ME-GI/GIE Pump Vaporizer Unit for LNG and ethane

Everllence

PrimeServ

ME-GI/GIE Pump Vaporizer Unit

Marine systems

The ME-GI/GIE pump vaporizer unit (PVU) is a standardized high-quality pump unit for supply of LNG or ethane to Everllence B&W two-stroke ME-GI/GIE engines. With a compact and intelligent design, the PVU provides a lean design and integration in the fuel gas supply system (FGSS).

Everllence PrimeServ Assist is an integrated part of the PVU and offers 24/7 monitoring as well as the option of servicing the unit remotely.

Working principle

The PVU is designed to supply LNG/ethane to the pressure and temperature required by the Everllence B&W ME-GI/GIE two-stroke engines.

The PVU receives cryogenic LNG/ethane supplied by a cryogenic centrifugal pump and is subsequently pressurized by a high pressure reciprocating pump, consisting of three cylinders actuated by linear hydraulic pistons.

The pressurized LNG/ethane flows through a compact printed circuit heat exchanger, in which it is heated by warm glycol water. Thereafter the gas is directed towards the gas valve train (GVT) and the engine.

The gas pressure delivered to the engine is controlled by hydraulic flow control of the pump. Individual control of the three cryogenic pumps heads, means that the PVUs are still able to operate with only two cold-ends in service, providing the redundancy required by the market.

Key benefits

- Low cost LNG/ethane PVU with embedded redundancy
- Automatically controlled and integrated in Everllence dual fuel control system
- Time between overhaul (TBO) cryogenic parts is 6,000 running hours
- TBO hydraulic parts is 32,000 running hours
- Compact design providing minimal footprint and low weight
- Worldwide service surveillance 24/7 monitoring and control by Everllence PrimeServe Assist

Pump Vaporizer Unit

Benefits

Embedded redundancy
With a compact and intelligent design, the PVU introduces a considerable saving in the complete FGSS. This is achieved by the simplifications implemented in the design, resulting in a reduced number of sub-systems and components, Due to the cryogenic pumps being actuated individually, embedded redundancy is enabled. This means that one pump cylinder can be taken out of service for overhaul, while the remaining two are fully operational and still able to provide up to 100% of the required capacity, depending on PVU and engine layout. In comparison, traditional crankshaft driven pumps requires two complete units to allow system redundancy.

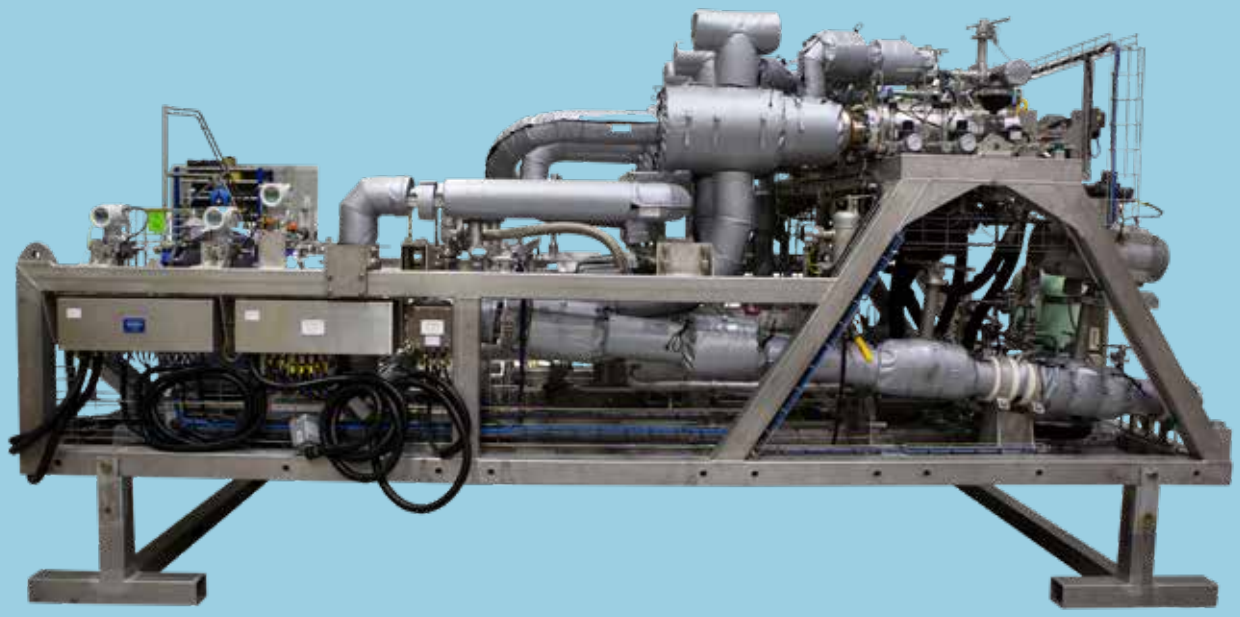
Compact and intelligent design
Compared to conventional systems, the PVU offers a significant reduction in weight and size. This offers a further cost benefit considering installation costs, such as foundations, piping, cabling, and deck stiffening

Extended TBO
The PVU also offers savings to the vessels OPEX through significant increase in TBO compared to conventional high pressure pumps. For the cryogeninc parts the TBO is 6,000 running hours and for the hydraulic parts TBO is 32,000 running hours.

High reliability and easy maintenance
The PVU is designed for the highest standards of quality, hence ensuring the best reliability on the marked. Easy maintenance is ensured by design with the operators in mind, providing easy access to exchange of spare parts.

Everllence strives to use the same components on the PVU as use on the ME-GI/GIE engines in order to minimize the amount of spare parts onboard. As an example, the controllers (MPC's) are identical and interchangeable with the once use on the main engine.

Engine control integration
The PVU control system design is based on knowledge of the ME-GI engine design and control system. This provides dedicated control with integrated condition monitoring features. The engine gas pressure and mass flow demands are instantly transferred to the PVU control system and further to the pump module. This results in a very stable and precise gas pressure control, in which it secures efficient ramp up and ramp down in all operating conditions. Further, the GVT downstream of the PVU control system ensures integrated control with the ME-GI engine. The PVU control system is based on the same hardware platform as the ME engine control system, which means that no extra spare parts are required.



Pump Vaporizer Unit (PVU)

PVU main data (LNG)

PVU size	3000 Mk. II	3000 Mk. II	8000 Mk. II
Maximum PVU Capacity[1] [kg/h] @ 300 barG	2700	4600	6900
Max SMCR[2] / max SMCR / [MW]	18	31	46
Glycol water flow / m_GW / [kg/h]	81333	117180	175753
Glycol water design heating duty / Q_GW / [kW]	600	980	1700
Air consumption / [l/min]		390 actual	
Air consumption / [l/min]		2-2.5	
PVU skid dimensions L x W x H / [mm]		3700 x 2240 x 2000	3900 x 2240 x 2000
PVU skid weight / [ton]	5.7	5.9	6.1

[1]LNG density 450 kg/m3 as per "MSC 86/26/Add.1 Annex 11"
[2]Max SMCR based on LHV=48.7MJ/kg; SGC=140g/kWh

PVU main data (ethane)

PVU size	4000E Mk. II
Maximum PVU Capacity[1] [kg/h] @ 300 barG	3100
Max SMCR[2] / max SMCR / [MW]	21
Glycol water flow / m_GW / [kg/h]	52635
Glycol water design heating duty / Q_GW / [kW]	370
Air consumption / [l/min]	390 actual
Air consumption / [l/min]	2-2.5 kg/h
PVU skid dimensions L x W x H / [mm]	3700 x 2240 x 2000
PVU skid weight / [ton]	5.7

[1]Specified density of fuel: 504 kg/m3
[2]Max SMCR based on LHV=47.5MJ/kg; SGC=152g/kWh

Scope of supply

ME-GI/GIE Pump Vaporizer Unit

Main PVU scope:

- Compact vaporizer heated by glycol water
- Cold-return line for continued circulation (no suction drum needed)
- Blow-off valve and safety valves
- Electrical cabinet with 3 MPC
- Stand-alone hydraulic power supply (SHPS)
- Sensors for control and supervision
- Fully automated PVU control system including supervision of operational conditions
- Participation in risk studies (HazOp)
- Supervision of installation
- Commissioning
- Participation of gas trial
- Class approval certificate for PVU (HazOp/ FMEA submission to class societies)
- Installation and operation manuals
- List of capacities

Additional scope offered by Everllence:

Main components

- LNG tanks
- Bunkering station
- Low pressure feed pump
- Glycol water system
- Nitrogen supply system
- Master gas valve
- Low pressure vaporizer (if needed)
- Gas compressor (if needed)
- Piping and cabling
- Electrical power switch board
- Filter for glycol water (250my)

Installation

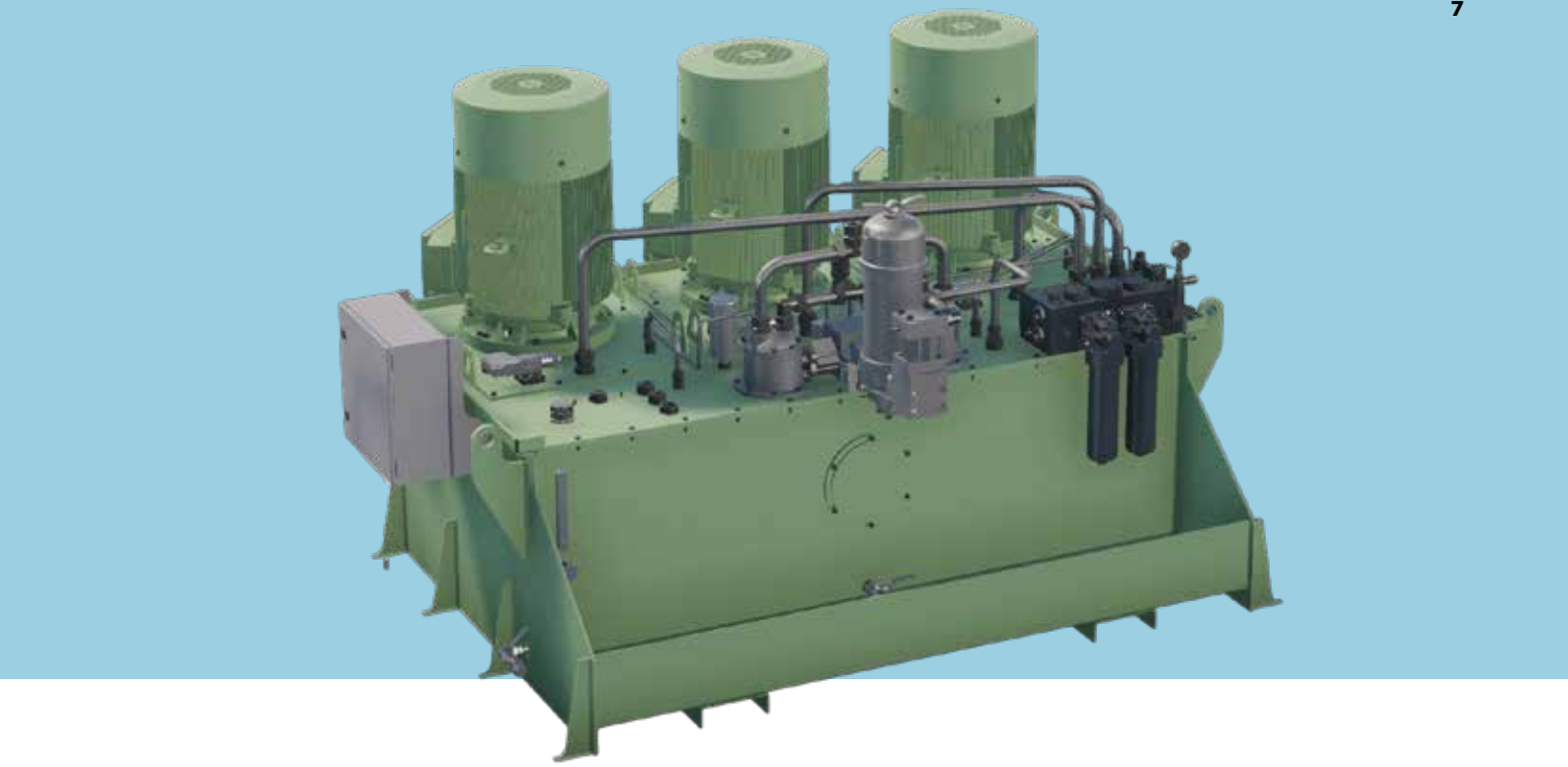
- Installation of PVU, electrical cabinet, HPS unit, glycol water system, MOP screen
- Piping; LNG pipes, HP gas pipes, glycol water pipes, control air etc.
- Hydraulic hose between PVU and HPS unit incl. heat tracing
- Electrical cabling e.g. between PVU and electrical cabinet

Approval

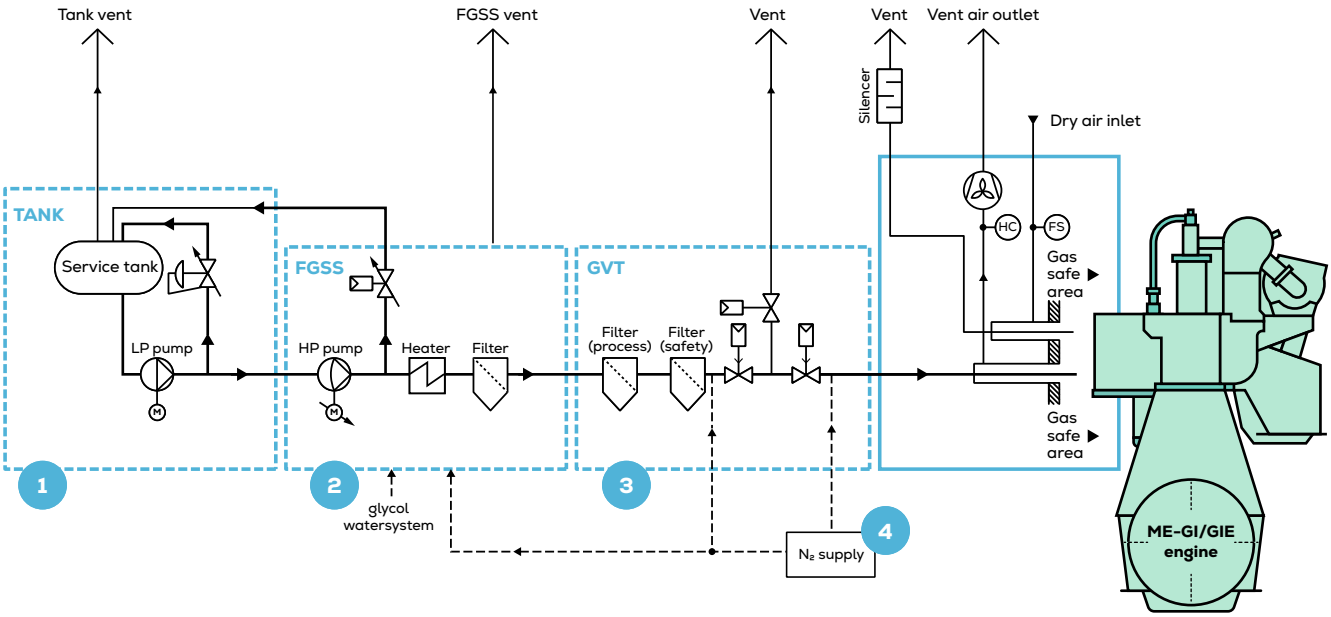
- FGSS class approval including PVU
- Overall HazOp

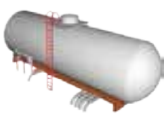
Control and safety system

- FGSS safety system with input/output from PVU control system, e.g. NG outlet temperature and pressure



Stand-alone hydraulic power supply (SHPS) Mk. II





1 LNG/ethane tank

2 FGSS incl. PVU

3 GVT

4 Nitrogen system (generator, booster, storage)

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