

TANK MONITORING SOLUTIONS

USING SUBMERSIBLE PRESSURE SENSORS

Define

Water level can be determined using a hydrostatic pressure sensor by taking a continuous pressure measurement at the bottom of the water column (WC) at which point the sensor's diaphragm is placed. The pressure existing at a certain depth within a liquid is directly proportional to the column of water above. This is different from differential pressure, which is determined by an up and down stream measurement. By calibrating a hydrostatic level sensor to the respective liquid density, its output signal is tuned to the column of liquid to be measured. Hydrostatic pressure sensors use the relationships stated below.

How It Works

The pressure at the bottom of the tank or WC is related to the height of the liquid. This level pressure is called hydrostatic head pressure. Typical units of measure for hydrostatic pressure are inches of WC or feet of WC.

27.679 inches of WC is the approximate equivalent of 1 PSI at 40°C. The volume of water will not affect the hydrostatic head pressure; it is the height that affects the pressure. Whether 27.679 inches deep in the middle of a large body of water or a small bucket of water the head pressure is the same.

Water density at 60°F (15.6°C) = 62.37 pounds per cubic foot.

The pressure exerted by a column of water one foot in height is:

$$\frac{\text{pounds}}{\text{cubic foot}} \times \text{sq foot} = \frac{.4331 \text{ pounds}}{\text{sq inch} - \text{foot WC}}$$

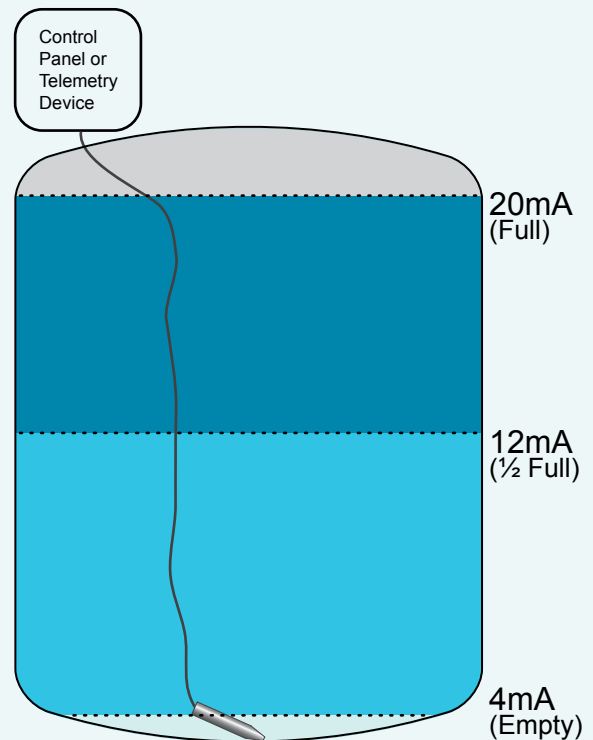
Or, what height of WC is required to generate one pound of pressure per square inch?

$$\frac{1 \text{ pound}}{\text{sq. inch}} \times \frac{\text{sq. inch} - \text{ft}}{.4331 \text{ pound}} = 2.3089 \text{ ft. WC}$$

As you can see in this example the pressure exerted by a column of water is dependent only upon the height of the WC and is independent of the affected area.

Example

AST Submersible sensors offer a linear output signal for tank monitoring. With the use of a 4-20mA output, the tank level will show a 4mA signal when the tank is empty and rise to 20mA when the tank is full.



PSI to Foot Conversion Table
(Based on Specific Gravity of Water @ 0.433 PSI = 1 foot*)

Sensor Measuring Range in PSI	Depth In Feet 100% FS	Depth In Feet 60% - 80% FS
0 to 2.5	5.77	3.46 to 4.62
0 to 5	11.54	6.92 to 9.23
0 to 7.5	17.32	10.39 to 13.86
0 to 10	23.08	13.84 to 18.46
0 to 15	34.63	20.78 to 27.70
0 to 20	46.18	27.70 to 36.94
0 to 30	69.26	41.56 to 55.41
0 to 50	115.45	69.27 to 92.36
0 to 100	230.89	138.53 to 184.71

* Water density at approximately 60°F/15.6°C will have results vary slightly with fluctuations in temperature.



AST4500/4510

SUBMERSIBLE PRESSURE SENSORS



The AST4500 and AST4510 submersible pressure sensors are approved to UL/cUL913 (CSA 157) Class 1 Div 1, Groups C and D for use in intrinsically safe areas with an approved barrier. For pressure ranges from 0-1 to 0-100 PSI that require a wide range of media compatibility, the submersible series is an excellent solution to level monitoring for indoor and outdoor applications.



AST4520

FLUSH DIAPHRAM SUBMERSIBLE WITH STEEL CAGE

The AST4520 Flush Submersible Series is the cost effective solution for level monitoring of turbulent tanks with viscous media. Approved to UL/cUL913 Class 1 Division 1 IS, Groups C and D with an approved barrier, the product ensures a safe, reliable source for level measurement. The AST4520 is offered with pressure ranges from 0-2.5 to 0-15 PSIG. The AST4520 steel cage front end design allows for proper flow of media while keeping the sensor at the bottom of the tank or well. With an engraved 316L housing and Kynar PVDF cable, this sensor is built to handle the toughest environments.

