



LNG Fueling Solutions Supplier of Choice: Oil & Gas Completions.



ISV



150k Vaporizer



Queen Portable

Background

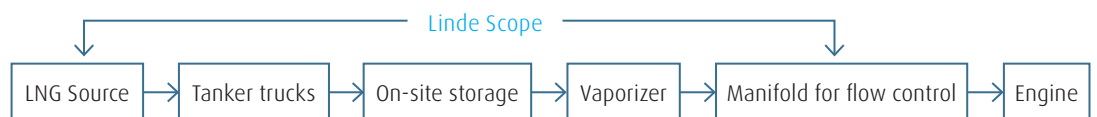
LNG is being increasingly used by the oil & gas E&P industry in three diesel fuel-intensive applications: drilling rig engines and gensets, pressure pumping equipment for completions, and trucks that deliver goods like water to the rig. Linde has helped lead these conversions. Perhaps the most important is pressure pumping equipment because of the large, concentrated fuel usage and, hence, the magnitude of potential savings.

Solution Needs.

Due to varying customer needs for engine size, type and count, there is no single LNG solution for well completions. Linde has designed a variety of systems for fuel flow, pressure and service requirements to meet the needs of our customers. Contact Linde with requirements that fall outside of these specifications.

Field of Use	Description	Typical Linde Equipment Solution	Linde Fuel Solution
Full frac spread-dual-fuel engines	<ul style="list-style-type: none"> Fuel substitution rates up to ~70% Up to ~20 engines Fuel flow up to 150K scfh Fuel pressures ~90 psig 	<ul style="list-style-type: none"> 1 LNG Queen Trailer +/- 1 ISO with 1 150K scfh Hot Water Vap or 1 225K scfh Ambient Vap Flow Control Manifold 	LNG shipped to the pad in cryogenic tanker trucks and stored on-site, vaporized and supplied through a manifold to the engine inlet
Full frac spread-dedicated NG engines	<ul style="list-style-type: none"> 100% fuel substitution Up to ~20 engines Fuel flow up to 225k scfh Fuel pressures ~125 psig 	<ul style="list-style-type: none"> 2 LNG Queen Trailers 1 225K scfh Ambient Flow Control Manifold 	
Partial frac spread	<ul style="list-style-type: none"> Up to ~ 8 engines Fuel flow up to 50K scfh Fuel pressures ~90 psig 	<ul style="list-style-type: none"> 1 LNG Queen Trailer and 50K scfh Ambient Vap or 2 ISVs plus generator Flow Control Manifold 	
Full frac spread-gas turbines	<ul style="list-style-type: none"> Fuel flow up to 200k scfh Fuel pressures ~250 psig 	<ul style="list-style-type: none"> 2 LNG Queens 2 High pressure Pumps 1 225K scfh Ambient Flow Control Manifold 	

The fueling solution is shown in this process flow diagram:



Equipment Options

Linde owns an expanding fleet of suitable equipment, which has been designed, HAZOP'D, engineered, constructed and operated to meet the rigors of oil and gas field requirements. These include the following:

Linde Equipment	Description and Key Specs	Full Frac Spreads	Partial Frac Spreads
Integrated Storage & Vaporization (ISV) Unit	<ul style="list-style-type: none"> • 20K scfh Electric Vaporizer • 16,000 Gallon LNG Storage • 480 Volt Power • Integrated PLC & Safety interlocks 		✘
Full frac 150K Vaporizer	<ul style="list-style-type: none"> • Warm Water Boiler • 150K scfh water bath vaporizer • Duel water pumps • Temperature controls 	✘	✘
Queen Portable	<ul style="list-style-type: none"> • 16,000 Gallon LNG Storage • Integrated PLC & Safety interlocks • PB Vaporizer 	✘	✘
Manifold	<ul style="list-style-type: none"> • 3" or 4" Design • Flexible hoses • Drive over ramps 	✘	✘

Contact Linde with requirements that fall outside these specifications.

Now...and in the Future, Linde is There

Linde is committed to safely, reliably, efficiently and economically serving the oil and gas community with the best LNG solutions. We are the leading global industrial gas company, with 100 years of involvement in LNG and the only company with extensive experience in cryogenic liquids performing this type of service.

We recognize that safety will be paramount and Linde has a world-class culture of safety consistent with O&G industry standards.

Converting to LNG fuel is affordable and easy. LNG is the premium natural gas supply option because it is the easiest to store the necessary volumes on-site, the fastest to deploy (rig up and rig down) and truly the only viable long-term solution for widespread adoption of natural gas fuel in completion operations.

Linde has contracted with numerous existing LNG sources across the U.S. and we are adding from these supplies on an ongoing basis. Linde will also use our know-how and experience in building-owning and operating LNG plants around the world to develop new LNG sources in and close to O&G basins. We will continue to expand our already sizable fleet of equipment to serve this market and deploying logistics and service personnel from Linde's other operations into this market. This includes leveraging the experience of our already supplying 10,000 truckloads per year of cryogenic gases used in energized gas completions.

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