What You Know Can Make All the Difference

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"In level measurement and monitoring, like so many other things, knowledge is power! Power, that is, to implement the most appropriate sensor technology properly the first time to fully achieve your objectives." This is one of my canned responses to the question I get from people about how to make certain that the best solution is employed for their level measurement needs.

I don't expect people to be experts on the wide variety of technologies available on the market for measuring and monitoring levels. That's why sensor manufacturers are here. However, you should know the details and aspects of what you own, your material and vessels. How much you know in these areas can make a difference between success and failure.

Generally there are two uses for level measurement and monitoring instruments: control and inventory. In control applications, a level sensor is used to manipulate some aspect of your process. Here are two examples:

Example 1. Controlling a Constant Feed Rate: Consider two vessels — "A" and "B" — both pressurized. The fluid from vessel "A" is required to be fed at a constant rate into vessel "B" to ensure proper production quality. This simple flow control problem is complicated by the existence of varying pressure in both vessels. As pressure varies the flow will vary. Controlling the process level in vessel "A" with a level controller and using the level controller output as an input to the flow controller is one way to approach this problem. This is known as cascade control. The output from the flow controller is then used to adjust a control valve for the feed flow into vessel "B." Therefore, measuring the level of vessel "A" accurately with the most appropriate process level transmitter is very important. This level control application utilizes a continuous level sensor/transmitter.

Example 2. Vessel Overfill Protection: Now consider a large silo containing a powder material. The silo contains some 200,000 pounds of material, which is held as inventory storage for production use. A pneumatic conveying system is used to transport the powder into the process where it is used. When the material in the silo reaches some low point, material replenishment must take place in order to ensure continued availability of material into the manufacturing process. When a new shipment of powder material arrives by truck or rail car, the material is pumped into the silo using a pneumatic filling system. To ensure that the silo is not overfilled a high level point is monitored for the presence of material. When material is detected at this point an emergency shutoff will occur, thereby preventing overfilling. Both the low and high level detection applications are examples of the use of point level indicators. These are switch or relay output devices, like a rotary paddle bin level indicator, and they signal the conveying system and your materials group of the situation. If the low level condition is not properly detected your process may need to shutdown unexpectedly. The high level sensor is critical also. It indicates to your fill control system that the vessel is at full condition and filling needs to be suspended. Not properly detecting this condition leads to overfilling, which can be costly, resulting in lost product, damaged equipment, environmental fines and clean-up expense.

Measuring the level of the material in a storage vessel for the purposes of accounting for it as "inventory" is the second type of use for a level measuring sensor. In this case the liquid, powder or granular material may be a "part" or "component" to your end-product, an "ingredient" or "admixture" to your process, or a catalyst used to transform your product from one stage to another. The common thread is that your material in this application is held in store and used as needed. Accounting for the amount of material in store at any given point in time impacts the production and finance of your business.

You must also consider material: My material is diesel fuel. My material is flour. My material is HDPE pellet. The list is huge of course. There are thousands of materials that are monitored continuously. Attributes of the material can make all the difference in selecting the best level sensor technology. Here's just a small list:

a. Specific gravity (liquid) or bulk density (solid). If you want to convert from level to mass, you will need to know this information. The more accurate your knowledge of this, the more accurate the conversion calculation will become. In addition, some technologies will respond differently to varying bulk densities, in the solids area, and may require adjustments or changes in options such as the paddle on a rotary paddle bin level indicator.

b. Corrosiveness/Abrasiveness. Especially when using invasive level sensor technology, or those that will have elements in contact with your material, you need to know how corrosive and abrasive the material is and how compatible it is with certain materials that the sensors may be constructed from. This will determine whether stainless steel or exotic metals are required or if a non-contact sensor technology must be used.

c. Dielectric Constant. Some sensor technologies are sensitive to the material dielectric constant. These include capacitance (continuous or point) and radar (contact or non-contact). The dielectric constant can vary widely from material to material and knowing the correct dielectric constant can mean the difference between success and failure.

d. Viscosity. Important for non-solid materials, especially for point level or switch applications. High viscosity fluids, including slurries, can stick and build up on invasive sensor elements in contact with the material. They also can affect the ability of some sensor technologies to work effectively.

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