Density and temperature profiling system for floating LNG storage

Natural gas being the cleanest fossil fuel currently available, the demand for LNG is increasing globally. During the last decade, in response to this demand, an offshore storage terminal market has been developed using floating LNG storage vessels. The key benefits of this development for customers include cost effectiveness, fast track deliveries, and a reduced environmental footprint.

As with shore based importing terminals, offshore regasification installations need to be able to deal with a wide range of quality variations in the incoming LNG.

Both offshore and onshore storage tank facilities can be affected by the stratification of the LNG, and by the undesirable effect of the so-called rollover phenomenon. Since the tanks are filled with different qualities of LNG coming from diversified LNG sources, supplied in accordance with medium to long term supply contracts and/or short term trades, there is always the potential for the stratification effect to evolve into a rollover phenomenon. Notwithstanding the operational process, the risk is always present and has to be evaluated. This involves the use of the appropriate tools to measure the density variations within the bulk LNG.

To properly manage an LNG storage tank, it is crucial to obtain exact in-tank process data, including the temperature, level, and density. These are all measured using highly accurate, repeatable, and reliable instrumentation, and are conveyed to the on-board automation system via a redundant communication link.

Since the accuracy of LNG gauging instrumentation changes when it is exposed to cryogenic conditions, accuracy under real cryogenic conditions (not in laboratory setting only) is an absolute requirement.

Industry leader in liquefied gas storage monitoring systems

Since the earliest days of liquid gas storage, Wärtsilä Tank Control Systems (formerly known as WHESSOE SA) has been developing cutting edge technologies that increase the safety of storing LNG - both onshore and offshore. Our services include:

- A complete offering
- Project management
- Field service
- Lifecycle support

Wärtsilä Tank Control Systems has extensive experience (since 1983) in designing and delivering tank gauging systems dedicated to land based LNG storage tanks. Using our experience and well proven technologies, our instruments are now customized for marine customers to address the challenges in storing LNG in offshore tanks.

The Wärtsilä Whessoe M1146 LTD gauge, initially designed for land based LNG and LPG refrigerated (Ethylene, Propylene and Ethane) tanks, is now available for offshore applications, including:

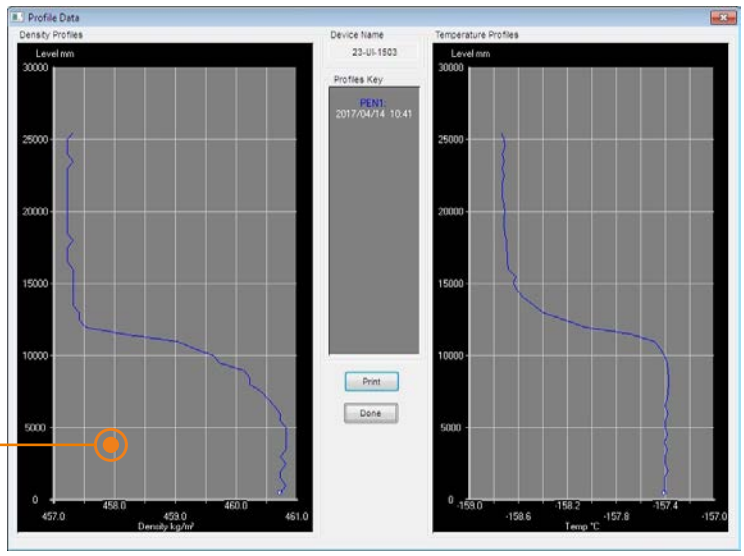
- FLNG (LNG FPSO)
- FSRU / FSU
- Gravity Based Structures (GBS)

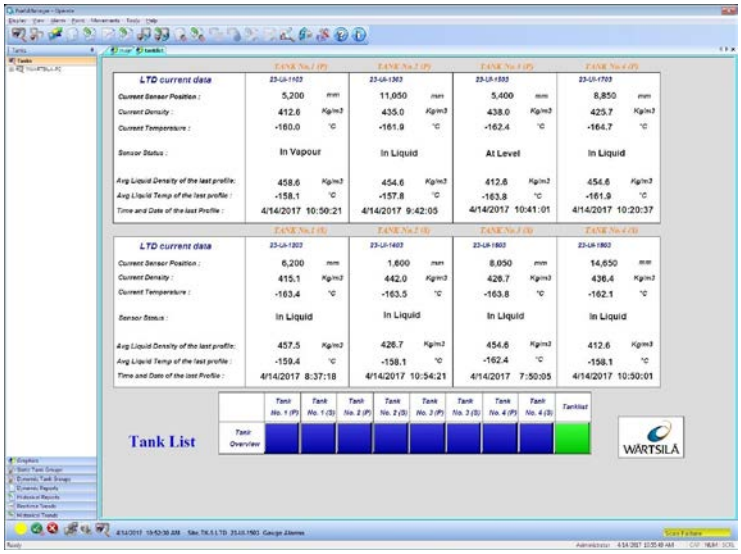
The Wärtsilä Whessoe M1146 gauge is based on a combination of patented sensing head and precision perforated tape technologies that together offer a high level of accuracy and repeatability for the data measurement (level, temperature and density).

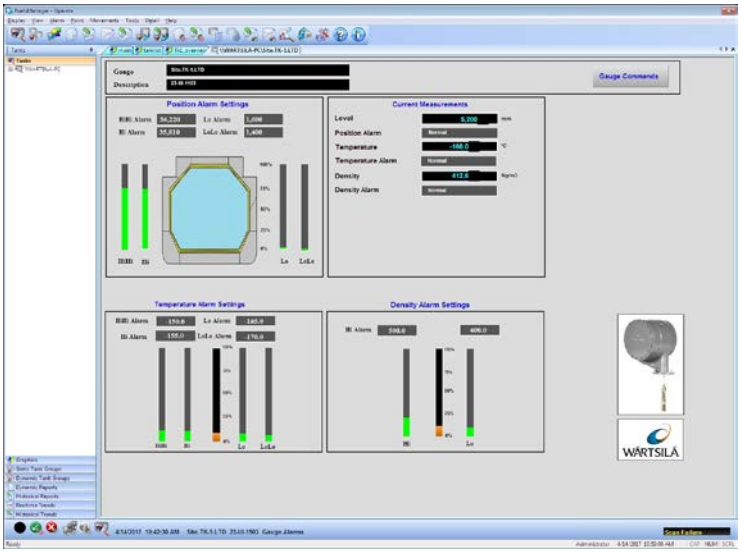
The gauge is installed at the upper deck level on a standard 6” full bore ball valve without the need for an inspection or calibration chamber. Working at user configurable speeds, it samples a maximum 250 data points to construct a detailed and accurate LTD profile, which allows an in-tank density analysis.

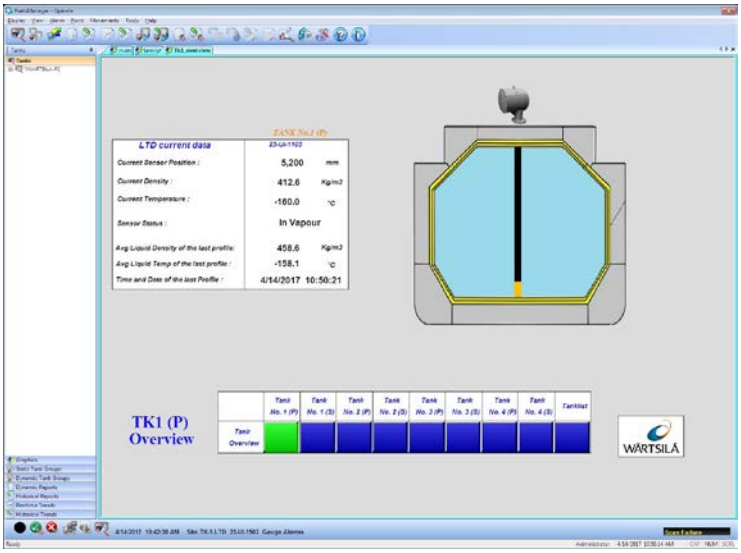
Being the lightest in its class, The M1146 gauge has the most compact design, integrating all functions within a single marine grade aluminium housing. It accommodates all electronics and wiring inside the flameproof compartment. As with all Wärtsilä Whessoe gauges, the LTD also features a local LCD display, showing current process and diagnostics data, while an inspection window is used to verify the sensor’s “home” position.

The Wärtsilä Whessoe LTD M1146 gauge has been granted the most stringent certifications, including approvals from Marine Class Societies.









The gauges can be either connected to the Automation System through redundant RS-485 links, or to the Wärtsilä Whessoe Tank Data Acquisition system which includes Operation and Maintenance features.

With more than 270 units installed worldwide on onshore LNG tanks, and with numerous references on FSRU, FLNG and GBS terminals, The Wärtsilä Whessoe M1146 gauge is the most advanced LTD gauge available on the market.

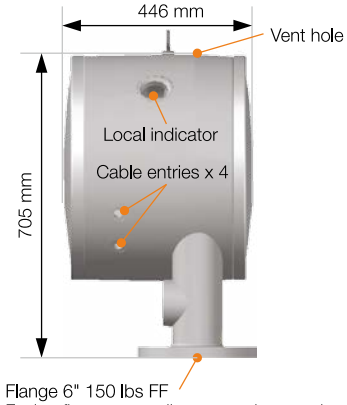
Benefits for our customers

- Accuracy and repeatability on density and temperature measuring data with up to 250 recordable samples per tank and a high level of repeatability (density and temperature).
- A compact and all-in-one design with minimized installation costs
- Low maintenance demands
- A proven track record within the LNG industry with more than 270 units installed worldwide.
- System upgrades available with optional rollover predictive software (Wärtsilä Whessoe LNG rollover predictor) available for membrane and Moss type tanks.

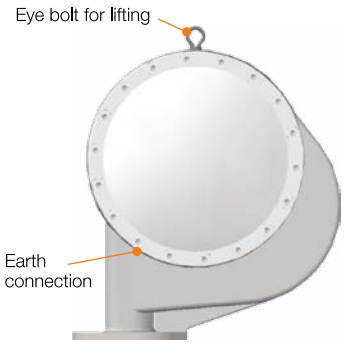
Wärtsilä Whessoe M1146 LTD for marine application

Technical data

Model N°		M1146
Product application		LNG and refrigerated LPG (ethane, ethylene, propylene)
Materials	Housing	ASTM B26 A356.0-T6
	Painting	Marine painting compliant RAL7035
	Sensing head	SS 316L
	Tape	SS 316L with PTFE
Weight		90 kg
Dimensions	Height	705 mm
	Width	650 mm
	Depth	450 mm
Operating temperature	Ambient	-20°C to +55°C
	Liquid	-200°C to +50°C
Maximum service pressure		700 mbar/g
Power supply		110-240 VAC
Frequency		50-60 Hz
EMC compliant		According IEC 61000-4 & IEC 61000-5
Output signal		RS485 / current loop Modbus RTU protocol
Cable enties		4 * M20X150 or 3/4 NPT by adaptator
Process connection		6" 150 lbs FF
Protection class		IP67
Level measurement	Range	0-60 m
	Accuracy	±2 mm on 20 m / ± 5 mm on 50 m
	Sensitivity	± 1 mm
	Repeatibility	± 1 mm
Temperature measurement	Range	-200°C to +50°C
	Accuracy	± 0.1°C
	Sensitivity	± 0.01°C
	Repeatibility	± 0.04°C
Density measurement	Range	400-1000 Kg/m^3
	Accuracy	± 0.5 Kg/m^3
	Sensitivity	± 0.1 Kg/m^3
	Repeatibility	± 0.1 Kg/m^3
Floater form		Cylinder
Floater dimension		79 X 446 mm
Seismic compliant		Refer to spectrum response
Display		Integrated LCD



Flange 6" 150 lbs FF
Facing flange according to purchase order
– LTD can be provided with flange adapter (material 316l) for specific process connection



Certification

ATEX: Ex d [ia Ga] / ia IIB T5 Gb/Ga
DNV: Design verification report n° P261.1I
compliant to DNV OS-D202 Ch.2 Sec.4
BV: Type approval n° 38949/A0 BV

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