Solution Note

Honeywell

SmartLine Level for Displacer or Float Replacements Installed in Side Cages and Still Wells

Displacer technology has been traditionally used for level, interface and density measurement. Displacers have been used for continuous level monitoring and point level detection in oil & gas, power generation, refining and petrochemical, nuclear power etc. They are used on almost all liquids inside chambers or directly on the tank, in low to high temperature from vacuum to high pressure.

Now, many corporations are looking for alternatives to the traditional mechanical float/displacer and they are choosing guided wave radar technology (RM71) for accurate, reliable and repeatable level and interface measurements.

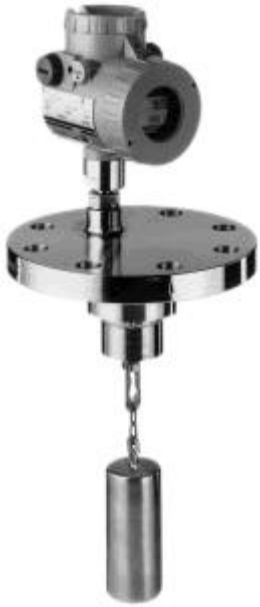
One of the reasons that TDR guided wave radar is being used as a replacement is the high initial investment cost for the displacers. Also due to the mechanical nature of a float or displacer the cost to maintain or repair becomes more of a factor the longer the unit is in service. This maintenance, repair, or even replacement of the displacer consumes labor hours and may result in the shutdown of the process for prolonged periods.

Principle

Displacers operate based on the Archimedes principle i.e. a body immersed in a fluid loses weight equal to the weight of displaced liquid

Challenges for Displacer Technology

While Archimedes principle still holds for a boat's buoyancy, it is certainly not the ideal level measurement technology For accurate level measurement using displacers, the product density must remain constant because any deviations from initial density will impact the measurement accuracy. For Interface level, using a displacer, the lower product level must always be less than the expected minimum top liquid level. This is not a requirement of guided wave radar/TDR. Displacers have moving parts that are subjected to wear and tear and need replacement or cleaning. They are affected by vibrations and turbulences will also contribute to increased maintenance costs. As the principle is dependant on the measured liquid density, the measurement will change every time the temperature of the process changes, affecting the density. Also, if a product coats the displacer, it becomes heavier and this again changes the measurement.



Solution

With recent advances in technology, the TDR guided wave radar RM71 brings a viable solution for replacement of displacers. For applications for level and interface, you should offer guided wave radar. For density measurement you will have to offer differential pressure (DP) Transmitters.

Challenges such as the existing process connection of displacer chamber , 2- wire loop powered connectivity, as well as relevant Exd as well as EXia ATEX certification are easily met with guided wave radar. Guided wave radar can operate up to a temp. of 300^{o}C (575 ^{o}F) with pressures of up to 300 bar (4350 psi) and are also available with compliance to NACE requirements and SIL 1 certification. Various o/p protocols like HART, Foundation Fieldbus and Profibus PA are also available.

The objective is to directly replace the faulty displacers with guided wave radar without any mechanical modifications to the chamber and using the existing process connection.

TDR (Guided Radar) Advantages

- RM71 is a maintenance free device. No moving parts / No mechanical drift.
- Not affected by density variations or changes. RM71 tracks the product surface whatever the density of the product may be.
- Unaffected by upper gas phases.
- Using TDR, two side process connections can be avoided.
- Less affected by product build up. Displacers are subjected to fouling in dirty service.
- RM71 has the necessary process connection of ¾" or ½" in NPT as well as G ISO226 connection, which can be directly used for displacer replacement without any mechanical changes.

Considerations When Using the TDR for Displacer Replacements

- Probe must be larger than the length of displacer.
- Centering of the probe should be made to avoid contact with the displacer chamber.
- The end of the probe should not touch the bottom of the chamber. Keep a small gap of ½" to ¾"
- Find out the manufacturer or the displacer chamber flange (ANSI, DIN or proprietary). Major torque tube chamber manufacturers are Masoneilan (190 mm), Fisher Leveltrol or Magnetrol (200 mm to 350mm).
- Guided wave radar performs well in case of density changes, vibrations or turbulences in the vessel.

Solution Examples

- **Tank**: Vertical cylinder at height 9.5M
- **Product**: Hot water
- **Pressure**: 20 bar
- **Temperature**: 90° C
- **Device**:
  - Connection: DN 80 PN 40
  - Sensor: Coaxial
  - Sealing: Viton
  - Approval: Exd
  - Mode: Direct

- **Tank**: Side chamber; cylinder height: 2 m
- **Product**: Hydrocarbon and water
- **Pressure**: Atm
- **Temperature**: 80° C
- **Device**:
    - Connection: DN 50 PN 40
    - Sensor: Single Road
    - Sealing: Viton
    - Approval: Exd
    - Mode: Direct

- **Tank**: Vertical cylinder at height 1.3 M
- **Product**: Hydrocarbon
- **Pressure**: 23 bar
- **Temperature**: Ambient
- **Device**:
    - Connection: DN 80 PN 40
    - Sensor: Coaxial
    - Sealing: Viton
    - Approval: Exd
    - Mode: Direct

SmartLine Radar in Reference Chambers

More Information

For more information on SmartLine Level products, visit http://www.honeywell.com/ps/hfs or contact your Honeywell account manager.

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