APPLICATION NOTE

Smart level setup feature

Dpharp EJA and EJX Series

Industry:

Oil & Gas, Refining, Chemical, Power, Iron & Steel, Water & Waste Water

Products:

Pressure Transmitter, DPharp EJA and EJX Series

Introduction

Level transmitter configuration can be very time consuming. Calculations required to determine proper range values for traditional transmitters can become complex due to the physical layout of an application.

DPharp transmitters with advanced software functionality eliminate this time consuming task. With maintenance shops getting smaller, finding equipment that allows us to do more with less becomes a priority.

Application

Using typical smart or conventional products all of the following must be considered:

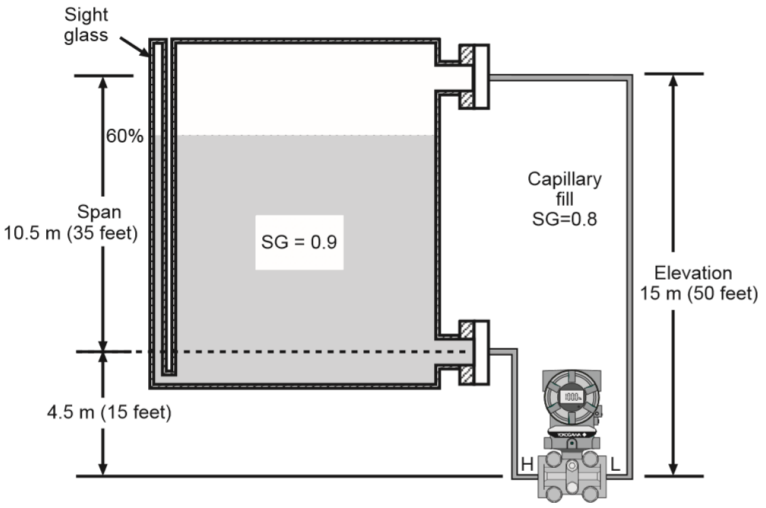
1. The specific gravity (SG) of the process;
2. Precise location of 0% and 100%;
3. Specific gravity of the capillary fill fluid or sealing liquid (for impulse tubing);
4. Vertical height of capillary or impulse piping;
5. Exact orientation of the transmitter to the vessel;
6. Vertical distance between the flanges.

Depending on the application, the vessel may be open (referencing atmosphere), or closed (under some blanket pressure).

Elevation is typically used when the vessel is closed. To reference blanket pressures, a low side wet leg or remote seal must be used. The low side pressure creates a negative force on the transmitter equal to the vertical height times the specific gravity of the fill fluid.

Suppression is positive pressure created on the high side of the transmitter typically due to a zero point above the transmitter. It is normally employed in an open vessel referencing atmosphere. This is a positive pressure equal to the vertical distance between the 0% point and the transmitter times the specific gravity of the liquid.

Elevation/suppression distance almost never agrees with the piping and instrumentation diagram (P&ID) because actual piping (or remote seal capillaries) do not form exacting angles in the field. In most cases, the precise vertical height is not known until the unit is installed.



Span is the vertical distance of the process times the specific gravity: Figure 1. 10.5 * 0.9 = 9.45 mH2O (31.5 inH2O).

Calibration range is the calculated 0 and 100% taking into consideration positive and negative pressures. In figure 1, the following applies:

0% = H - L
= (4.5 x 0.8) - (15 x 0.8)
= 3.6 - 12 = -8.4 mH2O (-28 inH2O)

100% = H - L
= (4.5 x 0.8) + (10.5 x 0.9) - (15 x 0.8)
= 3.6 + 9.45 - 12 = 1.05 mH2O (3.5 inH2O)

The calibration range is:
-8.4 to 1.05 mH2O (-28 to 3.5 inH2O)

The information required to perform the calculation is not readily available. It exists in vendors instruction manuals, P&ID's, but not until the unit is actually installed will all the variables be known because the process piping and capillaries do not form exacting angles in the field.

Solution

DPharp has a smart level setup feature that eliminates the need for elevation/suppression calculations, making set up quick and painless.

Calibration is accomplished by simply following these four steps (for Brain):

1. Span the transmitter to the process, height * specific gravity of 0 to 9.45 mH2O (0 to 31.5 inH2O) using the BT200 in C21: LRV and C22: HRV.
2. Install to the process using either capillaries or impulse tubing.
3. Bring the process to a zero (4mA) condition.
4. Through the BT200 execute H10: Auto LRV in the H: AUTO SET menu.

DPharp will calculate the total elevation/suppression and automatically setup the device for that installation. It will even correct the values in software at C21: LRV -28 and C22: HRV 3.5 so the customer can print and record the actual configuration for their maintenance documents.

But what if I cannot bring my process to zero? I have installed the unit, fluid is now in the tank, and the output of the transmitter does not agree with my sight glass. What do I do?

Most transmitters can only make adjustments at 0% or 100%. DPharp can make adjustments anywhere with full elevation or suppression. Once the transmitter is programmed with the correct span, all that is needed is a known point in the process (usually provided by the sight glass.) The output can be adjusted in one of two ways.

1. Simply adjust the encoder on the DPharp until the output reaches the known point. In figure 1, the output would be adjusted to 60%.
2. The correct value can be entered into J10: Zero Adj. In the case of this example, the proper output value of 60% would be entered. The amount of deviation can be viewed in J11: Zero Dev.

DPharp's digital sensing technology makes this possible. With analog sensing technologies (like capacitance sensors), range changes often necessitate a re-calibration or a trimming of the A/D converter to achieve specified performance. The digital DPharp sensor has no A/D converter, no trimming is necessary. The new range is guaranteed to perform within specification.

Notes

1. In level measurement, it is important to maintain a consistent reference pressure. On a closed tank system, this is most efficiently achieved by the use of remote seals and capillary systems.
2. It is important to note that the span is to be calculated on process height x specific gravity of the process fluid, and will not necessarily agree with the physical height.
3. Output will be linear to the level, regardless of fluid or blanketing system.
4. Use of remote seals eliminates problems such as condensation in impulse piping, the requirement for maintenance of condensate pots and fill fluid leaking into the process.

Main Features of DPharp

EJA110E Digital Solution

- ±0.03% Overpressure calibration protection
- ±0.1% per 10years long term stability
- 100:1 turndown
- ±0.055% accuracy
- SIL2 standard

EJX110A Premium Value

- ±0.1% per 15years long term stability
- 200:1 turndown
- Best-in-class high accuracy, 0.04%
- Multi-sensing output
- Multi-variable transmitter as EJX family line-up
- SIL2 standard

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