LNG Fuel Gas Systems

TGE Marine Gas Engineering

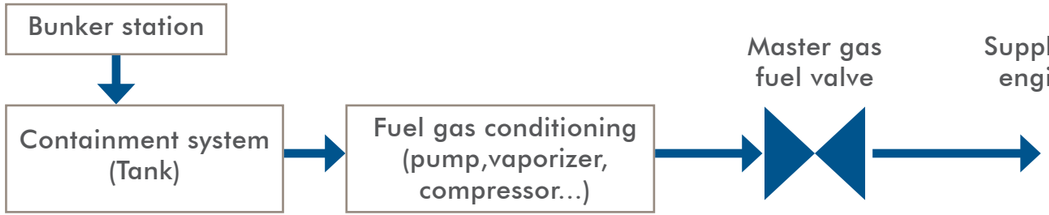
Our references include LNG fuel gas systems for

- All major engine makers (MAN, Wärtsilä, Caterpillar/MAK, Rolls Royce)
- All types of engines: 2-stroke, 4-stroke (Otto- or Diesel-process)
- Gas supply ranging from 4 bar g to 350 bar g
- All major classification societies (ABS, BV, CCS, DNV-GL, LR)
- Many different types of vessels (ConRo vessel, product tanker, car carrier, cruise vessel, gas tanker)

Introduction

As natural gas is a clean and environmentally-friendly fuel, it is of growing importance to the marine propulsion industry. Engines are available in a broad range of capacities with different engine technologies (2-stroke, 4-stroke, Otto- or Diesel-process) requiring different gas supply systems.

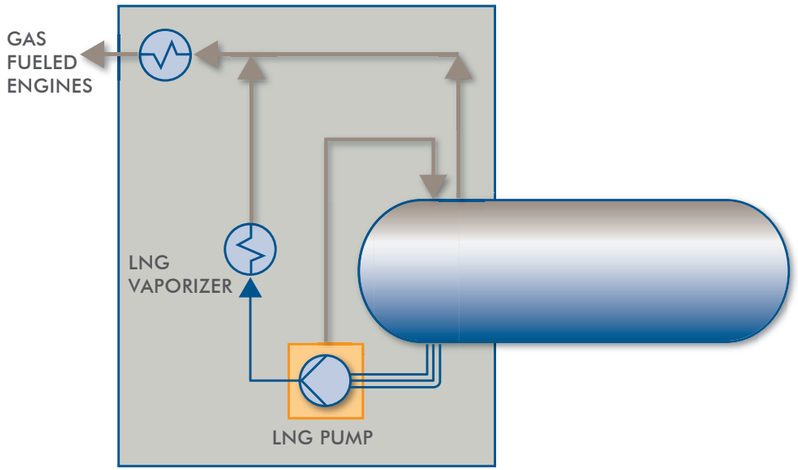
TGE Marine offers tailor-made LNG fuel gas systems for all types and sizes of engines. Our services and supplies cover the complete onboard system comprising storage, handling and processing of LNG from the bunker station to the fuel gas master valve at the engine, also including control & safety systems and auxiliary systems.

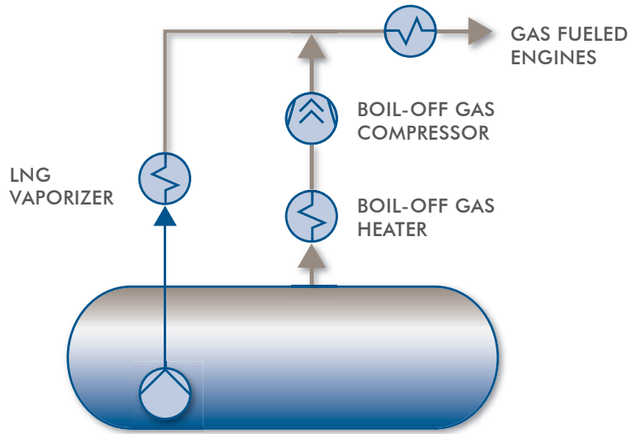


Technology

Type Low Pressure
Vacuum insulated tank

- Vacuum insulated tank
- Stainless steel box for process equipment welded to tank
- LNG pump in suction vessel
- Bottom outlet to fuel gas pump with double-wall piping
- Tank design pressure 10 bar g for easy BOG handling
- Gas to engine:
  4 bar g or 16 bar g



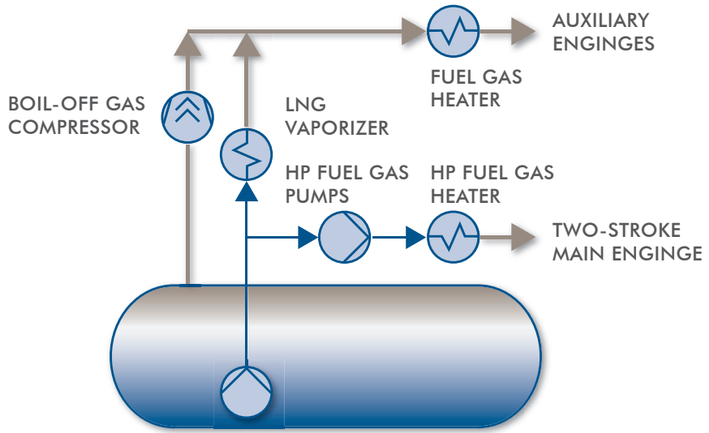


Type Low Pressure
Foam insulated tank

- Foam insulated type C tank
- No bottom outlet
- Submerged fuel gas pump and BOG compressor
- Tank design pressure 4 bar g for easy BOG handling
- Gas to engine:
  4 bar g or 16 bar g

Type High Pressure Fuel Gas System

- Foam insulated type C tank
- No bottom outlet
- Submerged fuel gas pump, high pressure pump, and BOG compressor
- Tank design pressure 4 bar g for easy BOG handling
- Gas to main engine: 350 bar g



LNG fuel tanks

TGE Marine has successfully supplied more than 350 IMO type C tanks as cargo tanks to gas carriers with capacities of up to 6,000 m^3 per tank. Currently, we are even building tanks of 12,000 m^3. Based on our proven track record we further offer LNG fuel tanks of IMO type C which can be delivered in any size.

Over many years, type C tanks have had an excellent safety record in the gas tanker market. Due to its fail safe design this is the only tank technology for marine LNG application which does not require a secondary barrier in order to cope with the risk of LNG leakages.

TGE Marine offers both, vacuum insulated and foam insulated type C tanks. Foam insulated tanks can be fabricated in a variety of shapes and sizes including conical and bilobe design for good volume efficiency and are therefore the preferred choice. Vacuum insulation is superior for applications requesting minimum boil-off rates but is significantly more expensive and limited to tank capacities of about 1,000 m^3.

References

New Semi Submersible Crane Vessel for Heerema, The Netherlands

Shipyard:	Sembcorp Marine, Singapore
Year of completion:	2018 (under construction)
Classification:	LR
Scope:	Low pressure fuel gas system for 4-stroke dual fuel engines with eight vertical foam insulated tanks and four parallel fuel gas processing trains

1,000 TEU Container vessel for Wessels, Germany

Shipyard:	tbc
Year of completion:	2017
Classification:	BV
Scope:	Fuel gas system with 480 m^3 foam insulated tank

26,500 dwt ConRo vessel for Crowley Maritime, USA

Shipyard:	VT Halter Marine, USA
Year of completion:	2017
Classification:	DNV-GL
Scope:	High pressure fuel gas system with 3 x 770 m^3 vacuum insulated tanks

124,000 GT Cruise vessel for Aida, Germany

Shipyard:	Mitsubishi Heavy Industries, Japan
Year of completion:	2016
Classification:	DNV-GL
Scope:	Fuel gas system for LNG supply by truck in harbor

3,800 Pure Car Carrier for UECC, Norway

Shipyard:	Nantong Cosco Kawasaki Shipyard, China
Year of completion:	2016
Classification:	LR
Scope:	High pressure fuel gas system with 760 m³ foam insulated tank

35,000 m³ Ethane carrier for Navigator Gas Ltd, United Kingdom

Shipyard:	Jiangnan Shipyard, China
Year of completion:	2016
Classification:	GL
Scope:	Complete gas handling system, LNG fuel gas tanks, high pressure fuel gas system for MAN ME-GI dual fuel main engine and low pressure fuel gas system for 4-stroke dual fuel auxiliary engines

16,100 m³ Caribbean FLNG for Exmar, Belgium

Shipyard:	Wison Offshore & Marine, China
Place of Installation:	Columbia
Year of completion:	2016
Classification:	BV
Scope:	Complete gas handling system with LNG fuel gas system, complete tanks

Conversion of 260,000 m³ LNG carrier for Nakilat, Qatar

Shipyard:	N-KOM, Qatar
Year of completion:	2015 (for conversion to dual fuel)
Classification:	ABS
Scope:	Skid-fabricated high pressure fuel gas system for ME-GI engine

Conversion of 3,750 dwt Product Tanker for Bergen Tankers, Norway

Shipyard:	Noryards, Norway
Year of completion:	2015 (for conversion to gas propulsion)
Classification:	BV
Scope:	Fuel gas system with vaccum insulated LNG tank

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