

Reduce maintenance costs while ensuring intrinsic safety

Overfill protection in Propylene Oxide (PO) chemical storage tank

Benefits at a glance

- Ensured explosion proof and intrinsically safe installation
- Reduced maintenance costs
- In-situ proof test
- Ensured overfill protection
- Second line of defense ensuring environmental protection



A Midwest chemical plant serving the automotive and OEM market needed to replace an aging carbon steel horizontal cylinder bulk storage tank with a new stainless steel vertical cylinder bulk storage tank. The existing tank had an older capacitance probe that needed to be upgraded to a current technology. The customer needed a solution from someone they trusted and that was experienced in dealing with safety. The customer selected Endress+Hauser based on a combination of past experiences, reduced equipment maintenance and price.

The Challenge The customer wanted to replace the existing capacitance device with radar. To prevent overfilling of the tank, Endress+Hauser recommended a tuning fork point level device also be installed. The customer needed to be able to test the instrument functionality without removing it from the tank.

Our solution Liquiphant FTL51 with Nivotester FTL325P Endress+Hauser installed a high level switch – Liquiphant FTL51 – to ensure overfill prevention in the customer’s propylene oxide (PO) storage tank. The Liquiphant was installed with an FEL57 electronic module and a Nivotester FTL325P to provide an intrinsically safe installation. The Liquiphant and Nivotester combination, which features a push-button to test the functionality, is SIL2 or SIL3 (with homogenous redundancy) capable in accordance to IEC 61508/IEC 61511 and ISA 84.0196 standards. The Pulse Frequency Modulation (PFM) signal transmission setup allowed the customer the ability to periodically run complete function test without removing the instrument from the tank. In addition, free-space radar (FMR51) was used to provide a continuous measurement of the level.

Solution details:

The FTL51 level switch vibrates the tuning fork and its resonance frequency in air is determined. When the forks are immersed into a liquid, the frequency changes and the instrument changes the state of its output. In addition, the analysis of frequency and the amplitude of the vibration also allows for continuous sensor reliability checks. For example, corrosion of the fork will result in an increase in resonance frequency, or blocking of the fork results in a reduction in the frequency of vibration, which will be detected instantaneously.

The FEL57 electronics module is a two-wire Pulse Frequency Modulation (PFM) transmission and is a very safe way of conveying frequency of the fork to the Nivotester. The Nivotester is typically installed in the control room or a panel and provides the power for the Liquiphant and monitors the frequency of the forks. There is an IS barrier built into the Nivotester, which provides the IS protection for the tuning fork and it features a relay output for level switch point and alarm.

The push-button on the Nivotester initiates an internal test on the complete system. The frequency to the tuning fork is reduced, causing the fork to vibrate at a lower frequency. This reduced frequency is transmitted back to the Nivotester and the output is switched. This tests the entire system and provides partial proof test coverage of approximately 90%. The customer is able in about 5 minutes to test the functionality of the switch without removing it from the process compared to several hours if it would have to be removed in order to be tested.

Results The Liquiphant and Nivotester ensured overfill protection in the customer's propylene oxide (PO) storage tank. The Pulse Frequency Modulation (PFM) signal transmission setup allowed the customer the ability to periodically run function test without removing the instrument from the tank – reducing maintenance costs while meeting the intrinsically safe or explosion proof installation requirements.



Vibronic Point level detection Liquiphant FTL51



Vibronic Point level detection Nivotester FTL325P

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