

CHEMICAL PROCESSING

LEADERSHIP | EXPERTISE | INNOVATION

Powder eHandbook



Tips for Effective and Safe Handling of Solids

Pump Up the Volume with Advanced Bin Level Measurement

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MONITORING INVENTORY levels in bins, tanks and silos has become increasingly challenging for companies that produce goods, the vendors that supply raw materials, and the solution providers that help companies monitor their inventories. Many processors deal with high value materials and no doubt the cost and value of raw materials, as well as inventory carrying costs are increasing. Suppliers to processing companies often share in the monitoring of material inventories and are partners in helping their customers manage just-in-time inventory, optimizing inventory turns and controlling costs. Companies that manufacture systems that help processors and suppliers manage their inventories are designing solutions to meet the evolving requirements of level sensors, creating advanced communications networks, and software that makes data easily accessible in real time.



The 3DLevelScanner is a non-contact, dust penetrating sensor that sends bin level and volume data to a PC.

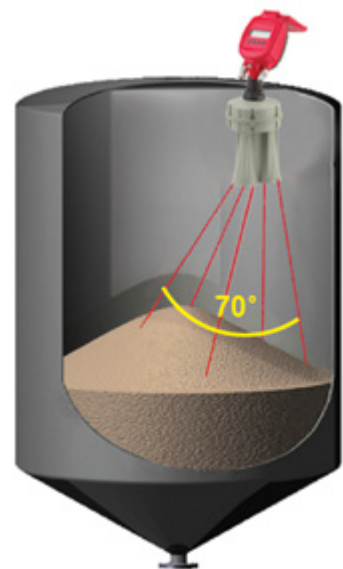
When it comes to measuring powders and solids in bins, tanks and silos, plant personnel are often faced with complex issues such as:

- Inventory must be more accurate
- Material volume as well as level is needed
- The material surface being measured is uneven
- Powders and solids in the vessel are prone to buildup
- There are high levels of dust present
- Devices must be highly reliable with minimal maintenance

Over the past few years, acoustics-based level measurement is one technology that has emerged as a proven solution to address these issues. The sensing device – more commonly referred to as a 3DLevelScanner – is coupled with a suite of solutions that can accurately measure most types of powders and bulk solids in challenging environments. It delivers both level and volume data using intuitive monitoring software that can be customized to meet the needs of multiple departments within an organization or shared with vendors who are partners in managing the inventory of materials.

MULTIPLE-POINT MEASUREMENT FOR BETTER INVENTORY ACCURACY

The non-contact, acoustics-based technology used by the 3DLevelScanner sends pulses in a 70° beam





angle, taking multiple measurements from the material surface. Most devices in use today take only a single measurement and dependent upon where the measurement is taken, the diameter of the vessel and the degree of irregularity of the material surface, a single measurement point may not accurately represent the true level of material in the vessel. Unlike single-point devices, the 3DLevelScanner continuously maps the surface of the material to account for changes in level, overall volume and surface topography. The software reports the lowest point detected, the highest point detected and the average level based upon a weighted average of all of the measurements detected in the bin. The data is used to provide the user detailed information about the level of material in the bin and calculate an estimation of the volume of material in the bin.

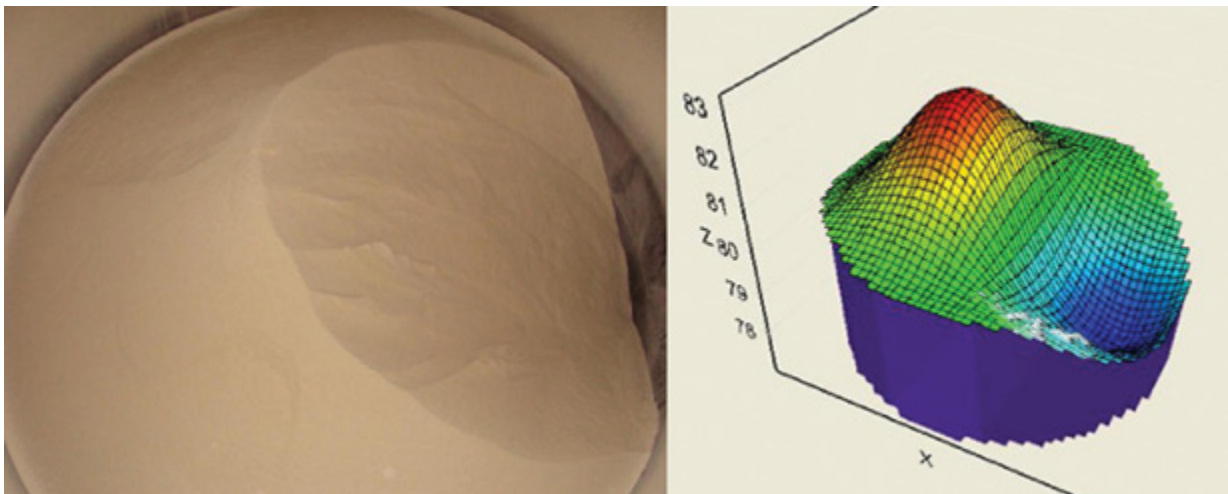
REPORTS BOTH LEVEL AND VOLUME

Advanced algorithms in the processing firmware are used to convert the detailed level measurement data to a volume estimate – such as tons, pounds, cubic or metric feet – for the vessel. In many cases, especially in applications with powders that are prone to irregular material surfaces or sidewall buildup, there will be points in the vessel that can be significantly lower or higher than the majority

of the contents. By detecting irregularities in the material surface, varied topography and excessive buildup can be accounted for in volume calculations. If a simple average formula was used to determine the average height of the material, it could be inaccurate. By using an algorithm that bases the average height from all of the points and the weights associated with them to determine the average volume and height/distance, the 3DLevelScanner can provide an estimation of bin volume that is more accurate than a volume estimate offered by any single point measurement device.

3D VISUALIZATION OF UNEVEN MATERIAL SURFACES

The 3DLevelScanner also offers the ability to generate a 3D representation of the material contents. By taking multiple measurements within the bin and then mapping the topography in the bin, the computerized profile created by the 3DLevelScanner can show high and low spots in the vessel as well as material built up on the sides of the vessel. With single point devices, a measurement may show the bin is almost empty, even when a significant amount of material remains in the bin. This visualization feature also helps alert maintenance management to the need for bin cleaning at the optimal time.



The image on the left shows the irregular material surface during the empty cycle; the image on the right is the 3D visual representation created by the software.



PERFORMS IN HIGH LEVELS OF DUST

The 3DLevelScanner uses a very low frequency acoustical signal to penetrate dust and take measurements that are determined by how long the signal takes to reach the surface of solid or powder material and return to the device. These very low frequency acoustical signals are able to penetrate suspended dust, unlike other technologies whose signals become unreliable or inaccurate when attempting to take measurements in dusty environments. The acoustical signals – which make a chirping noise – combined with a non-stick material in the horns of the sensor, prevent material from adhering to the internal workings of the device ensuring long-term reliable performance. The 3DLevelScanner is self-cleaning, offering very low maintenance in even the dustiest environments.



HANDLES VOLATILE OR HARSH ENVIRONMENTS

A combination of dust, humidity and heat may be present in vessels storing chemicals. A 3DLevelScanner with an extended operating temperature range of up to 250°F (120°C) can accommodate these higher temperatures without sacrificing measurement accuracy. Materials that have been heated in the production process may be conveyed into the silo when they are still relatively hot. Unlike some non-contact devices that are prone to becoming unreliable under challenging conditions, the 3DLevelScanner designed for harsh environments will maintain a high level of measurement accuracy. It will perform in a wide variety of materials including powders and fine granular substances such as alumina or silica.



The outside of the sensor is coated with dust. Inside the transducers are clean and fully operational.

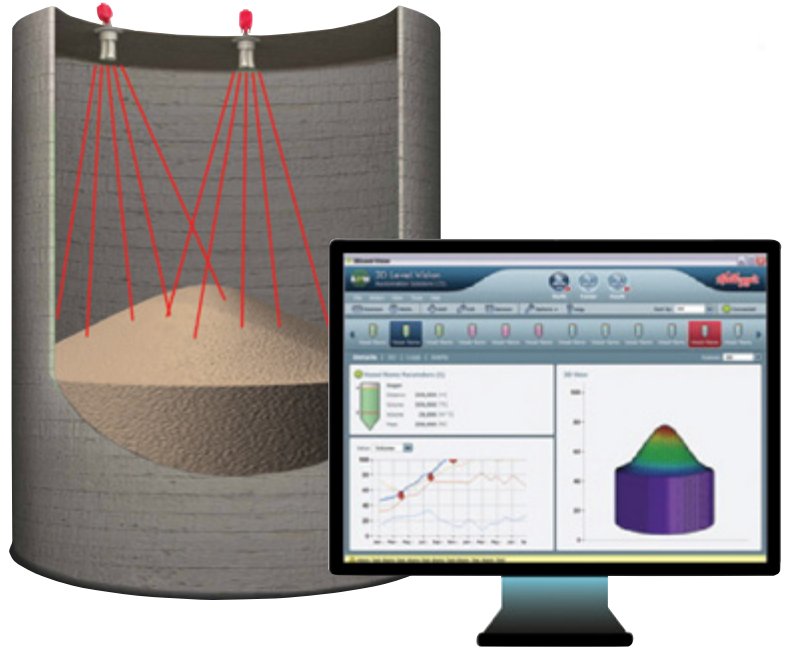
ACCURACY IN WIDE DIAMETER OR LARGE BINS

Suppliers and processors of materials such as alumina, bentonite, lime, silica, or sodium may store these and other bulk materials in vessels that are very wide or large. As the 3DLevelScanner measures and maps the material surface based upon a 70° beam angle, a single 3DLevelScanner provides the most accurate data in a vessel up to 45' in diameter. If an operation has wider vessels or the vessel is not at least as tall as it is wide, the 70° beam angle may not detect the entire material surface.

To achieve a high level of accuracy for large diameter bins or bins that are not very tall, multiple 3DLevelScanners can be mounted on the same vessel at locations that allow the sensor to more completely cover the material surface. Often two 3DLevelScanners – one mounted closer to the perimeter and one closer to center, but away from the fill stream – will provide the desired level of accuracy. However, a single scanner can be used in a very large bin if the ultimate goal for the system is not precise volume accuracy, but rather continuous, reliable level indication.

REAL-TIME MONITORING OF MULTIPLE VESSELS

Many processors have multiple types of bins, tanks and silos containing a variety of materials on site. Different people and departments across the facility may have need for bin level or volume data. Plant managers, production, maintenance,



When two or more sensors are mounted on a single vessel, the software aggregates the data to provide an average level, volume and single 3D image.

purchasing, logistics and accounting personnel utilize inventory data to perform their jobs. Highly accurate, timely data helps them streamline production, purchase and deliver optimally, and report fiscally. Advancements in software allow multiple users from multiple departments to quickly and simply view the data for all the vessels at the site or just selected vessels on a single screen.

Customized views allow users to quickly focus on those bins that need their attention. Data is available 24/7 and in real-time to help users optimize operations and make better decisions based on timely, accurate data. For example, production personnel may be concerned with bins whose levels are low and may need replenishment, or are reaching capacity and need to stop filling so as not to overfill and waste or damage material. By simply clicking on a single bin while in the multi-bin view, a user can view the detailed information for that bin and view the 3D profile. People from different departments can view the data simultaneously. Hosting the data on a single server assures it is accurate and all from the same database.



The levels of all vessels can be monitored by personnel from various departments from a common database in real time.

Unsurpassed Inventory Accuracy

3DLevelScanner



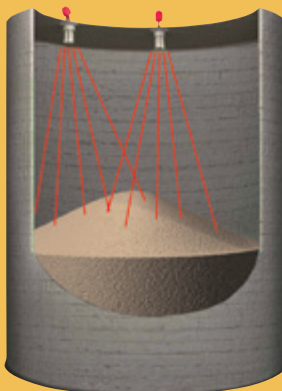
Non-Contact, Dust-Penetrating Level and Volume Measurement

- *Multiple-point measurement*
- *Detects and maps uneven surfaces*
- *Creates visual representation of contents*
- *Works reliably in dusty environments*
- *Self-cleaning, minimal maintenance*



***BIN*MASTER**

MVL Multiple-Scanner System



*Accuracy
in large
bins of
powders
and
solids*

3DMultiVision Software



*Monitor
all your
bins in
a single
window
from a
PC*

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