



LNG EQUIPMENT SOLUTIONS



www.ChartLNG.com



Chart Inc. is a leading independent global manufacturer of standard and custom engineered products and systems for a wide variety of cryogenic and gas processing applications. Chart develops solutions to meet the needs of the liquid natural gas infrastructure, providing innovation and proven quality throughout the value chain. In every market they serve, Chart strives to engineer products that deliver value and make the most of your investment in LNG.

MARKET SEGMENTS



PHOTO COURTESY UPS
UPS truck equipped with Chart LNG vehicle fueling system



VEHICLE FUELING

Natural gas is a lower-cost alternative fuel being utilized in a variety of vehicles. For larger truck applications, LNG is effectively displacing diesel without compromising on vehicle weight, fuel tank location or filling speed. As a naturally cleaner burning fuel, LNG has demonstrated success for more than two decades, and now with a compelling cost advantage, a growing network of fueling stations across America is leading the way to energy independence for heavy-duty trucking.



OIL & GAS

With a typical drilling site consuming 700 to 2500 gallons of diesel per day, a highly-efficient fuel like LNG could be a smart option. Oil and gas rigs are often located in remote, extreme environments - where no pipeline or electrical grid exists. Chart has been a pioneer in the field for consistency, developing solutions that offer durability, mobility and a continuous supply of natural gas - meaning less downtime and greater cost-savings.



RAIL

Natural gas as a fuel for locomotives has been gaining steam in the U.S. and Canada due to cost saving benefits. The potential is simply too big to ignore. In 2012 alone, the cost of diesel fuel to Class 1 railroads was more than \$11 billion. Even a small reduction in fuel costs would create massive savings for the industry, and mark a new chapter of rail powered by a clean, abundant and low-cost North American energy resource. Chart's cryogenic tank cars are ready to distribute LNG throughout the entire rail network.

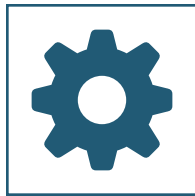


PHOTO COURTESY INCAT
Incat-built LNG ferry powered by Chart fuel system



MARITIME

Aggressive environmental regulations and economic drivers are pushing the marine-fuels market to cleaner and greener fuel alternatives. LNG is emerging as the future of marine fueling and already has a stronghold in the European market. As the LNG movement spreads across seas, Chart will continue to supply marine fueling solutions that meet this market's unique needs. With industry-leading cryogenic experience, Chart can supply on-board LNG fuel tanks, fuel systems and bunkering solutions for vessels of all sizes.



INDUSTRIAL

Across the board, industrial applications are anticipated to become a dominant player in LNG usage. Liquefied natural gas' low carbon footprint and negligible emissions (when compared to other fossil fuels) make it a preferred fuel for industrial applications in many parts of the world. The birth of the natural gas virtual-pipeline has paved the way for off-grid industrial consumers to take advantage of this natural gas energy source.



POWER GENERATION

Where no pipeline or electrical grid exists, LNG provides clean, low-cost fuel for use in all continuous power generation requirements. Chart has the experience and knowledge to help match generators with the right systems to supply a steady flow of natural gas – from small, continuous-use generators used on oil fields to large multi-megawatt systems for temporary utility applications. As regulations push for alternatives to diesel fuel, LNG's popularity as a power source increases.

LNG VALUE CHAIN

Chart offers supply chain support from the LNG plant through on-site storage and regasification. The natural gas can then be cryogenically cooled and loaded as a liquid to a ruggedized Chart vacuum-insulated transport trailer. Once on site, the liquid can be stored and dispensed for use in numerous market applications, where it efficiently replaces traditional fossil fuels.

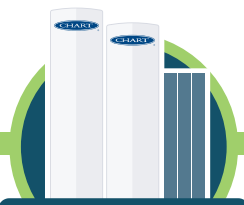




LIQUEFACTION



DISTRIBUTION



STORAGE



END USE



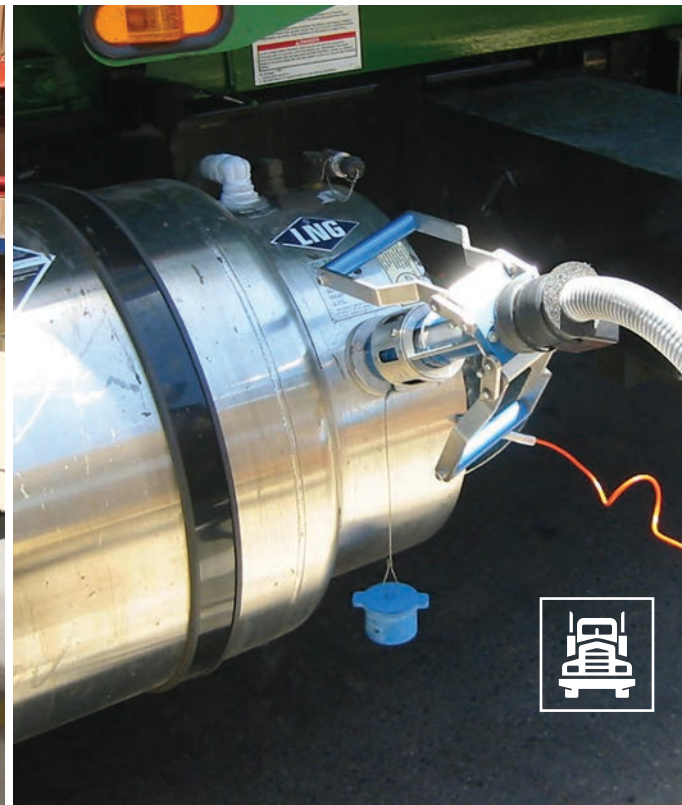
LNG FUEL SYSTEM

The industry leader in vehicle fueling systems for more than 20 years, Chart offers LNG on-board vehicle fuel systems to support modern spark-ignite or dual-fuel compression-ignition engines. Best-in-class performance and durability are standard.

SCOPE OF SUPPLY:

- Storage tanks
- Receptacle connections
- Auto-refrigeration
- Cryogenic tanks
- Gauging and electronics
- Heat exchangers
- Valves and regulators

Chart's on-board LNG fuel systems are optimal for heavy-duty vehicles requiring significant fuel capacity. LNG is vaporized during engine operation, in a vaporizer heated by the engine's cooling system, while a pressure regulator controls the delivery of gas to the vehicle's engine and maintains a constant pressure. The systems consist of one or more super-insulated fuel tanks, ensuring long-time, on-board storage and loss-free operation. Chart systems operate in the U.S. and Europe.



MICROFUELER

The Microfueler is a cylinder with a full-protection palletized frame designed specifically for the temporary storage and/or transportation of LNG. Its rugged design and construction allows for mobility even when full. The super-insulated permanent vacuum system has a 119 gallon capacity and provides days of holding time without product loss. It comes equipped with connectors, controls, and a pressure-builder for convenient dispensing.





Clean Energy LNG vehicle fueling station



VEHICLE FUELING STATIONS

Chart offers a wide variety of vehicle fueling stations, from small, self-contained stations to large, custom stations that provide both LNG and LCNG dispensing for any size vehicle fleet. Heavy-duty trucks, buses, refuse vehicles and frequently operated fleet vehicles, such as taxis, all have great potential for LNG fueling. Compared to more traditional CNG systems,

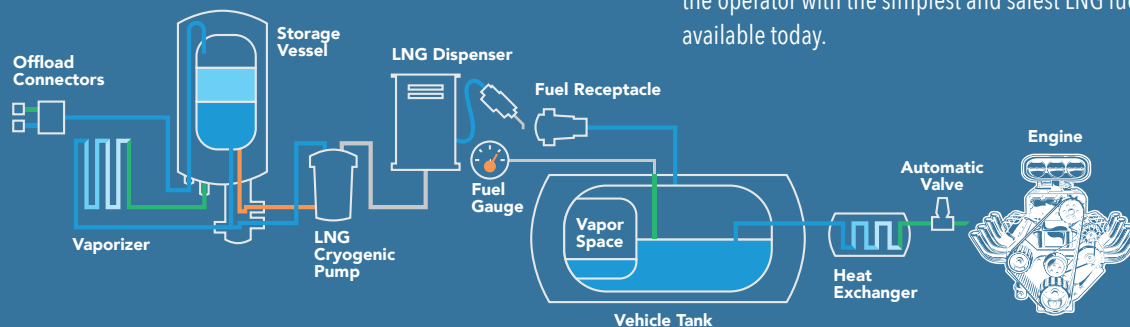
LNG enables lower vehicle dead weight and longer range because of its high density and low pressure.

Our fueling stations are engineered for single-hose, no-loss filling and auto shut-off for all LNG vehicle tanks. The patented submerged pump, controls and vehicle tank system provides the operator with the simplest and safest LNG fueling process available today.

ONE-STOP COMPLETE SERVICE

Chart has an engineering and sales staff experienced in all aspects of LNG/LCNG station design, operation and maintenance. We will help you set up the design and functional specifications for the station, as well as provide commissioning and training.

- Pre-bid assistance in sizing station, design and site selection
- Remote monitoring of station's performance and status
- Assist in obtaining permitting and regulatory approvals
- Supervise and install, test and debug, and assist in a station's early operations
- Service personnel stationed in key markets



LNG MOBILE FUELER



Chart's IMC-6000 fuel station is self-contained, preassembled and tested. The system is mounted inside a standard 40-foot ISO container and provides the following advantages:

- Quick installation - no field-welding required
- Seismically stable - system requires minimal foundation
- Lockable container doors provide station security
- Suitable for either temporary or permanent locations
- Can be easily relocated for future requirements





LNG ORCA DELIVERY SYSTEM

Having access to a permanent fueling station is not always an option, but that doesn't stop the need for filling vehicle tanks to power your operations in remote locations. The LNG Orca Delivery System is a completely self-contained mobile fueling station specifically designed to provide safe LNG fueling capabilities, with the flexibility to move where there is demand.

The system includes a patented liquid-submerged pump that greatly reduces refueling time. The Orca also features an integrated meter system that allows operators faster start-ups and single-hose, zero-loss filling with auto-shutoff. The system also features an integrated saturation coil that allows pump filling for spark-ignited natural gas or high-pressure,

direct-injection engine platforms – so you only need one solution to fuel multiple engine technologies. The Orca complies with the most stringent weights and measure requirements and highest safety and quality standards in the industry.

LNG MOBILE REGASIFICATION SYSTEM

Drilling sites are fast-paced and unpredictable. The flexibility of the all-weather, all-climate LNG Mobile Regasification System allows you to operate uninterrupted, even when refilling, so you don't have to waste time or worry about a drop in pressure.

This system is designed to provide a continuous supply of natural gas to power generator sets used on oil and gas drill rigs. It is comprised of a 15,000 gallon LNG storage tanker trailer with integrated vaporization, system controls and an offloading pump – an all-in-one package solution that significantly reduces the footprint of the drill rig.

We understand the demand of a drill rig can change in a matter of minutes, which is why this system is designed

to accommodate flows ranging up to 50,000 SCFH with pressures up to 100 PSIG, giving you the ability to handle variation quickly and efficiently. In addition, the system accepts deliveries of full tanker loads, helping save on transportation and fuel supply costs.

PRODUCT FEATURES:

- High-capacity offload pump is strategically located to allow flexibility of offloading on either side of the system
- Completely automated for delivery of gas – no need to turn valves, etc. – which means reduced man hours and opportunity for error

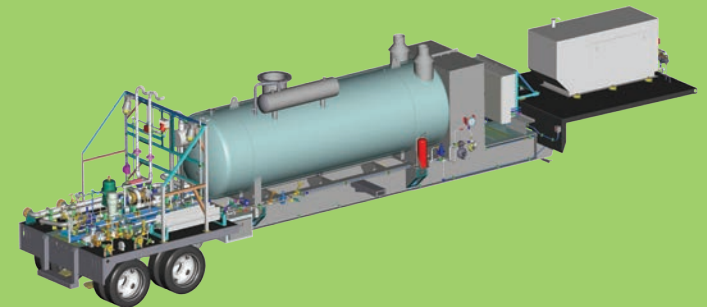
MOBILE HIGH-FLOW LNG VAPORIZATION SYSTEM

The Mobile High-Flow LNG Vaporization System is designed to meet the high-volume fuel requirements of the increasing number of pressure pumps, blenders and other field equipment used in the oil and gas industry today.

The system consists of a trailer-mounted water bath vaporizer, on-board generator and the associated controls, valves and piping. System operation is mostly

automated and controlled by an on-board PLC and touch-screen operator interface.

Robust design and construction makes the vaporization system ideal for the harsh operating environments often encountered at pressure pumping and drilling sites. The natural gas-fired water bath vaporizer delivers up to 150,000 SCFH with outlet pressures ranging from 40 to 100 PSIG.





ST-163000 TRANSPORT TRAILER



LNG TRANSPORT TRAILERS

The no-nonsense LNG Transport Trailer has one simple job that it does very well: transporting liquid over the road. These cryogenic semi-trailers feature:

- Horizontal vacuum-insulated tank composed of an inner pressure vessel and a structural frame outer jacket
- Very large capacity pressure-building coils and coil piping that allow off-loading by pressure transfer at rates up to 300 GPM
- Construction using durable, lightweight, thin-gauge carbon and stainless steel

These trailers are designed to effortlessly transport LNG on either U.S. or Canadian highways, ultimately providing liquid to fueling stations, large tanks, stationary equipment and more, in order to smoothly operate, without interruption.



ST-127000 TRANSPORT TRAILER



LNG STORAGE VESSELS

You need smart, low maintenance storage solutions that last. Chart offers just that: highly-engineered custom storage options to suit your specific needs. Our LNG storage vessels are used to store large quantities of extremely cold liquefied natural gas to a temperature of -260°F . To maintain this low temperature, Chart's vessels utilize a lightweight stainless steel inner vessel, with a durable outer jacket and highly-efficient vacuum insulation technology. The design allows for greater thermal performance and extended LNG hold times that result in minimal loss of stored product.

These shop-fabricated cryogenic vessels can be manufactured in a variety of sizes and in either horizontal or vertical orientation, depending on the specific needs of the customer. For those with space restrictions, the vertical vessels are a great option while vessels that will be in an area with high wind, seismic activity or even regulations with nearby tall buildings or monuments, are best served by a horizontal arrangement.

By manufacturing the vessels in a controlled environment versus site-erected vessels, Chart is able to offer quicker turnaround time for production and deliveries to the job site, as well as more accurate and comprehensive testing abilities. Shop-fabricated storage vessels allow for minimized on-site field welding, standardized piping configurations and reduced installation time.

- Maximum Allowable Working Pressures (MAWP) of 50 PSIG (3.45 barg) or more
- The 90,000 gal horizontal vessel is our most popular storage solution and weighs 168,300 lbs empty
- Weather resistant
- Low life-cycle costs and lightweight construction reduce operational and installation costs



LNG ISO INTERMODAL CONTAINERS

Our ISO Intermodal Containers provide an easy method to transport LNG worldwide by ship, rail or road. They are designed with highly-engineered thermal insulation and a rugged, durable construction that ensures your low-pressure, low-temperature liquid has a safe journey when traveling long distances for extended periods of time.

These reliable, low-maintenance containers come in a variety of working pressures, have a maximum gross weight of 34 tons and are currently offered in either 20 or 40-foot lengths.

The versatility of their design maximizes payload while providing a lower tare weight. Not only are the ISO Intermodal Containers considered one of the best values available on the market for LNG transport, but they also comply with important codes and standards including UN T75, ASME/DOT, EN, RID, IMDG, ADR, IMO and TPED.



RAIL

Chart offers tank cars and natural gas fuel tenders for transporting LNG by rail and fueling locomotives. Our proven designs have nearly 50 years of successful operating experience in the demanding rail environment.

LNG fuel tenders are an emerging technology and Chart is actively engaged with the governing bodies and major railroads to develop prototypes and define standards that will lead this revolutionary change. Balancing the tremendous structural forces with conflicting thermal goals

and automating controls to deliver gas seamlessly to the locomotive have become a reality through Chart's expertise.

LNG tank cars offer the ability to cost-effectively transport more than 30,000 gallons per tank car by rail. Chart's experience in designing and manufacturing tank cars for cryogenic liquids ensures a reliable tank car to move LNG across North America.



EMERGING MARKETS

As the need grows to seek out alternative energy sources and fuels, LNG continues to make inroads in several emerging markets. As a leader in LNG infrastructure, Chart works closely with corporations, regulators and experts to understand the fuel and energy needs that are especially suited to LNG.

MARITIME

Chart's full LNG fueling solutions for the maritime market allow you to capture the economic and environmental benefits of switching to LNG while maintaining system reliability. With more than 40 years of experience engineering and manufacturing LNG equipment, Chart can provide fuel system solutions for ferries, offshore vessels, barges or any other marine vessel in both new construction and retrofit applications.

Applications range in scope from standalone Type C fuel tanks (up to 250,000 gallons) to fully integrated fueling systems which include cold boxes, cryogenic pumps, vaporizers, vacuum insulated piping, control/safety systems and bunkering equipment. Our equipment is tailor-made to the customer's individual needs, compatible with both dual-fuel and all-gas engine technologies and can be built to any class requirements (DNV, LRS, BV, ABS, USCG) for both inland and deep-sea applications.

INDUSTRIAL

Industrial facilities face a constant challenge from high fuel costs and price volatility. LNG provides a clean-burning, less expensive and safe alternative to propane and crude oil products. Already a dominant fuel in the industrial sector, LNG is used in the production of paper, metal, chemicals, petroleum, stone, clay, glass, clothing and food-processing industries.

A multitude of industrial processes utilize LNG and reap all the associated economic and environmental benefits, such as reduced fuel costs and lower emissions. To date, Chart has provided LNG solutions for grain drying, industrial boilers, remote power generation, asphalt manufacturing – and the list continues to grow.

POWER GENERATION

Generators are used across a variety of industries to provide cost effective solutions where inadequate power or no power is available. In most primary generator applications, these are temporary rental solutions where mobile or short-term fuel supply is required. Chart's LNG storage tanks offer the advantages of LNG in a temporary solution. These tanks can be mounted to a trailer, on a skid, in an ISO frame or designed to the configuration that best fits the application and volume required.

Chart has installed and performed a number of tests proving a variety of storage and vaporization techniques for supplying natural gas to generators. This experience has made Chart the expert source to put LNG solutions to use with power generation. Understanding the overall solution allows Chart to bring products to market in the shortest time with the lowest possible risk. This amounts to increased profits for our customer.





www.ChartLNG.com

Let's get to work. Call us at 1-800-838-0856.

P/N 20871249