

Heater plugged in to the variac power supply	
Ar gas bottle connected to Reg1 and V7/V8 line	
GMV1 opened, Reg1 increased, V7 opened, air purged	Purge the air in the connection tube
V7 closed	Finish purging
V8, V9, V6 opened	
PG3 > 2 psig, V10 opened	
Gas flow > 130 scfh, stable	
Variac power supply on, increase the voltage	Turn on the heater
Humidity plateaued for > 10 minutes	Molecular sieves regenerated
Preheated for > 2 hours	
Variac power supply off. Voltage set at 0	Turn off the heater
V8, V9, V10 closed	
GMV1 and Reg1 closed	
Regenerating copper sieves	
Ar+2%H_2 gas bottle connected to Reg1 and V7/V8 line	
GMV1 opened, Reg1 increased, V7 opened, air purged	Purge the air in the connection tube
V7 closed	Finish purging
V8, V9, V6 opened	
PG3 > 2 psig, V10 opened	
Gas flow between 50 and 160 slpm (Ar), or between 130 and 400 scfh (labeled as Air). Preferrably at 400 scfh Air	
Variac power supply on, increase the voltage	Turn on the heater
Should the temperature exceed 225°C anywhere in the bed, switch to H_2-free gas until the hot zone cools back down to 200 – 210°C, then resume feeding the H_2 gas mixture	
The temperature of the all catalyst bed is stable or subsiding	
Humidity plateaued for > 10 minutes	Copper sieves regenerated
Variac power supply off. Voltage set at 0	Turn off the heater
V6, V8, V9, V10 closed	
GMV1 and Reg1 closed	
Humidity meter unmounted	
Completion	

V3, V5, V6, V9 closed	Prepare to evacuate the LAr filter
Scroll pump connected to V5	
V5 open, scroll pump on	
PG3 at 0 psig	
V5 closed	
V6, V10, V11, V12 closed	Prepare to evacuate the piece of the plumbing system
Scroll pump connected to V10	
V10 open, scroll pump on	
Pumping 10 minutes	
V10 closed	
V3, V5, V9 closed	
V17 closed, turbo pump off?	
V12, V6 open?	


Title: DUNE R&D SLArchetto P&ID
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SLAC National Accelerator Laboratory
Main Vessel 264L
Max heating power: 450W
LAIR2 Main Vessel 65L
Vacuum Vessel 70L
LAr Supply Dewar
Operating pressure: 17.6 psia
Main vessel: 10 psig MAWP
Pipes: 316SS with ½" OD
Cryogenic compatible
All metal valve
PRV1 6 psig
PRV2 50 psig
PRV3 50 psig
PRV5 200 psig
PRV6 50 psig
BD1 10 psig
BD2 6 psig
HT1 1200 W
Filter1
Pump
Turbo Pump
Heater
Filter
Check Valve
Flow Controller
Burst Disk
Regulator
Manual Valve
Pressure Gauge
Pressure Relief Valve
Pressure Transducer

Figure 1: P&ID