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Powder eHandbook



# Tips for Successful Powder Processing

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# Unsurpassed Inventory Accuracy

## 3DLevelScanner



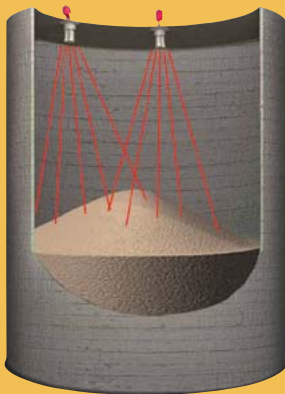
### Non-Contact, Dust-Penetrating Level and Volume Measurement

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



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## Cure Powder Measurement Headaches

3D technology can provide greater insight when measuring material in vessels

By Jenny Nielson Christensen, BinMaster Level Controls

**POWDERS HAVE** a tendency to create myriad material handling headaches, but with the advent of 3D non-contact technology, many of the hassles of level and volume measurement can be cured.

A relative newcomer to world of level measurement, the 3D sensor provides highly accurate level and volume measurement in challenging materials contained in bins, tanks, silos, domes and warehouses. The dust-penetrating, non-contact sensor sends pulses in a 90° beam angle, taking multiple measurements of the material surface and continually mapping it to detect changes in level to account for uneven surface topography. From the convenience of a PC or smartphone, the accompanying software reports the lowest and highest points detected and the average level based upon a weighted average of all measurements detected in the bin. The sensor also has the ability to accurately estimate the volume of material in the vessel. For the most advanced models, a colorful graphical representation indicates where high and low spots exist in the silo.

Now in existence almost five years, 3D technology is widely offered and is proven in thousands of installations, having been applied in a range of powders with bulk densities as low as 12 lb per cubic foot. As each 3D sensor installation is unique, a range of extensions and accessories have been developed to enhance the performance and reliability of the technology even when vessel conditions are not optimal. With operations demanding more accurate, real-time data about their inventory, new advancements continue to evolve for this non-contact volume measuring device.

### BENEFITS OF 3D TECHNOLOGY

Advances and improvements in non-contact radar have made it a popular choice in many operations. However, there are attributes of 3D technology that enable it to perform differently and better than radar in vessels containing powders. Radar only measures a single point on the material surface and takes that one measurement within an extremely narrow

### 3D SENSOR EQUIPMENT



Figure 1. 3D sensors take multiple measurements of the material surface and continually map it to detect changes in level to account for uneven surface topography.





beam at the same location repeatedly. While that one measurement point may be very accurate, radar ignores the irregular topography that often occurs in powders such as cone up or down and buildup that may form in the bin as it is emptied and filled.

Conversely, 3D measures multiple points within a 90° beam angle to account for uneven material surface. This allows for mapping of the material surface, enabling multiple measurements to be used for calculating a true volume of material, versus a single level measurement point that may or may not accurately reflect the amount of material in the vessel. Knowing the volume of material increases the accuracy of inventory valuation for better financial management and purchasing efficiency. Additionally, 3D software has the capability to render a visual of the material topography that can be used to understand material behavior and manage filling or emptying points and for scheduling maintenance to remove buildup.

### LEAVE THEM IN THE DUST

Dust can wreak havoc on the performance and accuracy of many level sensors, rendering them inaccurate and unreliable. In the case of radar, heavy dust may deflect the beam, preventing it from directly targeting the material surface and causing the measurement to be incorrect. Dependent on the stickiness of the material, radar may require frequent cleaning and preventive maintenance to continuously measure accurately. To address this, some radar devices are equipped with an air purge to periodically “dust off” the sensor.

The low-frequency, acoustics-based pulses used by a 3D sensor are able to penetrate excessively high levels of dust (Figure 2). With 3D sensors, the three-horn transducer is designed to resist dust buildup inside the horns. In most powder applications, annual minimal maintenance is all that’s needed. Another important attribute of 3D sensors: three transducers (Figure 3) send pulses to the material surface, versus radar which only has one. This results in better accuracy and more reliable performance.

Level sensors live in some pretty unhealthy

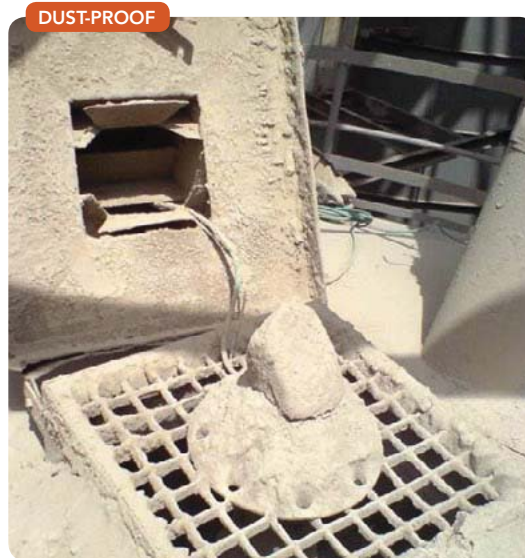


Figure 2. 3D sensors are proven to perform reliably in excessive dust.

### THREE TRANSDUCERS



Figure 3. Using three transducers to continuously measure and map the material surface helps ensure accuracy.

environments, many of which are characterized by extremely sticky dust. When dust is especially troublesome, a transducer with a Teflon coating resists buildup of dust on the device (Figure 4), ensuring the scanner performs optimally. The



**DUST PROTECTION COATING**



Figure 4. A Teflon-coated 3D sensor can be used in sticky, dusty materials to prevent blockage of the antenna.

**ANGLED VIEW**

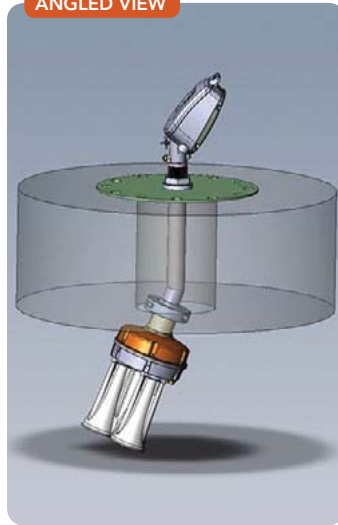


Figure 5. An angled neck extension provides improved coverage of the material surface when the 3D sensor can't be mounted in an optimal location.

**NECK EXTENDER**



Figure 6. A neck extension enables a 3D sensor to clear structures that may be present in the vessel.

Teflon-coated transducer prevents the antenna from becoming blocked, and the slick, self-cleaning surface requires minimal maintenance, reducing the need for workers to climb silos, and thereby enhancing employee safety. Some common applications for the Teflon-coated transducer include soybean meal, flour, sugar, alumina powder, fly ash and other materials that are prone to cling to surfaces.

#### LOCATION, LOCATION, LOCATION

Mounting the 3D sensor in an optimal location on the top of the bin is essential to getting the most accurate results. However, sometimes installation in the most desirable location isn't feasible or an existing opening is the only mounting option. The sensor must be able to "see" the contents of the bin in order to account for the entire material surface. To improve the 3D sensor's coverage of the material surface when it's not mounted in the best location, an angled neck extension allows the transducers to be pointed in

a more desirable direction that results in better coverage of the material surface (Figure 5). The angled neck extension can be used in instances where existing holes are too close to the vessel wall for the scanner to optimally scan the material surface. It can support angles of either 10° or 20° and should be used only if mounting the scanner in the most desirable location isn't possible.

If the sensor is mounted on a vessel with a very steep roof or in a hard-to-access location, it may be preferable to put the head of the sensor in an accessible area separate from the transducer. The head body separation assembly allows the transducers to be installed inside the bin while allowing the head to be located in an easy-to-reach location. This optional assembly is available in three lengths: 3 ft (1 m), 8 ft (2.5 m) and 33 ft (10 m).

#### CLEARING OBSTRUCTIONS

It's not unusual for a permanent structure or other



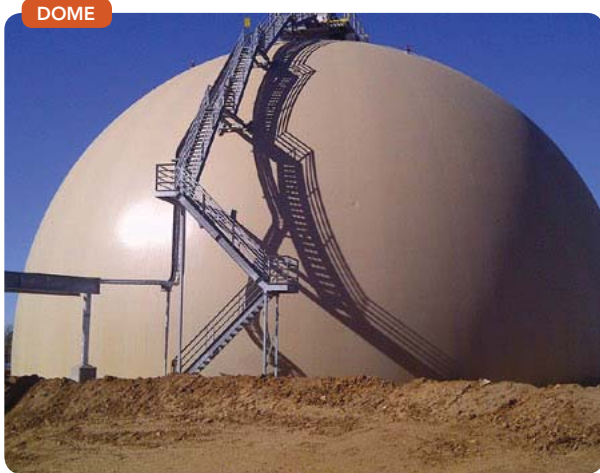


Figure 7. 3D technology is proven to measure material accurately in large domes and silos.

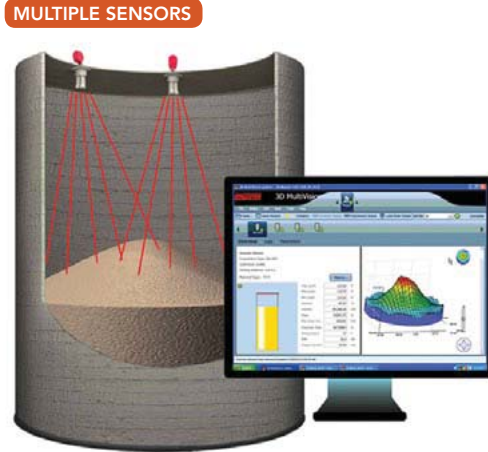


Figure 8. For very large vessels, multiple 3D sensors measure and map the material surface.

obstructions to be present in vessels, especially near the top of the vessel. The 3D sensor can see this structure, which impairs the accuracy of measurement results. Optional neck extensions (Figure 6) are used when it becomes necessary to lower the transducer assembly below obstructions such as beams or rafters that may interfere with the performance of the scanner. The neck extensions also are used when the scanner is mounted on a thick roof or on a raised socket. Neck extensions in 2-, 4-, 6- and 10-ft lengths allow the 3D sensor to be effectively installed without any degradation in performance, or the need for special structural alterations or adapters.

#### MULTIPLE SCANNERS DO DOUBLE DUTY

Very large silos, flat storage warehouses or domes (Figure 7) storing large quantities of powders, granules or other types of bulk solid materials are especially difficult to measure. Measuring a single point in these vessels and using that data to estimate inventory is risky, especially if the material doesn't flow freely and tends to want to clump or pile up.

For large vessels, multiple 3D sensors can be installed on the top of the vessel to measure and map the material within (Figure 8). With special software

that combines multiple measurements from multiple devices, a true volume of material can be estimated and the contents can be visually mapped to show the location of the high and low spots. Devices such as radar or ultrasonic only measure a single point, making 3D sensors a more accurate and viable option for large vessels.

#### DOUBLE VISION

3D sensors come with standard PC software for configuration of the vessel and for viewing level measurement data, the estimated volume of material in the vessel, and optional 3D visualization of bin contents. If a site has multiple vessels, an advanced software program can be used to monitor multiple vessels from a single screen. Vessels can be identified by location and contents and can be sorted to view only the desired vessels. Alerts can be set to notify users when material reaches a predetermined level, such as a high- or low-level alert. Plant management, purchasing and financial personnel are able to access inventory data as needed to make better-informed decisions.

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