Honeywell | Connected Industrial

Guided Wave Radar in Terminals

Solution Note

The SmartLine® Level Transmitter's guided wave radar measurement technology offers superior performance and improved safety in tank farms, refinery and terminal level applications.

Tank farms are crucial areas in terminals and refineries and have a significant impact on the overall business results. With growing complexity in the off-sites piping network, increased workload of operators and a continuing drive for higher efficiency, flexibility, and throughput, terminal operators are faced with two challenges. The first challenge involves automating terminal operations to increase efficiency and flexibility which in turn helps improve terminal business performance. The second and perhaps bigger challenge is to address serious and ongoing tank farm management safety issues; this has become priority across the industry.

Tank farms, storage areas and loading/unloading sites all need effective safety solutions to protect personnel, assets and the environment; the consequences of incidents at these facilities can be enormous. The tank farm environment, being a hazardous area, requires continual monitoring of critical process parameters. Accurate and reliable tank level monitoring is especially important to prevent overfill situations. Incidents at refinery and terminal tank farms continue to occur. Several catastrophic incidents can be traced to ineffective use of technology leading to loss of level control and ultimately to loss of containment, lost lives, damage to the environment and widespread disruptions. This topic has been addressed by the API2350 fourth edition and other relevant standards, papers, and recommendations.

Honeywell has the broad and deep experience and technology to address this need with its comprehensive solutions from custody transfer applications to those for standard process level tank measurement and overfill protection.

- SIL 2 / 3 and WHG certification
- Perfectly suited to address the demand for separate overfill and leak detection, including Automatic Overfill Prevention Systems (AOPS)
- Continuous level measurement makes any changes of level limits fast and easy
- ATEX, CCoE, CSA, CSA US, FM, IEC Ex, NEPSI, KOSHA and SAEx approvals
- Primary measurement for non-custody transfer vessels
- Two wire design saves on wiring and lowers installation costs
- Wireless communication as an option
- +/- 3mm is the best economical choice for monitoring and overfill protection
- Configuration software and DTMs included as standard. Easy programming via HART or Foundation Fieldbus
- Comprehensive set of process connections and flanges

Solution

While many level measurement points in tank farms require tank gauging grade instruments for custody transfer, there is still a need for process grade level measurement, from the input of the tank farm/terminal, through the various processes such as additive applications, temporary storage, storage of additives, slope tanks, and others. To address the increased need to measure level in those storage locations, one of the key technology or product decisions is the accuracy, and +/- 3mm is perfectly sufficient and the best economical choice. For this purpose, Honeywell offers the SmartLine Level Transmitter SLG700 series with guided wave radar (GWR) technology.

The same instrument is perfectly suited to address the increased demand for separate overfill and leak detection, including reliable Automatic Overfill Prevention Systems (AOPS), among other solutions. The SmartLine SLG700 series transmitters come with SIL 2/3 and WHG certification and much more.

Applications

For terminal tanks, SmartLine SLG700 transmitter can serve as the primary level measurement or as the secondary measurement.

The SLG700 can be used as the primary level measurement for inventory management where custody transfer grade instruments are not required. The SLG700 series instruments provide reliable, continuous level and interface level measurement with embedded strapping tables and volume calculation. The level and interface measurements are done simultaneously, and can be reported through an analog current loop, or through a digital (HART, Foundation Fieldbus) communication. The instrument is an easy solution for smaller tanks, additive applications, slope tanks and other vessels, from the input to the terminal, to the output.

The SLG700 transmitter can also serve as a secondary measurement that is physically separate and independent from the tank gauging (custody transfer) level control system, to fulfill safety requirements as recommended for the AOPS in accordance with API2350 guidance and other reports and recommendations on safety. A continuous level measurement provided by a SIL 2/3 certified GWR instrument is significantly better over commonly used point level detection devices for HI HI level. The point level detectors often need mechanical adjustments or replacement when the critical level to be detected changes. This is often a case when the construction of the tank is modified (changes in side vents, shell extension, changes to tank bottom) the tank is recalibrated or restrapped, the tank gauging equipment is changed or modified, there is a change in product, the flow rates (filling) change, change in classification, or updates in safety management plan.

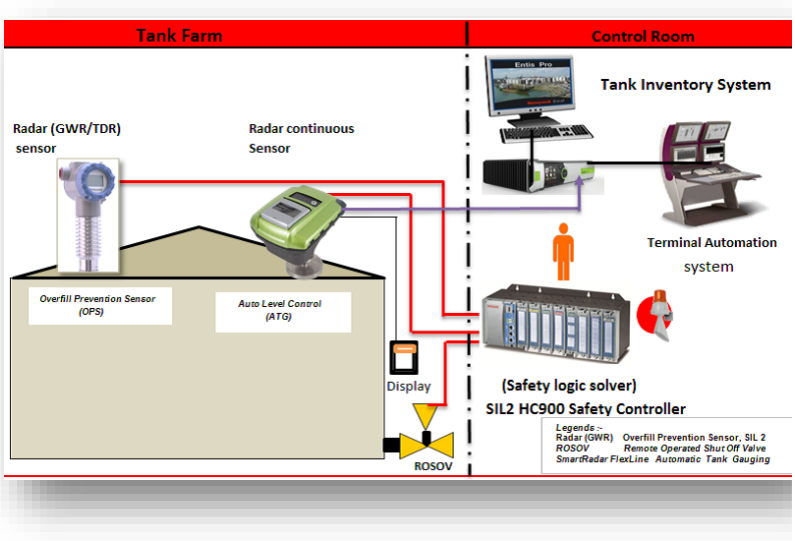

Figure 1: Use of GWR instrument as secondary measurement

Use of continues level measurement usually allows to respond to all of the changes with easy adjustment of the functionality of the AOPS system with fast and simple reprogramming. A schematic in Figure 1 shows an example of the SLG700 as a secondary measurement for overfill protection.

SmartLine SLG700 Series Features

With its modern signal processing design and superior level algorithm firmware, the SLG700 transmitter offers features that make it the best solution to use for a terminal tank level measurement.

A measuring range of 50 meters, temperature specification of -40°C to 200°C, and pressure range from -1 bar to 40 bar enables the SLG700 to cover a vast number of storage applications.

GWR, also called TDR (time domain reflectometry), technology delivers stable and accurate level measurement even with changing density, temperature, or pressure of the liquid in the tank.

The footprint needed at the bottom end of the probe is less than 1m (3 feet) for any tank height and the measuring beam with energy

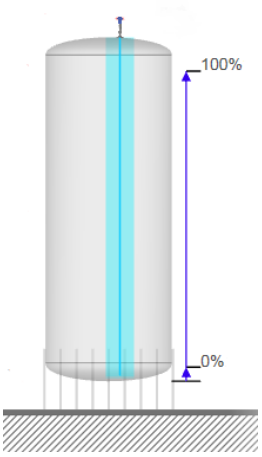

Figure 2: GWR instrument mounted on the top of a narrow tank with the measuring signal around the probe shown in blue.

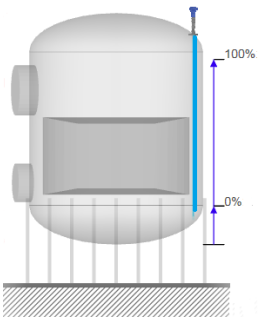

Figure 3: A tank with many internal obstacles, where a coax probe (marked blue) is used.

concentrated around a rigid or flexible probe allows for reliable measurement even in large tanks or when the mounting is in close proximity to the tank wall (Figure 2).

In very busy tanks, a 22 mm (less than one inch) diameter coax probe can be used. This probe can even touch any metallic or non-metallic construction in the tank, while still providing a reliable measuring signal (Figure 3).

Essential for remote or offshore tanks where access is difficult or expensive, GWR technology employs a fully electronic measurement with no moving parts, drastically lowering maintenance requirements and costs.

A superior level algorithm "locks" the measurement to the shape of the reflection from the surface of the measured liquid. Combined with SmartLine Level Transmitter's tracking features, this results in reliable and seamless level tracking over the entire range of measurement.

When using other level measurement technologies, measuring the interface level in a tank can be problematic as the total level in the tank fluctuates. Built-in guided wave functionality enables the SmartLine SLG700 transmitter to measure interface level and estimate the volume of the high value content (e.g. hydrocarbons) when tracking the amount of fluids (water) separated in the bottom of the tank.

The SLG700 transmitter provides advanced diagnostics and software that allow for rapid instrument commissioning and for continuous in-line monitoring which is especially important for SIL 2/3 and WHG requirements.

The SmartLine SLG700 series instruments are designed to work with the Honeywell's OneWireless™ Adapter OWA 100 (Figure 4) for wireless HART data transfer. This is a tremendous saving opportunity on cabling, when data is transferred over a large area in a scattered tank farm.

The wireless connection is not recommended to fulfill the AOPS functionality loop, but can always be used to send the measurement data to the terminal automation system.

Figure 4: OWA 100 attached to a Honeywell HART transmitter

In summary, to meet the above service requirements, SmartLine Level Transmitter SLG700 series continuous level measurement instruments provide the following features:

- 4-20mA with HART and FF output options
- 316 SS rod, coax (6.3m max) and wire (50m max) probes
- Temperature range from -40 to 392 ^{O}F (-40 to 200 ^{O}C)
- Pressure to 580 psi (40 bar)
- Ability to measure low (Dk=1.4) dielectric constant liquids
- Interface measurement
- SIL 2/3 and WHG certifications
- ATEX, CCoE, CSA, CSA US, FM, IEC Ex, NEPSI, KOSHA, and SAEx approvals
- Common process connections and flanges.

SmartLine Transmitter Family

The SmartLine Pressure, Temperature, Level and Multivariable Transmitters deliver total value across the entire plant lifecycle, from construction to operations to maintenance.

Smart Performance: SmartLine accuracy, stability and response time result in tighter process control, improving product yield and quality.

Smart Design: SmartLine's innovative modular design reduces complexity by allowing quick on-field replacement of parts without taking transmitters out of process and thereby reducing downtime, maintenance costs and spares inventory. SmartLine's universal terminals reduce costly wiring errors, troubleshooting and re-work by allowing loop wiring to be reversed. Rich advanced display and local configuration capabilities enable field operators to more efficiently perform tasks, solve problems and avoid errors with no need for a handheld device.

Smart User Experience: Smart messaging, maintenance and safety features as well as unique integration with Honeywell's Experion® control system reduce design and operator errors and enable faster intervention to avoid process upsets.

SmartLine Support Services

This product comes with worldwide, premium Technical Assistance Center (TAC) support services, which are part of the Total Care Field Instrumentation Services. The TAC services, along with the services provided by the local distributor, are designed to help customers improve and extend the usage of their field instrumentation, providing a safer, more reliable and more efficient operation.

Honeywell's Total Care Services bring 30 years of experience in terminals and the expertise of over 1,000 contracted customers around the world. Backed by the Honeywell Operating System, our support teams deliver greater in-depth domain and product expertise. We'll provide the right solution to critical issues—the first time—for a safer, more reliable and more efficient operation.

For More Information

To learn more about how the Honeywell Level Transmitter technology can improve tank level measurements and terminal operations visit www.process.honeywell.com or contact your Honeywell account manager, authorized distributor or system integrator.

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