

Helium recovery – challenges and pitfalls

Juraj Bella



Project started in 2014
Funded in 2017
Installed & commissioned
In October 2017
Partially paid in May 2018
Not fully operational yet

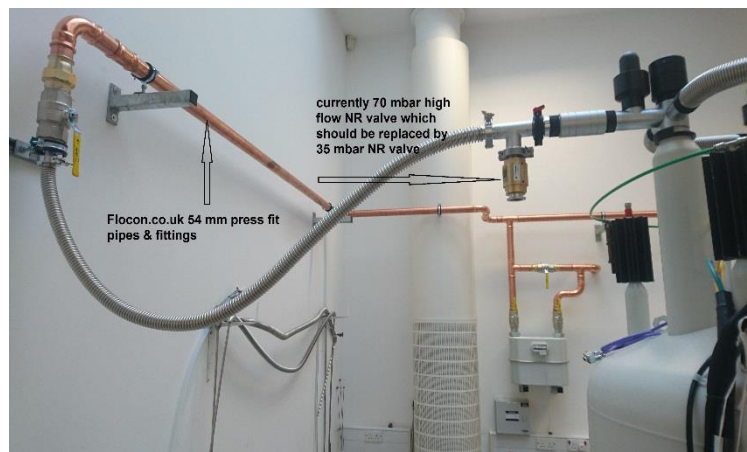


Sustainable Campus Fund of The University of Edinburgh & School of Chemistry

Helium recovery - components



THE UNIVERSITY of EDINBURGH



Helium recovery – performance



Description HR= Helium Recovery	Before HR installation	After HR commissioning	Recently 800 MHz	Recently 400-600
Typical liquid helium delivery	235-240 [l]	235-240 [l]	235-240 [l]	235-240 [l]
helium refill – transferred into the magnet/s	205 [l]	~160 [l]	205 [l]	220 [l]
Transferred out of the transport dewar	240 [l]	240 [l]	220+20* [l]	240 [l]
Helium refill efficiency (magnet in / transfer dewar out)	>80%	~60-70%	>90%	>90%
Boil off / losses anticipated during refill	35 [l]	80 [l]	15 [l]	20 [l]
Anticipated helium Gas generation (exp. ratio 757)	26 m3	60 m3	11 m3	15 m3
“Real” helium gas generation (expansion ratio ???)	?	70-80 m3	45 m3	45 m3
Helium gas compressed into MCP measured by digital gauge			45 m3	45 m3
Liquid helium equivalent of gas compressed into MCP (ex. ratio 757)			59 [l]	59 [l]
Everyday boil off according the helium consumption / refill		4.1 m3	2.7 m3	1.4 m3
Everyday boil off measured by gas meter		3.6 m3	2.6 m3	<1 m3
<ul style="list-style-type: none"> * - leftover in transport dewar 				

Helium recovery – potential pitfalls:



Helium gas bag upstream gas meter:
Could freeze & ruins refill efficiency



Check valves: low flow
and creates oscillating
back pressure which
ruins refill efficiency.



High pressure control panel:
Possible source of leaks.

Helium recovery – MotivAir summary:



- Not a turn key installation!
- Contract very vague – be sure to have your expectations (performance, efficiency...) included in the contract.
- Do not sign commissioning documents until successful helium refill has been carried out and you are happy with amount of helium being collected by the system / MCP.
- Try to design your system as simple as possible avoiding unnecessary in-line components like check valves & gas meters. They can ruin your helium refill efficiency.
- Be sure that all components are high flow rated.
- Check that compressor is delivering what it's suppose.
- Possible issues with too much helium gas generated (up to 4 times) during helium refills – so far unexplained mystery under investigation.