



Orchestrated Systems by TGE Marine

**CRYOGENIC GAS SYSTEMS ON BOTH VESSELS
DELIVERED BY TGE MARINE, GERMANY**

The picture shows three of TGE Marine's product lines working unanimously together. As supplier for the gas systems on both vessels TGE Marine is able to provide excellent services and expertise on the client side as well as the supplier side for liquefied gas fuels such as LNG, Bio-, and Synthetic LNG as well as alternative fuels (Ammonia, Ethane, LPG, etc.).

The 'Navigator Aurora' is equipped with a cargo handling system with storage tanks of 37,000 m³ carrying capacity for cryogenic liquefied cargoes.

The Propulsion of the vessel is based on a high pressure fuel gas system feeding a ME-GI main engine and four stroke auxiliary engines. Captured in the picture is the bunkering operation by the LNG bunker vessel 'Coralius'.

All systems related to liquefied gas transport, fuel gas system and bunker supply are provided by TGE Marine.

The 'Navigator Aurora', a 37k LEG/LPG/Ammonia carrier, one of a series of 4 vessels, is equipped with:

1 Cargo Handling System

- Gas handling system
- Cargo tanks

Key fact: 3 bilobe tanks, 35,000 m³ capacity, cascade reliquefaction plant

2 Fuel Gas System

- LNG fuel gas system for ME-GI engine
- LNG fuel tanks

Key fact: 2x 1,000 m² LNG fuel gas tanks

The 'Coralius', a 5,800 m³ LNG bunker vessel is equipped with:

3 LNG Bunkering System

- Cargo handling system
- Cargo tanks
- LNG fuel gas system

Key fact: 2 bilobe tanks 5,800 m³, cargo handling system, 2 BOG compressors, loading and bunkering manifold, 840 m³/h loading- and unloadingrate



Cargo Handling and Tank System by TGE Marine



Fuel Gas System by TGE Marine



LNG System and Tanks by TGE Marine

TGE Marine's product lines:

- LPG/Ethylene Gas Tankers
- Fuel Gas Systems
- LNG Tankers (Shuttle Tankers and Bunker Vessels)
- FSRUs (Floating Storage Regasification Units)

TGE Marine's services:

- Complete Cargo System
- Complete Fuel Gas System
- Engineering
- Procurement
- Construction Supervision
- Commissioning
- After Sales
- Ship Design



4 x 37,000 cbm LEG/ LPG/Ammonia-Carriers

'Navigator Aurora', 'Navigator Eclipse',
'Navigator Nova' & 'Navigator Prominence'
for Navigator Gas, United Kingdom

Shipyard: Jiangnan Shipyard Group Co., Ltd., China
Year of completion: 2016-2017
Classification: ABS
TGE's scope: EPCS-contract, gas handling system incl. cargo tanks and LNG fuel gas system for ME-GI engine and LNG fuel tanks

Vessel:
37,000 m³ semi ref. LEG carrier, type 2G

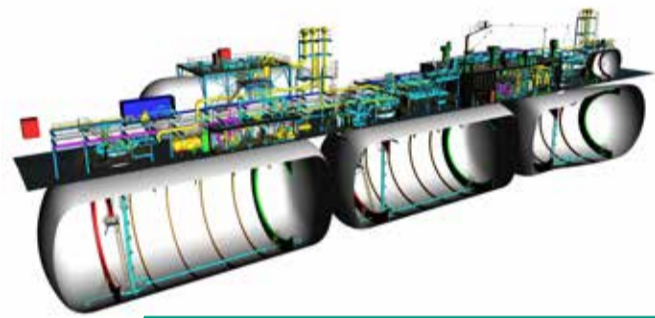
Length o.a.: 179.89 m
Beam: 29.6 m
Draught (LPG): 11 m

Characteristics of gas plant:

Capacity: 37,000 m³
Number of cargo tanks: 3 (bilobe type)
Material of cargo tanks: 5% Ni Steel
Cargoes: LEG/LPG/VCM/Ammonia
Design temperature/pressure: -104°C / 4.16 bar g acc. to IMO at sea
Maximum cargo density: 690 kg/m³
Number of segregations: 2
Cargo manifolds: 2 liquid lines, 1 x 14", 1 x 10" ANSI 300 lbs flanges
2 vapour lines, 1 x 10", 1 x 6" ANSI 150 lbs flanges
Loading- / Unloading rate: 4,000 m³/h / 3,300 m³/h
Deepwell pump: 6 x 550 m³/h at 120 m LC
Booster pump: 2 x 550 m³/h at 120 m LC
Number of cargo heater / vaporizer: 2 (1 x LPG, 1x Ethylene)
1 purge condenser: Shell & tube for LPG & Ethylene



'Navigator Aurora' with an LNG Fuel Gas System



3D View of Cargo Tanks and Fuel Gas System

Reliquefaction system:

Cascade / direct cycle
2 x refrigerant compressors (refrigerant Propylene)
3 x cargo compressors

Cargo piping system:

Stainless steel, AISI 316L

Inertgas plant:

PSA type Capacity: 1,500 Nm³ at 99.5 vol. % N₂

Deck Tank:

Capacity: 1 x 200 m³

Design Pressure / Temperature:

18 bar g/-104°C

LNG fuel gas system:

2x 1,000 m³ LNG fuel gas / cargo 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



'Navigator Aurora' with LNG Fuel Gas Deck Tanks



source: uavpic.com

5,800 cbm LNG Bunker-Vessel

'Coralius'
for SIRIUS VEDER GAS AB, The Netherlands / Sweden

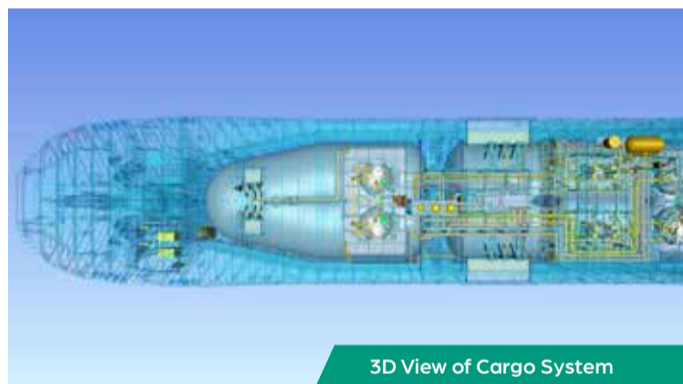
Shipyard:	Royal Bodewes, The Netherlands
Year of completion:	2017
Classification:	BV
TGE's scope:	Cargo handling system with cargo tanks, LNG fuel gas system
Vessel:	5,800 m ³ LNG bunker vessel
Length o.a.:	99.60 m
Beam:	17.94 m
Draught (LPG):	5.90 m

Characteristics of gas plant:

Capacity:	5,800 m ³
Number of cargo tanks:	2 (bilobe type)
Material of cargo tanks:	9% Ni steel
Cargoes:	LNG
Design temperature/pressure:	-163°C / 4.5 bar g
Maximum cargo density:	500 kg/m ³
Number of segregations:	1
Cargo manifolds:	1 liquid line, 1 x 8" DIN 150 lbs flange 1 liquid branch, 1 x 8" DIN 150 lbs flange 1 vapour line, 1 x 6" DIN 150 lbs flange
Bunker manifolds:	1 liquid line, 1 x 6" DIN 150 lbs flange 1 vapour line, 1 x 4" DIN 150 lbs flange
Loading- / Unloadingrate:	840 m ³ /h
Deepwell pump:	4 x 210 m ³ /h at 210 mL



Installation of Cargo Tanks



3D View of Cargo System

BOG-handling & fuel gas system:

2 x cargo compressors with intercoolers
2 x aftercoolers
2 x submerged fuel gas pumps
1 x forcing vaporiser
1 x fuel gas buffer tank
1 x fuel gas metering system

Cargo piping system: Stainless steel, AISI 316L

Inertgas plant:

Membrane system: Capacity: 100 Nm³/h at 3 vol. % O₂



LNG Bunkering