

# Clean Energy and Industrial Gases Group

Heat Exchanger Systems – LNG Edition

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#### Nikkiso Cryogenic Industries Clean Energy and Industrial Gases Group

Nikkiso Cryogenic Industries Clean Energy and Industrial Gases Group was created from the March 2019 consolidation of Cryogenic Industries and Nikkiso Cryo, both subsidiaries of Nikkiso Co., Ltd. Japan. Working together with our shared experience, resources and commitment to quality, will allow us to focus more closely on our customers' needs, providing individual support, service and solutions.

Cryoquip has been in the cryogenic industry for over 50 years, designing and manufacturing high quality equipment for the Industrial Gas and LNG markets. Utilizing our 5 worldwide facilities, we are able to serve the globe with high quality solutions, build specifically for the application. Throughout the years our technology and solutions have become the standard for a large variety of regasification applications.

As the world seeks for a cleaner future, traditional fuels have been sidelined for more ecofriendly solutions. One such solution is liquefied natural gas (LNG). Being the cleanest of the fossil fuels, LNG is rapidly becoming the fuel of choice for power and fueling applications. LNG reduces harmful Sox emissions to 0 ppm and reduces CO2 emissions by % compared with diesel. Cryoquip has be involved in the LNG industry for over 30 years supplying solutions for fueling applications, power generation, boiler conversions, pipeline feeds, ...etc. Pulling from our experience and our wide variety of products and technology, we are able to create a customized solution for any LNG need.





#### LNG Virtual Pipeline (Satellite LNG)



LNG Virtual Pipeline (or Satellite LNG) systems are used in locations where pipeline natural gas is not available. The systems receive LNG from either stationary tanks or ISO containers, regasify, regulate, and odorize to the downstream fueling need. Including various vaporizer technologies, piping systems, controls and cryogenic pumps (if required), each system is custom designed for each application and location of operation. Asphalt plants, burner/boilers, small power generators, and pipeline repair applications are a few examples where LNG virtual pipeline systems have been utilized.









04

#### LNG Peak Shaving

During extreme weather conditions, caused by cold fronts or heat waves, pipeline gas demand spike to meet heating or cooling (power generation) needs. In order to curb this spike in demand, LNG peak shaving facilities are utilized.

Nikkiso Cryoquip's regasification technologies have been used for these applications for decades in various sites around the world. Ambient Air Vaporizers (AAVs), Gas Fired Water Bath Vaporizers (VFTUs), and/or Shell & Tube (STV) vaporizers have all been used for these applications. Typical flow ranges for these sites are 24MMSCFD to 150MMSCFD.





#### LNG Power Generation

Natural Gas Turbine Generator

From LNG Storage Tank

As the world continues to find cleaner fuels for all sources of energy, one large industry stands out, Power Generation. Power plants are currently converting the fuel used to run power generators from traditional diesel to natural gas. Cryoquip's Power Generation systems provides a custom, turnkey solution for power needs when a natural gas pipeline is not present. Our are designed to feed generators from 1MW, up to 250MW power plants.

Each system is uniquely designed for each site of operation and can utilize a variety of heat sources to regasify LNG to the usable natural gas needed for generator feed. Utilizing steam, hot water, ambient air, and/or electric heat, our systems can adapt to any situation. If no heat source is available, we have our own closed loop hot water system that is used for shell and tube vaporizer technology.

Utilizing our unique group companies, we can combine Cryoquip's regasification system with low or high pressure LNG pump systems as well as control systems, and commissioning support.

HOT WATER

Power Grid

Hot Water Heater

POWER TO GRID









LNG Pump Skid



06

#### High Horsepower



Cryoquip's vaporization technology has been a standard in the high horsepower engine fueling industry. We are uniquely positioned in having our equipment fuel some the large moving engines, such as in mining trucks and locomotives. High or low pressures systems can be accommodated with varying technologies offered by Cryoquip. Our shell and tube vaporizers (VWU) and water pot vaporizers (VWP) have become the standard equipment in these industries, proving high quality and reliability.







#### **Dual-Fuel Marine Engines**

With the implementation of the IMO 2020 Sulphur cap reduction, the maritime industry has been transitioning their fleet's engines to dual fuel capability to utilize LNG as a cleaner option. Cryoquip has been at the forefront of this transition, providing LNG vaporization to the new fuel gas supply systems for vessels including: LNG Tankers, Container Vessels, RoRo Vessels, Ferry's, and Cruise lines.

Cryoquip's shell and tube technology has been certified by all major marine class societies including: ABS, Bureau Veritas, Class NK, DNV-GL, Lloyd's Register, RINA, and USCG. With over 6 years of operating equipment on marine vessels, Cryoquip's shell and tube VWU and water pot VWP technology are the most reliable solutions for the dual fuel marine industry.









#### LCNG Stations

Liquefied Natural Gas (LNG) and compressed natural gas (CNG) have become a more common fuel source for buses, garbage vehicles, and large haul trucks. Cryoquip has been involved in the supply of LNG vaporizers, pressure building coils, and saturation coils for LCNG stations for many years. Utilizing our ambient vaporizers (AAVs) and fan assisted vaporizers (FAVs), Cryoquip can provide the suitable equipment for any LCNG location and climate.



# Natural Gas for Vehicles

#### LNG Terminals



Nikkiso Cryoquip has an extensive line of LNG regasification technologies to cover many applications in both the export and import terminals. Export terminals may utilize ethylene heater, pressure builders, and flare gas vaporizers in order to operate the facility and dispose of waste streams. Nikkiso Cryoquip's ambient vaporizers have been used for these applications all over world for over 20 years.

LNG import terminals require a large capacity of regasification. For the main regasification, Nikkiso Cryoquip's portfolio of solutions including shell and tube vaporizers (STVs) and/or Ambient Air Vaporizers (AAV) are ideal for reliable operation. AAVs can also be utilized for the fuel gas heaters feeding backup submerged combustion vaporizers (SCV).







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