Measuring Pvc Level In Silos

J. Incontri, Marketing
KROHNE, Inc.
Beverly MA

Measurement Objectives:

- ✓ Reliable production supply thanks to continuous inventory level monitoring
- ✓ Reliable long range measurement even with extremely low tank levels in narrow silos
- ✓ No need for instrument flushing systems despite presence of products that are extremely sticky and dusty

Background:

A company that manufactures and processes PVC stores a variety of PVC shapes in several slim silos reaching heights of more than 65 feet (20 m). They supply product for their own production as well as to third-party producers. In additionto PVC powder and PVC granulate, regenerated PVC that is extracted from old shredded products is also stored.

Measurement requirements:

The level in the silos must be continuously measured to ensure a reliable production supply. The atmosphere in the silos is extremely dusty and the PVC dust is very sticky. Level measurement was previously done using ultrasonic devices, but this method often failed due to the great amount of dust build up and signal interference in the ullage space. Furthermore, since there is no compressed air supply installed on the tanks for the purpose of flushing the antenna, the customer was interested in non-contact radar measurement that did not require any kind of antenna cleaning. In an effort to find a suitable device, radar measuring devices from different manufacturers were installed as test units.

1 Tall Narrow Silos Prove Challenging for level

The chosen solution:

After the tests were completed, an FMCW radar level measurement instrument was selected for use in these applications. When it came to the antenna, a 3 inch (80mm) polypropylene drop shaped antenna (specifically designed for solid applications) was used for the irregularly shaped PVC granulate silos. A larger drop antenna 6 inch diameter (150mm) was used for the particularly minimally reflective PVC powder tanks since it features an even greater dynamic signal strentgh than the smaller diameter version, which is necessary to deal with the fine powder substance.

FMCW stands for "Frequency Modulated Continuous Wave" and is one of two popular radar level measurement techniques. When compared to the pulse method, FMCW features a much wider dynamic range and better signal strenght and those advantages clearly benefit these types of challenging solids and powder applications as well as difficult process liquid level tanks and reactor vessel applications.

The unique drop antenna (figure 3) has proven beneficial in powder applications since it is somewhat self cleaning, but more importantly perhaps, it focuses the available signal more than a horn can and that also improves performance in tall, narrow vessels.

Customer benefits

In the comparative test, these devices provided a reliable and stable measurement for all PVC granulate shapes, especially at low tank levels even without any kind of antanna aiming kit which had been necessary for the older instruments. Aiming kits were only needed for the extremely fine PVC powder applications to ensure more stable measurement. Once the radar was set at startup, no further aiming adjustments were needed.

Even though the PVC dust sticks permanently to the antenna, the egg-shaped solid design prevents any negative impact on the measurement. Thanks to the antenna's large radiating surface and the low dielectric value of the measured PVC product, the radar wave can easily pass through with minial effect on the signal strenth so no antenna flushing or special antanna dust protection is required, so they are effectively are maintenance-free during operation.

This solution allows the company to monitor the level in the silos at any time. It also eliminates any chance of running on empty and thus putting the production processes at risk.

2 FMCW Radar Gauge installed on top of silo

3 Unique Drop Antenna shape is unaffected by powder build up