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Good Vibrations in Storage Vessels

Vibrating rod level sensors for point level detection in challenging powders

By Jenny Nielson Christensen, MBA, Director of Marketing, BinMaster Level Controls

THE PROBLEM WITH POWDERS

What makes powders so challenging to detect with a level measurement device? One attribute is the variable composition of the powdered substance; it can be light and fluffy or extremely heavy and dense. The characteristics of the material stored in the vessel can vary due to factors such as moisture content or particulate size. Powders can be very fine – almost like a dust – or of a larger particle size, which will behave differently. Often in chemical processing plants, different types of material can be stored in the same tank over time, so it is more convenient to install a point level device that works in various types of materials.

If you are charged with managing a production facility, measuring the level of powders in bins, tanks, silos and other vessels is nothing to sneeze at. There are many types of level detection devices to choose from and undoubtedly, there will be performance and budgetary parameters that need to be met. A point level sensor is a device that sends an alert when the material in a vessel reaches a desired height, such as indicating if the vessel is nearly empty or full. Point level indicators are often the most affordable, reliable, and longest lasting solution for a chemical processing facility. When mounted in various strategic locations in the vessel, such as at near the top, at a critical replenishment midpoint, and near the bottom of the vessel, you can easily know when a bin is full, is ready for more material, or about empty. A rotary paddle switch, tilt switch, pressure switch or capacitance probe can be applied in a variety of powders with success. However, when dealing with challenging powders, a vibrating rod level sensor may be your best remedy.

TOUGH, YET SENSITIVE

The vibrating level sensor or vibrating rod is a piezoelectric driven vibration type level switch that is used for point level detection in bins, silos, hoppers and other vessels filled with powders or dry bulk solid materials. One of the technical advantages of a vibrating rod compared to other point level devices is its high sensitivity. A vibrating level

sensor can detect extremely light, fluffy materials as light as 1.25 lb./ft.3, such as aerated powders or flakes as well as heavier, coarse materials of larger particle size.

Vibrating level sensors are known for high performance and reliability and since the sensitivity is located at the tip of the sensor, material clinging to the vessel wall does not influence the function of a vibrating level sensor. Plus, a combination of low energy and tip sensitivity reduces the risk of false alarms due to building hollow spacing around an active sensor. As a vibrating level sensor is piezoelectric, it can be used to overcome difficulties in some applications associated with changes in dielectric constant, humidity, temperature, or material density.

A vibrating rod is a rugged sensor that is highly durable and virtually wear and maintenance free. For chemical processing applications where materials are harsh, the vibrating rod selected should feature stainless steel construction of all components that are in contact with the material or the vessel.

WON'T BUILD BRIDGES

A vibrating rod features a single rod element that prevents material from bridging, unlike a tuning fork that has two probes where material can lodge in between and result in a false signal. With a tuning fork, bridging can occur even in low level alarm applications where the pressure from material piled above the device can press material in between the two probes. When the material level drops below the level where the tuning fork is installed, the fork will still indicate "full" status, because the material bridged in between the probes doesn't fall away and continues to dampen the vibration. False full signals can interrupt a production process or shut down operations until the material in the vessel is replenished.

This sword-shaped design with sharp edges ensures material flows freely around the rod.

Particularly in powders, a single rod with a sword-shaped design overcomes the problem associated with tuning forks where material lodges between the two probes of the fork, builds a bridge and sends a false "full" signal. Some single rod

SWORD-SHAPED ROD MAXIMIZES VIBRATING ROD PERFORMANCE

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- Durable, stainless steel construction of all components in contact with material
- Hazardous location options for volatile environments
- LED status indicator light alerts to device status
- Three sensitivity settings, no calibration required
- Easy to install, convenient dual conduit entries
- Switch selectable high/low fail-safe
- High temperature and remote electronics models available

designs feature a round probe that may not be optimal for use in powders as material might adhere to it. A sword-shaped, single rod design is optimal for use in powders as its sharp edges encourage material to flow around the rod and reduce the risk of material sticking to it. The functionality of a vibrating rod improves when there is less surface area for material to cling to.

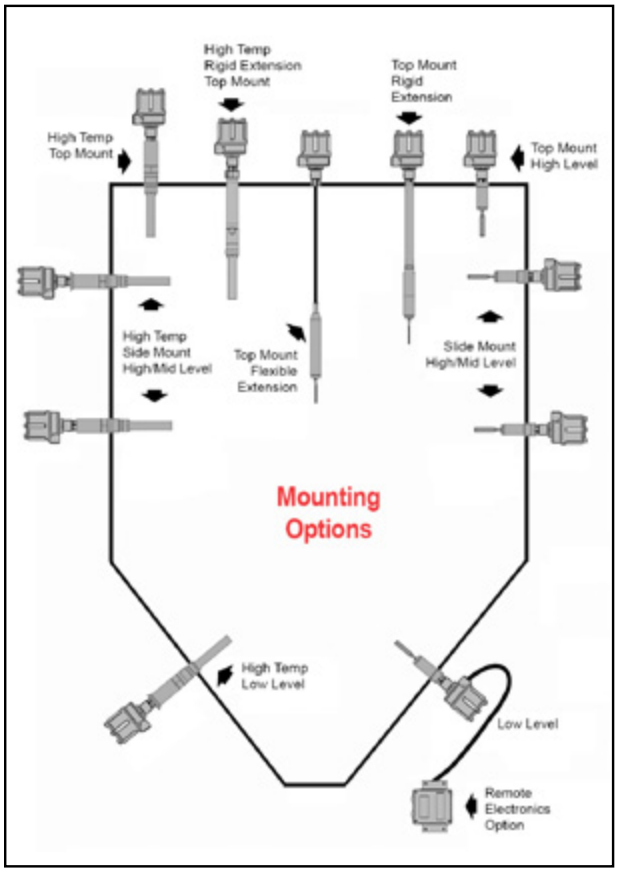
A TIP FOR EXCELLENT SERVICE

The tip of the sensor rod is what drives the sensitivity and correctness of the device status. The rod vibrates when there is no material covering the active rod. When the rod becomes covered with material as the vessel is filled, the vibration is dampened and an electronic circuit causes a relay to switch and sends an alert that the device is covered. Conversely, when the rod becomes uncovered, the vibration resumes and the relay will switch back indicating that the material level is now below the device.

With advancements in product design, most vibrating rods do not require calibration and easily adjust to the desired sensitivity level. Dust does not prevent the rod from vibrating, which ensures the device reacts properly when dust clouds or agitation are present. Environmental changes in the bin – such as temperature, humidity or pressure – do not require recalibration or impact performance. For process-critical applications, some models of vibrating rods offer a fail-safe alert that provides notification when power to the device is interrupted. This valuable feature helps to avoid overfills and empty tank situations that could shut down operations.

WHAT'S THE POINT?

Vibrating level sensors offer a great deal of flexibility utilized as a high, mid or low level alert mounted on the vessel wall. They can also be mounted on the top of the tank as a high level detector or in the bottom cone of a tank to sense when the tank is nearly empty. A vibrating rod mounted on the top of the tank can be extended down into the tank using a rigid or flexible extension. A top mounted, rigid extension can be installed anywhere on the vessel roof, as long as it is not in the fill stream. The rigid extension can be made of galvanized or stainless steel and is manufactured to a customer's specification, so the vibrating rod can detect material when it reaches the desired headroom height. A flexible extension made of steel rope reinforced cable withstands the rigors of material falling into the bin.



Some manufacturers may offer the option of mounting the electronics remotely from the sensing rod to protect the electronics from excessive conditions such as heat or vibration. In some chemical processing facilities, high temperature vibrating rods – some of which can withstand temperatures of almost 500°F – may be mounted directly on the vessel or using remote electronics. ■

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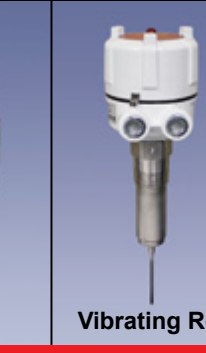
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