SICK

Sensor Intelligence.

Guided radar technology to overcome tank monitoring challenges

Continuous level measurement using the SICK guided wave radar sensor

Hygiene is a crucial consideration for food and beverage makers, so when it comes to the continuous measurement of the level of materials in storage vessels, ideally the sensor should never come into contact with the material being measured. Many would suggest that a non-contact radar instrument is the way to go, but many vessels in the food and beverage industries have a smaller size than in other industries, and often contain metallic stirrers and agitators, or other metallic obstructions. In most cases, applying free-space radar may be impossible due to its wide signal dispersion, even at higher frequencies.

So if a non-contact solution cannot be used, then any solution that comes in contact with the material to be measured must be completely hygienic in design. While there a number of contact-based technologies for measuring level, they must not only be hygienic, but must also be up to the challenges presented by food and beverage manufacturing. Those challenges include foam and product build-up, viscous liquids and high temperatures.

Hygiene-critical conditions

The machines and plants in hygiene-critical productions can be divided into three hazard zones, with corresponding consequences for the components that are to be used there.

- **Zone C:** Non-food area where sensors cannot come into contact with food. Standard sensors can therefore be used in this zone.
- **Zone B:** Where external surfaces and plant components are cleaned with cleaning agents and disinfectants. Stainless-steel sensors and components in a washdown design are the ideal solutions in this case.
- **Zone A:** Where the sensor is in the immediate vicinity of the product. Not only must it undergo extremely demanding cleaning and disinfection processes, but it must also meet special hygiene requirements and comply with standards and regulations relating to hygiene. These situations call for stainless steel sensors with a fully hygienic design that offer maximum protection against germs and contamination risks.

Solution: guided radar

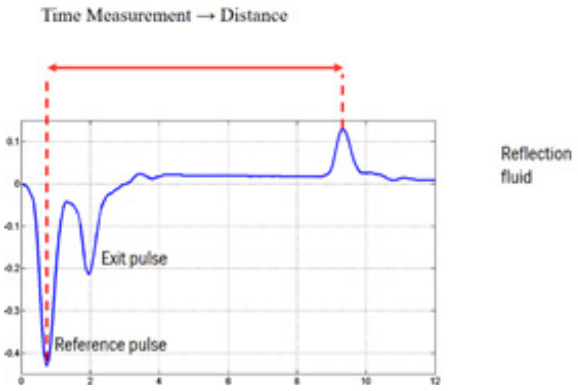
Guided radar technology that has a suitably hygienic design is a possible solution to these challenges. A key advantage of guided radar is that it can be adapted to changes in the density, dielectrics or conductivity of the fluid. Additionally, changes in pressure, temperature and most vapour space conditions have no impact on the accuracy of measurements (provided the dielectric constant of the vapour space is not significantly different from that of air). Guided radar devices also have no moving parts so maintenance is minimal.

Alternative technologies such as capacitive systems and conductivity probes may not provide reliable measured values due to product build-up, and in general, float switches do not meet hygienic requirements concerning cleaning capability and sterilisation.

About guided radar technology

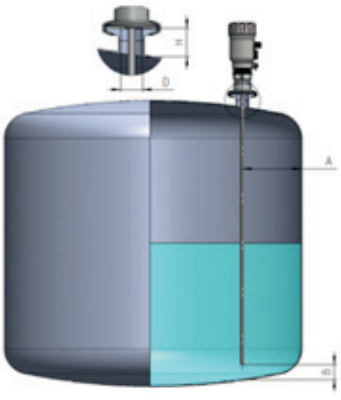
Guided wave radar (GWR), which utilises time domain reflectometry (TDR), is a reliable and flexible means of measurement level with a single sensor in environments where multiple liquids need to be measured.

In a time domain reflectometry installation, the sensor is mounted on the top of the tank or vessel, and a waveguide probe extends to the lowest measurement point. A low energy pulse of microwaves is transmitted down into the vessel, guided by the probe.



Guided radar signal response.

At the point of the liquid level (air/liquid interface), a significant proportion of the microwave energy is reflected back up to the transmitter. The transmitter calculates the distance by measuring the time delay between the transmitted and received echo.



Installation of SICK LFP Inox.

While guided wave radar works in many conditions, some precautions need to be taken during installation. Metallic probes should not be in direct contact with other metallic objects in the vessel, as it will impact the signal. A minimum clearance should always be kept from the side of a metallic tank to receive an accurate signal.

Hygienic GWR solution from SICK

The SICK LFP Inox guided-wave radar level instrument provides up to four digital and one analog output that can be programmed to provide multiple switching points or continuous level measurement for PID loops within the higher level control system.

With a sleek design, the LFP Inox can be used in vessels with tight geometries, in chambers and in tanks of up to 4 m in depth.

In some applications, particularly in dairies and breweries, heavy foaming can occur — including the generation of wet, compact foams in the course of conveying, mixing and bottling milk or beer. The smart algorithms built into the LFP Inox sensor make it suitable for applications with foam when the true level of the liquid needs to be measured by ignoring the foam. The Foam mode is an easy-to-use feature available in the LFP Inox making it convenient to use in applications such as milk filling.

SICK LFP Inox can handle harsh process conditions and can withstand process temperatures up to 180°C, and with advanced diagnostics and IO-Link onboard, LFP Inox is ready for Industry 4.0 applications.

In terms of hygiene, the LFP Inox is made of FDA-compliant, food-grade stainless steel that features a surface roughness (Ra) of 0.8 µm. This facilitates residue-free cleaning and minimises the possibility of build-ups, thus preventing hotbeds for bacteria and other microorganisms. The same applies to the changeable, hygienic process connections. The level sensor has been certified by the EHEDG (European Hygienic Engineering & Design Group) and also meets the 3-A hygiene certificate of the US food industry.

The high temperature and pressure resistance of the sensor mean that the sensor head is also entirely compatible with sterilisation procedures.

SICK has a wide range of products suitable for the food and beverage industry. To find out more, visit https://www.sick.com/hygienic-solutions.

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About SICK

Sensor Intelligence. For all requirements.

As an innovation leader and pioneer in the development of groundbreaking sensor technology, we offer solutions that are already up to the challenges of the future today. With intelligent sensor technology that collects data and evaluates it in real time, adapts to its environment and communicates in the network. The development of intelligent solutions for our customers' applications is at the forefront of our efforts. In order to be able to implement this, we continue to research and develop technologies that enable sensors and sensor systems to intelligently control processes and communicate with other components in complex networks. In our own 4.0 NOW factory, we are already showing how this works. This is where man and robot work together. This is where both batch size 1 and mass are produced. This is where our sensors have to meet our requirements.