Is 80 GHz radar so focused that it’s a non-contact alternative to guided wave radar?

What if the same directional performance and measurement certainty of guided wave radar (GWR) were available in a non-contact radar device? 80 GHz non-contact radar appears to be just that—“unguided” guided wave radar with focusing superior to any sensor that came before it. But is 80 GHz radar a real alternative to guided wave?

This paper will consider common concerns users have when selecting a level instrument and compare how the technologies stack up. At the end, we’ll determine whether 80 GHz radar is a non-contact alternative to guided wave.
User Considerations

Set up: The textbook installation of a guided wave sensor goes like this: A plant chooses a GWR instrument, installs it in a vessel, and the sensor measures accurately up and down the rod or cable. This is how it works in most cases, but not all. Operators sometimes have to account for different rod lengths and configurations for each individual application. Adding a mounting nozzle often further complicates matters when using guided wave radar.

Non-contact radar, on the other hand, is comparatively simple to set up. High transmission frequency radar units emit a focused beam angle and have a correspondingly small antenna system. In fact, 80 GHz sensors have the smallest antenna in the world, making them appropriate for a variety of vessels and easy to retrofit without costly modifications. In a variety of applications and on nearly any vessel, 80 GHz radar is easy to install.

**Advantage:** 80 GHz radar

Process conditions: In terms of process temperature, GWR and 80 GHz radar stand toe-to-toe: Each type of sensor can perform reliably in temperatures just below the 400° F mark. Both technologies are durable enough to withstand vapor, condensation, and foam. When it comes to process conditions, neither technology gives an inch.

**Advantage:** Draw

Buildup: When used with viscous, adhesive media like crude oil, GWR rods and cables can get covered with thick, measurement-distorting product residue. This buildup often results in false signals and increased cleaning and maintenance to avoid cross-contamination between batches.

80 GHz non-contact radar sensors still measure effectively through buildup and splashing. They feature flush antenna faces that minimize cross-contamination, saving operators in cleaning and maintenance costs.

**Advantage:** 80 GHz radar

Measurement range: 80 GHz devices do a tremendous job filtering out interference in the near range and detecting level at the bottom of the measurement range. In fact, when teamed with the most advanced STC electronics, these sensors can detect a few millimeters of oil from over 98 feet away, and measure up to the antenna face.

GWR matches 80 GHz sensors in terms of overall accuracy (±2 mm), and delivering trustworthy measurements at the bottom of a tank. However, guided wave radar cannot compare in terms of measurement in the near range.

**Advantage:** 80 GHz radar

Use with chambers, bridles, and stilling tubes: Guided wave radar is the ideal technology to use in these applications because GWR rods and cables keep radar signals close to them. A hyper-focused signal is important in a chamber, as many are between two and four inches in diameter. Even the 3° beam angle of 80 GHz sensors isn’t a focused enough signal to keep non-contact sensors from picking up false echoes from chamber walls, welds, and buildup.

**Advantage:** Guided wave radar

Measurement through a valve: Let’s eliminate the suspense: Level measurement through a valve is easy with 80 GHz devices and impossible with GWR.

Operation through a valve has always been tricky for older, wider beam non-contact radar devices, particularly with poorly-reflecting, low-dielectric (dK) products. The wider transmission beams pick up interfering noise from valves, nozzles, gaskets, joints, and other surfaces. 80 GHz sensors are so tightly focused they are capable of measuring through the smallest of apertures.

**Advantage:** 80 GHz radar
About those poorly-reflecting, low-dK products:
Accurate, reliable measurement of low-dK products has always been one of the hallmarks of guided wave radar. Until recently, if a liquid weren’t reflective enough for non-contact radar, GWR was the solution of choice. That has changed.

The huge dynamic range of 80 GHz radar means it is sensitive enough to measure low-reflectivity products that bounce back hardly any microwave energy from the product surface to the sensor. The dynamic range of 80 GHz radar is the best yet among non-contact radar sensors, and it matches GWR’s ability to measure media with poor reflective qualities.

**Advantage:** Draw

Performance with vessel internals: The tight focusing of 80 GHz radar sensors bypasses vessel internals, so it measures the liquid surface only. Even in busy tanks that may have heating coils, baffles, ladders, and agitators, there is much less to go wrong and less engineering needed with non-contact devices. That’s not to say that GWR can’t measure in applications with internals present, but initial setup is more complicated.

**Advantage:** 80 GHz radar

The Results: Non-contact 80 GHz sensors present a (sometimes) alternative to guided wave
Both radar technologies deliver outstanding results and are suited for use in specific applications, but it’s clear that 80 GHz technology is a huge step forward in liquid level measurement and process control.

Non-contact 80 GHz radar sensors present an alternative to guided wave instruments in some applications. In applications with lots of buildup, where mounting on a valve is necessary, and with internal obstructions, non-contact radar is often a more appropriate choice. Guided wave radar, however, is a viable technology that has its place. GWR is an excellent solution for measuring low-dK products, and level inside stilling wells, briddles, and chambers.

The process instrumentation world is large enough for both types of radar sensors; there are plenty of liquid level applications to go around. Operators should be careful to work with suppliers who will take their individual circumstances into consideration when recommending a level measurement technology.

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