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, customer facing 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 customer 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.
- HAZOP (Hazard Operability)
- FMEA (Failure Mode and Effects Analysis)

Factory and Site Acceptance tests

Cryostar headquarter 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 test 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
LNG Chain

Natural Gas Pipeline

Coal Bed Methane / Mines

Renewable Sources
Digestor & Landfill

Purification Unit

Small Scale Liquefaction

LNG Terminal

With CRYOSTAR Technology
**SMALL SCALE LIQUEFACTION & DISTRIBUTION - Biomethane and Natural Gas**

- **Natural Gas Pipeline**
- **Coal Bed Methane / Mines**
- **Renewable Sources**
  - **Digester & Landfill**
- **Small Scale Liquefaction**
- **LNG Terminal**
- **LNG Peak Shaving**
- **LNG Transport**
- **Satellite Plant**
- **LNG & LCNG**
- **Vehicle Refueling Station**
Small Scale Liquefaction Plants

Based on its experience with the boil off gas re-liquefaction system onboard LNG carriers, Cryostar now offers small scale LNG or LBG plants for on-shore natural gas or biogas liquefaction application with capacity from 5 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 trailers loading stations and LCNG/LNG or LCBG/LBG refueling stations.
Small Scale Liquefaction Plants

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

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.
**LNG Pumps**

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

**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 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:

- **PLUG’IN**: Centrifugal pump system for mobile tankers with electric control panel powered through customer on site electrical network

- **MIXTRAN/LECTRAN**: Autonomous centrifugal pump system for road tankers powered through a generator coupled with truck engine PTO.

- **HYTRAN**: Autonomous centrifugal pump system with hydraulic motor for road tankers powered through truck hydraulic system.
**Stationary pumping systems**

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**: Reciprocating pump typically used for slow filling LCNG applications up to 250 Nm3/h
- **MRP**: Oil lubricated reciprocating pump typically for LCNG refueling stations up to 870 Nm3/h
- **HPP**: Oil lubricated reciprocating pump typically used for large LCNG refueling stations and natural gas peak shaving up to 23’700 Nm3/h
- **LDPD**: Reciprocating pump typically used for peak shaving plants up to 3000 Nm3/h
- **PD 3000**: Vertical reciprocating pump typically used LCNG refueling stations up to 415 Nm3/h
- **GSV**: Oil lubricated reciprocating pump typically used for large LCNG refueling stations up to 1’830 Nm3/h
**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 equipments 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
- Control of the whole LCNG 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 refueling of liquefied 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 2 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 equipments for LNG refueling stations:

Multifunction submerged LNG pump skid

- 320 l/min flow capacity
- Instant start and stop of fueling trough the use of a submerged SUBTRAN pump
- Plug and play design for connection to storage tank, and dispensers
- Possibility to feed 2 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

Station PLC driven control panel and software

- Siemens S7 PLC
- Touch screen operator interface
- Friendly user interface
- Control of the whole LNG station
- Efficient station management software
- Integrated safety features
- Future extension possibilities
- Remote maintenance access
Automotive Injection Pump

Cryostar is participating to the High pressure injection concept by developing and building a fuel pump based on Canada-based Westport Innovations Inc.’s cryogenic technology used in the heavy duty automotive market. The Cryostar LNG pump system is powered by the truck’s hydraulic system; it works like a double-acting jack. The high-pressure side is similar to Cryostar’s standard pumps, but adapted to the specific environment of the system. The pump has been designed especially for integration in the Westport LNG tank.

Features of Westport HPDI:
- higher dual fuel engine efficiency
- use of cold rather than saturated LNG
- lower particles emissions
- diesel-cycle operation with approximately 95% replacement of diesel fuel
- single nozzle refueling

Peak Shaving Systems

The peak shaving system allows storing and supplying natural gas on demand in case of increasing gas consumption, or lack of gas supply from the natural gas grid.

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

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

This system is composed by LNG storage tanks, high pressure pumps, vaporization system, regulation system, and is managed by the global plant control system with remote access possibility.
What we offer the world of Cryogenics

★Process Machinery: Throughout its history, Cryostar has always been a pioneer in serving the air separation plants 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 let down, geothermal plants, waste heat and natural gas liquefaction.

★LNG Transport & Terminals: Cryostar is the only supplier of combined cryogenic machinery for LNG carriers 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 ★★★