

How do I choose the correct pressure range when specifying a pressure transducer for measuring fluid level in a deisel or water tank?

Maretron offers pressure transducers with different pressure ranges. You choose a particular transducer based on the depth of the tank (assuming you install the pressure transducer at the deepest part of the tank, otherwise use the installation depth of the transducer). All of Maretron's pressure transducers use Pounds per Square Inch (PSI) to specify the range. One PSI equates to approximately 28 inches of water or 34 inches of diesel fuel. So divide the tank depth by one of these numbers to determine which pressure transducer to use. It is important to pick the right range for a transducer or else you can get large errors in the reading by specifying a range greater than what you need (always pick the smallest possible transducer for the particular application - see FPM100 User's Manual to understand more about transducers and accuracy when measuring tank level).

Example #1

We have a water tank that is 75" deep and the transducer is installed at the bottom of the tank. So we divide 75" by 28 and we get 2.67 PSI of pressure when the tank is full. So for this example we would choose a 0-3 PSI transducer since it will accommodate the 2.67 PSI when the tank is full. We still have one more thing to check and that is to make sure we don't exceed the burst pressure of the transducer because if we do, the transducer might be permanently damaged. We check the burst pressure by examining the datasheet and finding the transducer's specified burst pressure. Let's assume the transducer we want to use has a burst pressure of 2.4 times the nominal pressure, so for this example we multiple the 3 PSI transducer by 2.4 and we get a burst pressure of 7.2 PSI. So for this particular transducer, we must not exceed 7.2 PSI or approximately 200 inches of water ($7.2\text{PSI} \times 28"/\text{PSI} = 200"$ depth). So as long as total depth of fluid (tank depth plus fill tube height)

does not exceed 200”, we have the picked the right transducer. If the total depth of the tank and fill tube exceeds 200”, then we need to pick the next higher range with an understanding that measurement accuracy will suffer.

Example #2

For this example, let’s assume that there is a main diesel tank down low in the vessel, which is permanently connected together with port and starboard saddle tanks. The main tank is 30” deep with a 12” vertical rise piping connecting the saddle tanks. Both saddle tanks are 24” deep. So the overall tank depth is 66” (30” main tank, 12” connecting pipe, and 24” for saddle tank). Note that the transducer range is selected based on the column height of the fluid, which in this case is based on the vertical height of the fluid in the main tank, connecting pipe and main tank. The connecting pipe might be much longer than 12”, but we are only concerned with the vertical height, which is commonly referred to as “column height”. Given the overall tank depth of 66”, we divide this by 34 since 1 PSI of pressure equates to 34” of diesel fuel ($66 / 34 = 1.9$ PSI). So when the tank is full, or the “column height” is 66”, 1.9 PSI of pressure is exerted. Unfortunately, Maretron does not offer a 2 PSI transducer so you need to go up in size to the 0-3 PSI transducer. Again, don’t exceed the burst pressure so add the fill tube vertical height to the overall tank depth to make sure you don’t exceed the burst pressure.

Remember, the only thing that’s important about selecting the proper transducer range is the height of the column of fluid. If you take two tanks containing the same type of fluid and the same depth with one tank having a diameter of one foot and another tank with a ten foot in diameter, they both exert the same pressure at the bottom for each tank. The pressure at the bottom of the tank is not influenced by the shape or size of the tank, only column height determines pressure measured.

A couple more things to keep in mind as you specify and use pressure transducers for tank level monitoring:

- 1) Will the tank be pressurized for testing leaks? If so, the burst pressure will most likely be exceeded resulting in permanent damage of the pressure transducer it is recommended to install a shut off valve to protect the sensor during this test..
- 2) Will the tank be exposed to freezing temperatures? Expanding ice within the pressure transducer orifice will most likely rupture the diaphragm resulting in permanent damage of the pressure transducer.
- 3) Do not test the sensor by inserting objects into the sensor opening the action will most likely rupture the diaphragm.
- 4) Is the vessel and associated tanks subjected to high G forces from pounding off waves? Consider using pressure snubbers to filter the transducer from high pressure spikes.

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