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The Rise of 3-D Level Measurement

3-D Multiple-Point Measurement Improves Inventory Accuracy

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When you need better inventory accuracy in your bins, tanks and silos — more is better. That is, measuring more than one level point in the bin is better. Measuring multiple points in a bin and calculating inventory based upon a sampling of measurements versus a single measurement will provide improved volume accuracy. Revolutionary advancements using acoustical-based technology features multiple-point measurement and employs 3-D mapping software that graphically depicts the topography of the bin to deliver volume accuracy that surpasses the performance of single-point measurement devices.

What Kind of Volume Accuracy Can You Expect?

3-D technology has been proven to deliver up to .5- to 3-percent volume accuracy when mounted in the proper location and used in a bin that is less than 45-feet in diameter. For bins wider than 45-feet or silos wider than they are tall, volume accuracy will begin to diminish, but will still be more accurate than any single-point device. The reason for less accuracy in wider bins is the device sends acoustical pulses within a 70-degree beam angle. If the entire material surface is not covered, accuracy may be less, or you might need more than one 3-D device in the bin to cover the entire material surface. Mounting the device in a less than optimal location will impact accuracy, as will obstructions in the bin that might interfere with the signal. Other factors that may impact accuracy include audible noise — such as excessive noise during filling — as the acoustical pulses can be disrupted by sound.

How Does 3-D Technology Measure Up?

Typically, a single-point device mounted 1/6-inch from the outer diameter in a center-fill, center-discharge bin will provide 5- to 7-percent accuracy. Weight- and cable-based sensors or guided radar-type devices are proven to provide this level of accuracy. When mounted properly, the location can account for the angle of repose in the case material is "cone up" or "cone down." A single measurement point can be highly accurate – some devices, such as radar or ultra-sonic, claim less than 1" – but that applies only for that one point in the silo. However, some technologies might not be this accurate when dust is present in the bin, dependent upon how dust might interfere with the performance of the device.

How Does 3-D Technology Work?

A scanning device sends low-frequency acoustical pulses and receives echoes of the pulses from multiple points within the bin. Unlike most devices that are measuring one point and determining a single distance, 3-D technology takes measurements from multiple points within the bin and uses these points to determine not just the level, but also calculate the volume of material in the bin. For example, how many bushels of soybeans are in a grain bin? The low frequency pulses used in 3-D technology are proven to work in dusty environments — even flour and cement — where other technologies have failed. It offers very low maintenance and is self-cleaning, making it ideal for high dust environments.

What is 3-D Mapping?

Say there is an up or down cone, multiple filling or emptying points, the material is prone to sidewall buildup, or the material is a powder that is prone to bridging. This can result in an uneven material topography where there are points in the bin that are lower or higher than the majority of the bin contents. If just one measurement is taken at a random point, it may not be truly representative of the volume of material remaining in the bin. 3-D technology solves this problem by taking multiple measurements and providing the user minimum and maximum distances, as well as, an average distance, that is weighted and calculated based on actual Measurement points. When using an advanced version of the software, these measurement points are converted into a graphical representation of the bin contents that shows high- and lowpoints and detects sidewall build-up.

How is 3-D Optimized for mySilos?

The optimal mounting location for the scanning device is determined by using a program that takes the bin dimensions and outputs a drawing that shows the mounting location that will provide the best accuracy. The scanning device is then mounted on the top of the bin using a mounting plate that ensures the device is completely level. The patented acoustics-based technology sends out pulses that measure bin contents at multiple points inside the bin within a 70-degree beam angle. This data is sent to a personal computer loaded with 3-D software that generates detailed log reports that allow the user to easily monitor inventories remotely from the comfort of an office. Remote configuration of the device, as well as software upgrades and troubleshooting, can be done via a cellular modem, which is installed along with the device.

What are the Benefits of More Accuracy?

Plants are demanding better accuracy whether they are looking to track the inventory of high value plastic resins in a few small silos or the amount of corn in a million bushel bin. For many operations, a few percentage points of accuracy can account for thousands of inventory dollars. Plant and purchasing personnel are looking to increase inventory turns, reduce carrying costs, and optimize purchasing cycles and delivery logistics. 3-D accuracy can help explain variances by detecting variations in bin topography including sidewall build-up, while also helping plant managers optimally schedule maintenance and reduce downtime. There is no level measurement device that will provide 100-percent volume accuracy, so it's important to understand just how much accuracy is needed for your operation, and to weigh the expense of gaining more accuracy versus the value to your operation. Getting the best results takes knowing the exact specifications of your silos, applying strapping tables to account for changes in bulk density throughout the silo, the patience to fine tune the technology to your silo parameters, and perhaps most important – to set realistic expectations.
If you seek better accuracy, 3-D technology delivers volume accuracy that surpasses any single-point level measurement device.

Actual Applications of 3-D Technology

Description: *Food processing operation with material prone to dust and sidewall build-up.*
Material: Rice
Bin Details: 100-feet-tall by 27-footdiameter carbon steel silo with cone bottom.
Challenge: Provide highly accurate volume measurements and stability as bin was emptied almost completely   before refilling. Desired more precise headroom than a single-point device.

Description: *Manufacturer of livestock feed with very wide bin, wider than it is tall*.
Material: Shell corn
Bin Details: 60-feet-tall by 105-foot diameter galvanized steel bin with cone top and center fill.
Challenge: The customer had no level controls and was looking to manage inventory. Wanted more accuracy   than a single point device as the bin has multiple pullout locations.

Description: *Plastics manufacturer*
Material: Plastic regrind
Bin Details: 18-feet-tall by 15-footdiameter steel-corrugated bin, centerfill/ center-discharge with steep cone   bottom.
Challenge: No other level control technology would provide consistently reliable measurements. The top of the bin was difficult to access and the steep cone at the bottom made it difficult to tape.

Proven to Work in Worldwide Applications

Concrete Silos at Ethanol Plant

Corn Bins

Food Processing Plants

United States
The 3DLevelScanner was installed at a major producer of lime and limestone products to help them improve inventory management.

Scandinavia
A leading producer of high quality, limestone-based products for the Northern European market has installed the 3DLevelScanner to measure raw materials in several Scandinavian sites.

Poland
A Polish subsidiary of the world's largest producer uses the 3DLevel Scanner to monitor the volume of lightweight, expanded clay aggregates.

Spain
A top Spanish manufacturer and marketer of gypsum and laminated gypsum board uses the 3DLevelScanner to assess inventories of raw gypsum mineral crystals under very harsh environmental conditions.

Greece
A large Greek producer of white cement and mortar installed the 3DLevelScanner to monitor inventories under very challenging process conditions.

Poland
One of the top global companies in the cement industry, with a presence in more than 50 countries across five continents, installed the 3DLevelScanner in multiple sites in Spain and Poland to accurately measure loads of raw material that randomly form inside silos under extremely challenging, dusty environmental conditions.
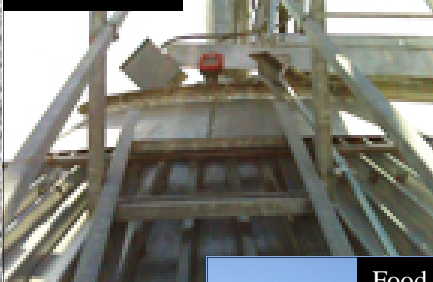
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