



FABRUM.

**DEVELOPMENT-SCALE
HYDROGEN LIQUEFIER**

DEVELOPMENT-SCALE LIQUEFIER

FABRUM HLQ100

Fabrum's development-scale hydrogen liquefier utilises Gifford-McMahon-type cryocoolers to cool gaseous hydrogen to the point of condensation. No liquid-nitrogen precooling is required, though there is the option to add this capability to boost the daily hydrogen liquefaction rate to 15 kg/day. The liquid-nitrogen precooling module enables liquid nitrogen to be delivered through a port in the side of the container in which the liquefier is housed.

The liquefier is fully self-contained within a 20 or 40-foot ISO container. To meet hazardous area (HA) requirements, the container has an internal division creating two HA zones. A non-hazardous zone houses the control equipment, helium compressors and peripheral systems. A smaller Zone 2 area houses the main liquid-hydrogen storage vessel (MSV) and cold heads.

Boil-off gas from the MSV is automatically recondensed such that the system can operate indefinitely in a zero-loss mode in which a steady-state quantity of liquid hydrogen is maintained in the MSV. The MSV also provides a port to allow a gaseous feed of boil-off gas (hydrogen) from a test rig.

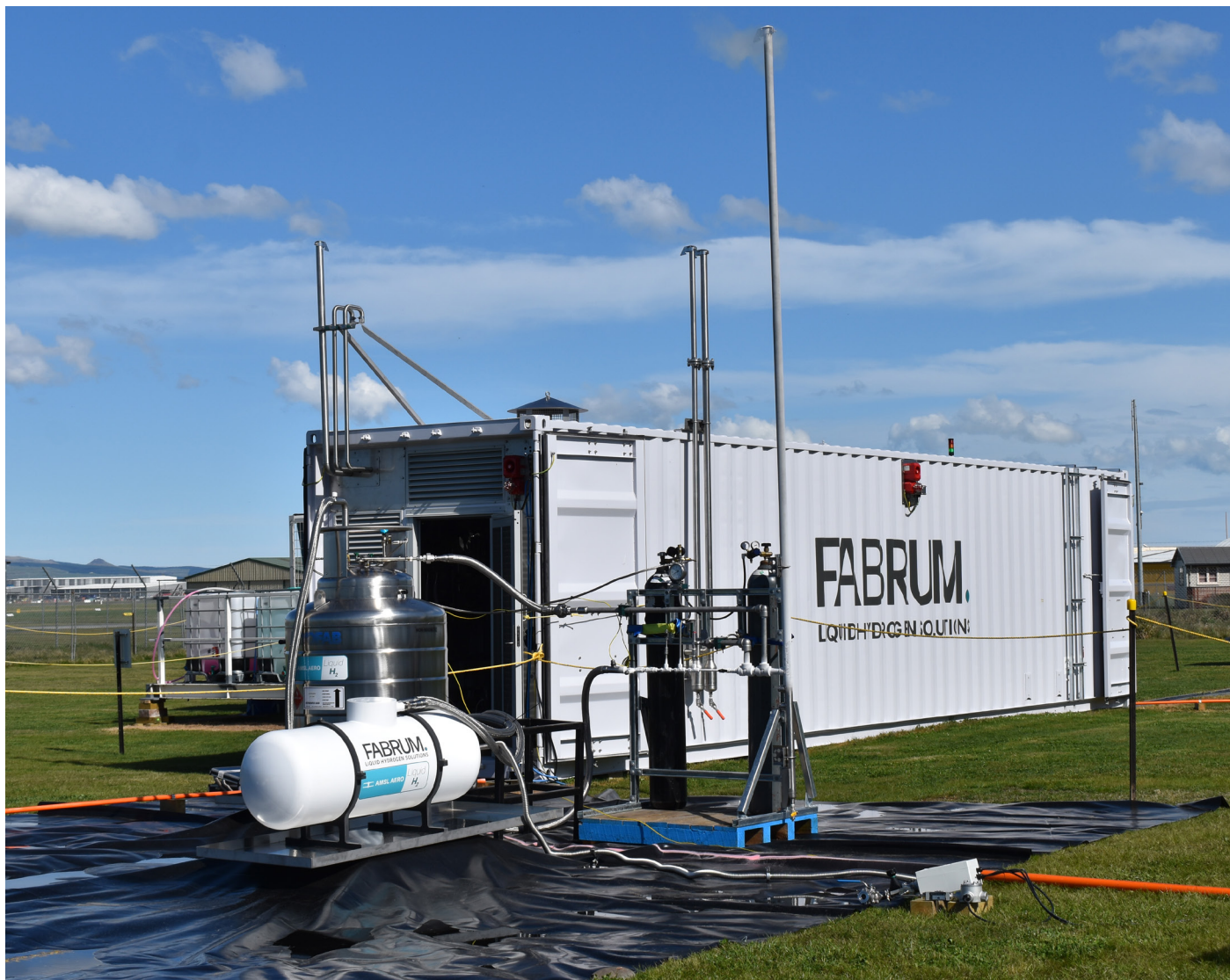
The MSV will have a dispensing interface that is comprised of a cryogenic-valve-isolated bayonet fitting. Dispensing from the MSV is carried out via pressure transfer.

The Fabrum Hydrogen Liquefiers deliver these attributes:

- | | |
|---|--|
| 01 Utilisation of pulse-tube, Gifford-McMahon, and turbo-expander technologies for high efficiency cooling | 04 Rapid turn-up/turn-down response: ideal for renewable energy |
| 02 Patented pressure-wave-generator pulse-tube cryocooler technology | 05 Integration into existing operation |
| 03 No requirement for sacrificial liquid nitrogen precooling | 06 Standby, zero-boil-off mode |

Innovating Hydrogen Liquefaction:

Fabrum's Containerised HLQ Liquid Hydrogen System



FABRUM HLQ100

PARAMETER	OPERATING VALUE
Nominal hydrogen liquefaction rate (with LN ₂ precooling)	Up to 15 kg/day
Nominal liquefaction pressure	6 barg
Nominal power consumption	50 kW
Cryocooler technology	Gifford-McMahon
Footprint of plant	20' or 40' high cube ISO Container
Main storage vessel (MSV) capacity	300 L
Life Cycle (Designed)	25 years
Hydrogen supply quality requirement	99.999% without contamination removal, can be reduced with additional system
Startup time	24 hours from a warm start (approx) 2 hours if shutdown for less than two days
Warranty period	12 months

“We operate at the bottom of the world but we perform at the top of it; and this is just the beginning of our story.”



Mission Critical Solutions.

Providing world leading solutions in engineering and cryogenic technology. Clever Solutions for a Better Future.

NEW ZEALAND

128A Waterloo Road
Hornby
Christchurch 8042
Phone +64 3 982 2810