



# SOLVING THE SEVEN MOST COMMON TANK GAUGING PROBLEMS

Many terminals and tank farms struggle with tank gauging because they use outdated equipment, resulting in unreliable operations, inefficient routines and high operational costs. However, modern tank gauging systems can solve these issues, resulting in improved performance and profitability.

When handling large volumes of liquids, it is imperative for refineries, chemical plants and bulk liquid storage terminal operators to know precisely how much product is in any given tank. When products change hands or are moved in or out of tanks, the monetary values involved can be enormous. Despite this, the devices and systems used to gauge tank contents often receive insufficient attention.

One of the main reasons for this is that those responsible for inventory management and custody transfer often believe the technologies in these systems are static and there is little to gain from making improvements. As a result, they settle into familiar but ineffective work practices, believing the inefficiencies and uncertainties they deal with are simply part of their daily life.

Many facilities still depend on manual procedures and inefficient systems, and large numbers of devices don't operate accurately or reliably enough.

## COMMON PROBLEMS

These are the seven most common issues that can affect tank gauging performance:

1. Systems lack scalability and flexibility
2. Inadequate safety systems
3. Inaccurate measurements
4. Obsolete components
5. Complicated software
6. Mechanical systems require frequent maintenance
7. Non-existent lifecycle support

Fortunately, modern tank gauging systems can solve all these problems, resulting in significant operational improvements and financial benefits.

## PROBLEM 1 - SYSTEMS LACK SCALABILITY AND FLEXIBILITY

Keeping track of a large group of tanks requires a tank gauging system able to bring all the level and temperature measurements into one place, and convert each tank's readings to net volume. Older systems lack flexibility to use different gauging technologies, and lack the scalability necessary to add devices, instruments and measurements.

## SOLUTION

Today's systems can work with a wide variety of new and old measuring technologies, and they make adding new devices much easier. Selecting tank gauging devices should not be a one-size-fits-all approach, and there are a wide range of radar gauges available to solve specific problems related to different types of tanks and contents. These devices can be networked using various protocols to seamlessly interface with the distributed control system, the supervisory control and data acquisition system, and the safety instrumented system.

Current software, such as the Rosemount TankMaster platform, can work with a variety of old and current protocols, bringing together many product families and specialised field devices. A data concentrator can

combine the data from multiple field devices connected to a specific tank, or even a group of tanks, to make the installation cost-effective and reliable. Level gauges, temperature sensors and other devices can be combined so they are accessible in a new or legacy network.

In many cases, wireless communication can extend sensing and monitoring capabilities without major additions to the existing wired infrastructure. Wireless communication enables a step-by-step improvement of the technical level without heavy investments.

## PROBLEM 2 - INADEQUATE SAFETY SYSTEMS

Many plants and tank farms were built before the current safety standards were widely distributed and followed. Overfill protection might be nothing more than strategically placed mechanical switches designed to stop the flow in the nick of time. Unfortunately, few of these meet the requirements of IEC 61508/61511, and bringing older equipment into compliance is now more critical.

## SOLUTION

Modern radar level gauges provide a safety system with continuous surveillance of a tank's contents. They are certified and proven in use for storage tank safety applications, and are a critical part of an IEC 61508/61511, SIL 2 or SIL 3, as well as an API 2350 compliant system.

Models such as Emerson's Rosemount 5900S 2-in-1 can serve the same function as two devices: one for normal level monitoring as required by the tank gauging system, and a second safety measurement in compliance with API 2350 and IEC 61511 with a SIS/SIL certificate. Both measurements are continuous, accurate and reliable, and function completely independent of each other.

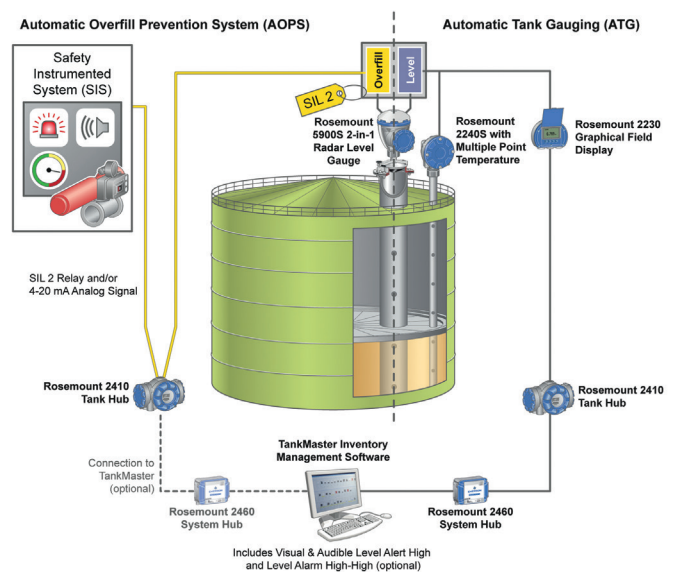


Figure one: Two independent radar gauges in one tank opening

## PROBLEM 3 - INACCURATE MEASUREMENTS

In many custody transfer applications, the level and temperature measurement is the sole basis for calculating how much product has changed

hands. Given the size of many storage tanks, a difference of a millimetre or two in level measurement could equal thousands of barrels. A measurement discrepancy can therefore cause the operator a significant inventory loss, or leave the customer shorted.

**SOLUTION**

Today's radar level gauges are capable of repeatable accuracy with an error range less than 0.5 millimetres, which exceeds regulatory requirements. Corresponding tank gauging systems can incorporate secondary measurements such as temperature to deliver the precise total quantity by either mass or volume. Using a precise radar gauge can deliver a 180% reduction in volume uncertainty over traditional methods such as float-and-tape.

**PROBLEM 4 - OBSOLETE COMPONENTS**

The level gauging devices mounted on many tanks date back to original construction. Some may have been updated, but at many facilities few have been replaced unless there have been complete failures.

**SOLUTION**

Radar gauges can work with old tank gauging systems using an emulation mode. New radar devices can be programmed to respond like a float-and-tape or servo unit if necessary to work with the existing inventory management system. So even if the existing system is old and cannot readily handle new technologies, the new gauging devices can still deliver improved accuracy and reduced maintenance headaches. When the overall tank gauging system is upgraded, the emulation capability can be turned off, allowing the new instrument to deliver its full range of information and diagnostics.

Adding new wired instruments is the traditional method for creating a new measurement point, however wireless instruments are a convenient alternative. Emulation and wireless make it practical to upgrade a system incrementally, bit by bit as the situation demands, or as funds are available. It is not necessary to launch a large-scale CAPEX project to fix everything at once.



Figure 2: Modern radar level gauges can be installed in existing tank nozzles and interface with existing management systems

**PROBLEM 5 COMPLICATED SOFTWARE**

For some facilities, bolting on a new tank level instrument might be the easiest part of the process. Getting the new instrument to communicate with the tank gauging system so it can process the signal and send it to the right place might be more difficult. Inventory management software should be straightforward and easy to use, providing the calculations necessary to convert level and temperature measurements to net volume.

**SOLUTION**

Newer platforms such as Rosemount TankMaster software are easy to

use, with intuitive programming and human-machine interfaces, and they integrate seamlessly with higher level process control and enterprise-level systems. In addition to reading levels and collecting data, such platforms can provide integrated inventory management capabilities, including API tables, net standard volumes, custody transfer approvals, batch handling, and automated and manually generated reports.

**PROBLEM 6 - MECHANICAL SYSTEMS REQUIRE FREQUENT MAINTENANCE**

Traditional level measuring devices are mechanical, with many moving parts. Consequently, there is always the risk of malfunctions that could cause the mechanism to jam, or readings to be affected.

**SOLUTION**

Newer level gauging technologies have no moving parts and nothing extending into the liquid. Non-contacting radar units barely extend into the tank and have no moving parts. Many radar level instrument configurations have self-diagnosing capabilities able to determine if the antenna parts are getting coated with dirt or build-up. A loss of signal strength is an indicator of fouling, and can warn of accumulations long before they affect the device's accuracy. For many radar instruments, mean time between failures for critical parts is measured in decades.

**PROBLEM 7 - NON-EXISTENT LIFECYCLE SUPPORT**

When systems contain a hodgepodge of equipment, getting one company to help with an issue can be a challenge. Buying from a variety of suppliers isn't always planned and often happens on a piecemeal basis, but can result in erratic and generally poor support. Some operators therefore want to have one supplier responsible for the entire tank gauging system, but often find this isn't practical if that company can't provide the range of products and services necessary.

**SOLUTION**

Adopt a lifecycle strategy developed in partnership with the right kind of supplier. Working with a company capable of providing the right products and ongoing support creates a high degree of reliability and system performance.



Figure 3: Partner with a trusted advisor knowing your business

These seven most common tank gauging problems can all be effectively addressed. The first step is connecting with the right partner – a supplier able to provide an open and scalable tank gauging system, including a full range of level and temperature measuring instruments, along with all the necessary supporting networking hardware for new and installed equipment. To make it all work seamlessly, a comprehensive and flexible inventory management software platform is needed to tie everything together. This type of system lets you take control of your terminal or tank farm, enabled by superior accuracy, reliability and overfill prevention.

**FOR MORE INFORMATION**

This article was written by Ulf Johannesson, manager product marketing tank gauging, Emerson.

[www.EmersonProcess.com/Rosemount-TankGauging](http://www.EmersonProcess.com/Rosemount-TankGauging)