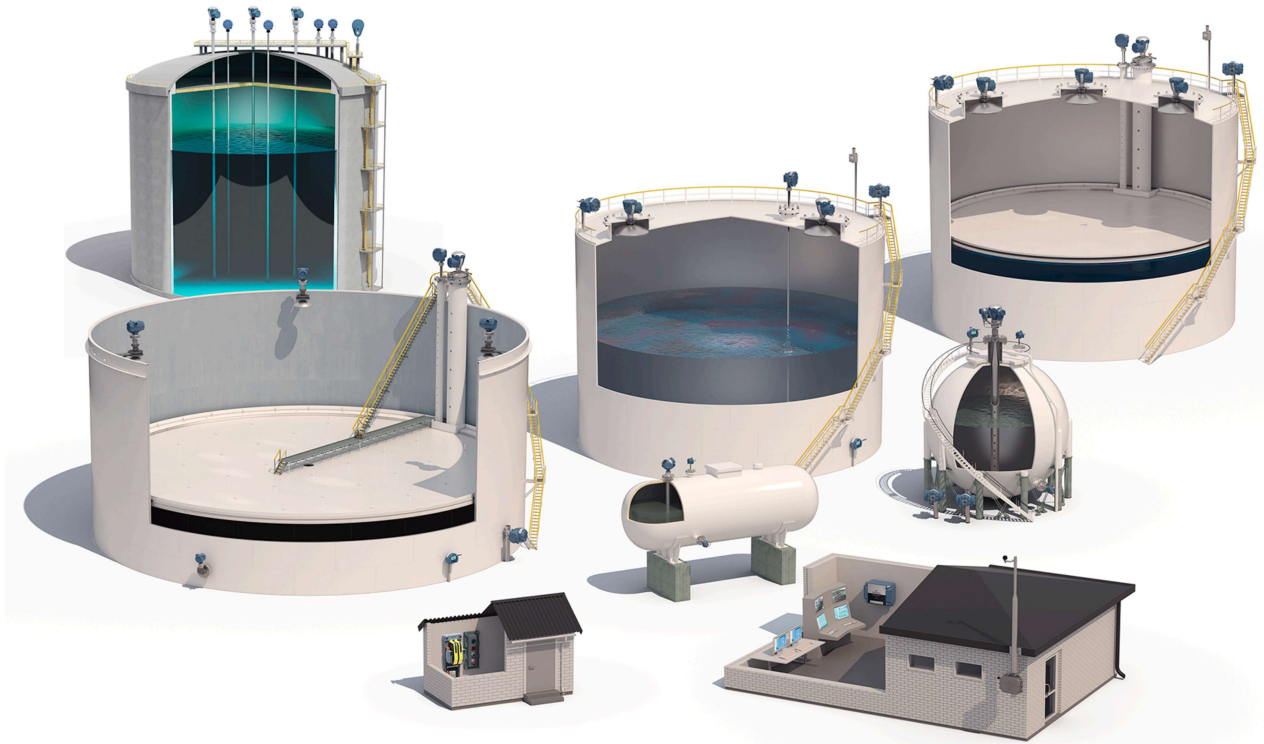


# Rosemount™ Tank Gauging System

High-performance bulk liquid measurement  
and overfill prevention



## Secure efficient operations and reduce risk with scalable and open architecture tank gauging technology

- Get certified custody transfer accuracy based on innovative radar technology
- Comply with safety and overfill prevention standards such as API 2350 and IEC 61511
- Simplify automation and expansion with Emerson wireless solutions
- Improve inventory management and oil movement operations
- Use emulation to easily replace old gauges from other vendors

# What if you could meet every challenge today and tomorrow?

## Protect the value of your investment

There are always new challenges to face in a tank storage facility. Expansion or refurbishing projects mean you have to connect new equipment to your installation. This is also the case when you replace damaged or outdated technology. Emerson’s Rosemount Tank Gauging System lets you meet your challenges so you can increase plant efficiency and protect the value of your assets.

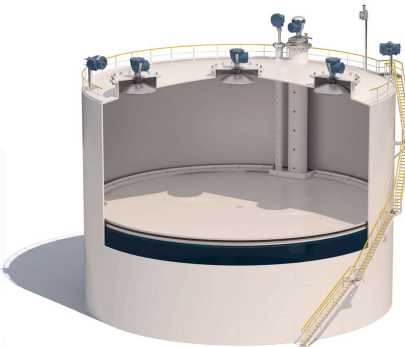
## Works everywhere

The Rosemount Tank Gauging System is suitable for all applications and tank types: pressurized or non-pressurized, with fixed or floating roofs. Applications include bulk liquid storage tanks in:

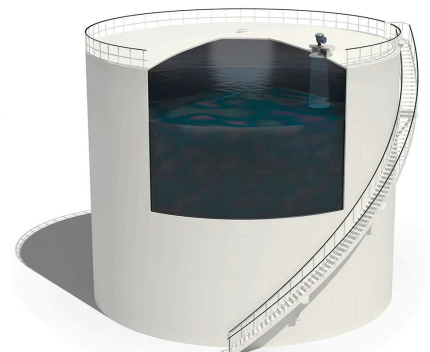
- Tank storage terminals
- Refineries
- Aviation fuel depots
- Lube oil depots
- Full containment storage tanks storing LNG and other liquefied gases
- Petrochemical industries
- Biofuel plants
- Vegetable oil depots
- Distilleries
- Power plants



Floating roof tank



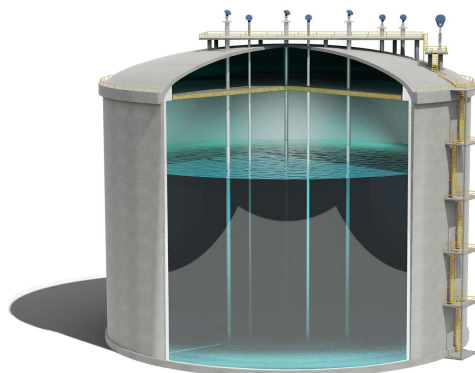
Floating roof tank



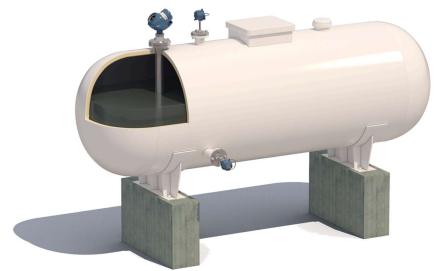
Fixed roof tank



Pressurized LPG tank



Full containment storage tank



Bullet tank

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# System overview

The Rosemount Tank Gauging System measures and calculates tank data for custody transfer, inventory management, product movement, mass balance and loss control, as well as leak detection and overfill prevention.

Functions include:

- Complete inventory management and custody transfer functions as per OIML and API standards
- Multiple spot temperature measurement
- Free water interface level measurement
- Vapor pressure and hydrostatic pressure measurement giving online density
- IEC 61508 certified SIL2/SIL3 independent overfill prevention
- Interoperability with all major DCS and host systems
- Automatic proof-testing without affecting tank operations
- Floating roof monitoring
- Support for full containment storage tanks, including features for roll-over prediction and stratification



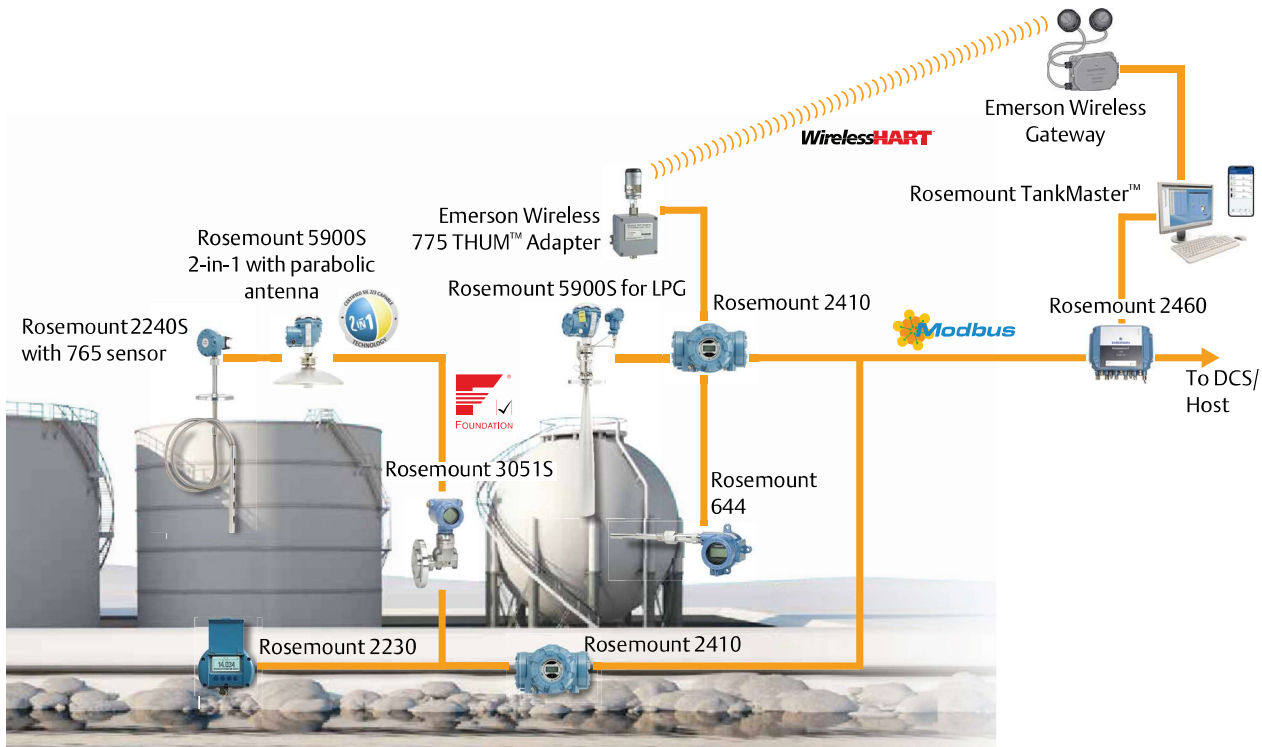
**Inventory Control & Tank Operations Monitoring**  
Inventory management, oil movement, blending.



**Certified Transfer**  
OIML and local certificates, custody transfer and internal transfer. High precision.



**Overfill Prevention**  
Overfill protection safety, floating roof monitoring, leak detection.



The two-wire Intrinsically Safe (IS) self-configuring Tankbus enables cost-efficient and safe installation.

# Make the most of your tank farm

## Boost plant efficiency

Having access to reliable and accurate real-time tank inventory data is key to high plant productivity. Operators can handle more tanks, and safely fill them higher to better utilize the storage capacity. Rosemount Tank Gauging System is based on a scalable technology with open architecture, allowing you to improve efficiency step by step.

- Possible to combine devices freely including devices from previous systems
- Automatic configuration of devices speeds up commissioning
- Wired and wireless networks can co-exist within the same system
- Installation can be done with tanks in operation (except for pressurized tanks)
- Rosemount TankMaster Mobile gives you access to live inventory data, whenever and wherever you need it



## Raise the level of safety

Lawmakers, corporate management, insurance companies, members of the community – demands for increased safety come from just about everywhere. Rosemount Tank Gauging System allows you to meet existing and future requirements at the same time as you protect plant assets, the environment, and human lives.

- Continuous surveillance – radar level gauges are always in operation
- Two-wire intrinsically safe cabling on tanks
- IEC 61508 certified SIL 2 and SIL 3 capable level and alarm output devices
- 2-in-1 gauging allowing simultaneous level measurement and independent alarm functionality
- API 2350 overfill prevention guidelines and expertise available whenever you need it
- Remote proof-testing without affecting the process
- Continuous automatic monitoring of floating roofs
- Cool-down control, leak and stratification detection for liquefied gas



*Certified SIL 2 or SIL 3 capable overfill safety*



*Unique 2-in-1 solution with full separation*

## Ensure precise measurements

The Rosemount Tank Gauging System gives you precise data for certified custody transfer, inventory management, and loss control. The level measurement accuracy of  $\pm 0.5$  mm (0.02 in.), together with the highest precision average temperature measurement, ensures exact net volume calculations. In cases where medium accuracy is sufficient, we offer a number of cost-effective gauging instruments.

- Level gauges with no moving parts and only the antenna inside the tank
- Custody transfer certification by OIML as well as many national institutes
- Precise measurement lets you stay in control of the inventory and custody transfer
- Keep accurate track of leaks and overfills



Transmitter for three- or four-wire calibrated average temperature sensors



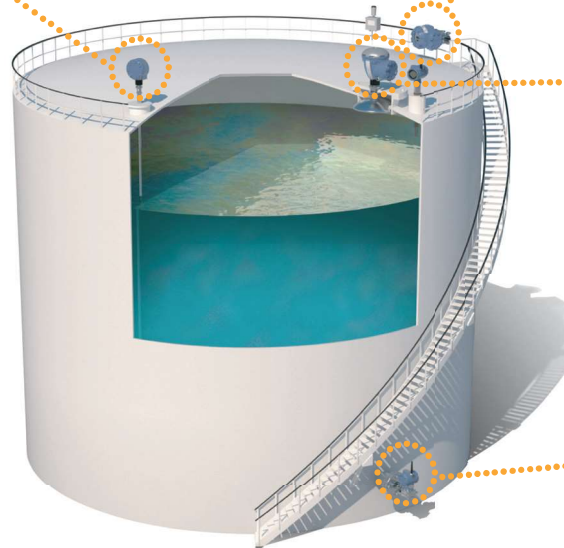
Display and communication hub for wired and wireless data



Ultra-precise radar level



Pressure measurement for online mass and density

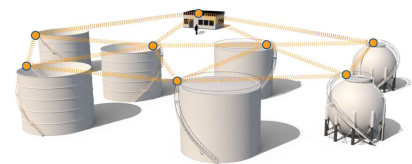


# Use modern technology to go further

## Reach more tanks at less cost

Wireless tank gauging allows for installation cost savings by up to 70 percent. The Rosemount Tank Gauging System supports Emerson’s wireless technology, based on the wireless field network industry standard IEC 62591 (*WirelessHART®*). The wireless network is self-organizing and automatically finds the best way around any obstacle.

**WirelessHART**



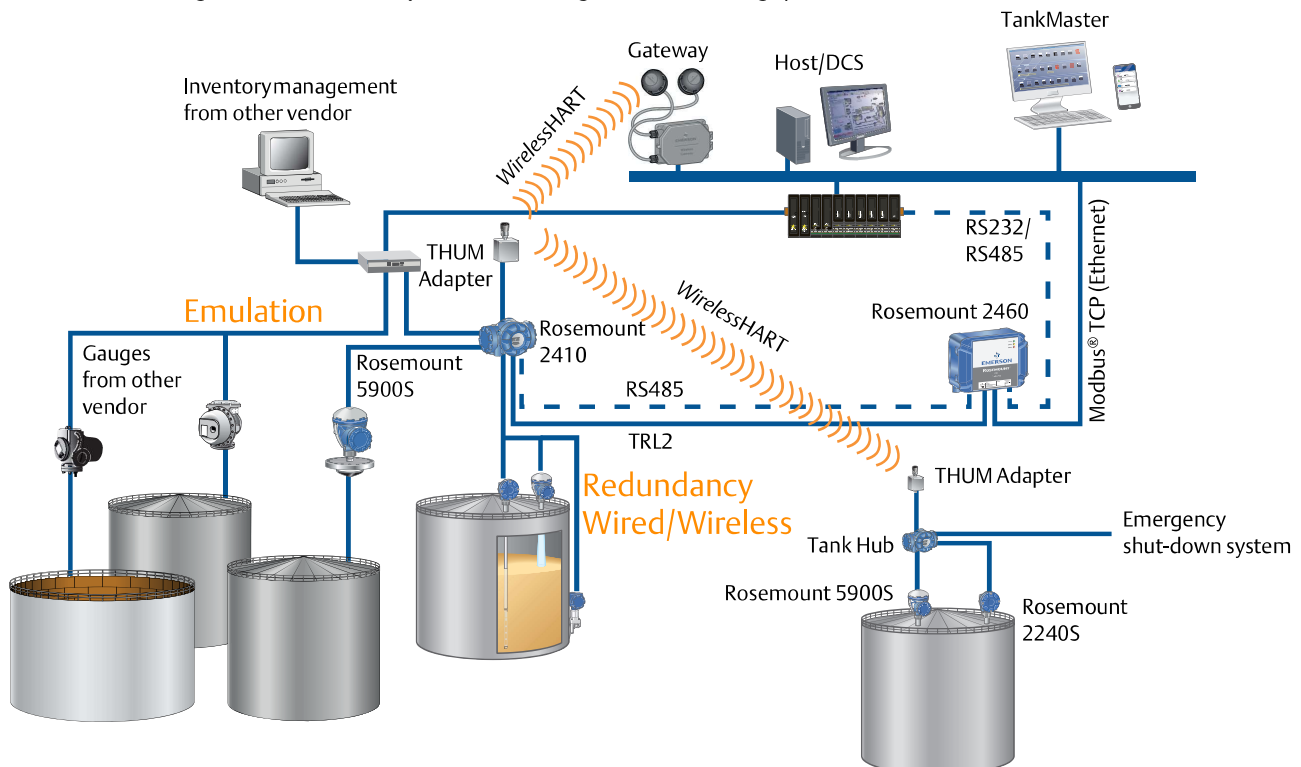
Wireless data transmission gives you a lot of benefits and opportunities:

- No need for digging and trenching in a potentially complicated and dangerous tank environment
- Possible to connect tanks located far away and divided by water or roads
- Easy to automate all bulk liquid storage measurement
- Redundant communication can be created without time-consuming cabling work
- Downtime for expansion, upgrading, and maintenance is kept to a minimum

## Meet the future with emulation

Emulation technology lets you replace old level gauges from all major vendors, with modern radar-based tank gauging using your existing field wiring and host system.

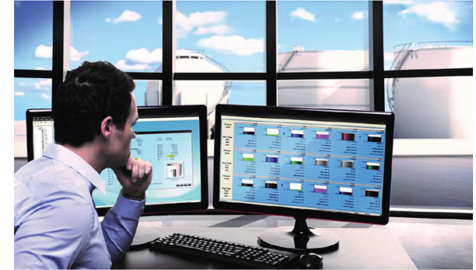
- Easy way to upgrade your tank gauging system at a pace that suits you
- New and accurate devices make it possible to improve efficiency and safety
- Precise data strengthens tank inventory control allowing increased throughput



## Stay in control with Rosemount TankMaster

TankMaster is a powerful, easy-to-use Windows™-based inventory management software package. It is easy to configure with no software engineering time required. Data can be shared with users on all levels and information can be accessed wherever you are. Graphic plant layout with customized views for efficient operations:

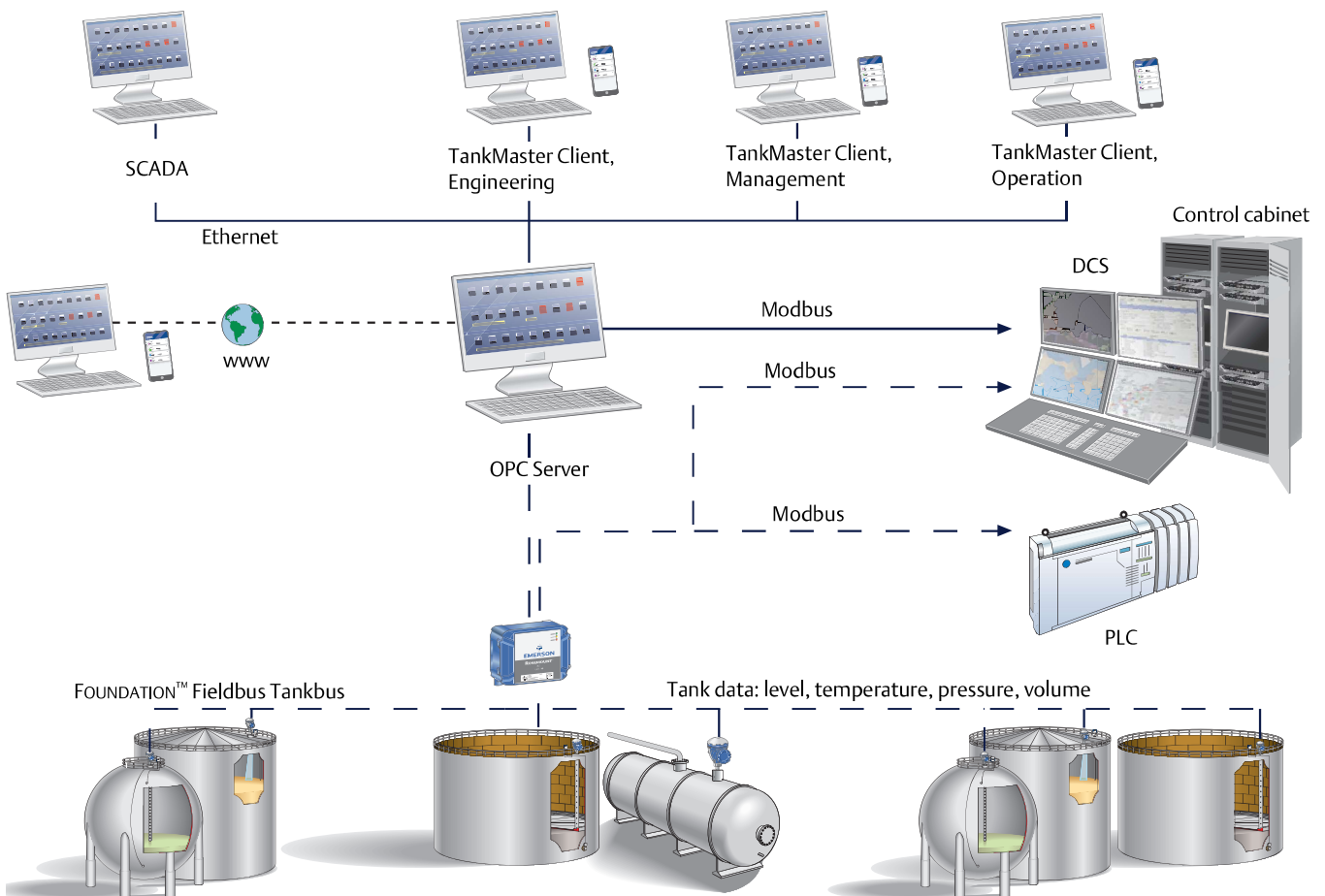
- Gives the operator a complete tank content overview
- Provides inventory and custody transfer functions with API net volume calculations
- Collects all tank gauging data from the measurement devices on the tanks
- Offers alarm handling and reporting
- Allows proof-testing from the control room
- Provides system configuration and service



## Rosemount TankMaster Mobile provides immediate access to inventory data

Rosemount TankMaster Mobile is an application for remote monitoring of tank farms. It's an add-on to the Rosemount TankMaster Inventory Management software, adding mobility, sharing, and networking. TankMaster Mobile provides operational information available whenever and wherever you need it:

- Easy-to-use web application optimized for computer, tablet, and smartphone
- Instant overview of your tank farm and fast drill down to details
- Cyber secure solution



*TankMaster distributes essential inventory tank gauging data.*

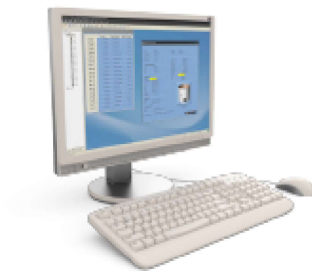
# Key devices for tank gauging

For decades, Rosemount radar level gauges have been the obvious choice when precision is critical. The 5900S gauge builds upon this legacy by offering level measurement accuracy of  $\pm 0.5$  mm (0.02 in.). Even if accuracy is important, the need can vary. This is why we include gauging solutions for both demanding custody transfer with full inventory management functionality as well as applications where accuracy is less critical. See [Appendix A](#) for list/links to product data sheets for each device.

## Inventory Management Softwares

### TankMaster Inventory Management Software

Gain control over your inventory data. In addition, use it for system configuration and remote proof-testing.



### TankMaster Mobile Inventory Management Software

Rosemount TankMaster Mobile is an application for remote monitoring of tank farms. It's an add-on to the Rosemount TankMaster Inventory Management software, adding mobility, sharing, and networking.



## Radar level gauges

### Rosemount 5900S Radar Level Gauge

Non-contacting,  $\pm 0.5$  mm (0.02 in.) ultra-high performance level measurement. Antennas available for all tank types.



### Rosemount 5900C Radar Level Gauge

Reliable  $\pm 2$  mm (0.08 in.) non-contacting measurement. Antennas available for all tank types.



### Rosemount 5300 and 5408 Radar Level Transmitters

Guided wave radar and non-contacting radar level transmitters for medium accuracy, non-inventory grade applications.



## Temperature and free water level

### Rosemount 2240S Multi-input Temperature Transmitter

Ultra-stable temperature measurement. Connects up to 16 spot temperature sensors for average liquid temperature measurement and online temperature stratification monitoring.



For measuring shell temperature in cryogenic applications, the flange connection is designed to allow connection of separate individual spot sensors.



### Rosemount 565, 566, 765, and 614 Sensors

Four-wire calibrated temperature sensors and free water level measurement. Up to 16 Pt-100 spot elements per sensor/transmitter.



### Rosemount 644 Temperature Transmitter

For single-point temperature measurement.



### Rosemount 214C Single Point Temperature Sensors

For single-point Pt-100 temperature measurement.



## Pressure

### Rosemount 3051S Pressure Transmitter

Enables online density, mass, and vapor pressure measurement.



## Communication and accessories

### Rosemount 2410 Tank Hub

Collects and transfers data from one or several tanks. Enables emulation, wireless communication and SIL certified overfill prevention.



### Rosemount 2460 System Hub

Transfers tank gauging data to TankMaster Inventory Management System and to Host/DCS.



### Rosemount 2230 Graphical Field Display

Remote data access at tank top or ground level.



### Rosemount 2100 Series Liquid Level Switch

Alternative option with point level switch when gauge in constant operation is not used for overfill prevention.



## Rosemount 2180 Field Bus Modem

Used for connecting a TankMaster PC to the TRL2 field bus (if not using the system hub).



## Emerson Wireless Gateway

Connects wireless self-organizing networks with any host system.



## Emerson Wireless 775 THUM Adapter

Adds wireless to all measurement points.



## Connection Cabinets

Customized cabinets for wiring connections, communication devices and servers.



## System functions

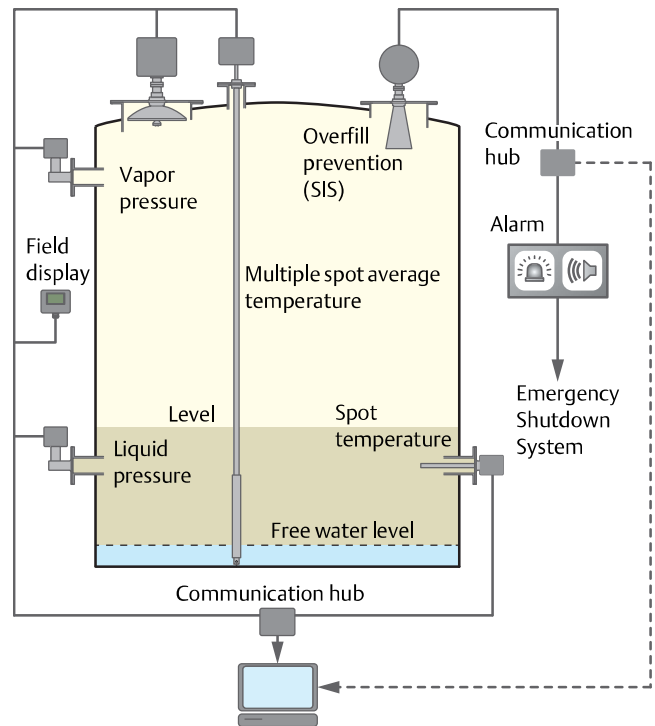
The Rosemount Tank Gauging System performs a number of important tank storage facility functions. The exact scope can vary according to specific user requirements. (For a more detailed list of inventory management functions, see Rosemount TankMaster Inventory Management Software [Product Data Sheet](#), document number 00813-0100-5110.)

### Measurements

- Tank level
- Level rate
- Free water level (interface)
- Average liquid temperature (only elements in liquid are considered)
- Spot temperature
- Temperature for cool-down monitoring and leak detection in LNG and other cryogenic tanks
- Vapor and liquid pressure
- Density
- Gross volume based on up to 5000 strapping points
- Net volume according to API standards
- Mass
- Floating roof position

### Data communication functions

- Communication with other systems, DCS, SCADA, PLC, Enterprise system etc (Ethernet, RS485/232, Modbus TCP/RTU etc)
- Emulation of other vendor’s field bus/gauges
- Emulation or other vendor’s control room HMI
- Modbus or FOUNDATION Fieldbus wired transmission of data
- WirelessHART transmission of data



*Inventory Management, custody transfer, net volume, gross volume, density, mass, etc.*

### Other functions

- Operator graphics and Human Machine Interface
- Web application for computer, tablet, and smartphone
- Alarm handling
- Relay outputs for overfill prevention alarms (SIL)
- 4-20 mA SIL output
- Relay outputs for overfill prevention and other alarms (non-SIL)
- Remote proof-testing
- Leak alarms
- Batch reporting
- Log reports
- Mass balance reports
- Historical data sampling
- Floating roof monitoring
- System configuration and setup
- Product temperature profile including product stratification monitoring and alarming
- Roll-over prediction

# Technology

## Radar level gauging

Rosemount radar level gauges provide outstanding reliability with no moving parts and only the antenna inside the tank.

For radar level measurement, there are mainly two modulation techniques:

- Frequency Modulated Continuous Wave, FMCW:** Used by high-performance radar level gauges. Rosemount 5900S uses FMCW, together with digital reference and filter technology, which enables custody transfer accuracy.
- Pulse method:** Measures the time it takes for a pulse to travel to the surface and back. The time difference is converted to a distance, from which the level is calculated. One special case of the pulse method is the Time Domain Reflectometry (TDR) technology, as used in Rosemount 5300, where a low-power nano-second pulse is guided down a probe towards the process media surface, where it is reflected back.

The radar gauge/transmitter consists of a transmitter head and an antenna. The transmitter head can be combined with any antenna type in the same gauge series, minimizing spare parts requirements. No matching of transmitter head and antenna is required, which means the transmitter head can easily be replaced without opening the tank.

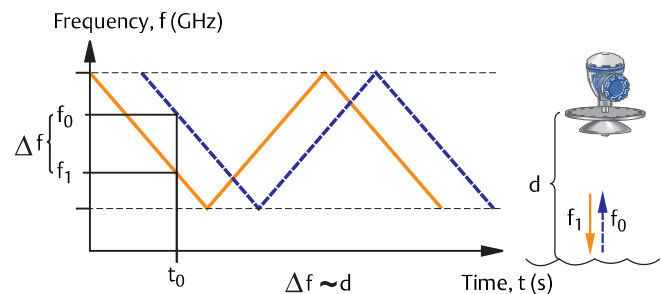
### The FMCW method

The FMCW-based radar gauge transmits microwaves toward the surface of the liquid. The microwave signal has a precise linear frequency variation.

When the signal has traveled down to the liquid surface and back to the antenna, it is mixed with the signal that is being transmitted at that moment.

The reflection from the liquid surface has a slightly different frequency compared with the signal transmitted from the antenna.

The difference in frequency is measured, and it is directly proportional to the distance to the liquid surface. This technology provides a measured value with high accuracy.



### Technology for real-world tank applications

Since the Rosemount 5900 Series antennas have an inclined polished surface where microwaves are emitted, they are less susceptible to condensed water or product. The drops of condensation do not cover the active part of the antenna, and the radar signal is not attenuated. This results in higher accuracy and better reliability.



Antenna design with no horizontal surfaces according to the American Petroleum Institute Standard (API ch. 3.1B ed.1).

The Rosemount 5900 Series radar level gauges with parabolic antennas are designed also for harsh environments like bitumen tanks.



*The antenna is in operation after having been exposed to blown bitumen at 220 °C (430 °F) for several months.*

The Rosemount 5900 Series with still-pipe array antenna uses the Low Loss Mode technology transmitting radar waves close to the pipe centerline. This technology virtually eliminates signal and accuracy degradation due to rust and product deposits on the inside of the pipe wall.



*The Low Loss Mode enables full accuracy also in old and worn still-pipes.*

For best measurement performance in LPG applications, an integrated pressure sensor enables corrections for vapor influence. Measurements in closed tanks with liquefied gases including LNG can be verified using a permanently installed verification pin with a known distance to the antenna.



*The still-pipe used for LNG and LPG ensures adequate signal strength from the surface, also when the liquid is boiling.*



*Antenna design with no horizontal surfaces according to the American Petroleum Institute Standard (API ch. 3.1B ed.1).*

## Open and scalable system architecture

The system can include a wide range of devices making it easy to build a large or small customized tank gauging system. Thanks to the modular design, a system can easily be expanded or upgraded.

All field devices are connected on the Tankbus, which is based on the open FOUNDATION Fieldbus industry standard.

### Lower cost and easier commissioning

The Rosemount Tank Gauging System supports plug-and-play technology for trouble-free installation.

All fieldbus segments in a system are autoconfigured minimizing the need for specific FOUNDATION Fieldbus knowledge.

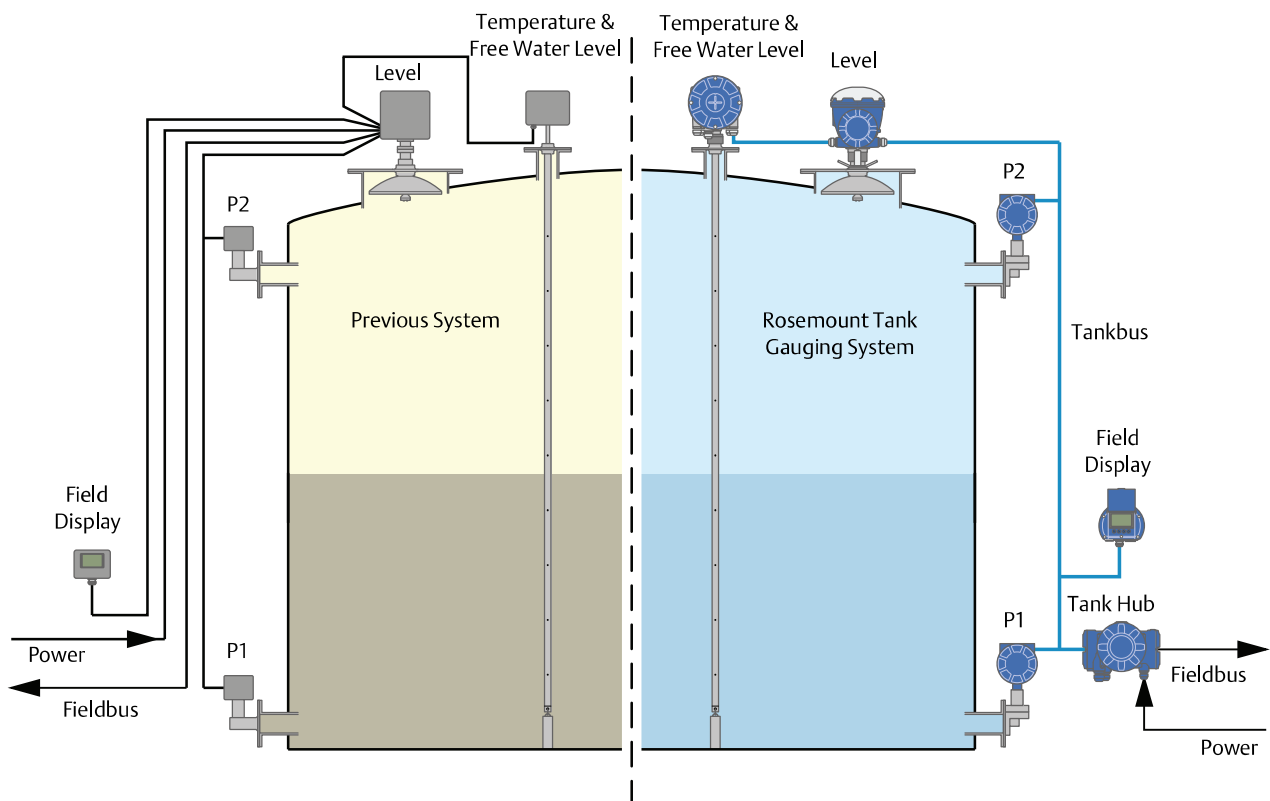
The existing field cabling can normally be used. No special tools are required, and all parts can easily be carried to the tank roof.

Installation can be done with tanks in operation, except for cryogenic storage and pressurized tanks such as Liquefied Petroleum Gas (LPG) tanks.

### Intrinsically safe cabling on tank

The system is designed to minimize power consumption, which enables the use of two-wire intrinsically safe technology. The field devices are powered by the Tankbus via the Rosemount 2410 Tank Hub using FISCO (FOUNDATION Fieldbus Intrinsically Safe Concept). This solution has several advantages:

- Increased safety at system start-up and operation
- Quicker and easier installation due to less cabling
- Cable usage without conduits

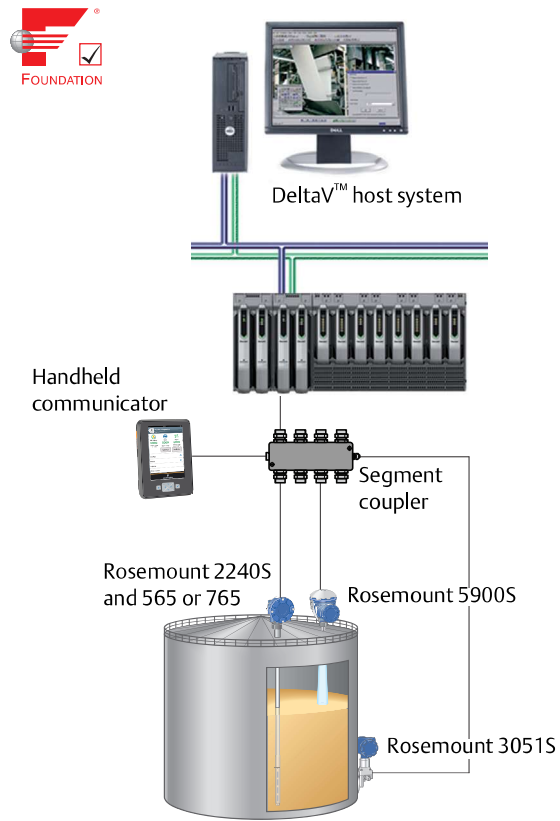


### Integration with other systems

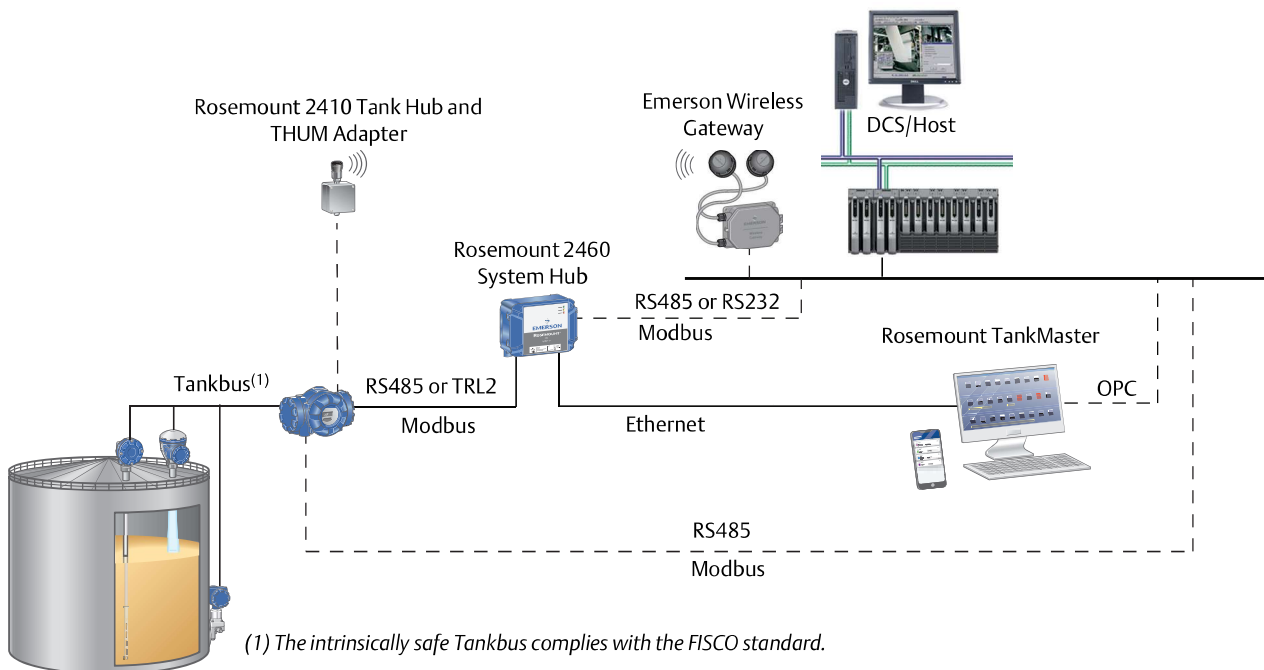
The Rosemount system can be connected to all major suppliers of DCS, SCADA systems, plant host computers, or terminal automation systems. Integration can be made in several ways via:

- TankMaster PC
- Rosemount 2460 System Hub
- Rosemount 2410 Tank Hub
- Direct connection to the tank devices if the host system is based on FOUNDATION Fieldbus (no Rosemount 2410 or Rosemount 2460 hub included in this case)

Using a connection to TankMaster gives the advantage of communicating both measured values and comprehensive inventory data. The Rosemount 2460 system hub can also provide inventory data.



Tank gauging devices connected directly to a FOUNDATION Fieldbus host system.



(1) The intrinsically safe Tankbus complies with the FISCO standard.

Connection to a host system can be made via Rosemount 2410, Rosemount 2460, a TankMaster PC, or directly.

## Reduce the risk of tank overfills

The Rosemount Tank Gauging System can be used as part of a highly reliable automatic or manual overfill prevention system. In such Safety Instrumented System (SIS) applications, level measurement is duplicated in one Basic Process Control System (BPCS) layer and one independent Functional Safety layer.

The Rosemount 5900 Series gauges and tank hubs are IEC 61508 certified SIL 2 or SIL 3 capable. They include separate certified alarm loop relays or analog output functionality.

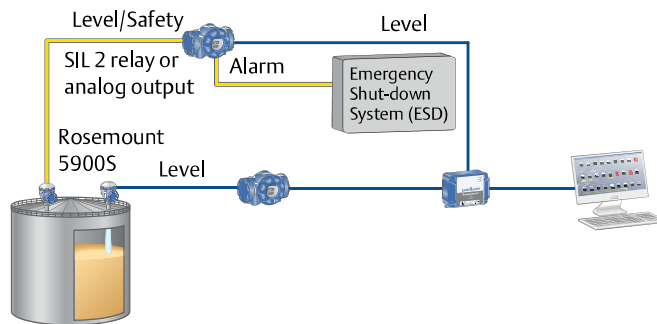
The innovative 2-in-1 technology saves installation cost and reduces complexity by enabling the Rosemount 5900S gauge to provide dual level data in two independent layers of protection using only one housing and a single tank nozzle. The level output from the safety layer sensor is available as redundant level measurement data.

One important advantage is that the Rosemount 5900 Series gauge is in constant operation. Unlike a conventional switch, it provides continuous information about its status and performance, since it is being used in everyday tank farm operations.

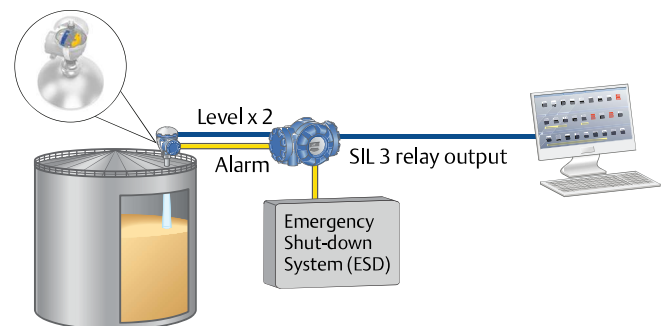
In addition, the alarm level can easily be set to any chosen value.

The level value from the radar level gauge is transferred on the digital bus to a TankMaster PC or other host system, whereas the alarm signal uses the separate relay or analog output in the Tank Hub. Follow the recommendations in the Safety Manual (document number 00809-0200-5100). See also some available SIS/BPCS configuration examples on page 25 to 28.

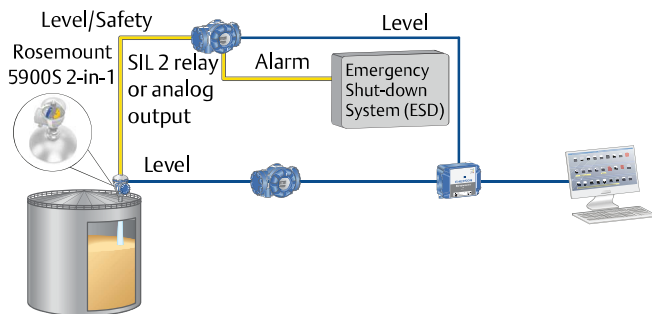
The Rosemount gauging system supports all categories covered by the API 2350 revision 4, which is the first internationally recognized tank gauging standard for overfill prevention. It covers not only instrumentation but also procedures and processes for the whole plant/terminal life cycle, including the requirements for establishing a detailed risk assessment. See “[The Complete Guide to API 2350](#)”, document number 00821-0100-5100 and “[The Engineer’s Guide to Overfill Prevention](#)”, document number 00805-0100-1042.



SIL 2 certified system with dual gauges.



SIL 3 certified system with 2-in-1 gauge.



SIL 2 certified system with 2-in-1 gauge.

The Rosemount 2410:SIS Tank Hub is typically used in combination with Rosemount 2410 single tank hub for an independent SIL certified protection layer.

## Automatic remote proof test

TankMaster includes a proof-test manager, which allows operators to safely perform proof-testing of overfill alarm functionality remotely from the control room. The proof-testing made at regular intervals can be combined with the continuous product level monitoring.

The proof-test manager performs a number of tests:

- High-level alarm verification using a reference reflector
- High-level alarm verification with simulated reference reflector
- One-point level verification by hand-dipping to verify automatic level measurements
- Analog output verification
- Relay output verification

A step-by-step proof-test wizard guides the user through the selected tests.

Once the selected proof-tests are done, a summary will show a list of the performed tests with the results.

The proof-test functionality supports wired systems with Rosemount 2410 tank hubs and Rosemount 5900 gauges, both non-SIL and SIL.

The Rosemount 2230 Graphical Field Display can be used to initiate a pre-configured proof test of a Rosemount 5900 gauge.

### Proof-test report

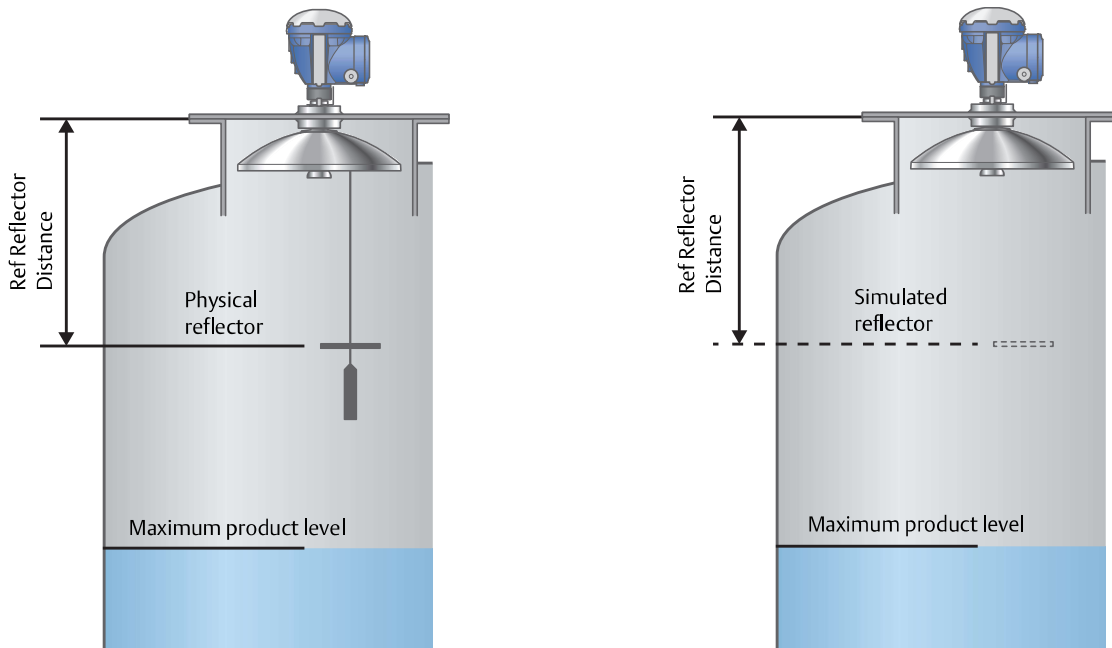
When the proof test is finalized and approved, a test report is automatically created. The test report includes field device-specific information, detailed test results, when the test was performed, who performed the test, and who approved it.

### Proof-test history

All proof-test reports can easily be displayed on a later occasion using the proof-test history option.

### Proof-test scheduling

The proof-test scheduling lets the user specify when the next proof-test should be performed. The test frequency and the desired type of reminder may also be set (pop-up message and/or e-mail).



*The high-level alarm verification proof test can be based on either a simulated reference reflector or a physical reference reflector.*

## Use wireless technology to reach more tanks at less cost

The Rosemount Tank Gauging System supports Emerson's wireless technology, based on IEC 62591 (*WirelessHART*), the industry standard for wireless field networks. Reducing field wiring leads to substantial savings in infrastructure, design, and labor required for installation and commissioning.

In addition, the time between project start-up and an up-and-running wireless system is drastically reduced. Wireless tank gauging allows for cost savings up to 70 percent, and gives other benefits as well.

### Better utilization of tank capacity

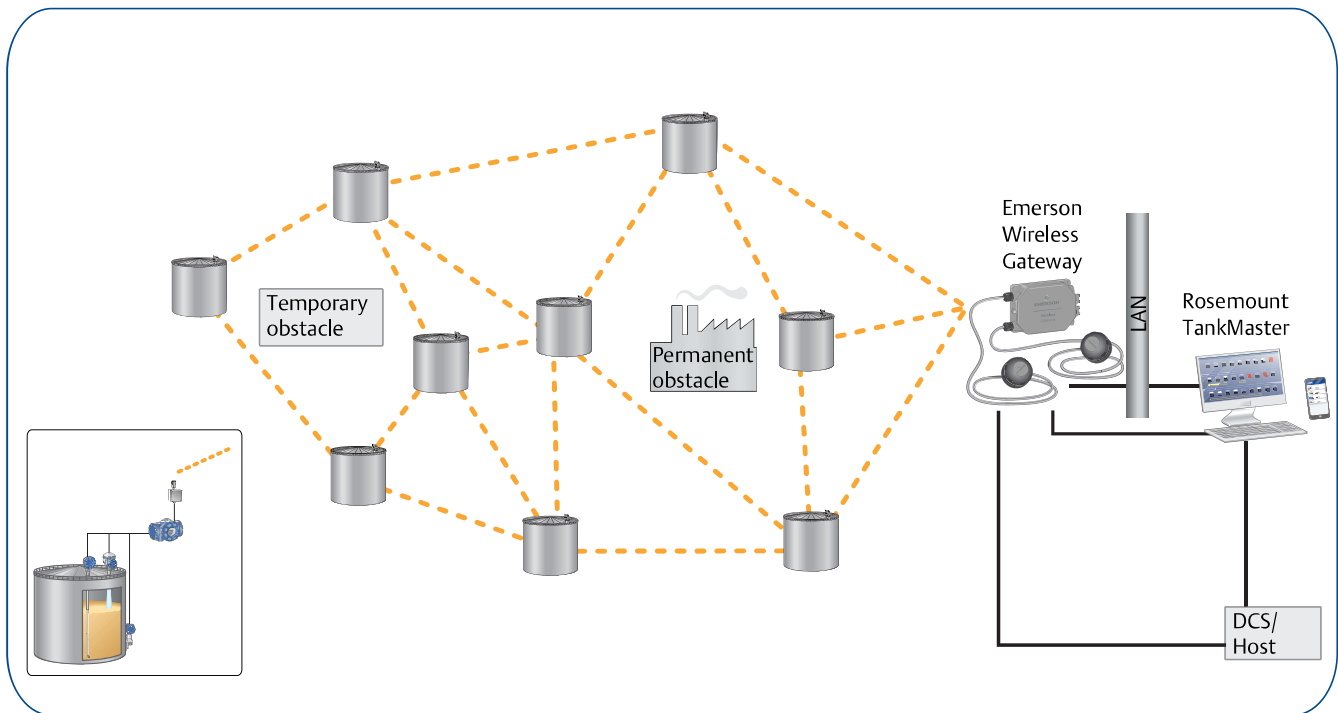
Wireless functionality allows tank gauging data from remotely located tanks, previously collected manually or not at all, to be integrated into the system. This results in a more efficient tank capacity utilization, as well as better inventory and loss control functionality.

### Self-organizing field network increases reliability

A wireless device can transmit its own data as well as relay information from other devices in the network. The self-organizing field network automatically finds the best way around any fixed or temporary obstacle. Nodes can identify a network, join it, and self-organize into dynamic communication paths. Reliability increases when the network expands - the more devices, the more communication paths. For fastest update rate, direct hops to the gateway are required.

### Secure data transmission

Emerson's wireless field network is designed for best-in-class security. Data is protected by 128-bit encryption, authentication, verification, anti-jamming, and key management.



All wireless devices communicate with the host system through the Wireless Gateway. A Rosemount Tank Gauging System can consist of both wired and wireless networks.

## Wireless connection of tank gauging equipment

The Wireless Gateway is the network manager that provides an interface between field devices and the TankMaster inventory software or host/DCS systems.

Each wireless node in the Rosemount Tank Gauging System consists of a Rosemount 2410 Tank Hub and either a Rosemount 5900 Series gauge or one or several Rosemount 5300/5408 transmitters plus the other tank devices. Rosemount 2410 is connected to the mains power, and a THUM Adapter. The tank gauging system can be complemented with other wireless devices such as pressure and temperature transmitters.



*Emerson Wireless Gateway.*

*The wireless transmission supports measurement data handled by the tank devices such as level, temperature, free water level, and pressure.*

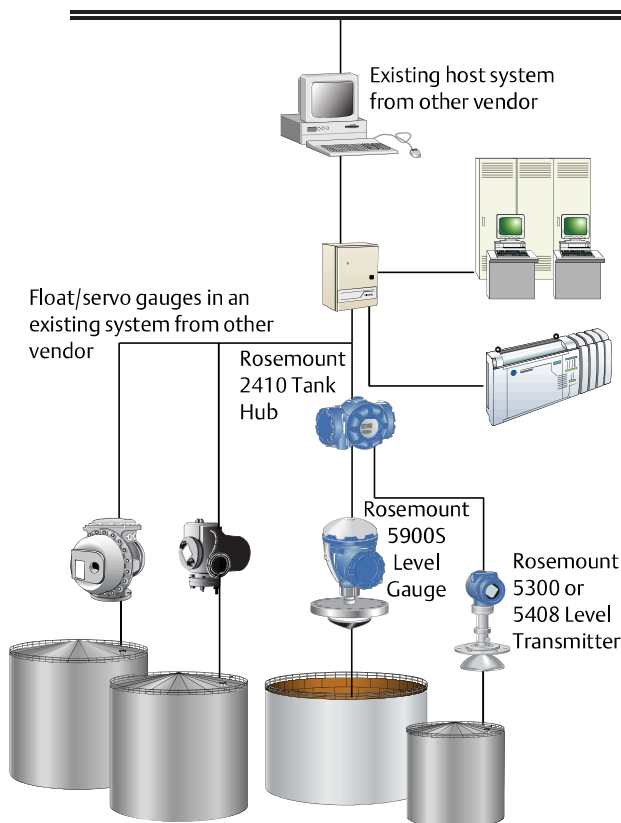
## Easy step-by-step installation using emulation

The Rosemount gauging system is compatible with all other major tank gauge vendors. Step-by-step modernization of an existing tank gauging system is possible using available field and control room solutions.

### Gauge emulation

Many old mechanical float or servo gauges from other vendors can be upgraded with modern Rosemount level and temperature devices and a Rosemount 2410 Tank Hub, using the existing tank openings, field cabling, and control system. By replacing mechanical gauges, it is possible to avoid re-calibration work, the expenses associated with spare parts and maintenance.

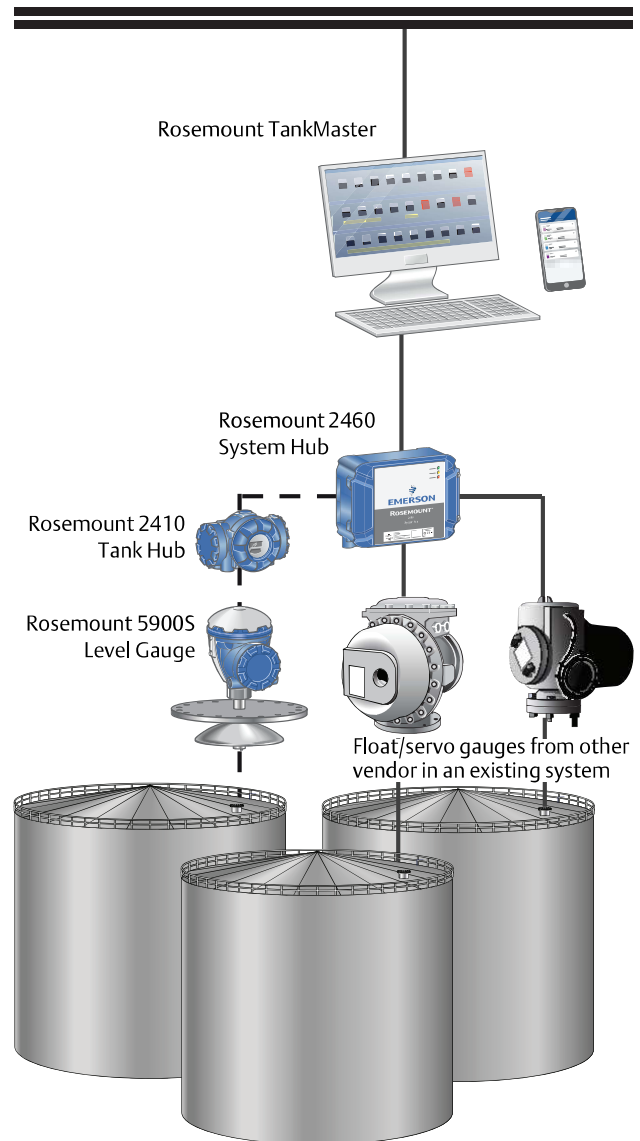
The new radar gauge is normally installed with the tank in operation. No hot work is required. The Rosemount 2410 has an open design, covering everything from electrical interface and communication protocol to utilization of different power sources.



*A Rosemount gauge seamlessly replaces another device, independent of measurement technology. Data from the tank is displayed as before on the existing inventory management system.*

### Seamless control room connectivity

In addition, other tank management systems can be seamlessly replaced with the Rosemount TankMaster software. Since the Rosemount 2460 System Hub supports emulation of other vendors' control room devices, Rosemount TankMaster can replace an existing inventory management system and still be able to communicate with the field devices in use. This solution provides interoperability, and problem-free communication with existing field devices, often with a better update rate than before.

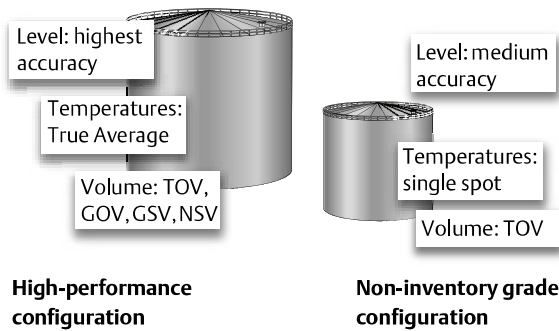


*Replacing old tank monitoring software with TankMaster.*

## Tank gauging as a system application

Tank gauging is an integrated system application, which has specific requirements on the measuring devices in the system. These requirements vary depending on how the system is used. A Rosemount gauging system can be configured with highest accuracy for custody transfer/inventory control, or with medium accuracy required for less critical applications.

- Custody transfer
- Inventory control
- Oil movement/operations
- Overfill prevention
- Leak detection
- Oil movement/operations
- Overfill prevention



### High-performance inventory and custody transfer applications

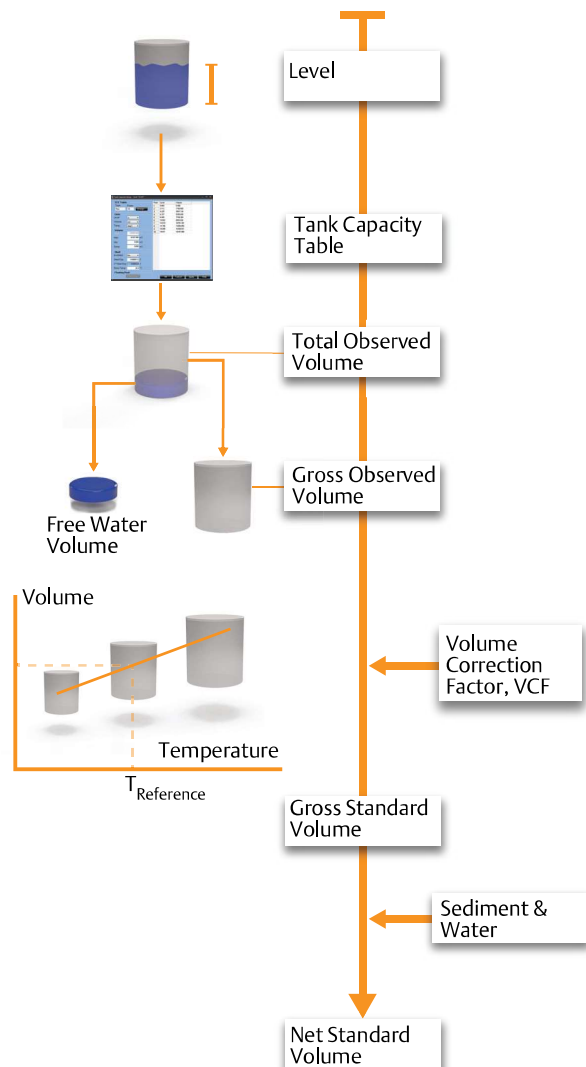
A Rosemount gauging system used for custody transfer gives accurate measurement values for volume calculations. These calculations require a selection of suitable devices to obtain high performance for measurement of level, free water level, average temperature, and in some cases reference density. If any of these sensors is poorly matched, the result of the standard volume calculation may suffer. Similar conditions apply for inventory measurements, for which the net standard volume is important. For mass balance and loss estimation, the calculated mass is in focus.



The Rosemount Tank Gauging System includes equipment for high-accuracy measurement and calculations such as:

- Level: Rosemount 5900S
- Temperature and Free Water Level: Rosemount 2240S with Rosemount 565/566/614 or 765 Sensors (four-wire sensor with up to 16 spot elements)
- Pressure: Rosemount 3051S
- Volume calculations as per API standards: TankMaster WinOpi software and Rosemount 2460 System Hub

System devices exchange measured data between units to optimize functionality. For instance, product temperature measurement functions use level information for calculating average product liquid temperature. Data from pressure transmitters is used to calculate density, etc.



Inventory parameters are calculated based on input data available for the current tank. The figure shows an example of how the measured product level is converted to a standardized volume.

### Non-inventory grade applications

In a system primarily intended for oil/product movement only, level and observed volume (TOV) are important parameters, but do not necessarily require the highest accuracy. The Rosemount gauging system includes the following equipment for non-inventory grade measurement and calculations:

- Level: Rosemount 5408 or Rosemount 5300
- Temperature: Rosemount 644 Transmitter with Rosemount 214C Sensor
- Volume calculations: TankMaster WinView software or Rosemount 2460 System Hub

### Operation and configuration

The TankMaster software is the operator's interface to the system. This user-friendly software is easy to configure and start up. No specialized software engineering is required. It gives the operator a good overview and quick access to any measured values.

This software provides a wide range of inventory and custody transfer functions such as net volumes according to API/ISO standards, reporting, alarms, graphics, trends, batch handling, etc. It also supports floating roof monitoring and proof-testing.

In addition, the TankMaster software is the primary configuration tool. Basic configuration can also be done with a Field Communicator, the AMS Suite or DeltaV.

Protocols for communication with major suppliers of plant host computers, such as DCS or SCADA systems, have been developed and certified. In many cases the plant's DCS/SCADA system works as the operator's interface for tank management data from the Rosemount gauging system.

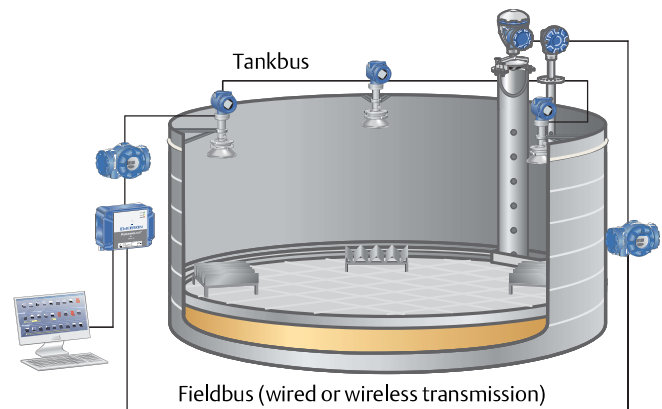


### Floating roof monitoring

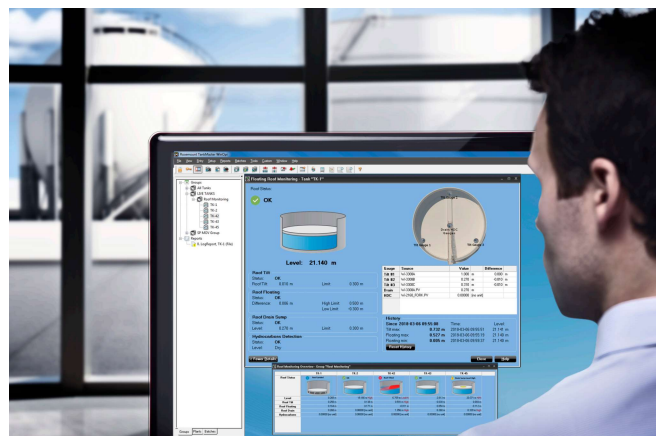
Floating roofs on storage tanks offer advantages in terms of reduced need for vapor recovery but can also create operational and safety issues. A sinking, tilting, leaking, or collapsing roof can cause significant mechanical damage, create overfills and the release of explosive hydrocarbon vapor. The cause of the tank malfunctioning may be that the roof is stuck due to damaged or wrongly mounted rim seals.

Leaking pontoons, overfills, strong winds, and inadequate draining during heavy rain or snowfall can also dangerously affect buoyancy and roof position.

By measuring the floating roof position, the Rosemount Tank Gauging System can continuously monitor the roof and give alarms for roof tilting and other hazardous tank conditions. Normally the roof monitoring is combined with liquid level measurement in a still-pipe for complete tank overview in the control room operator's interface.



Automatic floating roof monitoring with radar.



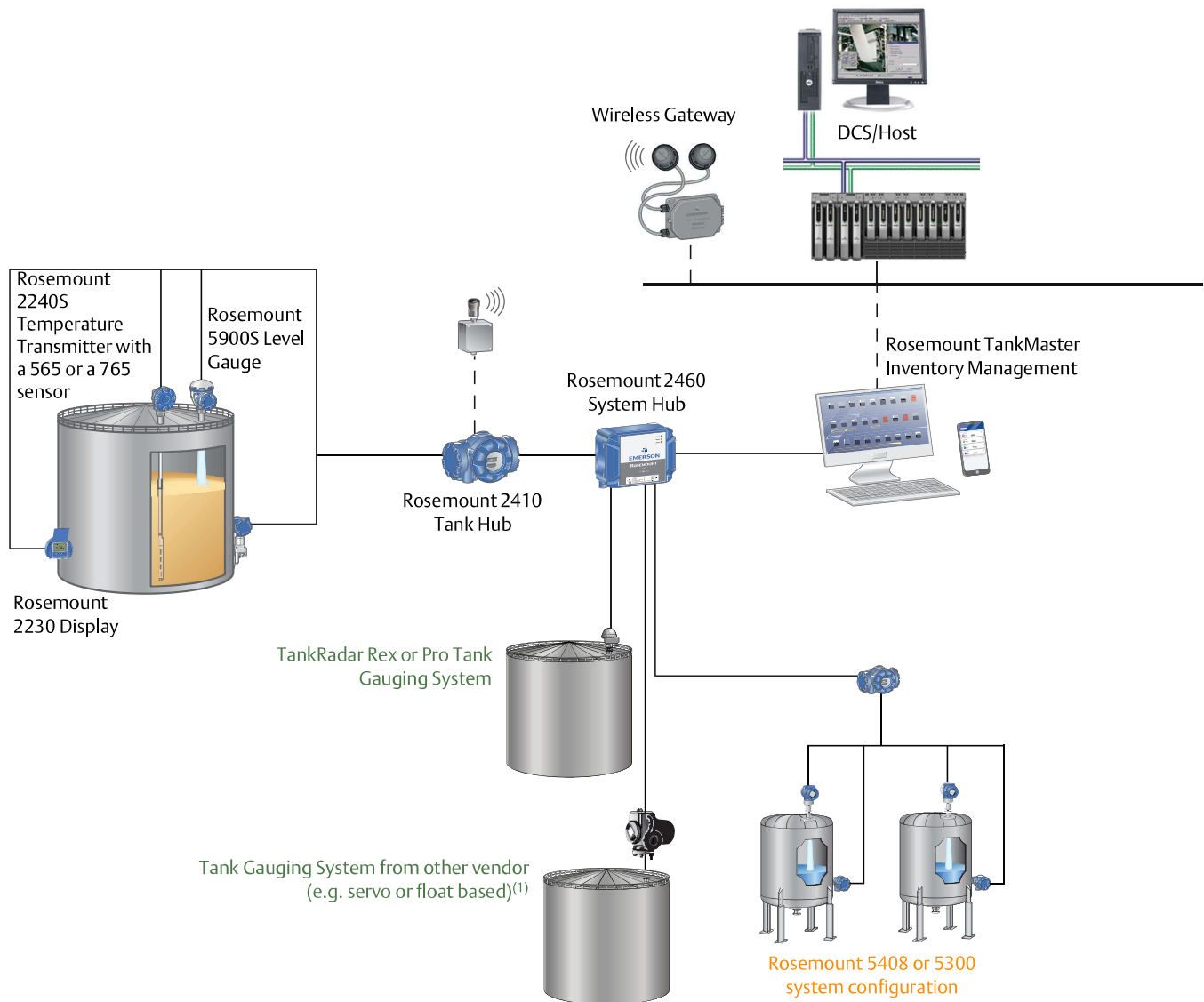
The operator can check tank conditions in real time.

# System layout configurations

## Open architecture enables the most cost-effective layout

The Rosemount Tank Gauging System supports a large number of configuration combinations. It can incorporate both Rosemount 5900S-, 5900C-, 5300-, or 5408-based configurations, networks with previous generations of Rosemount radar gauges (TRL2, Rex, Pro), and even gauges from other vendors.

Wired and wireless networks can co-exist within the same system. This flexibility enables a step-by-step upgrade.



1. Requires Rosemount 2460 System Hub.

## Custody transfer and inventory tank gauging – 5900S system configuration

The Rosemount 5900S-based tank gauging configuration is used for the highest demands on accurate measurements for inventory management and custody transfer. Precise net volumes are calculated using tank strapping tables and compensation for temperature and tank characteristics.

For temperature measurements, the Rosemount 2240S Temperature Transmitter is combined with the Rosemount 565, 566 or 765 Multiple Spot Temperature Sensors. The Rosemount 3051S transmitter is used for pressure measurements.

Each tank has a designated Rosemount 2410 Tank Hub.

All values are transferred to the TankMaster software, which has a complete set of inventory and custody transfer functions. TankMaster includes an API/ISO calculator for volume and density. Alternatively, inventory data can be transferred directly from the Rosemount 2460 System Hub to the DCS/Host without going via TankMaster.

When highest transfer precision is not required, the Rosemount 5900S can be replaced by the Rosemount 5900C Radar Level Gauge.

### High-precision system

