*Technical Article*

PROCESSING

Level with me

# The first step to accurately measuring level is to understanding it

Techniques associated with fluid level Measurements

In old Gangster movies, when the cops were asking informants about information, they would ask: "Is that information on the level?" They are asking is the information accurate. Engineers with a large tank can relate: they need to know if their media is on the level. For years, engineers used floats and a site glass to determine level. Technology has caught up. Now, an engineer can determine level using technology.

There are many places to turn.

Hydrostatic head pressure: You measure the level of a tank by measuring the head pressure and translating that signal into a level output. Pressure sensors are a traditional sensing technology. Simple to use and install, gauge and differential pressure sensors are suitable for a broad range of tank level applications and measurements. They can be either submersed in the media, or flush mounted on the tank. Hydrostatic pressure sensing can be difficult in dirty liquids that clog small orifices or corrosive environments that destroy the sensor materials. A submersible pressure sensor will not be affected by splashing or foam, since it's in the media. However, the media density can affect accuracy.

A Bubbler level system uses compressed gas and submerged tubing in conjunction with the sensor to measure the fluid level. Bubbler systems are ideal for level measurement of open channel run off systems or duct and tank situations where debris, foam, steam, or surface turbulence makes standard methods of level measurement impractical.

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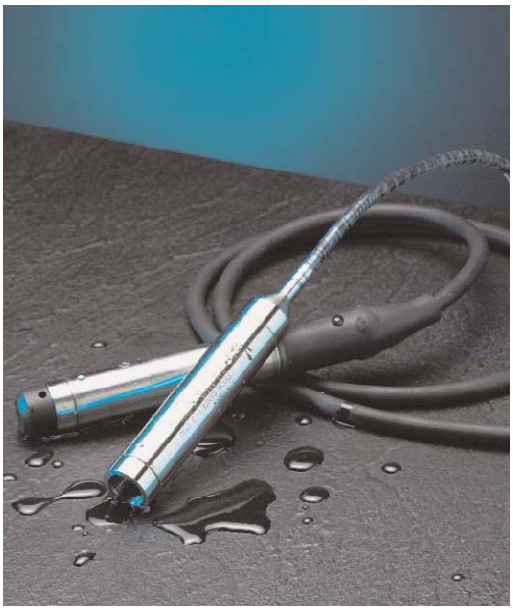

Ultrasonic level sensors are a fast growing sensor types. Mounted above the process vessel, they detect the surface by transmitting a series of ultrasonic pulses towards a surface. The time taken for the reflected echoes to reach the sensor face are calculated and converted to distance for transmission as a current loop output. Since they are separated by at least several inches from the process, they are less likely to be effected by the media type, and useful in sanitary applications. Sound reflective objects within the "beam angle" and range may affect ultrasonic sensors, so care must be taken in installation to eliminate "false echoes". Foam, dust, splashing or even fog can also create erroneous readings.

Radar level sensing is an extension of the Ultrasonic level sensing. Radar sensors use low power microwave radiation to detect the surface of the liquid. Like Ultrasonic Sensors, this technology has advantages that are suited to the needs of special applications encountered in food, beverage or pharmaceutical production. Radar level sensors are used in reflective liquids that have a foaming surface, vapors or a dusty condition beyond ultrasonic wave capabilities.

Capacitance sensors rely on the different dielectric properties of air and the media to detect level. With conductive liquids the tank wall and an insulated active electrode form a capacitor. As the level changes, the dielectric property of this "capacitor" will change linearly. A bare metal rod or cable becomes the electrode in non-conductive media. Advanced measuring techniques using insulated concentric sensors allow for interface level measurement of liquids which contain differing water, oil or foam levels. Tank grounding for capacitance is highly technical so knowledge of the tank materials and grounding is vital.

# An engineer can determine level using technology

**Selection Criteria**
Understanding the mechanical and electrical configuration of the vessel/tank in question is critical to selecting the proper level sensor. Does the sensor come in the required length or range to suit the application? Can the sensor be simply installed, or must unique mounting hardware be specified?

Are there any internal devices within the vessel, or conditions such as spraying or splashing liquids, which will interfere with the sensor chosen? For instance, splashing can impair the accuracy of Ultrasonic and radar sensors. Since a submersible or tank mounted sensors sits in the media, splashing has no depredating effect on accuracy. However, if the media is extremely harsh, a submersible might not work.

How critical is the accuracy of the sensor in the application? If your media has a high cost per gallon, then accuracy is probably critical. Does the level measurement system need specific approvals for use? If you are interested in changing the manner in which you measure level, will your new solution

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provide the needed electrical interface for present and future methods of operation? Will the electrical installation require additional enclosures to house intrinsic safety barriers, interposing control relays, etc.?

**Installation criteria**
Most level sensors are designed for simple installation into standard fittings. Float level sensors often have small process connections, yet the float may require a larger opening requiring adapters.

**Recommendations**
Level sensing technologies exist to allow level sensing of virtually any fluid with high degrees of accuracy. Some are very simple and very inexpensive. When volatile media is concerned, approvals become an issue. Sanitary applications demand certain approvals as well. Careful review of the specifications for installation and conditions to avoid will help you to determine the best sensor or group of sensors for your application. As with all safety systems, never rely on a single piece of equipment to prevent or warn against unsafe fluid levels. A bargain solution or the wrong solutions will cost more in the long run.

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