APPLICATION NOTE Chemical

Level measurement of liquid sulphur in storage tanks

- Reliable, continuous level measurement of low reflective medium
- Maintenance-free solution: no crusting on antenna
- Instruments easy to set up and use

1. Background

Sulphur (S) is a non-metallic element that melts at 119°C. Its dielectric constant (ε_r value) decreases as temperature increases up to 159°C, and then increases above that value. It has been used since antiquity, often for fumigation, medicine and bleaching cloth; today it is mainly employed in the production of sulphuric acid, fertilizers, insecticides and fungicides.

Liquid sulphur recovered from gas and oil facilities is either pumped to outside blocks, where it solidifies or to storage tanks for direct shipping in liquid form. The storage tanks are heated to maintain the temperature and hence avoid solidification.

2. Measurement requirements

A chemical plant in Morocco produces fertilizers made from liquid sulphur. The sulphur is stored in 23 tanks, each 18 m high and fitted with heating jackets. These jackets use hot steam to keep the temperature of the sulphur stable at 130°C and to avoid crusting and solidification.

The plant uses air bubbling level transmitters and differential pressure systems to measure the product stored in these tanks. The operation of the air bubbling transmitters not only consumes a lot of gas, but also requires periodic checks of the air generating pumps. The differential pressure systems (Delta P) need frequent cleaning of the upper sensor due to crystallization and regular recalibration of the lower sensor which detunes after a while.

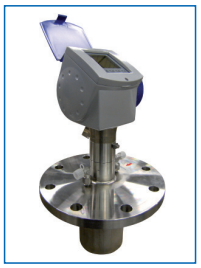
Thus, the plant was looking for a reliable and low-maintenance solution, which is also easy to install and user-friendly. It had to be able to accurately measure low ε_r values of hot, moving liquids continuously in high tanks and comply with hazardous requirements.

KROHNE

3. KROHNE solution

For this application KROHNE provided 23 OPTIWAVE 7300 C non-contact Radar (FMCW) Level Meters with

- DN 150 PN16 flanges
- DN 80 horn antenna
- Antenna heating system using steam



OPTIWAVE 7300 C with special antenna heating system

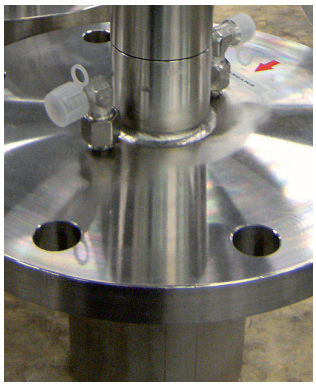
DN 80 antenna with heating system

4. Customer benefits

Using FMCW radar technology, the meters continuously measure over a wide dynamic range. That is why neither the low reflective medium, nor the tank height or the moving surface during the filling and emptying of the tanks can affect the measurement.

The antenna heating system is directly connected to the hot steam circuit available on site. No other installation steps are necessary. It not only minimizes condensation of sulphur vapours on the horn antenna but also prevents it from crusting as liquid sulphur tends to solidify at temperatures below 120°C. Climbing to the top of the tanks for periodic cleaning or recalibration is no longer necessary: the non-contact radar device does not require any maintenance. Being a 2-wire device, the installation of the meter needs less wiring and configuration is very simple due to the wizard driven setup. A large LCD display with 4-button keypad makes operation easy without opening the housing. Hence, the requirements of the customer in terms of reliability and easy installation are fully met.

This, and the fact that radar technology has no gas consumption at all, significantly reduces the expense and, including the competitive price of the OPTIWAVE 7300 C, makes it a very cost-effective solution for the customer.



G $^{3}/_{8}$ connections for heating system

5. Product used

OPTIWAVE 7300 C

- Non-contact Radar (FMCW) Level Meter for liquids and pastes
- 2-wire loop powered for minimal wiring expense
- Maintenance-free
- Reliable measurement: ±3 mm accuracy up to 10 m and ±1 mm repeatability, even in tanks with agitated surfaces or internal objects
- Operates up to a process connection temperature of 200°C
- Measuring range up to 80 m
- Dielectric constant (ε_r value) ≥1.5
- PACTware and DTM for commissioning are supplied free of charge
- FMCW technology: excellent value for money
- Ex approved for use in hazardous areas
- Optional antenna heating systems
- Wizard-driven setup

Contact

Would you like further information about these or other applications?
Do you require technical advice for your application?
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Please visit our website for a current list of all KROHNE contacts and addresses.

www.krohne.com