

Measuring Volume in Bins, Tanks and Silos

By BinMaster

If your operation requires storing materials in bins, tanks or silos containing ingredients, finished goods, or waste materials, chances are monitoring the inventory in those bins is important to continuous manufacturing operations and timely replenishment activities. An acoustics-based inventory management system has many advantages for food processing operations and offers a variety of sensors that can meet the accuracy requirements and budgetary parameters for any type of operation that routinely manages powders, granular and bulk solid materials.

Commonly referred to as a 3DLevelScanner or generically a scanner, this technology has revolutionized inventory management by taking the data available to operations personnel from a simple, single point of level measurement to a complex volume estimation with a very high level of accuracy.

Non-contact for food safety

One of the many advantages of scanner technology is that there is nothing that comes into contact with the material, so there's no risk of contamination, making it safe for use in food processing operations. The technology works by sending very low frequency acoustical signals to the surface of the material. Scanners are proven to work in light powders like flour, fine granular material such as sugar, all types of grains, and even hard to measure materials like the waste of blood and feathers from poultry processing operations. It is recommended for any material with a bulk density greater than 12 lb./ft.³

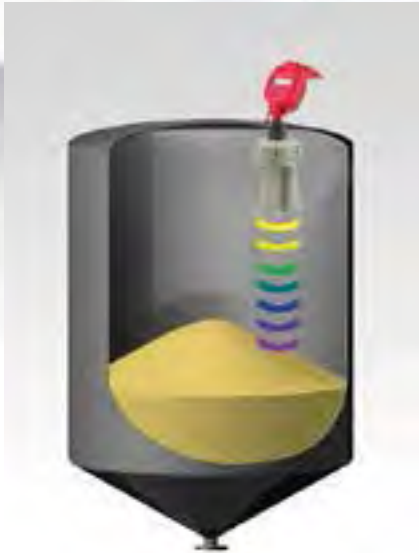
Reliably Penetrates Dust: Perhaps one of the greatest benefits of acoustics-based versus other level measurement technologies is its ability to measure reliably in high levels of dust. Many food processing operations routinely handle excessively dusty materials that can be difficult to measure. Dust particles are prone to confusing some types of level sensors that won't measure at all or provide inaccurate data when dust is present. Scanners will perform reliably in high dust environments such as soybean meal, providing highly accurate inventory data.

Self-Cleaning Reduces Maintenance: Due to the nature of acoustic pulses that "chirp" and send an almost imperceptible vibration through the device, the sensor stays clean. This means it

will perform consistently and reliably over a long period of time and require virtually no maintenance. For excessively sticky, clingy materials, a Teflon® coated option can be used to further prolong the preventive maintenance cycle. Other types of sensors may require routine maintenance at short intervals or an air purge for cleaning, which can be expensive to run to the top of a tank. Some scanners also have the ability to track the topography of the material in the silo, making it possible to detect side-wall buildup, so removal of the buildup can be scheduled in a timely fashion.

Multiple-Point Measurement Accuracy: Most every device for monitoring materials in silos measures only a single fixed point repeatedly in the same location. The scanner has the ability to measure multiple points within the silo, which enables the





The RL detects level in a narrow beam and is ideal for bins of all size where a single measurement point is adequate.



The S model measures multiple points within a 30° beam angle and is ideal for smaller silos.



For larger silos, the M model measures multiple points within a 70° beam angle to accurately calculate volume.

software to calculate a much more precise volume of material contained in the silo. Plus, these measurement coordinates can be used for three-dimensional mapping of the contents to create a visual representation of the material topography. It can be valuable to know if buildup exists or if a cone is up or down when planning maintenance or replenishment of inventory.

No Climbing Enhances Safety: No one likes risking an accident or OSHA violation and all of the hassles, time and money that they present. By eliminating the need for climbing silos to check inventory levels, acoustic sensors make the workplace safer by preventing accidents. As inventory data is sent from each silo to a personal computer, the data can be viewed from the safety of an office. OSHA regulations for climbing or entering silos require compliance with stringent rules and complicated paperwork that can be avoided using an automated measurement system.

A Model for Better Accuracy: Scanners come in a variety of models to address the accuracy desired, the vessel size, the behavior of the material, and the budgetary parameters of an operation. The most basic model – referred to as an RL for detecting reliable levels – will measure material within a narrow beam directly below the device. It is recommended when the level of material in the vessel needs to be monitored continuously and is well suited to materials that flow freely and are less prone to buildup.

When an estimation of volume is also needed, more complex processing of data is performed by an S model that determines average volume based upon an average level in the vessel determined

by multiple measurements taken within a 30° beam angle. This model is ideal for smaller diameter silos up to 16 feet in diameter and up to 200 feet tall.

For very high levels of volume accuracy, the M model measures material within a wider 70° beam angle and is appropriate for larger silos or silos with highly irregular topography. The M model provides high, low and average levels, plus a very accurate volume estimation based upon multiple measurements across the material surface.

The addition of visualization of the material surface is provided by an MV model that measures and maps the surface and displays a graphical representation of the topography of the material in the silo on a computer screen. This can be used in the detection of cone up or down conditions or to identify where there may be buildup in the vessel that may need removal. This model is most often applied in powders or other materials prone to buildup or in larger vessels with multiple filling and emptying points.

Although any scanner model can be used in any size vessel, a thorough understanding of the desired level of accuracy will determine which model will provide the best performance.

Acoustic level sensors are revolutionizing inventory management in bins, tanks and silos by providing more accurate, continuous, real-time information to help make operations safer and more efficient. Plant managers report that they are able to buy smarter, replenish when needed, reduce safety stock and keep their employees out of harm's way with a scanner system. 