

PIONEERING THE SAFE OFFSHORE STORAGE OF LNG

Powering a better future



Developed to do better

SVANEHØJ

Engineering excellence: past, present and future

Svanehøj Tank Control Systems is an integral part of Svanehoj Group and was established in Calais, France in 1961 as Whessoe plc.

Whessoe equipped its first gas carriers in the 1970s and its first liquefied natural gas (LNG) storage tank in 1983. It was also the first to provide a level, temperature and density (LTD) gauge for floating storage. Whessoe (which was formed in Darlington in 1790) was acquired by Svanehoj in 2022.



Reduced installation and maintenance

Natural gas is used widely in residential heating and cooking, energy production and transport. It's also used in the production of other gases, such as hydrogen and ammonia, as well as fertilisers, methanol and refinery products. In its purest form, natural gas is the cleanest of all fossil fuels, producing lower emissions of CO₂, NO₂, SO_x and particulate matter than other similar fuels. In the form of liquefied natural gas, it can be shipped across the world in large quantities.

Due to lower costs, new technologies and the development of smaller LNG infrastructures, LNG is becoming available on a much wider scale than previously. Demand for the product continues to increase globally, especially with its low impact on the environment.

These days, LNG is often stored in offshore facilities known as floating storage and regasification units (FSRUs). The smallest of these is still very large, at about 120,000m³, so Svanehøj Tank Control Systems has designed smaller barges that contain storage tanks and regasification systems.

Svanehøj Tank Control Systems has extensive experience 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 customised for marine customers to address the challenges in storing LNG in offshore tanks.

The 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).



Experts in floating LNG storage

Svanehøj Tank Control Systems has unparalleled experience in providing instrumentation and safety management systems for offshore LNG storage facilities – including the world's first level, temperature and density (LTD) gauge for use in floating storage. We are the world leaders in LNG marine gauging, with over 320 vessels supplied with our gauges worldwide.

Offshore storage is an ideal solution for providing customers with fast and flexible access to gas in new areas, or where land-based storage tanks aren't a feasible option. Because the offshore facilities are floating, they can be relocated if necessary to meet changing market demands.

Keeping your facilities safe

Like land-based storage facilities, offshore LNG storage tanks need to be able to deal with wide variations in the quality of the incoming gas. They can also be affected by stratification and the phenomenon of 'rollover'. It's therefore vital that the right instruments and systems are in place to assess any risks by taking accurate measurements of any variations in density, level and temperature of the LNG.

This is another area where Svanehøj can help you. Our capabilities range from the design of ships and tanks right down to the precise instrumentation needed to ensure the safety of any gas carried. Our Tank Control Systems section is committed to providing you with cost-effective, high-quality solutions that will enhance the safety of your storage and regasification operations whilst minimising any impact on the environment.



LNG offshore storage tank instruments and software

Svanehøj Tank Control Systems can provide stand-alone products or a completely integrated safety solution for the offshore storage of LNG. All of our products are designed to reduce risks and boost safety by providing the highest levels of accuracy, reliability and repeatability.

Our comprehensive range of monitoring and control solutions for LNG offshore storage tanks includes the following products:



Level, temperature and density (LTD) gauge

One of the key instruments in our floating storage tanks is a marine version of the M1146 LTD Gauge. This is both compact and the lightest gauge in its class – yet it contains a host of functions designed to provide highly accurate data relating to the measurement of level, temperature and in-tank density. It's the world's most advanced LTD gauge.

Key features and benefits include:

- Accurate and repeatable temperature and density data.
- An all-in-one design, with minimal installation costs.
- Low maintenance requirements.
- A proven record for reliability.
- System upgrades.
- Optional rollover predictive software.

The LTD gauge on offshore based terminals is independent of the Tank Gauging System. It is dedicated to density and temperature measurement throughout the LNG tank level for monitoring stratification conditions of the LNG.

The LTD gauge provides the following measurement on the full height of the tank:

- Sensor position at level measurement point.
- Temperature at level measurement point.
- Density at level measurement point.



Tank data acquisition system (TDAS)

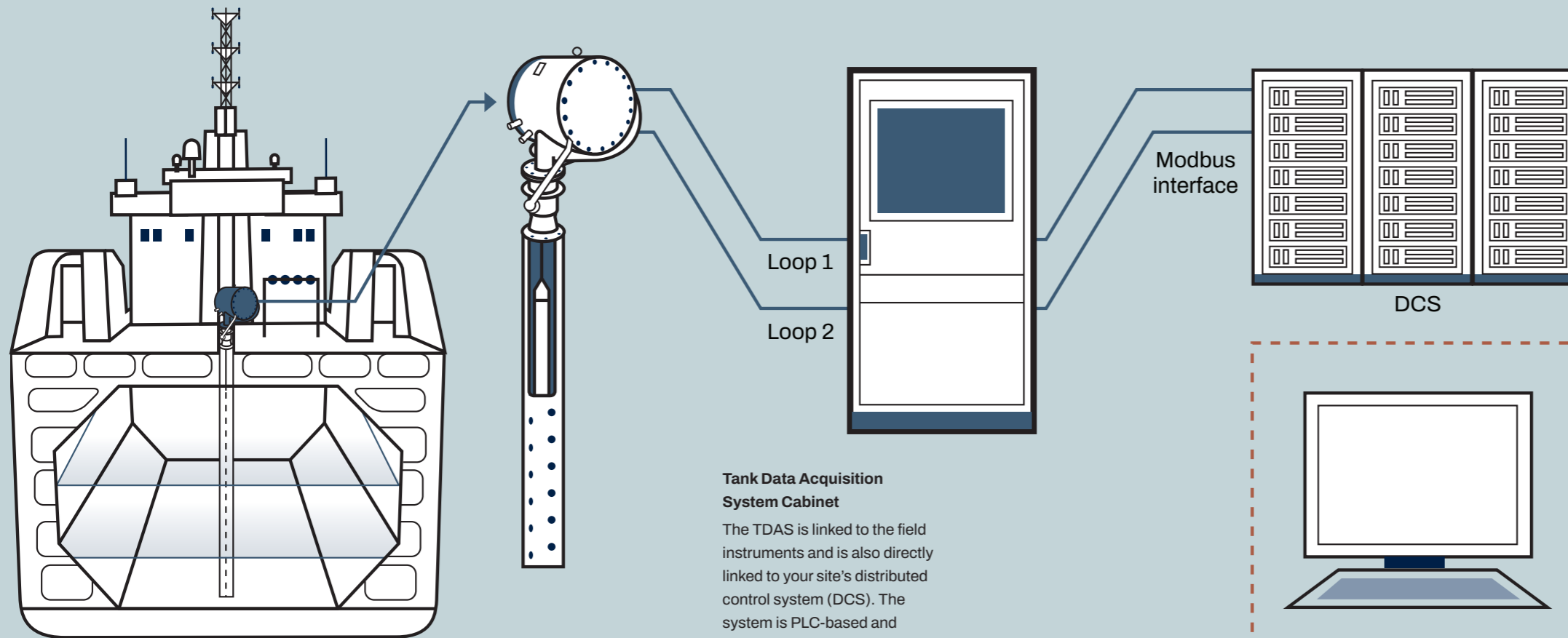
The Tank Data Acquisition System is composed of:

- The PLC-based acquisition system.
- The HMI in the control room.

The TDAS is linked to the field instruments and is also directly linked to your site's distributed control system (DCS). The system is PLC-based and includes all necessary I/O modules. It is fully redundant (power supply; I/O modules; CPU) and provides hot standby with Achilles Level 2 certification to ensure a high level of security against malware, spyware, and virus attacks.

Key features and benefits include:

- Achilles Level 2, ISA secured certifications.
- Hot standby architecture to ensure full redundancy without loss of data.
- Built-in associated operating modules to provide a high level of security.
- Full redundancy on field buses (RS 485 Modbus).
- Redundant Ethernet-based communication between the CPU and the communication module.
- A fully modular, evolutionary and open architecture.
- Worldwide spare parts and support available for the system hardware.



LTD (Level, Temperature and Density) Gauge – 01146

Dedicated to density and temperature measurement throughout the LNG tank level. The LTD monitors the LNG storage and detects the stratification.

Tank Data Acquisition System Cabinet

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Rollover Predictive Software – LNG Rollover Predictor

Monitors the evolution of the layers of LNG and rollover phenomenon in a stratified storage. The rollover prediction software integrates an automatic mode where the chemical composition calculation is based on measured parameters (density, temperature and operating pressure) from the LTD gauges.

LNG tank safety and management software

Liquefied natural gas offshore tanks must be able both to handle and have sufficient storage capacity for multiple grades of LNG. To control costs effectively, the storage capacity of both new and existing storage tanks needs to be optimised. Meanwhile, boil-off means that the chemical composition of the stored LNG will be in constant flux. It's therefore vital to monitor the possible development of stratification, along with warnings of any unstable stratifications that could occur.

Our flagship software offering is the LNG Rollover Predictor. Although originally designed for land-based storage tanks, it has now been adapted for marine usage. It handles all grades of LNG and estimates the evolution of the chemical composition in real time. It can therefore calculate the development of any stratification and if necessary generate an alarm.

Fully automatic

The LNG Rollover Predictor needs a chemical composition in order to trigger the calculation process (manual entry). This data is manually imported into the software by the terminal's operator, based on the surveyor's report (LNG carrier) or collected from the DCS when a gas chromatograph is available.

Svanehøj Tank Control Systems has addressed this operational challenge by connecting the rollover prediction platform to the terminal's distributed control system (DCS) that provide the chemical compositions, gathered from the

terminal's sampling units (semi-automatic mode). The latest version of the LNG Rollover Predictor goes beyond the current limits by enabling the chemical composition calculation based on measured parameters (density, temperature and operating pressure). It makes the system very unique and fully automatic, thus avoiding the terminal's operator to interface with rollover prevention software.

The key features and benefits of the Svanehøj Whessoe LNG Rollover Predictor include:

- Monitoring of all components that could affect LNG stratification.
- Accurate prediction of stratification and rollover phenomena.
- Detection of a rollover for up to 30 days at a time.
- The ability to make the right decisions at the right time – so that any corrective action can be taken.



Field service

Svanehøj Tank Control Systems provides trustworthy and reliable services for gas and hydrocarbon tank instrumentation systems. Our team of experts service Whessoe equipment during the annual maintenance and if unexpected breakdowns occur. Svanehøj Tank Control Systems is the official brand and the right partner to service your instrumentation system. Svanehøj's service network reaches almost all corners to support our customers globally.

Troubleshooting

In the case of breakdowns or failures we offer fast and effective root cause analyses and repair. Our experts analyse all of your instrumentation equipment and operational pattern to identify the cause of the incident.

Immediate repair

Fully-equipped with the necessary tools and parts, our engineers can provide imediate repairs of your tank gauging equipment when on site.

We continually invest in educating our engineers, who are trained to offer advanced maintenance and repairs, no matter how complex the issue.

On-site training

As a benefit to having our engineers at site we offer on-site training of your operational and maintenance teams in the operation and general maintenance of your tank gauging system. This will make sure that your installations perform efficiently and reduce potential maintenance costs in your day-to-day operations.

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