Ball Valves, Gate Valves, and 80 GHz Radar: What We've Learned

Last summer, I had the chance to do something I wish I had more time to do: experiment. I, along with members of our field service group, spent a couple days in our on-site lab, testing the performance of the VEGAPULS 64 80 GHz radar sensor for liquid level measurement when mounted on ball valves and gate valves.

Reports from the field inspire action in the lab

We were inspired to conduct these tests after reports of success in the field. One such success came from a major refinery in Ontario that stores butane in enormous spheres approximately 55 feet in diameter. The spheres feature a two-inch ball valve atop a nozzle. A valve of that size could prove challenging for any radar sensor—even one with a hyper-focused 3° beam angle and electronics that ignore false signals like the VEGAPULS 64. Refinery operators installed the 80 GHz sensor on the valve and the sensor is working better than any process instrument previously installed in the application. This was just one of many stories from across North America that made their way back to VEGA Americas' headquarters in Cincinnati and motivated us to test it out for ourselves.

To reflect the realities of the field, we tested the VEGAPULS 64 with the four most commonly-used valve sizes. In each case, an empty vessel was filled and emptied again. The sensors used stainless steel process connections and we verified measurements at empty, half-full, and full. As a point of comparison, we also recorded level measurements using sensors with identical process connections but no isolation valve.

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VEGA Americas Field Service Technician Dan Nartker readies a pair of VEGAPULS 64 sensors for testing with gate valves.

Test Results

As it turns out, the stories from the field proved true in the lab as well. The VEGAPULS 64 performed well with each size and style of valve tested. Using standard settings with no special adjustments, the 80 GHz sensor delivered a clear signal every time with all four sizes of ball valves and gate valves. The results were unanimous and possibly groundbreaking for plants that produce and/or store volatile liquids.

Why Do Users Isolate?

There are many reasons to isolate a process instrument from the process itself. Using a valve to isolate from a tank allows operators and technicians to make instrument repairs and calibrations to level instruments without interrupting the process. Further, isolating an instrument from a tank helps fortify plant and personnel safety. Historically, using a 26 GHz radar level sensor with a valve has proven challenging.

Ball valves and gate valves contain many interior surfaces that reflect radar signals and all of these reflections make it difficult to discern which signals are from the valve and which are from the product. This confusion forces users to turn to instrumentation manufacturers for help servicing the product or assistance selecting a special-order valve. This is not the ideal use of time for facility personnel.

What Do Our Findings Mean for Users?

The performance of the VEGAPULS 64 on valves in the test environment and the in the field may very well represent a significant shift in the way operators think about liquid level measurement, particularly level measurement of hazardous chemicals and other volatile substances.

The 80 GHz transmission frequency of the VEGAPULS 64 erases the difficulty previously experienced by plant personnel hoping to use a ball valve or gate valve to isolate a level sensor from the process liquid. The high-frequency instrument emits a radar beam as narrow as 3° depending on selected antenna, so fewer signals are reflected by a valve's interior. This minimized noise creates a clear picture of the level inside a tank without installing a special-ordered valve.

Users can now isolate all of their liquid tanks with a ball valve or gate vale and use 80 GHz radar for liquid level measurement. The superior focus of the sensor empowers users to install an accurate radar sensor for liquid level without sacrificing signal clarity. Even low-DK product can be measured through a ball valve or gate valve with an 80 GHz radar that features large dynamic range, like the VEGAPULS 64.

This is potentially a significant breakthrough for operators who regularly work with reactors, acid tanks, and spheres storing hazardous liquids where valves are common and media is difficult. It is easy to imagine a future where all users separate the volatile liquids in their storage tanks and reactors with a ball valve or gate valve and measure level with an 80 GHz radar sensor.

Watch this video to see how the VEGAPULS 64 performs on a ball valve

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