3DLevelScanner™

Accurate Volume Measurement for Powders & Bulk Solids

The BinMaster 3DLevelScanner uses non-contact, dust-penetrating technology to provide unsurpassed bin volume accuracy. Unlike single point devices, it works by measuring multiple points within the bin. This advanced acoustics-based technology is proven to perform in powders and bulk solids contained in tanks, silos, warehouses, and even open bins and piles. Its unique 3D mapping capabilities provide a visual representation of bin contents, detecting cone up or down as well as sidewall buildup.

Multiple Point Bin Volume Measurement

- Continuous and non-contact measurement
- Measures uneven powder or solid material surfaces
- Detects cone up, cone down and sidewall buildup
- Provides minimum, maximum and average distances
- Performs in extreme levels of dust
- Calculates highly accurate bin volume
- Communications include 4-20/HART, Modbus RTU, TCP/IP and RS-485
- Measuring range up to 200 feet
- Self-cleaning with minimal maintenance
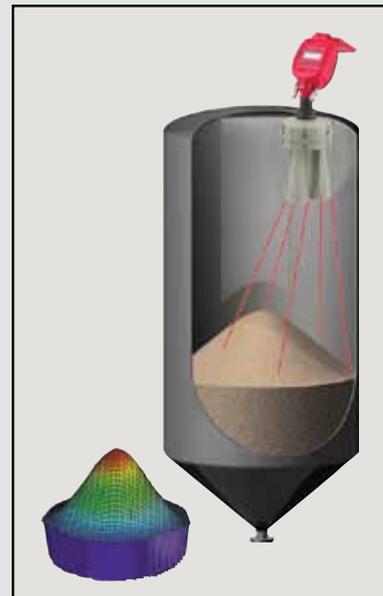
BINMASTER®
www.binmaster.com

Non-Contact, Dust Penetrating
Bin Volume Measurement

Actual installation on rice bin.

Using patented acoustics-based technology, the BinMaster 3DLevelScanner measures bin contents at multiple points making it one of the most accurate devices on the market today. Its advanced, low-frequency technology penetrates dust, allowing it to perform reliably where other technologies have failed.

The 3DLevelScanner provides a scaled 4–20 mA output that can represent either the product or headroom volume. A digital HART communication signal superimposed on the 4–20 mA cable can enable two-way field communications, allowing for additional information beyond the normal process variable to be communicated to the 3DLevel Manager software. Multiple scanners can be directly connected via a RS-485 network to a PC running the 3DLevel Manager software or to multiple computers on a network using TCP/IP via a RS-485 network. Alternatively, a Modbus implementation can utilize the RS-485 network to send data. Theoretically, it is possible for up to 64 scanners to be polled on one RS-485 network.

Works in Dust

The 3DLevelScanner uses a very low frequency acoustical signal to penetrate dust and take measurements which are determined by how long the signal takes to "travel to" 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 "confused" when attempting to take measurements in dusty environments. The acoustical signals, combined with a non-stick material, 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.


Outer unit is coated with buildup from dust.

Inside the unit is clean and fully operational.

Multiple Point Measurement
Ensures High accuracy

Unlike conventional technologies that measure one point and determine a single distance, the 3DLevelScanner scans and takes measurements from various points within the bin. These points are used to determine the volume of material in the bin. Measurement points are not averaged to calculate bin volume. Instead, each point is given a "weight" or strength of accuracy rating assigned by an algorithm to determine the true volume of material within the bin.
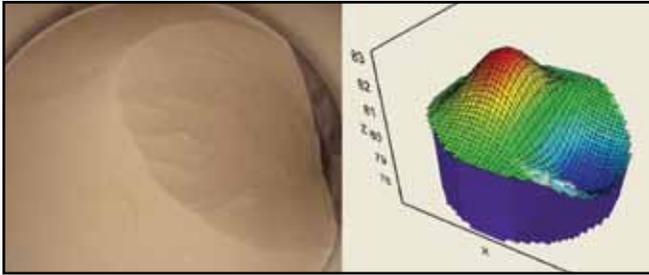
The image on the left shows the irregular material surface during the empty cycle; the image on the right is the visual representation created by the software.

In many cases, especially with applications prone to irregular material surfaces, there will be points in the bin that are lower or higher than the majority of the bin contents. If a simple average formula was used to determine the average height of the product, 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 a much more accurate estimation of bin volume.

Safe, Non-Contact Technology Reduces Risk

The 3DLevelScanner is a non-contact device, so it is ideal for food processing, pharmaceuticals, or chemicals where contact with the material being measured must be avoided. It is also suitable for "sticky" materials whose level needs to be monitored, but the material could cause problems by adhering to the measurement device. It also avoids situations such as broken or buried cables, which can cause maintenance problems and result in downtime and periods when no measurements can be taken.

Suitable for Pellets, Granulars, Powders and Most Other Bulk Solids

- **Grain, Seed & Feed**
- **Ethanol & Bioenergy**
- **Chemical Processing**
- **Aggregates & Cement**
- **Food Processing**

- **Pulp, Paper & Wood Pellets**
- **Petrochemicals**
- **Mining & Metals**
- **Plastics Manufacturing**
- **Power Plants**

3D Meets the Demand for Greater Accuracy

Inventory is money – The demand for greater accuracy applies whether the concern is just a few small silos containing high dollar resins or a million bushel bin full of corn. Each percentage point the bin measurement is inaccurate can represents thousands of inventory dollars.

Bins today can hold more than one million bushels.

Profit versus loss – Managing assets and carrying a large, high value inventory is of great concern to finance, the plant manager, or any corporate executive with profit and loss responsibility. A measurement that differs by several feet in a bin can create significant variances in volume and the calculated dollar value of the inventory.

Controlling cost of goods – In manufacturing and processing facilities, raw material in bins and other storage vessels can account for the majority of work-in-process inventory. Today, it is not unusual for a bin to hold a million bushels of material.
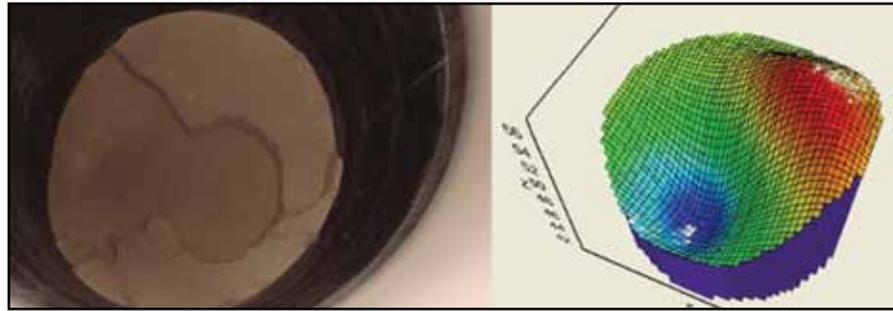
Unexplained variances – Measuring just a single point in the bin can lead to large variances, such as when measuring the same point in the bin when filling when the cone is up or emptying when the cone is down. Excessive variances can cause unexplained material losses or result in material shortages, disrupting the production process.

Smarter purchasing and logistics – Purchasing and logistics personnel need to ensure inventory is adequate for production, while at the same time optimizing inventory turns. An accurate stock position helps to optimize inventory carrying costs, while utilizing storage capacity to optimize transportation and logistics.

Accurate volume allows for optimal scheduling and logistics.

Detects bridging and sidewall buildup – By taking multiple measurements within the bin and then mapping the topography in the bin, the computerized profile created by the 3DLevelScanner can show bridging as well as material built up on the sides of the silo. By detecting irregularities in the material surface, excessive buildup can be accounted for in volume calculations. 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 feature also helps alert to the need for bin cleaning at the optimal time.

*Significant bridging is evident in the photo, which is detected and displayed in the 3D image on the right.*

Prevent silo collapse – There have been instances around the world where excessive buildup on one side of the silo has caused the silo to collapse. By detecting the buildup of material early, excessive damage to the silo and surrounding structures can be avoided. Installing a 3DLevelScanner can lead to a reduction of insurance claims and costly, time-consuming rebuilding of structures.

Theft detection and theft deterrence – Whether intended or not, it is not highly unusual for large amounts of inventory to simply disappear. Continuous inventory management allows for activity in the bin to be monitored and logged every day and night, and for unexplained variations to be researched promptly.

Volume Accuracy

Volume Accuracy - 3DLevelScanner M/MV
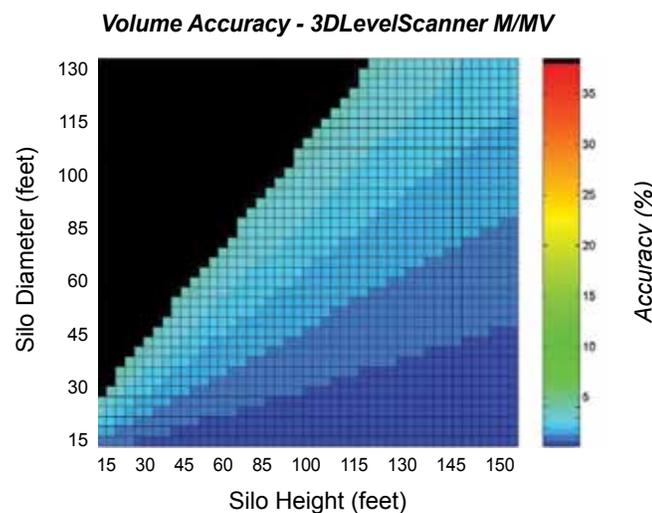
This chart depicts the potential variances in bin accuracy of a 3DLevelScanner. The M and MV models properly applied can provide volume accuracy of .5 to 3 percent.

# Narrow or Wide, Tall or Short Bin Applications

S model employs 30° beam angle for narrow bins.

There are three models of the 3DLevelScanner referred to as S, M and MV, all of which come with proprietary 3DLevel Manager software. Designed for bins up to 45' wide, the M and MV models employ a 2-dimensional array beam former that sends very low frequency, dust-penetrating acoustical pulses and receives echoes of the pulses from multiple points within a 70° beam angle on the surface of the material in the bin. The MV model offers the added feature of visualization, generating graphical representations of bin topography.

The S model is for narrow bins up to 14' diameter and up to 200' tall. The S model employs the same technology as the M and MV models, but within a narrower 30° beam angle. The S model takes an average of the numerous measurements within the narrower 30° coverage window, and calculates the average volume from the measurements within that window.
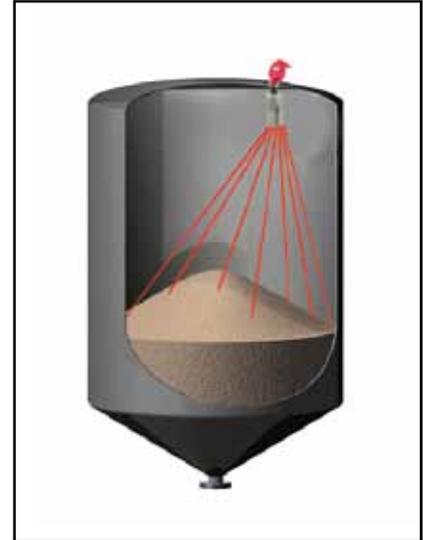
M and MV 70° beam angle for wide bins.

Models for Varying Applications

Model	S	M	MV
Bin Height	Up to 200' tall	Up to 200' tall	Up to 200' tall
Bin Diameter	Up to 14' diameter	Up to 45' diameter	Up to 45' diameter
Beam Angle	30°	70°	70°
3D Visualization	No	No	Yes
Output Data	Average distance	Estimated volume plus minimum, maximum, and average distance	3D visualization, estimated volume plus minimum, maximum, and average distance
Best Application	Tall, narrow bins with little or no corrugation	Wide bins, taller than they are wide	Wide bins, taller than they are wide

Note: Models 3DLS-S, 3DLS-M, and 3DLS-MV can be used on silos with a larger diameter than specified, but with decreased accuracies given that the beam angle will not span the entire surface of the material. Multiple scanners can be used on large diameter silos.

BinMaster 3D Benefits Add Up

Feature	Benefit
Multiple Point Accuracy	Taking measurements from multiple points versus a single point takes into account variations that can occur on material surfaces.
Dust-Penetrating Technology	Acoustical-based, low frequency technology is unaffected by dust, working where ultrasonic and radar have failed.
Non-Contact Measurement	Appropriate for foods, chemicals and pharmaceuticals as there is no risk of moving parts coming into contact with bin material. No risk of broken cables.
Volume Measurement	The M and MV models take into account multiple measurements to calculate a highly accurate bin volume (not weight or mass).
Detects Sidewall Buildup	The MV model with its 3D mapping visualization capability will detect and provide a graphical representation of sidewall buildup.
Unaffected by Material Type	Can be used in a variety of powders, granulates, pellets and other solids with no need for special calibration.
Long Measurement Range	Appropriate for tall bins (taller than they are wide) and able to measure a range up to 200 feet.
Low Power	Consumes very little power, making it cost effective to operate.
System Redundancy	Three independent transducers help to ensure accuracy.
Remote Configuration	A remote link with BinMaster's engineering laboratory during the initial installation period allows bin parameters to be loaded in the software and fine tuned for optimum performance.
Self Cleaning	The acoustics-based technology helps keep the transducers clean, requiring only periodic maintenance (every six months) in even extremely dusty environments.

3DLevelScanner
Expertise from BinMaster

More than 50 Years Experience – Since 1953, BinMaster and its parent company Garner Industries have built its reputation by treating customers right. BinMaster is financially strong and is here to service your needs now and well into the future.

Thousands of Satisfied Customers – For 50 years, BinMaster has been supplying companies of all types and sizes with a wide variety of bin level solutions. With a reputation for quality products and responsiveness from sales to service, BinMaster recognizes the lifetime value of each and every customer.

Wide Array of Products – With a complete line of point and continuous level control devices and inventory management solutions, BinMaster's skilled sales staff will fit you with what you need to address your challenges and meet your budget. BinMaster offers SmartBob cable-based systems plus rotaries, capacitance probes, vibrating rods and many more devices for indicating bin levels and conditions.

75,000 Square Foot Operation – BinMaster owns and operates an ISO certified, state-of-the-art manufacturing plant in Lincoln, Nebraska, USA and is more than 100 employees strong. BinMaster is a manufacturer of level controls and also has an extensive machine shop for metals and plastics fabricating.

Engineering Expertise – BinMaster employs five full-time engineers and has a highly experienced in-house technical support staff, plus a nationwide support network of fully-trained distributors. BinMaster's policy is to address every inquiry on the same business day.

Nebraska Ethanol Plant

Wisconsin Corn Bins

Texas Beverage Processing Facility

Nebraska Snack Food Plant

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