

WÄRTSILÄ

Electrical & Automation Services

**WÄRTSILÄ TANK CONTROL SYSTEMS
LAND APPLICATION**

ENERGY
ENVIRONMENT
ECONOMY



Represented by:



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LEADING THE INDUSTRY IN LIQUEFIED GAS STORAGE INSTRUMENTATION AND SAFETY SYSTEMS

Since the earliest days of liquid gas storage, Wärtsilä Tank Control Systems has been at the cutting edge in developing technologies that increase the safety of LNG and LPG storage. In particular, the company's instrumentation and safety systems ensure that all hazardous aspects related to the storage are known and controllable.

In close cooperation with leading gas companies, new technologies have been developed and extensively tested for endurance, accuracy, and reliability in the harsh environments associated with liquid gas storage. Our highly accurate instrumentation, control platforms, and safety shut-off valve systems are installed worldwide to help protect

personnel, the environment, equipment, and the product itself.

If your product is LNG, LPG or ammonia, Wärtsilä Tank Control Systems can provide an application-specific solution for your business needs. Today, the liquid gas industry is driven by the economics of operational scale. In order to apply efficient business management, while adhering to stringent safety regulations, operations personnel must have access to correct information.

Throughout the production cycle, from storage to distribution, the availability of precise data is essential, and it needs to be relayed to the control room in real time. Whether your operation is large or small,

our solutions are custom designed to suit your requirements best. They can operate independently, or be interconnected within a plant-wide system. Our vast experience, research, instrumentation technology, and service support will add value to your business. Our network of sales offices, application specialists, service facilities, and training centres provide local support to customers in key locations worldwide. This provides rapid access to a single point of contact in order to source the most effective solutions – Wärtsilä Tank Control Systems.

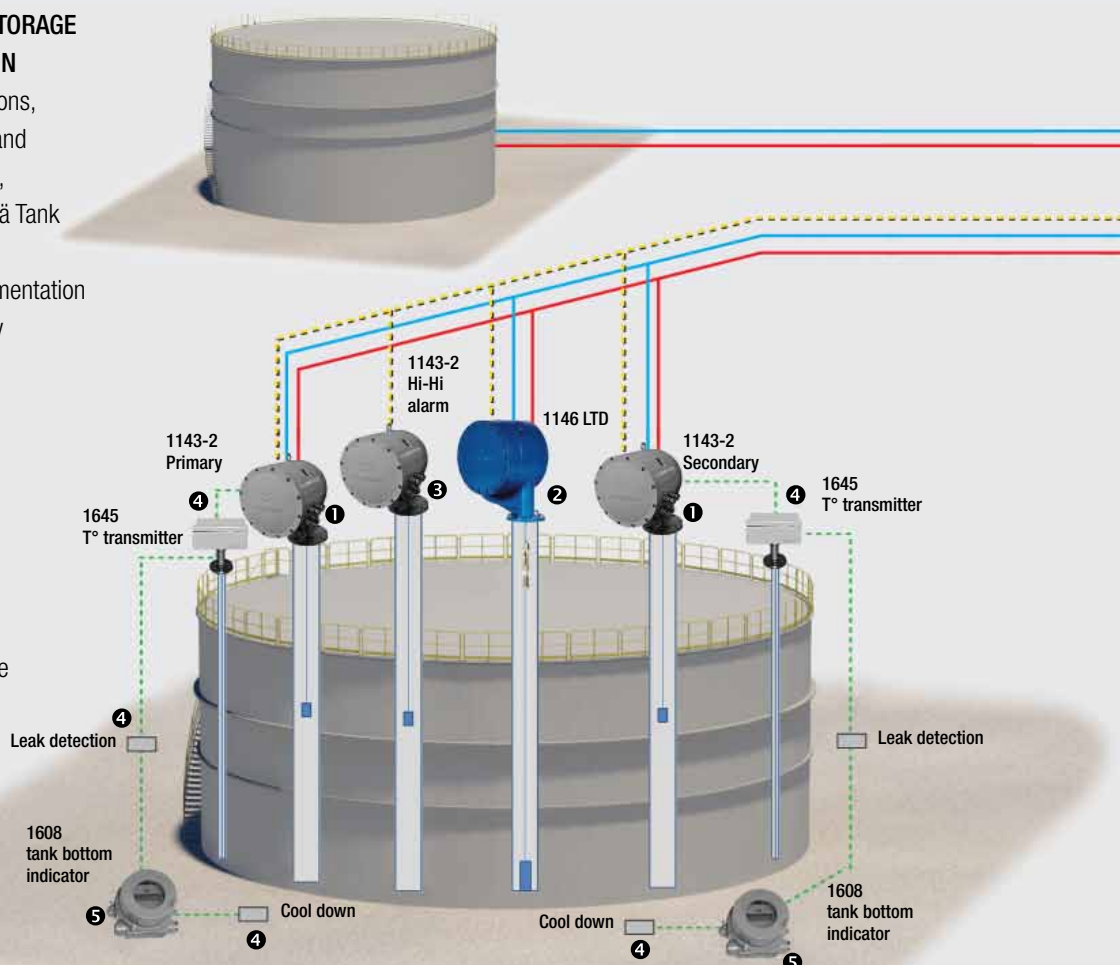
TOTAL LIQUEFIED NATURAL GAS STORAGE TANK INSTRUMENTATION SOLUTION

For those highly specialised applications, whereby safety, accuracy, reliability, and repeatability are of prime importance, you need look no further than Wärtsilä Tank Control Systems.

Our total LNG storage tank instrumentation solution comprises the following, fully integrated system components:

- SIL-3 certified servo level gauges
- High/high level alarm gauges
- Product temperature probes
- Fully automatic LTD gauges
- Leak detection and cooling temperature transmitter system
- PC based SCADA package
- Roll-over predictive alarm software
- LNG sampling system.

The entire system communicates via a redundant communication link.





1 Model 1143 Mark II Servo Level gauge

Monitors level changes as small as 0.1mm. Incorporating a single body concept, it accommodates all electronics, including the main power connection and redundant Modbus communication. The gauge is fully SIL-2 certified and, in a multi-gauge system application, conforms even to SIL-3. The Model 1143 gauge is suitable for custody transfer applications. The gauge has passed seismic testing and is certified to withstand a 12 g acceleration force.



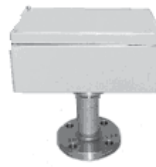
2 Model 1146 LTD gauge

The world's most advanced LTD gauge, this is also based on Wärtsilä Tank Control Systems's unique single body concept. It accommodates all electronics and wiring, and is mounted on a single flange. Travelling at user configurable speeds, it samples 250 data points to construct a detailed and accurate LID profile. Communication is via redundant Modbus. As with all gauges, the LTD also features a local LCD display, showing all process and diagnostics data, while an inspection window is used to verify the sensor's "home" position. The gauge has passed seismic testing and is certified to withstand an 8 g acceleration force.



3 Model 1143 Mark II High/High level alarm

For applications requiring SIL-3 certification, 2 or 3 gauges are linked to the site's ESD system. The configuration even exceeds the minimum requirements as put forward in NFPA-59A. With local LCD displays, it provides all process and diagnostics data. An inspection window is used to verify the sensor's "home" position.



4 Model 1645 temperature/pressure transmitter

Handles up to 16 RTD's and 3 pressure signals. It is linked to the level gauges for power and the communication of all measured data. With a daisy chain connection of up to 5 units in a local (IS) field-bus, it is capable of handling in-tank temperature masts, as well as leak detection and cool-down elements.



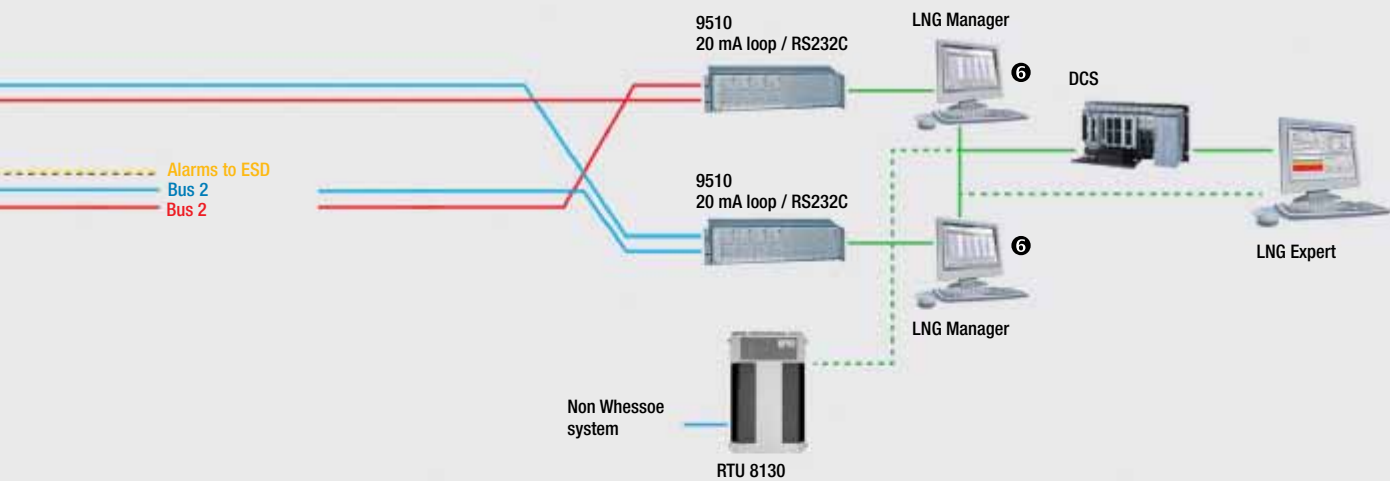
5 Model 1608 Local indicator

Local, tank base indicator. Model 1608 allows field operators to observe all measured data available on the local (IS) field-bus. Like the temperature transmitters, it is powered from the level gauge.



6 LNG Manager

All process data can be linked back to our PC-based, redundant, control engineering and configuration platform, the LNG Manager, or alternatively directly linked to the site's DCS. In instances where the LNG tank gauging instruments are being linked directly to the site's DCS system, configuration and maintenance tasks are handled through a portable PC, known as the LNG System Maintenance Supervisor.



CONTROL PLATFORMS LNG MANAGER

All process data can be linked back to our PC based, redundant, control, engineering and configuration platform, LNG Manager®, and can be directly linked to the site's DCS.

In instances where the LNG tank gauging instruments are being linked directly to the site's DCS system, configuration and maintenance tasks are handled through a portable PC, called LNG System Maintenance Supervisor®.

SITE SAFETY STRATIFICATION MANAGEMENT AND ROLL OVER PREVENTION



LNG MASTER

The storage and handling of LNG is a business where profitability is largely dependent upon safety and cost control, beginning from the initial design of the site.

The days of a single receiving tank being used to receive just one specific grade of LNG, are long past. Most, if not all LNG receiving terminals, have multiple sources of supply, and with the increasing use of spot market trading, mixed LNG tank content conditions will only increase.

Through the use of LNG MASTER software, developed and owned by Gaz de France SUEZ, cost reductions can indeed be achieved without compromising safety at all.

By running various simulations using LNG MASTER, the site design engineer can reduce capital expenditure (CAPEX) by

- Optimizing the number of tanks
- Optimizing tank capacity
- Optimizing the boil-off related equipment
- Optimizing all safety equipment

Once the site is built and operational, LNG MASTER will provide means of reducing operational expenditures (OPEX) by

- Optimizing operations (filling/mixing) through the selection of the safest and most cost effective discharge conditions
- Stratification management.

LNG EXPERT

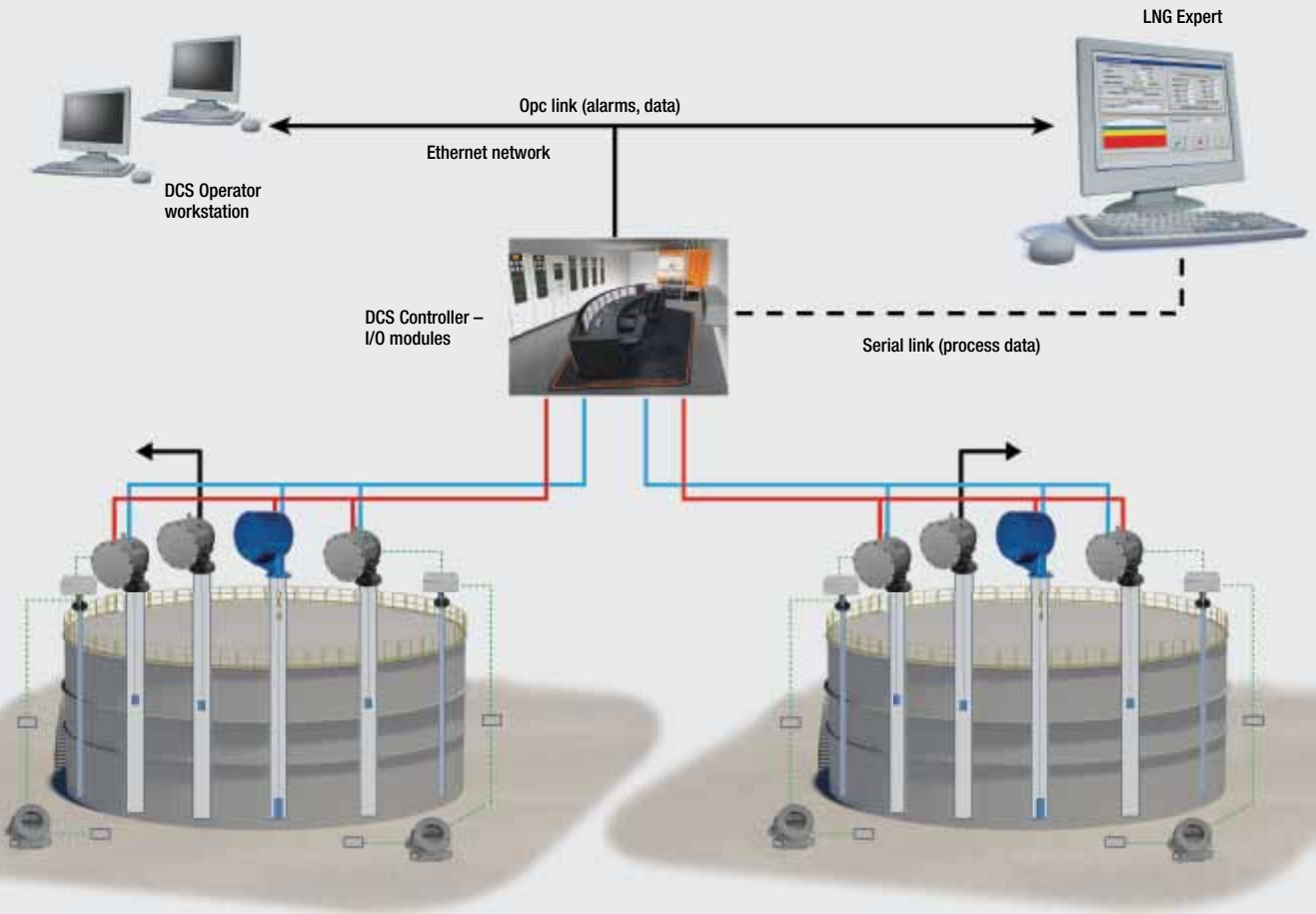
The latest evolution in LNG storage tank management is the LNG expert software developed by Wärtsilä Tank Control Systems. LNG expert is the world's only validated online, and fully automatic, roll-over predictive and alarm software. Based on LNG MASTER, it provides the user with a watchdog that monitors all the site's components impacting and influencing the formation and evolution of LNG stratification.

It continuously monitors all data and calculates the expected development of stratification, if any.

Should a certain stratification in any of the tanks linked to the same vapour space appear likely to evolve into a roll over situation, it automatically generates an alarm, leaving sufficient time for the operators to take corrective action.

As such, the LNG expert meets all requirements as put forward in the European SEVESO II directive.

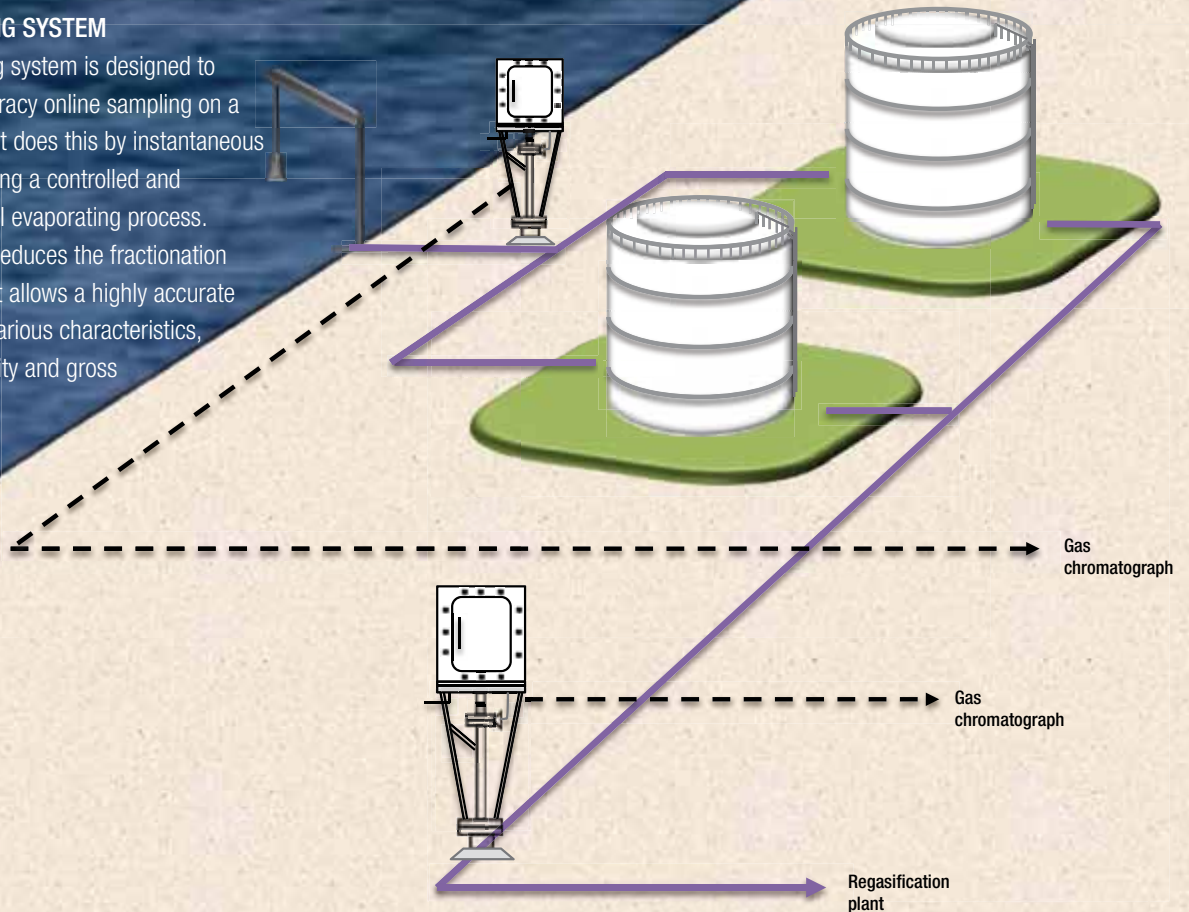




ONLINE SAMPLING SYSTEM

The LNG sampling system is designed to perform high accuracy online sampling on a continuous basis. It does this by instantaneous re-gasification, using a controlled and regulated electrical evaporating process.

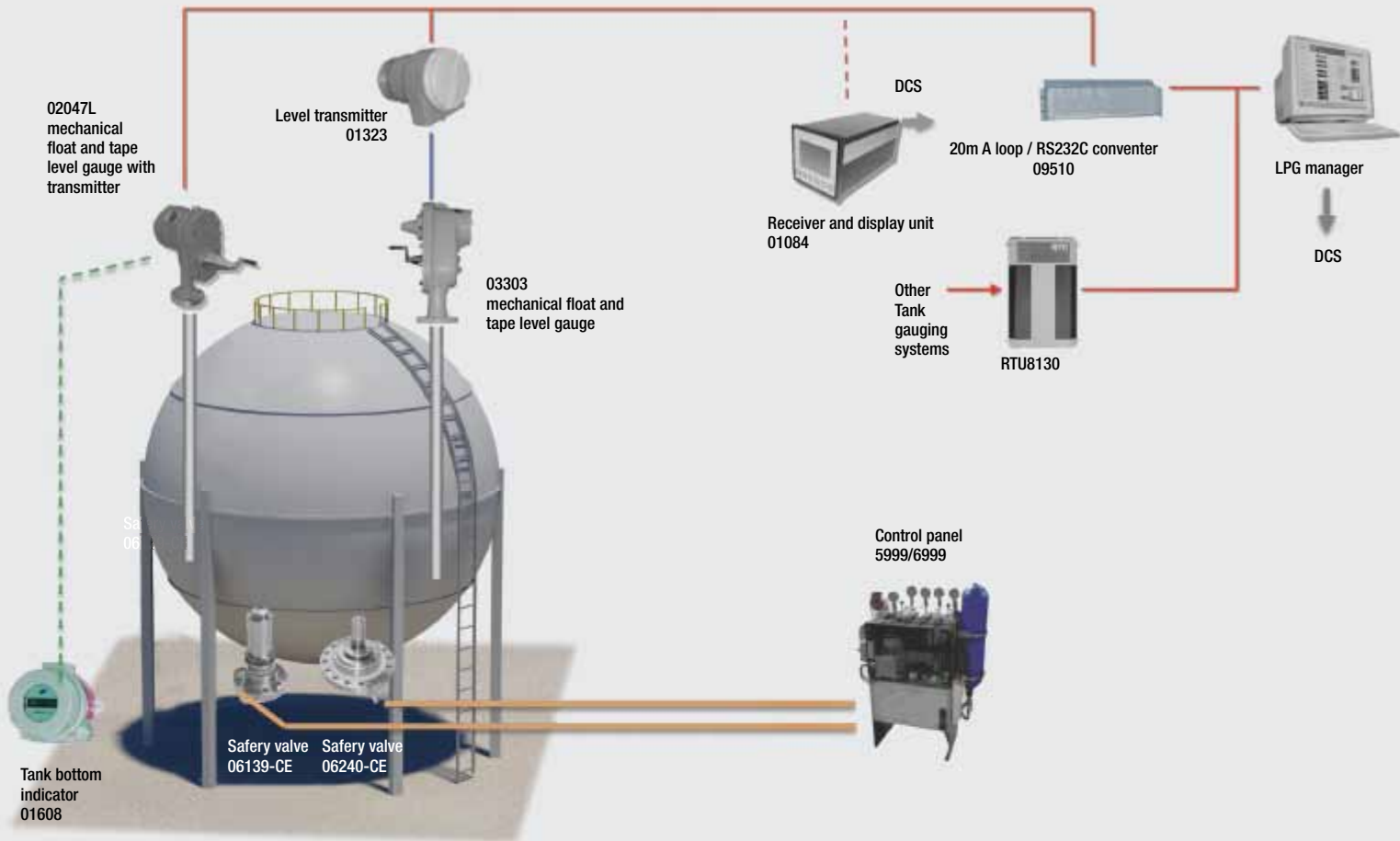
Because it reduces the fractionation distillation effect, it allows a highly accurate determination of various characteristics, such as LNG density and gross calorific values.



LPG PRESSURIZED TANK

Wärtsilä Tank Control Systems offers complete solutions for LPG pressurized tanks and liquefied chemical gases (vinyl chloride, ethylene, propylene, butadiene, ammonia, etc.).

These include level gauging or safety shut-off valves systems with hydraulic panel remote, that enable the full protection, control, and supervision of the storage plant.



LIQUIFIED PETROLEUM GAS STORAGE TANK INSTRUMENTATION AND SAFETY SYSTEMS

The Liquefied Petroleum Gas (LPG) family of products, comprising liquefied petroleum gas, petro-chemical gas, and chemical gas can be stored under different process conditions. These range from pressurised to refrigerated storage, and from small above ground bullets to large underground cavern storages.

Each of these conditions calls for application-specific instrumentation system solutions and safety shut-off valve systems,

with requirements varying from very simple products to custody transfer instrumentation packages.

The optimization of your process starts with the site design, and continues throughout the life cycle of the plant.

Our instrumentation solutions are designed to help you attain optimal results for your very specific needs. They are tailored to help you reach your business goals.

We offer a fully comprehensive interlocking range of instrumentation, comprising:

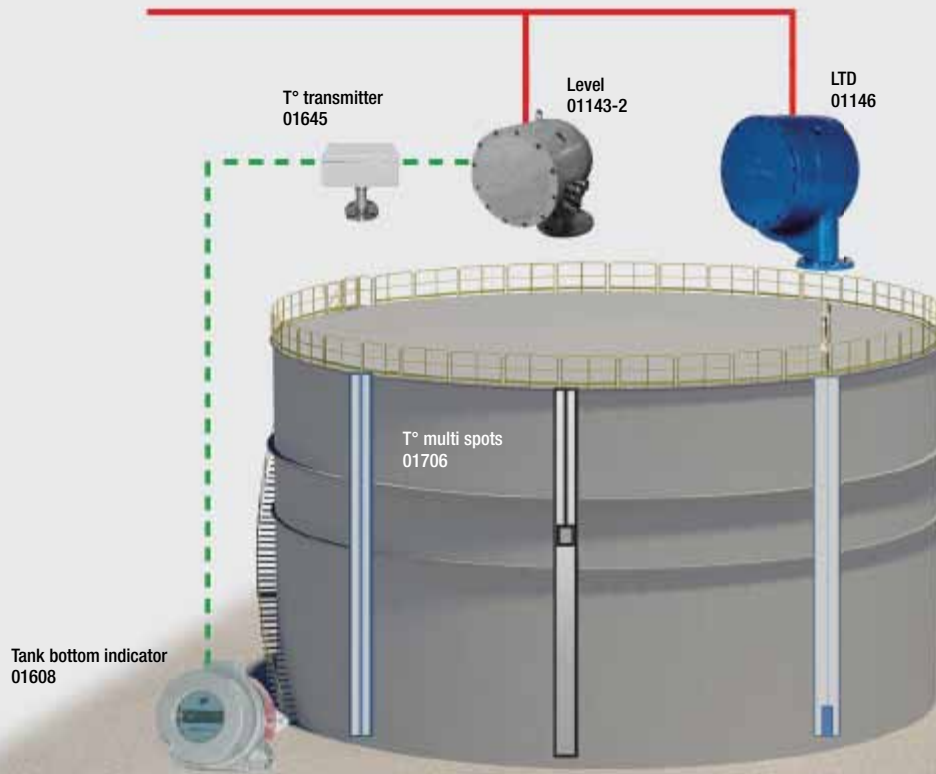
- Level and temperature gauges
- PC-based control platforms
- Hydraulic or pneumatic operated safety shut-off valves systems for pressurised LPG tanks (sphere and bullets)
- Atmospheric, refrigerated LPG storage tanks

- LPG cavern storage
- LPG bottling stations
- LPG road transport (trucks and trains).

SAFETY SHUT-OFF VALVE SYSTEMS

Wärtsilä Tank Control Systems offers a comprehensive range of hydraulically or pneumatically operated safety shut-off valve systems. They cater for a multitude of safety-critical applications involving flammable or toxic cargoes on road haulage vehicles, bulk carriers, and various storage facilities such as LPG spheres and bullets.

Our hydraulically operated safety shut-off valve systems comprise the required number of valves, installed either inside the tanks and/or in the filling and discharge lines. The latter could be the interconnecting piping between plant sections. All valves, whether mounted in



LPG REFRIGERATED TANK

The servo driven gauge 1146 is used to drive the density/temperature sensor over the total height of the liquid column and transmits the measured data to the control equipment. Also the level gauge 1143-2 displays, records and prints all information necessary for control and safety of the storage tank with a very high accuracy.

the tanks or within protective line housings, are controlled from a central control panel, mounted in a hazardous zone. From here, all valves can be manually controlled, or linked to the site's central control room and the ESD system.

Overall safety is enhanced by installing numerous fusible plugs, fitted at fire sensitive locations within the hydraulic control lines. The valves automatically return to a safe position immediately upon detection of a potential hazard, such as fire, the loss of power, a loss of nitrogen, or an earthquake. Of course, this also occurs when the operator sets the valve(s) to a closed position.

Most, if not all, the world's major oil and gas companies have installed our safety shut-off valve systems, which in many cases have been exclusively specified.

LPG ROAD TANK

Safety valve
06139-CE



Stainless steel safety
valve 06239-I



Safety valve
06141





LPG CAVERN STORAGE APPLICATION

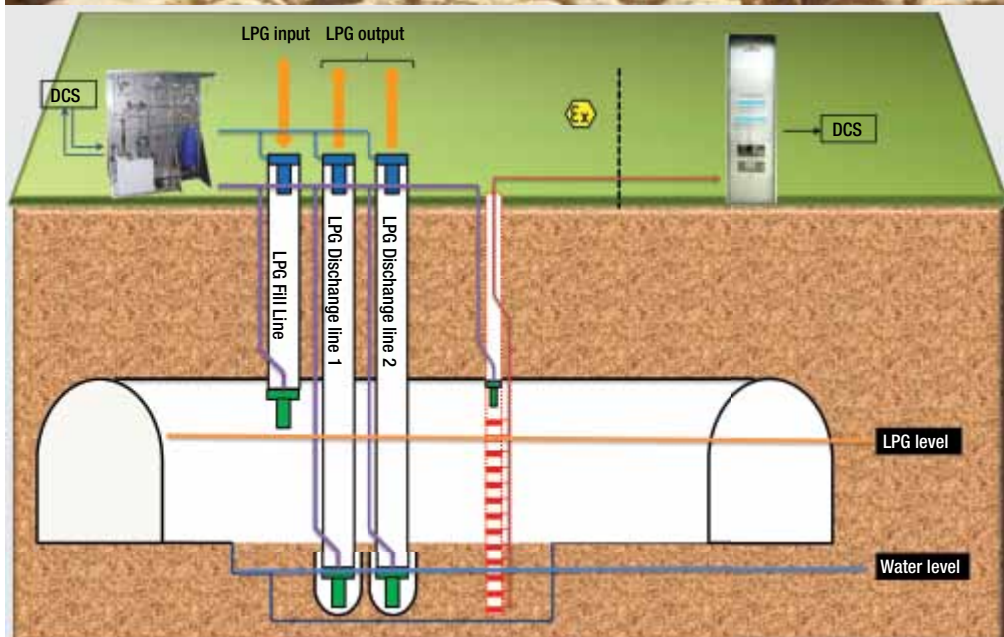
Wärtsilä Tank Control Systems is a key player in LPG cavern storage applications. We have developed, in close collaboration with key customers, a unique and dedicated range of products that meet the specific needs of this type of storage.

The particularity of this application is that LPG is stored under pressure, but almost always some 70 to 220 m underground. Site locations are selected on the basis of the following geophysical criteria:

- The rock must be hard enough for the cavern to be stable.
- The caverns are unlined. The stored product is prevented from escaping based on the principle of hydraulic containment, whereby the caverns are located at such a depth that the water naturally present in the surrounding rock creates a counter pressure higher than the pressure of the stored product, thus preventing it from migrating.

Based on the above, the water pressure in the rock can be enhanced artificially by special water supply systems (water curtains). Caverns provide significant benefits for large volume storage, are safer than pressurised spheres, provide the necessary flexibility to store products, and are economic to build.

The capacity of a single LPG cavern is about 100,000 m³. As a result, proper instrumentation, such as our level & temperature alarm probe and our safety shut-off system, is the most secure way for protecting the storage of such huge volumes of LPG.





Level alarm, temperature & water bottom measurement systems 01817.



Electric-hydraulic control panels for safety valves 06999.



Hydraulically operated safety shut-off valves 06240 & 06156.



INTEGRATED SOLUTION

Thanks to Wärtsilä's Electrical & Automation Services organisation, full turnkey solutions can be offered to our customers, from engineering, to installations on site, and final commissioning.

LIFECYCLE SUPPORT

Our philosophy is to serve customers throughout the lifecycle of their installation. We are available for project conception discussions; we offer advice during the design phase, and we provide support until the operational life is finalized.

We provide OEM spare parts, modernisation and upgrading solutions, technical support, training, and maintenance on site.





VISIT US AT WWW.WARTSILA.COM

FROM SERVICE TO SERVICES

A number of our customers have recognized us as their preferred service supplier to ensure the availability and cost-efficient operation of their installations. They find they get leverage from a variety of benefits by having their entire power system fully serviced by one global supplier.

Wärtsilä Services provides holistic, integrated service for our marine and power plant customers. To serve you better, we are continually broadening our range of solutions by adding products and services that further enhance the value of our one-stop-shop service and expanding our global network. We support your business, in-situ or from our numerous service centers around the globe, regardless of your equipment make.

We provide tailored efficiency solutions throughout the marine propulsion and power plant product lifecycle in the following services product lines:

- Engine Services
- Propulsion Services
- Boiler Services
- Electrical & Automation Services
- Operations & Management Services
- Training Services
- Environmental Services

We can tackle everything from basic support with parts, manpower and technical support to full service agreements. The work can encompass installation and commissioning, performance optimization, upgrades, conversions, and environmental solutions. Service contracts can extend from parts and manpower all the way to long-term, comprehensive contracts including performance and asset management agreements.

Wherever your installation is located, you will find a Wärtsilä Services center nearby. More than 11,000 dedicated professionals, operating in over 70 countries in 160 locations, are waiting for your call. We are never too far away to help.

This not just service, it is peace of mind – the security of knowing that your installation is covered by the world's most experienced marine and power plant services company: Wärtsilä.



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Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers. Wärtsilä is listed on the NASDAQ OMX Helsinki, Finland.

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