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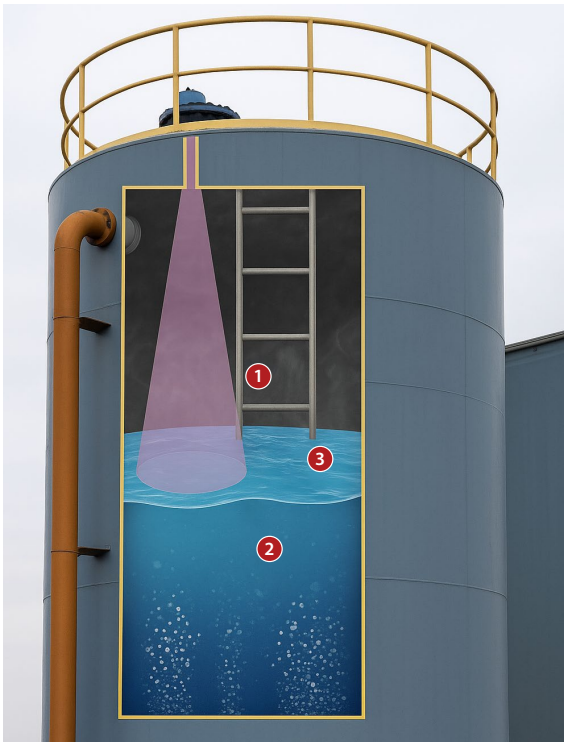
Non-Contact Radar: Critical Considerations For Liquid Level Measurement

Accurately assessing level instrumentation needs is vital for ensuring process efficiency and reliable performance. Achieving this requires a clear understanding of the available liquid level sensing technologies, along with their advantages and limitations in specific applications. In this article, we focus on the application considerations and configuration characteristics of non-contact radar. These factors are relevant whether the device operates using Pulse Burst Radar or Frequency Modulated Continuous Wave (FMCW), helping users make informed decisions for consistent, long-term measurement accuracy.

The Three Ds

Radar applications are shaped by three key factors: the **dielectric** constant of the process medium, the **distance** or measuring range, and potential signal **disturbances**. The dielectric constant determines how well the medium reflects radar energy. Water-based liquids, being highly conductive, create strong signal reflections, while hydrocarbon-based liquids, which are insulating, generate weaker reflections. Understanding these conditions is essential to ensure accurate measurement and proper selection of non-contact radar technology.

The measurement range of radar is influenced by several factors, including the chosen antenna, the dielectric constant of the medium, and any signal interference. Disturbances such as turbulence, foam, false targets from internal obstructions, multiple reflections from the tank roof, or rapid level changes can weaken or scatter signals. Extremely high or very low liquid levels may also create challenges, impacting the accuracy and reliability of radar-based level measurement.



Signal Processing

Advanced signal processing helps manage common disturbances, such as:

- False echoes caused by obstructions or multi-path reflections from sidewalls 1
- Turbulence generated by agitators or aggressive chemical reactions 2
- A layer of light to medium-density foam 3

Radar's signal processing capabilities are critically important, as radar is subject to interference effects similar to those experienced with light. The quality of this processing is what distinguishes today's leading-edge radar transmitters from conventional options. Advanced signal processing can reliably manage most disturbances, extracting true level measurements from false targets and background noise. For this reason, Magnetrol® radar products are designed to handle even rapid level changes that have traditionally challenged loop-powered transmitters. These devices incorporate robust false target recognition and rejection routines, yet achieving the best results also depends on proper installation and correct antenna orientation to minimize reflections and ensure measurement accuracy.

Registered Address
Able Instruments & Controls Ltd
Cutbush Park, Danehill, Lower Earley,
Reading, Berkshire, RG6 4UT. UK.

Phone
+44 (0)118 9311188

Email
info@ableinstruments.com

Web
ableinstruments.com

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Antennas

The transmitter's antenna both sends and receives the radar signal, with Pulse Burst Radar transmitters supporting options such as dielectric rod antennas, horn designs, or encapsulated horn types. Measuring range depends primarily on the device's capabilities, the dielectric constant of the process medium, and the level of turbulence present during operation.

Installation

Using Magnetrol® Pulse Burst Radar products as an example, a standard installation procedure outlines the essential steps for mounting, wiring, and configuring transmitters. While most units are shipped preconfigured from the factory, certain models – such as the **PULSAR** and **Model R82** – allow reconfiguration in the shop whenever needed.

To support setup and maintenance, a HART® remote device, such as a HART communicator, can be employed to establish a communication link. Once connected to the control loop, the communicator displays the transmitter's measurement readings and also serves as a convenient tool for configuration adjustments and troubleshooting activities, ensuring reliable operation.

Benefits

Pulse burst radar instrumentation is designed to measure a wide range of liquid media under varying process conditions, from calm water-based surfaces to turbulent or aggressive hydrocarbon environments. Because it is a non-contact technology, it eliminates common issues such as coating from viscous media or corrosion caused by harsh chemicals. Its efficiency becomes especially clear with greater measuring ranges, where it proves more economical than extended probe systems.

Radar measurement remains highly reliable, as it is virtually unaffected by vapours, air movement, or changes in factors like specific gravity, conductivity, or dielectric constants. With no moving parts and a fully electronic design, these instruments require minimal maintenance, lowering long-term operating costs. Additionally, as two-wire, loop-powered devices, they simplify both power requirements and installation.

For a deeper look into the advantages of our non-contact radar solutions, please download our Radar Solutions Brochure by clicking this button.

For more information, please contact Able Instruments on +44 (0)118 9311188 or by email: info@ableinstruments.com

Pulsar

Model R82

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Registered Address
Able Instruments & Controls Ltd
Cutbush Park, Danehill, Lower Earley,
Reading, Berkshire, RG6 4UT. UK.

Phone
+44 (0)118 9311188

Email
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Web
ableinstruments.com

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