CRYOTEC Anlagenbau GmbH

WÜRZEN

GAS

Modern Small-Scale LNG Plant Solutions

Clean and Stand-Alone

Small Volume – High Energy Density – Many Possibilities

LNG is becoming increasingly important all over the world for optimizing the natural gas supply, and in the mobility and transport sector. Liquefied natural gas is a fuel for the future, because its low NOx emissions combined with reduced CO_2 sustainably improve the ecological balance.

CRYOTEC is a technology provider with a range of solutions for LNG plants that make an important contribution toward making the value-added chain for the mobility and transport sector profitable and future-proof.

IDEAS INSIDE EPC

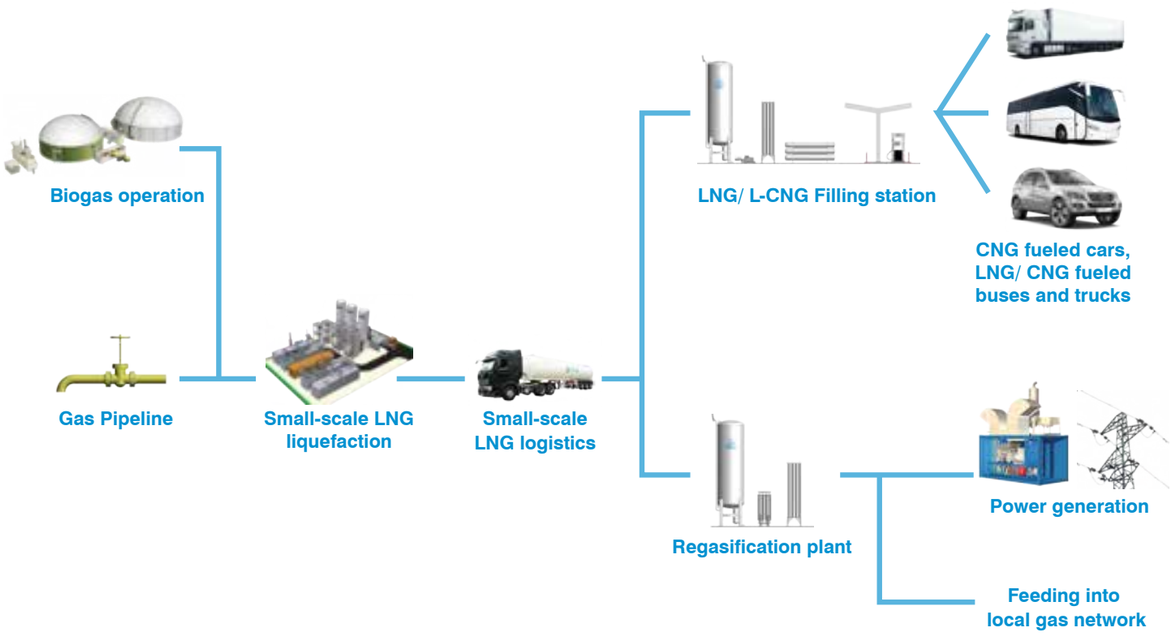
WHY LNG ?

- LNG is the only sustainable and commercially viable alternative to diesel fuel for longdistance freight transport and as a future technology in local public passenger transport.
- LNG has great potential for reaching the targets of reduced greenhouse gases and improved air quality - fewer emissions of particulate matter, sulphur, nitrogen oxide and CO_2.
- It not only reduces the dependence on crude oil but also increases the reliability of supply.
- The advantage of the liquid state of natural gas is its very high energy density and very high energy content, which allow the long ranges that are particularly important for long-distance freight transport: Ranges of 1,000 km and more can be achieved with just one tank of fuel
- LNG is non-toxic and non-corrosive.

CRYOTEC – LNG PORTFOLIO

- LNG tank farms
- Regasification plants
- Transport solutions (ISO containers, semi-trailers)
- Decentralized power generation plants
- Block-type thermal power station solutions
- Boil-off gas handling

LNG SUPPLY CHAIN



Liquefaction Plants for Natural Gas

Containerized and Modular (Skid-Mounted) Solutions

CRYOTEC plants are specifically designed to meet customer requirements. Our liquefaction plants for natural gas are planned as containerized or skid-mounted solutions. When coupled with our regasification plants, remote regions can be supplied with inexpensive natural gas.

Products from the Natural Gas Liquefaction Plant

LNG – ready for delivery to:

- Local customers for heat and power generation
- LNG tank farms for regasification and feeding into local gas networks
- Refueling stations for L-CNG (up to 300 bar over-pressure) and LNG (up to 18 bar overpressure) – for trucks, cars, buses, locomotives.

Separation of LNG – ready for delivery to:

- Local customers for heat and power generation
- LPG filling stations

Applications for Small-Scale LNG Plants

- Alternative to gas pipelines – transport by truck, train or ship
- Storage and regasification plants to cover peak loads
- Tank farms for a decentralized natural gas supply to industrial plants and local networks.
- Fuel for natural gas refueling stations (CNG/LNG), power generation by block-type thermal power station, heat generation for industrial plants
- Emergency power supply

HIGHLIGHTS OF OUR PLANTS

- Highly efficient liquefaction
- Skid-mounted and standard container designs have the advantages of a low space requirement and time-saving assembly on the construction site
- The plant can be run autonomously with a gas turbine or block-type thermal power station
- The plant can be air-cooled if cooling water is not available

We supply turnkey natural gas liquefaction plants with the following capacities:

LNG

1,000 kg/h	5,000 kg/h
1,500 kg/h	7,000 kg/h
3,000 kg/h	10,000 kg/h
4,000 kg/h	Additional capacities on request.

LNG Filling Station Solutions

CRYOTEC Anlagenbau supplies and constructs turnkey LNG filling stations. These filling station systems are planned, supplied and constructed either as a mobile system solution (skid-mounted, containerized) or as a stationary tank farm.

LNG als Fuel

- LNG is a clean fuel with only low emissions of sulfur, soot and nitrogen oxides. It does not contain any carcinogenic substances. LNG helps to improve the air quality in urban areas.
- LNG contributes toward reducing greenhouse gas emissions, and complies with the regulations derived from the European standard VI.
- LNG-powered vehicles can be quieter than diesel-powered vehicles. This is particularly attractive for vehicles driven in inner-city areas, or making deliveries to supermarkets in the early morning and late evening.
- A combination of LNG / L-CNG filling stations is an efficient technology for serving a wide range of vehicles.

Comparison of the Properties of LNG and Diesel

	LNG*	Diesel
Heat value (MJ/kg)	50	43.13
Heat value (kWh/kg)	13.89	11.98
Density (kg/l)	0.39	0.83
Sulfur content (ppm.)	0	10
Self-ignition temperature (°C)	537	210
Energy equivalent	1 kg	1.3 l

* Heating value, density and energy equivalent are always dependent on temperature and storage pressure and refer to the usual H gas.
Source: „*LNG in Deutschland: Flüssigerdgas und erneuerbares Methan im Schwerlastverkehr*“; www.dena.de

Engineering Services from CRYOTEC

- Determination of the filling station capacity
- Process engineering
- Mechanical engineering
- Construction planning
- Engineering, Measuring & Control Equipment
- Safety technology
- Fire protection
- Remote data transfer
- Creation of the safety documentation complying with the Federal Immission Control Act and a propagation calculation
- Creation of the requisite approval documents (planning applications, applications complying with the Federal Immission Control Act and Industrial Safety Regulations)
- Delivery, erection and assembly of the filling station
- Performance of all construction work
- Commissioning and trial operation, acceptances by the German Technical Inspection Agency
- Training and instruction of operating personnel

LNG Regasification

Regasification plants enable energy providers to cover peak periods of natural gas consumption.
This involves re-evaporating the liquid natural gas and feeding it into the supply network or used for generating heat or power. The cold energy in the LNG released by the re-evaporation can also be put to good use for cooling or freezing purposes.

LNG Regasification Plants

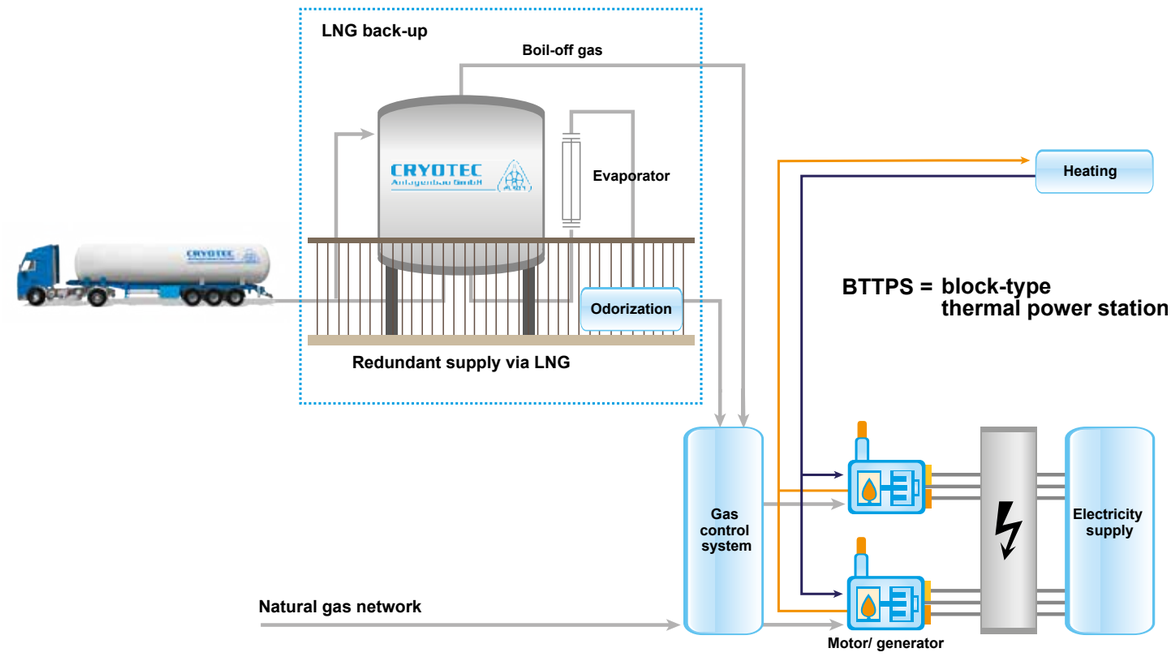
In the LNG tank farms, the cryogenic, liquid natural gas is stored in doublewalled, vacuum-insulated tanks. The atmospheric evaporators transform the liquid natural gas into its gaseous form, that can then be fed to where it will be used. The plant equipment in these satellite stations has been in reliable use in the field of technical gases for years.

Regasification by Air Evaporator only

LNG 1 m³ (liquid) + **Natural gas 600 Nm³** (gaseous)

→ **~6,250 kWh** fuel energy for generating electricity, heat and/or cold

Emergency power plants / cogenerated heat and power



CRYOTEC Anlagenbau – Made in Germany

CONSULTING SERVICES

ENGINEERING SERVICES

PRODUCTION

COMMISSIONING & HANDOVER

SERVICES

AIR SEPARATION PLANTS
- Cryogenic Processes
- Membrane Technologies
- Storage & Handling of O_2 / N_2 / Ar

CO_2 TECHNOLOGIES
- Gas Drying & Purification
- Plants for Liquefaction of CO_2
- Storage and Handling of CO_2
- Plants for the Manufacture of Dry Ice

LIQUEFACTION PLANTS
- Gas Drying & Purification
- Plants for Liquefaction of Gases
- Purification & Handling of Noble Gases
- Small Scale LNG-Plants

SPECIAL APPLICATIONS FOR TECHNICAL GASES
- Purification and Liquefaction of H2
- Energy Storage (e.g. H2 & LNG)
- Purification & Handling of Noble Gases
- Containerization
- Construction of Industrial Refrigeration Plants

EPC GROUP

EPC ENGINEERING & TECHNOLOGIES
- Polymers & Fibers
- Chemicals
- Pharmaceuticals & Fine Chemicals
- Biotechnologies
- Renewable Energies
- Engineering Services & Infrastructure

CRYOTEC Anlagenbau GmbH
- Cryogenic Systems
- Systems for Compression & Liquefaction of Gases
- Small Scale LNG Systems
- Air Separation Systems
- CO_2 Technologies
- Special Applications for Technical Gases

BAUPROJEKT
- Construction Engineering
- Infrastructure
- Building & Civil Engineering
- Project Management
- Technical Building Equipment

MADE IN GERMANY

QUALITY LNG-SOLUTIONS

IDEAS INSIDE

SPECIALISTS IN TECHNICAL GASES

MODULAR SYSTEMS

PLANT CONSTRUCTION

AFTER SALES SERVICES

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A MEMBER OF EPC GROUP

CRYOTEC Anlagenbau GmbH is certified per DIN EN ISO 9001