

Comparing Displacer Transmitters vs. Differential Pressure Transmitters for Liquid Level Measurement



There have been many technologies over the years that have helped the process industry with level measurement. From the early days of simple mechanical float-operated level switches, the process instrumentation industry has been innovating new technologies to make its customers' lives simpler. One of these older technologies commonly used in the process control industry is the differential pressure (DP) level transmitter, which first was

introduced in the 1950s. It measures the hydrostatic head pressure of a liquid in a vessel and converts this to a level measurement, based on an input specific gravity/density of the liquid. A newer technology that is also dependent on specific gravity is the displacer level transmitter. There are significant differences between these two products, which affect the installation, maintenance and accuracy of the level transmitter chosen.

Calibration

There are many factors that must be considered when choosing either a DP transmitter or displacer level transmitter. The DP transmitter infers level measurement from the hydrostatic head pressure. Even though specific gravity is a variable that needs to be

input into the transmitter electronics, the displacer transmitter is in contact with the process and the level measurement is direct. The DP transmitter requires calibration and re-calibration if any of the initial parameters change or the same DP is used on different products in the same tank. The calibration process can be very time consuming and expensive, requiring up to 12 process variables to be input into the transmitter. The displacer transmitter only demands two variables to be entered (specific gravity and temperature) for proper operation, making it easier to switch product in the tank and re-calibrate the displacer transmitter. Furthermore, a displacer transmitter (specifically, the E3 Modulelevel® unit from Magnetrol®) does not require liquid to calibrate. The software can be programmed by either a wet or dry calibration, which can save time and money compared to a DP transmitter.

Temperature Range

DP transmitters can have a standard operating temperature of up to +250°F (121°C), with special construction increasing the upper temperature limit to +650°F (343°C). The displacer transmitter can reach temperature ratings up to +850°F (454°C). This high temperature option can be utilized specifically for level measurement in a hot oil separator application.

Mounting

The mounting of a DP transmitter is very limited. It requires two side-mounted locations on the vessel, with one being near the bottom. This location is prone to leakage as all of the fluid is above the bottom of the vessel. If the seals are not properly secured, it is possible for liquid to leak out the bottom attachment. For displacer transmitters, mounting can be configured to meet the application's needs and does not necessitate a connection location at the bottom of the tank.



Magnetrol® E3
Modulelevel® Displacer Transmitter

Installation Cost

Although DP transmitters have a lower initial cost, the additional cost of running heat tracing can result in similar installation costs for the two technologies. The displacer transmitter is configured after installation with two variables and then it is ready to use in a customized setting.

In summary, there are benefits to choosing a displacer transmitter over a DP transmitter. The below chart outlines the major differences highlighted above:

Function	Differential Pressure Transmitter	Displacer Transmitter
1. Level Measurement	Infers level measurement from hydrostatic pressure head	Direct level measurement with displacer in contact with process
2. Calibration	Up to 12 process variables	2 variables required for proper operation
3. Liquid Required to Calibrate	Yes	No
4. Temperature Limits	Standard temperature range up to 250°F (can be made up to 650°F)	Standard temperature range up to 600°F (can be made up to 850°F)
5. Mounting	Very limited with lower connection at bottom of vessel	Very customizable and can have an external chamber or be direct insertion
6. Installation	Installation costs can become very high	Quickly and easily installed

With the new high temperature capability to go along with best-in-class SIL SFF of 92.3%, the E3 MODULEVEL displacer transmitter from MAGNETROL is a better choice than the differential pressure transmitter for many demanding level applications. For more information regarding how MAGNETROL can help you replace your DP transmitter with an E3 MODULEVEL displacer level transmitter, please visit www.magnetrol.com.



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