

Aberdeen, Scotland. Gaseous hydrogen fuelling station for buses.



Description The hydrogen fuelling station installed in Aberdeen is the largest and most advanced station of its type in the UK. The station is fuelling Europe's largest fleet of ten fuel-cell-powered hydrogen buses provided by Van Hool. The ten buses are operated by the UK's two leading bus operators – First Group and Stagecoach – consuming more than 80 metric tons of hydrogen per annum. Aside from public and private sector investment, this groundbreaking facility is being part-funded by the Fuel Cells & Hydrogen Joint Undertaking (FCH JU), Innovate UK (formerly the Technology Strategy Board) and Scottish Government. In addition to validating the techno-economic case for hydrogen-powered buses in intercity duty cycles, the project is also focused on understanding the role electrolysers can play as an energy-storage and grid-balancing medium.

Station overview The state-of-the-art station features two of BOC's proprietary IC90 (900 Bar capable) compressors along with two fast-flow 350 Bar dispensers to reduce the long fuelling times associated with buses. The IC90 compressors also future-proof the station for when 700 Bar passenger cars are introduced into the region. High-purity, zero-carbon hydrogen is produced and stored on site from three HySTAT 60 alkaline water electrolysers. Power for the facility is provided through the National Grid using a Scottish Government "green" tariff.

Design The entire facility has been designed as an independent stand alone solution, but modular in design to allow scope for growth. The compressors and electrolysers are located in standard steel ISO containers and the hydrogen is stored in a number of 500 Bar cylinders which can be increased or decreased in number to match demand. Currently two hi-flow 350 Bar dispensers form part of the design, but additional dispensers can also be added if required.

Automation system Safe and fast refuelling is achieved by a PLC-based automation system:

- Optimised software reflecting the experience of systems installed worldwide
- A Siemens touch-panel-based operator system is used to monitor all processes
- Online access to the entire control system and data acquisition
- Remote diagnostics and maintenance is part of the operating strategy

Safety concept Designed and built to meet global technical standards, the entire facility can be adapted to region-specific codes and standards (e. g. US, EU). The hydrogen safety concept for vehicle fuelling includes:

- Continuous monitoring of system leakage in operation and stand-by mode
- Initial pulse and hold, then continuous leak testing of the vehicle during fuelling
- Hydrogen gas is monitored in confined areas
- Automatic emergency shutdown (ESD) will cut off all power to the facility as well as all hydrogen supplies to the dispenser
- Integrated lightning protection

Station details	Location	Aberdeen, Scotland
	Start of operation	March 2015
	Accessibility	Private
Technical data	Electrolyser station	
	Type	3 x HySTAT 60
	Dimensions (L x W x H)	Each 6 x 2.5 x 2.8 m (3 x 20 ft ISO containers)
	Weight	~ 16 tonnes each
	Maximum production rate	5.1 kg/hr each electrolyser
	Purity	99.999%
	Operating pressure	Up to 1 Mpa/10 bar Ambient
	Ambient temperature	-20°C to 40°C
	Typical power consumption	5.2 kWh/Nm ³ 60.1kWh/kg
	Compressor station	
	Type	2 x IC90 (running at 50 Mpa/500 bar each)
	Dimensions (L x W x H)	Each 3.1 x 2.5 x 2.6 m (2 x 10 ft ISO containers)
	Weight	~10 tonnes each
	Electrical requirements	80 kW (each compressor)
	Inlet pressure	0.5 to 16 Mpa/5 to 160 bar
	Maximum compression rate	30 kg/hr each compressor
	Noise level	~75 Db(A)
	Ambient temperature	-40°C to 50°C
	Typical power consumption	~1 kWh/kg hydrogen
	Buffer storage	
	Capacity	374 kgs
	Maximum storage pressure	50 Mpa/500 bar
	Card reader	
	Type	Tokheim SlimDiaLOG (RFID)
	Dispenser	
	Type	Tokheim Fast Flow x 2
	Flow rate measuring	Mass flow meter
Maximum flow rate	120 g/s each	
35-Mpa maximum delivery pressure	43.75 Mpa/437.5 bar	
Temperature compensation	Linde protocol	
Fuelling nozzle	WEH TK16 fast flow	

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