Using Non-contacting Radar on Underground Flare Knockout Tank Reduces Costs

RESULTS

- Saved $10,000 per year in operation and maintenance costs
- Enables automatic control of level, reduced flare emissions, and full use of tank capacity
- Trending software enables correlation of level measurement to process events

Since the operator confidence in the level measurement was much higher, the tanks were able to be automated and utilized to their capacity.

APPLICATION

Flare Knockout Tank

Application Characteristics: Mixture of oil/hydrocarbons and dirty water that tends to leave deposits on surfaces

CUSTOMER

Petro-Canada

CHALLENGE

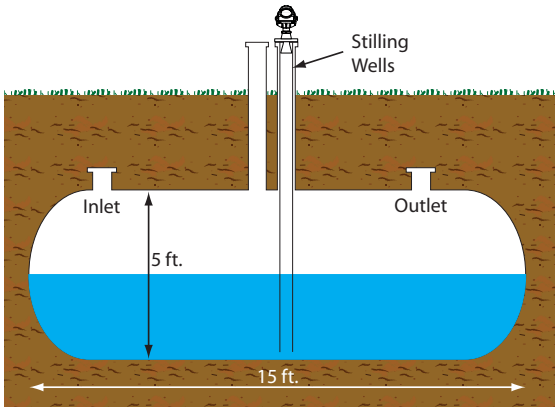
A Flare Knockout Tank is typically an 8' x 24' (2.4 m x 7.2 m) horizontal bullet vessel used for liquid removal and short term storage upstream of a hydrocarbon processing plant flare system. Fluid in knockout vessels is mostly water along with some hydrocarbon which is subjected to further processing in the plant.

In cold climates, flare knockout tanks are often buried at least 8 feet (2.4 m) underground to prevent freezing. The simplest way to access the tank is with a stilling well that begins above ground and reaches down to the bottom of the vessel. These particular tanks have stilling wells with only 1.5 or 2” diameters.

Because of accessibility, only top down level technologies can be used. Mechanical float technologies have been used, but the coating tendencies of the oily water mix required regular cleaning. Guided wave radar was another option, but would require long rigid probes which could be damaged during shipping and installation. Even a slightly bent probe can create a false level where it touches the surface of the pipe. High level switches have also been attempted, but they too were unsuccessful. Due to maintenance and unreliability of the level devices, Petro-Canada had not been able to automate these tanks. In order to prevent overfill and maintain plant safety, trucks were sent to empty them sooner than was necessary.

SOLUTION

Given the constraints, radar is a good solution for this application. By using non-contacting designs, maintenance issues are eliminated. With narrow diameter stilling wells, it is necessary to use a radar device with a suitable antenna.



The flare knockout tanks are buried underground for insulation from the Canadian winters.

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Process Management

The Rosemount 5400 Series Radar Transmitter was the right fit for this application. Often for these applications, a best practice is to install a new small-diameter well that fits inside the existing well to ensure its integrity. When installing non-contacting radar in stilling wells, it is important that the antenna size matches the stilling well's inside diameter as closely as possible, preferably with a 1 mm or smaller gap between the antenna and the pipe wall. For this application, a Rosemount 5402 was installed on the existing flanged 3" (80 mm) diameter outer stilling well with a flanged 1.5" (40 mm) diameter inner stilling well, and the antenna was trimmed to fit the 1.5" well.

After installation, the device must be configured for the application. In the case of the Rosemount 5400, this process is very simple. The transmitter is shipped with Radar Master, an easy-to-use PC configuration tool. The wizard embedded in the software guides the user through the setup process. One of the elements of setting up a radar unit for use in stilling wells is the need to compensate for the change in propagation speed of the signal which naturally occurs in pipes. Radar Master automatically initiates this calculation when the user inputs the pipe's inside diameter. This function helps to optimize the performance of the device for this type of application.

When compared to competitive devices, the customer noted that the Rosemount 5400 was much easier to set up and the software was more intuitive. He also liked the trending tools that came as part of the package. Not only did it provide redundancy to the DCS trends, but it allowed the operators to focus more closely on the level readings corresponding to process events.

Since the operator confidence in the level measurement was much higher, the tanks were able to be automated and utilized to their capacity. This resulted in fewer trips to empty the tank and reduced trucking costs. By using the Rosemount 5400 in this application, Petro-Canada estimates they save about $10,000 per year in operational and maintenance costs. Being able to make this measurement reliably, eliminating the maintenance nuisances, and improving their operations made the Rosemount 5400 a good fit for this application.

The Rosemount 5400 was mounted on a stilling well shell. The antenna was trimmed to fit the smaller pipe inside

A view of the level trend from the DCS.

RESOURCES

Rosemount 5400

http://www.emersonprocess.com/rosemount/products/level/m5400.html

Rosemount Technical Note - Guidelines for Choosing and Installing Radar in Stilling Wells and Bypass Pipes

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