

FrostByte

World's largest single-unit air separation plant

Member companies contribute expertise to ground-breaking fuel project

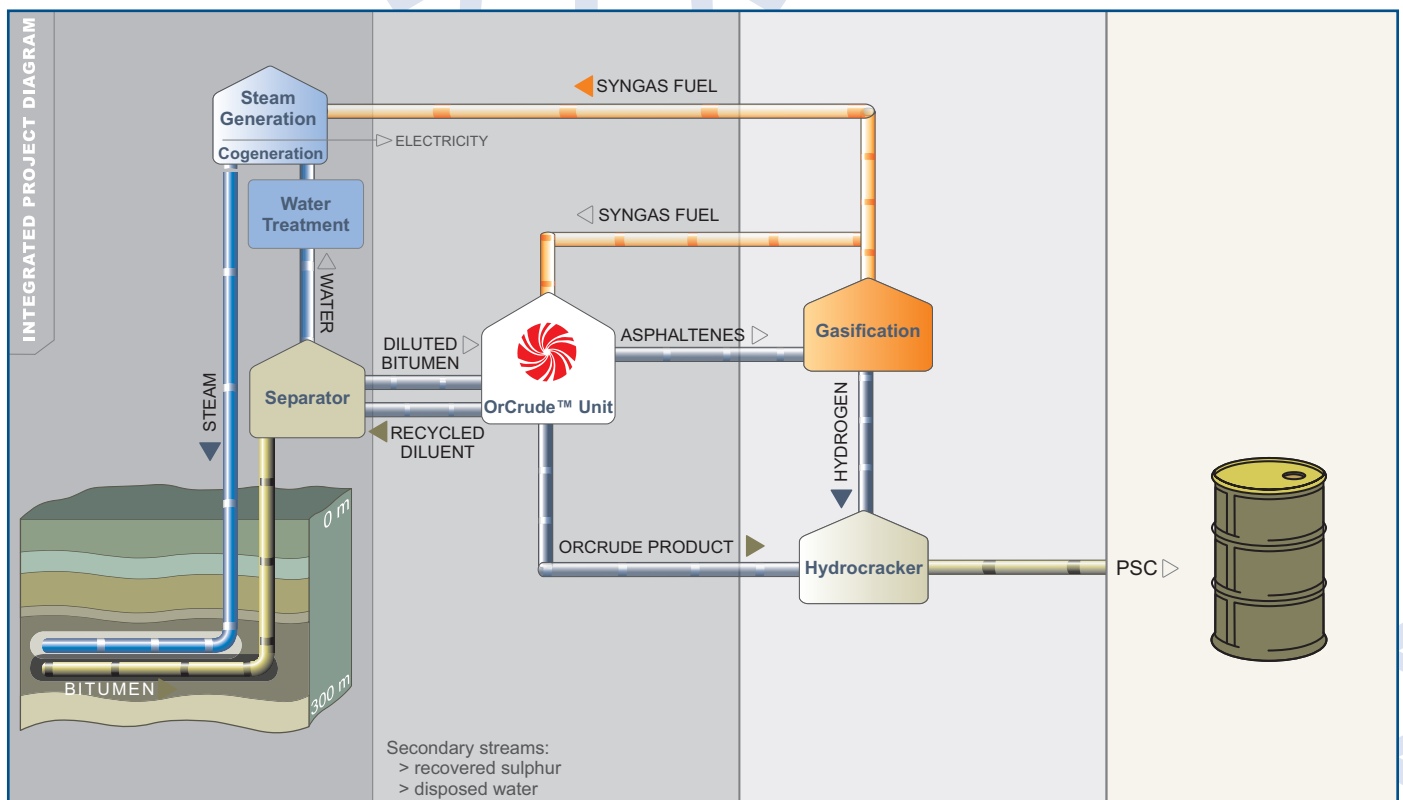
Cryogenic Industries member companies ACD and Cryoquip are contributing their expertise in building the world's largest single unit air separation plant. The Long Lake Project is a joint venture between OPTI Canada Inc. and Nexen to produce a premium synthetic crude. The project will produce and upgrade bitumen into a high value synthetic crude oil at a significant cost advantage over competitive technologies, by virtually eliminating the need for externally purchased natural gas.

The project will use steam assisted gravity drainage technology (SAGD) to recover bitumen. The bitumen will be partially upgraded using OPTI's proprietary OrCrude™ process, followed by conventional hydrocracking and gasification. SAGD recovers bitumen through: drilling of horizontal well pairs; injecting steam into the

upper well; steam rising through the oil sands and heating the bitumen; and, bitumen flowing with condensed steam (water) into the lower well, and then to the surface. The end result will be a premium synthetic crude, produced in an economically, environmentally, and socially responsible way. Long Lake's resource base is vast enough to sustain 60,000 barrels per day of synthetic crude oil production for more than 40 years. Long Lake is located approximately 40 km (25 miles) southeast of Fort McMurray, Alberta, Canada.

Air Liquide Process and Construction Inc. has been selected for the construction of a world-scale air separation unit to supply large quantities of high purity oxygen and other utility services to the Long Lake Project. The air separation unit, designed to supply 3,900

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World's largest single-unit air separation plant

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metric tons per day of oxygen, will be one of the largest single-train facilities in the world and will be integrated with other production units to optimize energy efficiency.

For this project, Air Liquide has selected Cryoquip to design and supply one of its largest VSSU vaporizers for the Long Lake Project. A VSSU (vaporizer steam sparged u-tube) consists of a cylindrical tank to store hot water and u-shaped metal bundles that vaporize cryogenic liquids to gases. On site construction of the air separation plant began in March 2005 and commissioning is expected in early 2007.

The tank of this vaporizer can hold 19,000 gal (71,923 l) of water and is coated on the outside with polyurethane foam to provide insulation and insure efficient operation. The length of the vaporizer is an exceptional 39 ft (12 m) with a tank diameter of 10 ft (3 m). The tank support legs on the vaporizer not only have to sustain 197,362 lbs (89,522 kg) when the tank is full of water but also have to be rated to -49°F (-45°C), well below the normal design point of carbon steel.

The interior of the vaporizer comprises two oxygen stainless steel bundles, operating on two different process streams. The first 40 in (101 cm) diameter bundle is designed to be capable of vaporizing liquid oxygen to gaseous oxygen at a flow rate in excess of 2,100,000 scfh (59465 scmh). The u-tubes within the first bundle must also cope with the high pressure of the oxygen which stands at 1,145 psig (79 barg).

The second bundle is smaller with a 38 in (97 cm) diameter and will operate at a lower pressure.

Since the water in the tank is to remain hot enough to vaporize the oxygen, steam is sent to the tank at 375 °F (191 °C) with a maximum temperature capable of reaching 542 °F (283 °C). The steam flows

into the tank through 12 steam spargers that are located inside and in the bottom of the tank and deliver steam at a combined rate of 21,000 scfh (595 scmh).

In the event that there is a power shortage or blackout which then interrupts the flow of steam into the tank, the vaporizer can still send out oxygen gas warm enough to meet the customer's standards for a full 15 minutes at which point the customer has time to either repair and restore the steam flow or determine if they have to cease operation of the vaporizer.

Air Liquide has awarded ACD the compressor loaded expander portion of the contract for the project. This large frame size expander/compressor is one of the highest pressure machines ACD has built. The machine will be shipped complete with a lubrication system and a seal gas system. The lube system will supply a continuous flow of clean filtered oil to the rotor bearings. The seal gas system will provide a buffer gas system to prevent migration of the oil into the process. Additionally Air Liquide has opted for the new Low Hysteresis guide vane design that will provide accurate repositioning of the expander guide vanes.

This unit is designed to meet the Canadian requirements and will conform to the Canadian Standards Association (CSA) and all components will be provided with Canadian Registration Numbers (CRN). Additionally the complete skid and system assembly must be able to withstand an outdoor installation at temperatures of -50°F (-46°C).

For more information about the project, visit www.longlake.ca, contact Peter Schreiber at Cryoquip, tel +1.951.677.2060, pschreiber@cryoquip.com or Tom Gerbard at ACD, tel +1.949.261.7533, tgerbard@acdcom.com.

High flow rate vaporizers

Cryoquip-China's new Hangzhou facility is manufacturing high flow rate vaporizers. Pictured are two model CV 1000 units designed to provide the continuous flow of 1000 Nm³/hr (38,000 scfh) of nitrogen. The customer, Air Products, provides the Jingjing Glass Company in Shandong Province, northern China, with industrial gas. Jingjing manufactures large sheets of glass using a "float glass technique" in which the glass is manufactured suspended on a supporting layer of nitrogen gas. This ensures the glass is perfectly flat and uniform in thickness and avoids any mechanical handling of the glass until it solidifies. It is critical that the gas supply is continuous and consistent to prevent the collapse of the cushion of gas. The gas also provides a shield around the glass, protecting it from atmospheric air pollution which would cause hazing. This type of glass is used in the manufacture of electronic products as well as in the construction industry.



LECTRAN® pumping system offers high performance, low cost

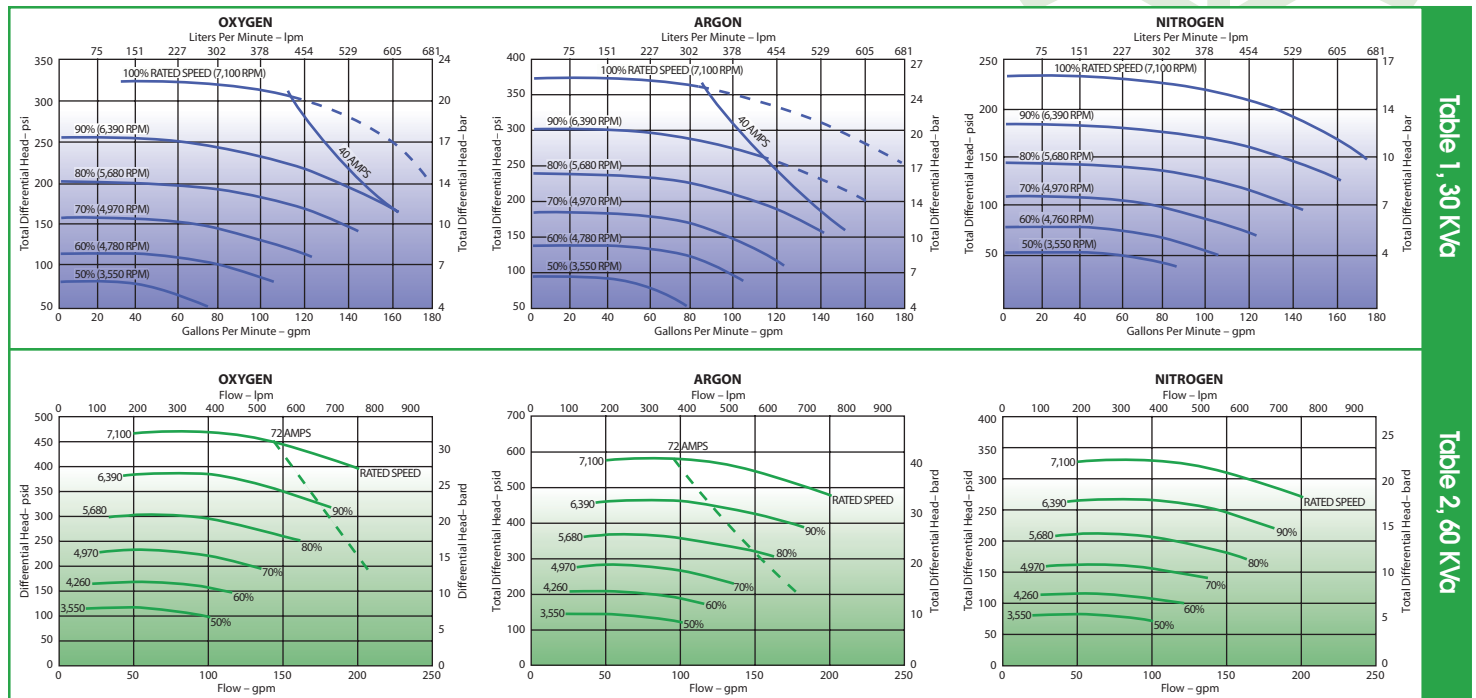


Table 1, 30 KVA

Table 2, 60 KVA

Used by all major producers of cryogenic liquid products, the LECTRAN® mobile cryogenic pumping system is part of ACD's worldwide product line currently supplied by Pittsburgh Cryogenic Services, Inc. (PCS). These electrically operated pumping systems are used for efficiently transferring liquid cryogenic products from a truck or semi-trailer to a stationary storage tank or other vessel. (See Performance Curves, Table 1.)

Varied product line

Flexibility is the key to meeting customer needs, and LECTRAN systems are designed to permit tailoring the system to the delivery vehicle's performance characteristics and customer pumping needs. For example, systems are offered with several different gear ratios – as well as direct drive – to accurately match the PTO rpm with the alternator's speed requirements. Also, customers can choose systems offering the desired pressure and flow rates and in constant or variable speed.

Simple, yet full-featured

All LECTRAN systems consist of a brushless AC generator (alternator), electric motor, cryogenic pump, and associated controls. The alternator is driven by the truck engine's power takeoff or auxiliary power unit. It provides the electricity needed to power an electric motor, which in turn drives the liquid transfer pump.

At a cost about one-quarter that of hydraulic pumping systems, LECTRAN is an excellent alternative that offers significant benefits, including:

- leak-free, environmentally safe operation
- complete liquefied gas transfer system

- highly reliable components, requiring minimal maintenance
- driver-friendly safe and easy operation
- lightweight, compact, and easy to install components
- highly efficient operation, using less horsepower than competitive systems
- availability in constant-or variable-speed
- variable flows and pressures (by regulation of the power source)
- alternator installation in any of several positions for maximum flexibility
- pump shaft sealed against both static and dynamic leakage
- single-source maintenance service
- most parts and systems shipped same day
- customer service line answered 24 hours a day

What's new

PCS has added a new, more powerful high output (HO) Lectran system to its product line. This new system includes a 60 KVA alternator, 60hp motor and a 1.5x2.5x7.37 centrifugal cryogenic pump capable of delivering much higher flow rates and pressures. (See Performance Curves, Table 2.)

“The new HO Lectran pump is comparable to hydraulic transfer systems, but at a lower cost, better efficiencies, higher reliability, and more environmentally-friendly way to transfer liquid,” said Jim Estes, General Manager, PCS. “Each system fills a specialized need to many customers in the cryogenic industry,” he added.

For more information, contact Ed Huckestein at Pittsburgh Cryogenic Services, Inc., tel +1.724.695.1910 or pittcryo@pittcryogenic.com.



Cryoquip develops a truck mounted nitrogen converter

SLS cryogenic pump companion

Cryoquip developed the Advanced Diesel Fired Vaporizer, ADFV series vaporizer, a truck mounted, direct fired diesel liquid nitrogen converter, for the oil industry. An intermittent requirement was needed for a flow rate in excess of 600,000 scfh (16,000 Nm³/hr) of high pressure nitrogen gas for use in oil well extraction enhancement, refinery cleaning, and other remotely located chemical purging applications.

The vaporizer/converter had to be portable, independently powered, and compact enough to fit into a very restricted space on the back of a liquid nitrogen tanker truck. Cryoquip's solution to this problem is the ADFV vaporizer. Advanced fired units are currently being developed with capacities up to 2 million scfh (52,600 Nm³/hr).

The entire vaporizer/converter system is truck mounted and self-contained. It is extremely compact in design and fits a minimal volumetric space relative to its capacity. Liquid nitrogen is supplied from the storage tank to an on-board boost pump. The boost pump raises the pressure of the liquid nitrogen and delivers it to the suction side of an on-board high-pressure liquid nitrogen pump. The vaporizer is capable of operating at pressures up to 10,000 psig (690 bar) with options to 15,000 psig (1034 barg). It has a complex arrangement of reverse flow combustion chambers with fuel nozzles with the capability of eight stage firing to enhance the overall range of temperature control of the unit. Diesel fuel is supplied from the truck's fuel tank to the vaporizer, a boost pump and into the high-pressure fuel pump.



The Cryoquip Advanced Diesel Fired Vaporizer

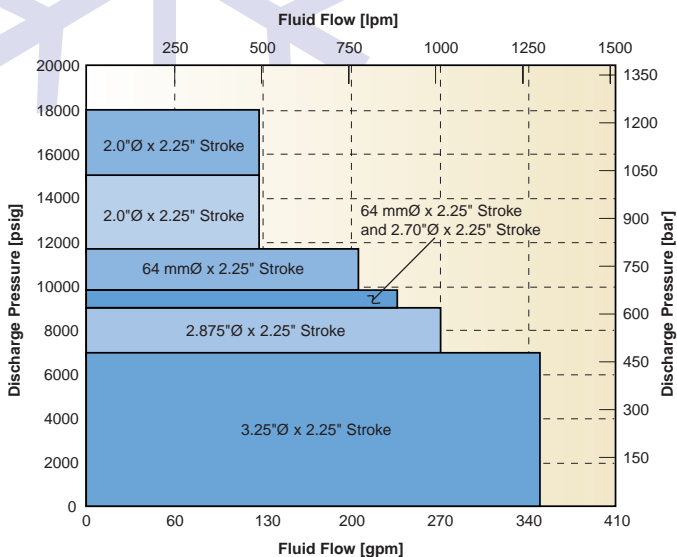
A hydraulically driven, multi-bladed fan provides air to the vaporizer combustion chamber for vaporization and for system cooling. The heart of the vaporizer comprises a unique arrangement of combustion chambers that which both preheat and mix combustion air providing maximum combustion efficiency.

The systems nitrogen vaporizer accomplishes the difficult task of introducing the required amount of heat into the heat exchanger and dissipating that heat into the surface area of the heat exchanger tubes successfully, in a very short distance and minimal space, without compromise to the overall reliability, integrity and longevity of the coil.

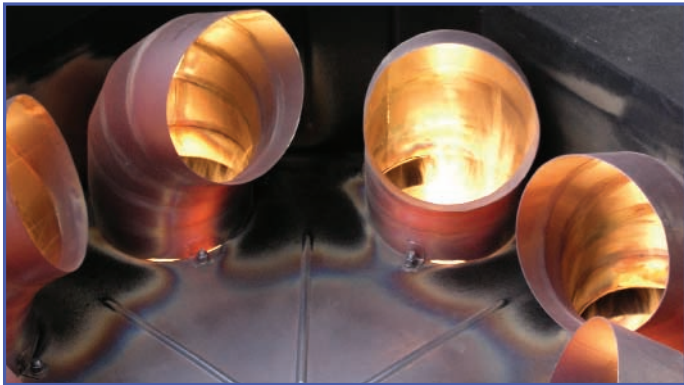
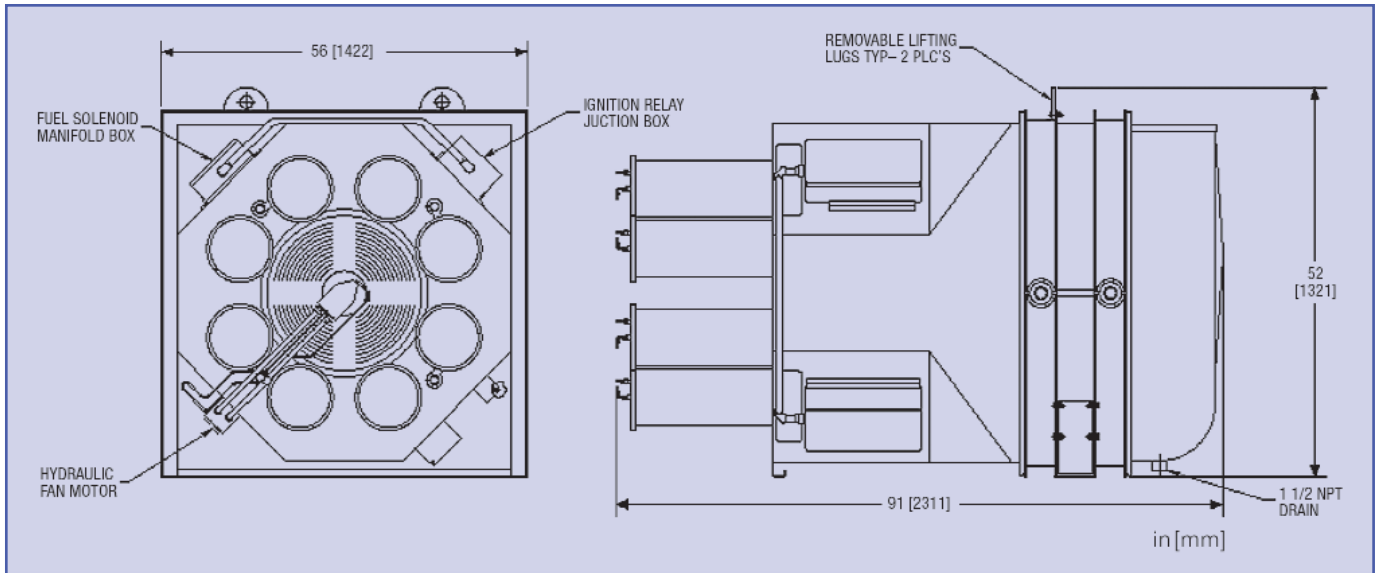
This direct fired nitrogen vaporizer system has been specifically designed to be used with ACD's SLS cryogenic pumps to provide maximum system output efficiency. ACD's SLS pumping series provides high performance and reliability to the oil well service industry.

A new shaft design, improved forced-oil lubrication system, and more cold end options (six) provide flexibility and much-improved efficiency. Better than 30 to 1 turndown ratios allow for a wide range

5-SLS 1500 Horsepower Cryogenic Reciprocating Pump



5-SLS



Cryoquip test fires the internal burner cans of the ADFV vaporizer.

of operating parameters including low enough flows to meet coil tubing applications.

The 3-SLS series provides flow rates up to 206 gpm (1.15mm scfh) at pressures up to 18,000 psi with gearbox options including 600 and 1,000 hp capabilities. For higher flows, the 5-SLS series provides flow rates up to 320+ gpm (1.8mm scfh) at the same pressures. Power requirements for the 5-SLS series reach 1,500 hp.

For more information contact Bryan Smith at Cryoquip, tel +1.951.677.2060, bsmith@cryoquip.com or Rick Young at ACD, tel +1.949.261.7533, ryoung@acdc.com.

Cryoquip goes offshore

Cryoquip-UK has recently supplied equipment to enhance the safety and efficiency on the world's longest undersea pipeline project. The system is designed and executed by IGAS Technology Solutions, through Dominion Technology Gases, who provide the system package and welding gases to Stolt Offshore's LB200, one of the world's largest pipe-laying vessels, as it works on the 1200 kilometre Langeled gas pipeline. Stolt Offshore will construct and lay about 890 km (553 miles) of the pipeline from Norway to the UK, completing 525 km (326 miles) this year and 360 km (224 miles) in

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Cryoquip goes offshore

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2006. The challenge was to supply a moving vessel with a system tailor-made to meet the demands of a rigorous schedule and exacting conditions.

The requirements included:

- A system to deliver propane, used for pre-heating the pipe, to 40 user points on the barge
- The ability to blend argon and carbon dioxide (the main components of welding gas) into an 80/20 mix for repair work and a 50/50 mix for pipeline construction on-board the vessel
- A system to deliver the welding gas to six welding supply stations around the barge

Dominion's 300 bar (4351 psi) Quad packages reduce the number of offshore lifts and cuts shipping, transport, and rental costs by up to 40%. The unique gas-mixing system to blend the argon and carbon dioxide on-board the vessel helped reduce the number of offshore lifts as pre-mixed welding gas is too unstable to transport at higher than 90 bar (1305 psi) pressure. Supplying it would have increased the turnover of cylinders almost tenfold. (See Containerized Mixing System.)

For more information contact Brent West at Cryoquip, tel +44.1227.714.350, sales.uk@cryoquip.com.

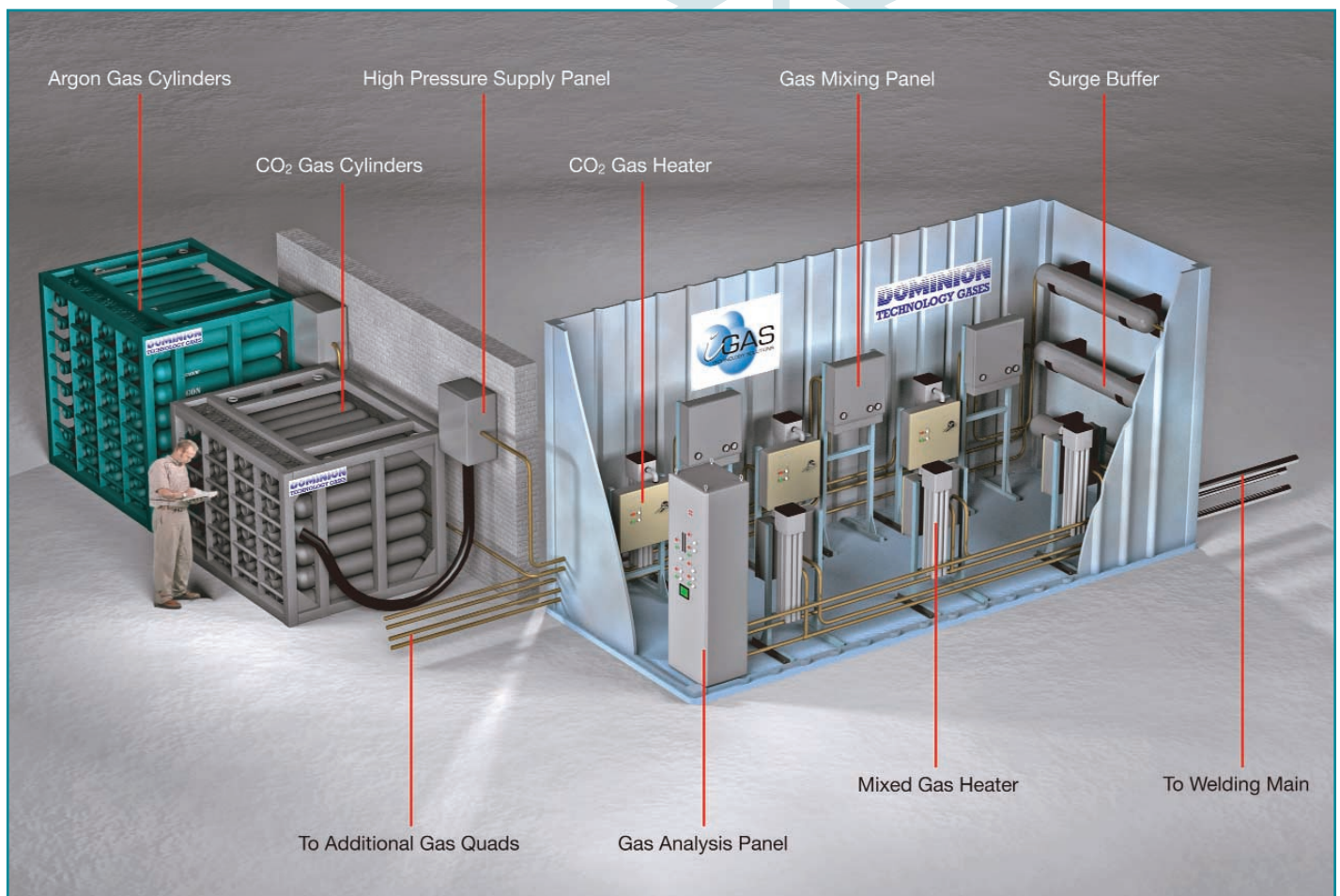
Cryoquip's heaters ensured:

- the CO₂ supplied to the mixing panels was in the gaseous state
- the mixing gas headers were kept at a temperature of 15°C (59°F) above ambient to ensure ease of operation at the welding heads

The project was completed and commissioned within nine weeks of the order, including some of the following elements:

- The installation of over 1.2 km (0.75 miles) of pipework for the propane system in two weeks
- The installation and commissioning of the gas mixing system, including 800 metres of supply header on-board in three weeks
- The installation of a continuous electronic monitoring system, allowing mixing, data collection and retrieval
- The acquisition of DNV approvals within one week of completion

The Langede pipeline will run from the Ormen Lange gas field, 120 km (75 miles) west of Norway, via Nyhamna and the Sleipner area, through to Easington on the southeast coast of England. The field is expected to meet 20% of the UK's gas demand for up to 40 years.





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Calendar of Events

AUG 29-SEPT 2	CRYOGENIC ENGINEERING CONFERENCE/INTERNATIONAL CRYOGENIC MATERIALS CONFERENCE (CEC/ICMC) • Keystone, CO, USA tel +1.303.499.2299, fax +1.303.499.2599, cecicmc05@centennialconferences.com, www.cec-icmc.org
SEPT 7-9	THE 7TH CHINA INTERNATIONAL EXHIBITION ON GASES TECHNOLOGY, EQUIPMENT & APPLICATION (IG, CHINA 2005) • Hangzhou, China tel +010.6558.1930, ig.china@ait-events.com, www.china-gases.com
SEPT 12-17	INTERNATIONAL ESSEN WELDING FAIR • Essen, Germany tel +49 (0) 201.7244.290, fax +49 (0) 201.7244.448, info@messe-essen.de, www.messe-essen.de
SEPT 20-24	GAWDA ANNUAL CONVENTION • Maui, HI, USA tel: +1.215.564.3484, fax +1.215.963.9785, gawda@gawda.org, www.gawda.org
OCT 22-26	INTERNATIONAL OXYGEN MANUFACTURERS ASSOCIATION (IOMA) • Hong Kong, Peoples Republic of China tel +1.202.521.9300, fax +1.202.833.3636, ioma@iomaweb.com, www.iomaweb.org
NOV 13-16	FABTECH INTERNATIONAL AND AWS WELDING SHOW • Chicago, IL, USA tel +1.305.443.9353, fax +1.305.442.7451, info@aws.org, www.aws.orgs



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