SMALL SCALE LIQUEFACTION & DISTRIBUTION
Biomethane and Natural Gas
The Cryostar Group

Specialising in equipment and expertise for industrial gas, LNG, hydrocarbons and clean energy, Cryostar is an international company exporting more than 90% of its products and serving customers worldwide.

Founded in 1966, Cryostar is present on all continents, supported by its business centres and subsidiaries. Today the company combines the resources and competencies of a local network with decentralised teams and its management and research headquarters in France.

Cryostar delivers pumps, turbines, compressors, heat exchangers, automatic filling and refuelling stations, natural gas liquefaction/regasification plants and power plants to customers with the most demanding requirements. Cryostar’s innovative solutions have a proven track record of improving customers’ process performance.

Cryostar has always been at the forefront of cryogenic technology. In 1967, it was the first company in Europe to produce cryogenic distribution pumps for liquefied air gases.

It is in this spirit of consistently bringing innovative solution to customers that Cryostar has developed packaged solutions from small scale natural gas liquefaction to distribution.

Think global, act local

To stay close to its customers around the globe, Cryostar has established several Business & Service Centres and collaborates with experienced local agents and distributors.
Safety

Safety is an integral part of Cryostar’s management and manufacturing commitments. A dedicated risk analysis is performed for each new project using the following techniques:
- HAZOP (Hazard Operability)
- FMEA (Failure Mode and Effects Analysis)

Factory and Site Acceptance tests

Cryostar’s headquarters hosts the world’s biggest and most sophisticated pump and turbine testing facility. Each pump and turbine is pre-tested offering customers guaranteed performance. On-site performance testing validates the liquefaction plants and fuelling stations process performances.

Quality

Cryostar complies with the following standards:
- ISO 9001-2008 + ISO 14001
- PED 97/23/CE
- ATEX (94/09/CE)
- IECEX
- UL & NFPA
- GOST-R and ROSTECHNADZOR (RTN) permit
- Compliance with HPGSL or KHPGSL
- NMI-MID-NTEP
The LNG supply chain
Small Scale Liquefaction Plants

Based on its experience with the boil off gas re-liquefaction systems onboard LNG carriers, Cryostar now offers small scale LNG or LBG plants for onshore natural gas or biogas liquefaction applications with capacity from five to 400 tons per day.

Cryostar is the ideal partner to supply you with a complete supply chain solution from the natural gas or biogas sources to the end user, including the LNG trailer loading stations and LCNG/LNG or LCBG/LBG refueling stations.

Cryostar focuses on a skid-mounted Liquefaction Unit. For additional packages such as gas treatment, polishing and Balance of Plant, we offer a solution in collaboration with customers and our network of partners.
**Small Scale Liquefaction Plants**

Small Scale Liquefaction technology relies on the principle of a closed refrigerant cycle to produce the cold power needed to condense the natural gas.

A compander is a combined expander and compressor in a single, integrally-geared machine installed in the refrigerant cycle.

The processes developed by Cryostar allow LNG production from various gas sources such as pipeline, renewable sources (digesters and landfill), associated and stranded gas, and coal beds/coal mines.

Landfill gas to LNG plant in Altamont, California using mixed refrigerant cycle as small scale liquefaction technology.
LNG Pumps for transport

CRYOSTAR LNG pumps benefit from 40 years’ experience in cryogenic fields. These pumps are present all along the LNG supply chain: from extraction plant, through LNG Tanker & Carrier equipment to LCNG and LNG vehicle refueling stations.

Centrifugal pumps for LNG Transfer (up to 1250l/min or 330GPM)

- **Gearbox driven pumps type GBS/CBS**
  Ground- or truck-mounted pump driven by a gearbox with a fixed-speed motor

- **Submerged motor pumps type VS**
  External ground- or truck-mounted pump with submerged motor

- **Submerged pumps type Subtran**
  ground- or truck-mounted multi-stage submerged pump fitted into a sump and requiring a frequency converter.

- **Hydraulic driven pumps type CBSHD/CSH**
  CBSHD, CSH: Truck-mounted pump driven by a hydraulic motor

Mobile pumping systems

Cryostar offers pumping solutions for any kind of mobile tanker configuration:

- **HYTRAN**: Autonomous centrifugal pump system with hydraulic motor for road tankers powered through truck hydraulic system.
- **PLUG’IN**: Centrifugal pump system for mobile tankers with electric control panel powered through customer on-site electrical network.
**Loading and offloading solutions**

Full skidded centrifugal pump mounted on a rigid base frame with electric control panel and all required accessories for safe on-site loading/unloading.

**Reciprocating pump for LNG High Pressure (up to 600 bars or 8700PSI)**

**SDPD Simplex/Duplex/Triplex:**
Reciprocating pump typically used for slow filling LCNG applications - Flow up to 1049 Nm³/h - Pressure up to 320 bars

**MRP Simplex/Duplex/Triplex:**
Oil-lubricated reciprocating pump typically for LCNG refueling stations - Flow up to 2638 Nm³/h - Pressure up to 420 bars

**LDPD Simplex/Duplex/Triplex:**
Reciprocating pump typically used for peak shaving plants - Flow up to 11663 Nm³/h - Pressure up to 80 bars

**HPP Simplex/Triplex:**
Oil-lubricated reciprocating pump typically used for large LCNG refueling stations and natural gas peak shaving - Flow up to 19085 Nm³/h - Pressure up to 600 bars

**PD 3000:**
Vertical reciprocating pump typically used LCNG refueling stations - Flow up to 415 Nm³/h - Pressure up to 400 bars

**GSV Simplex/Duplex/Triplex:**
Oil-lubricated reciprocating pump typically used for large LCNG refuelling stations - Flow up to 2400 Nm³/h - Pressure up to 400 bars
Liquid to Compressed Natural Gas “LCNG” refueling stations

An LCNG fueling station compresses liquefied natural gas (or biogas) up to 300 bars in order to fuel CNG vehicles.

Advantages of LCNG stations:

- The density of LNG at 1 bar is 630 times higher than CNG at 1 bar and ambient temperature
- LNG presents a higher CH₄ content than gas from the grid (>95%)
- Compressing LNG instead of CNG reduces drastically the power required for compression
- LCNG stations can be installed in locations with no gas pipe network
- Maintenance costs of an LCNG station are much lower than for a CNG station
- LCNG station can be combined to an LNG station using the same storage tank
CRYOSTAR core equipment for LCNG refueling stations:

High-pressure pumps

- Complete skid-mounted pump and accessories
- Longer maintenance intervals
- Reduced gas losses
- High safety level
- High efficiency
- Reduced installation costs

Line control panel

- Complete skid-mounted panel
- Vaporizer outlet temperature control
- Line and buffer pressure control
- Buffer connection with automatic buffer isolation valve
- Odorizer entry connection
- Reduced installation costs
- Main line shut-off valve for safety shut-down
- Line and buffer pressure indicators
- Line and buffer safety valves
- Ready to be connected to the CNG dispensers

Station PLC-driven control panel and software

- Siemens S7 PLC
- Touch screen operator interface
- Friendly user interface
- Controls the entire LNG station
- Efficient station management software
- Integrated safety features
- Future extension possibilities
- Remote maintenance access
Liquid Natural Gas “LNG” refueling stations

The LNG refueling system, using a liquid natural gas (or liquid biogas) storage tank, allows liquefied gas refueling gas at pressures up to 20 bars.

Advantages of LNG stations:

- Reduction of the vehicle on-board tank size and weight compared to CNG
- Increased vehicle autonomy (approximately two times more)
- Re-condensation or recovery of the vehicle boil-off gas
- Much lower investment cost per kg of dispensed gas
- Very short refueling time
- High refueling measurement accuracy <0.3% (possibility of Weights and Measures approved dispenser)
- Instant start and stop of the submerged pump
- Available for single (cold) and dual (saturated) nozzle vehicles
- Real time management of the storage tank pressure
- Possibility to integrate the saturation and unloading functions to our pump skid
CRYOSTAR core equipment for LNG refueling stations:

Multifunction submerged LNG pump skid

- 320 l/min flow capacity
- Instant start and stop of fueling through the use of a submerged SUBTRAN pump
- Plug and play design for connection to storage tank and dispensers
- Possibility to feed two dispensers
- Low gas losses and boil-off gas recovery system
- Constant flow and pressure refueling
- Available with saturation and trailer unloading functions

LNG dispenser Coriolis Flow Meter W&M approved

- 160 l/min flow at nozzle
- Capable of fueling cold and saturated vehicles
- Weights and Measures approved (NMI, NTEP, MID)
- High measurement accuracy (99.5%)
- Fully equipped with hoses, nozzles, and break-away system
- Heated nozzle receptacle
- Automatic recovery of vehicle boil-off gases
- Available with vent back nozzle
- Easy, safe, and reliable operation

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Bunkering

Considering the development of Emissions Controlled Areas (ECA), LNG as a fuel for shipping will become an answer to low sulphur (SOX) requirements on seas and in ports around the world.

Thanks to over 40 years’ experience in off-shore LNG systems, Cryostar is launching a complete set of LNG Bunkering equipment tailored to market requirements in terms of performance, safety, and efficiency.

Cryostar is able to supply either stand-alone pumps within a large range of performances, or complete solutions including pump skids, controls, and metering.

Peak Shaving Systems

The peak shaving system allows natural gas to be stored and supplied on demand in case of increasing gas consumption, or gas supply outages from the natural gas grid.

These systems usually require very high flows, as well as medium to high pressure.

Once the LNG is pressurised, it is sent to the vaporizers before being injected into the grid.

As part of our LNG systems portfolio, Cryostar offers trailer unloading pumps, booster pumps, reciprocating high pressure pumps, as well as complete PLC controls solutions and cryogenic process consultancy to meet customer requirements in terms of plant performance and reliability.

Cryostar has participated in key projects around the world.
Cryostar also supports the following industries

**Process Machinery:** Throughout its history, Cryostar has always been a pioneer in serving the air separation plant industry, including multi-stage vertical pumps, oil- or generator-loaded expanders, etc.

**Distribution Equipment:** Centrifugal and reciprocating pumps, cylinder filling and gas supply systems, LNG/LCNG/LH₂ fuelling stations, etc.

**Clean Energy:** Cryostar’s Clean Energy product range was set up in response to an increasing demand for clean and carbon-free energy generation. It covers a variety of applications such as pressure, geothermal plants, waste heat and natural gas liquefaction.

**LNG Transport & Terminals:** Cryostar is the leading supplier of combined cryogenic machinery for LNG carrier cargo handling systems, i.e. boil-off gas compressors, gas heaters and vaporizers and on board re-liquefaction plants.

★★★ Contact us: sales@cryostar.com ★★★

Service

Customer service is at the heart of Cryostar. Our company offers a wide range of high quality services designed specifically to provide our customers with expert knowledge and skills starting at the very first contact. This ensures that we provide the optimal solution in terms of efficiency, safety and long-term cost effectiveness before, during and after the sale.

**Before:** Thousands of hours have been invested to ensure Cryostar is at the cutting edge of technology, setting the standards of the future. Behind this is a group of highly qualified, experienced engineers, exploiting advanced computer technology and testing equipment to ensure Cryostar is a byword for quality and safety.

**During:** Cryostar owns the world’s most sophisticated in-house test stand for pumps and turbines.

**After:** Spare parts, in-house repairs, training sessions, consulting and on-site services.

★★★ Contact us: CryostarCustomerService@cryostar.com ★★★

Training

Cryostar’s training centre has a highly qualified staff of engineers, travelling around the globe to customer sites or business centres, where they train equipment users to get the most out of Cryostar technologies.

★★★ Contact us: CryostarTrainingCenter@cryostar.com ★★★
For contact and address of the Cryostar locations worldwide, please go to www.cryostar.com/locations/