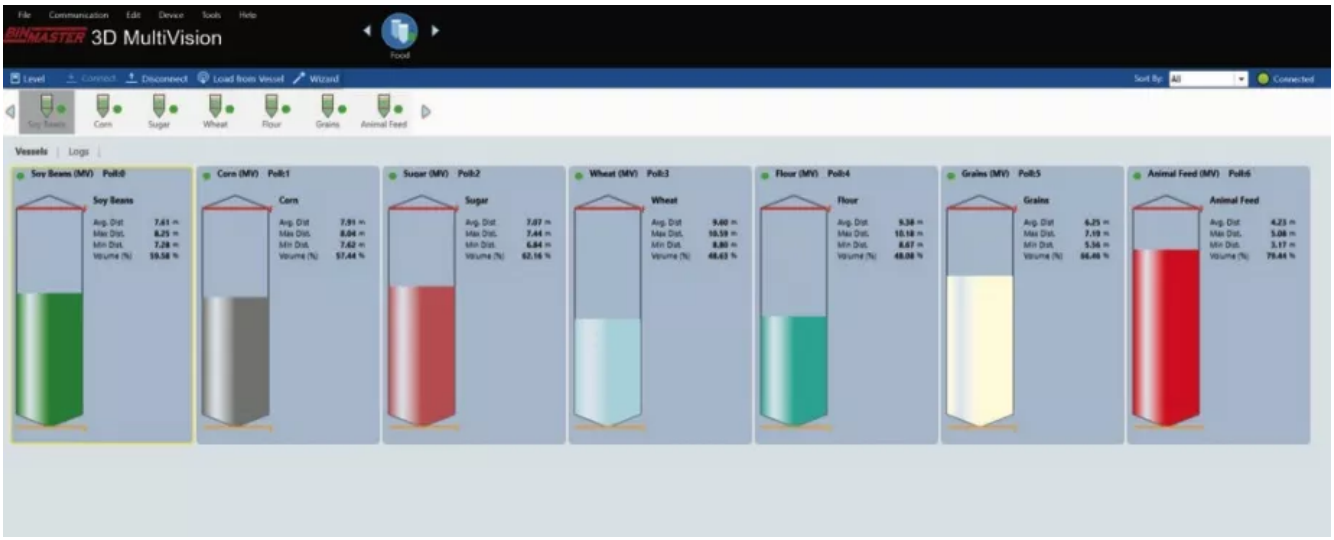


Whitepaper

3D Level Sensors can solve the toughest Food Storage Challenges

Bearbeitet von am 25. Feb. 2019

For almost a decade, 3DLevelScanners have been providing highly accurate level and volume measurement in challenging materials contained in bins, tanks, and silos. Measuring and mapping the material surface, these sensor sends pulses in a 70° beam angle, taking multiple level measurements and accounting for uneven surface topography when calculating volume.

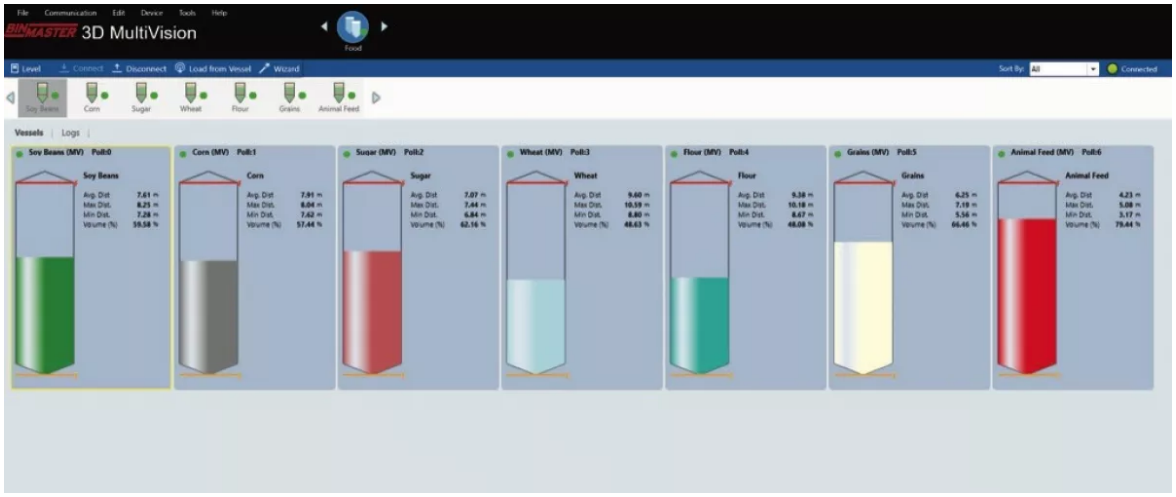
Each sensor comes with 3DVision software that reports the lowest and highest points detected and the average level based upon a weighted average of all measurements in the bin. For the MV and the MVL models, a colorful graphical representation indicates where high and low spots exist in the silo. 3D scanners keep pushing the boundaries – and addressing the concerns of increasingly complex food operations. This article shares a few of the newest innovations.

View multiple Silos on a single Screen

MultiVision software for inventory visibility across an organization

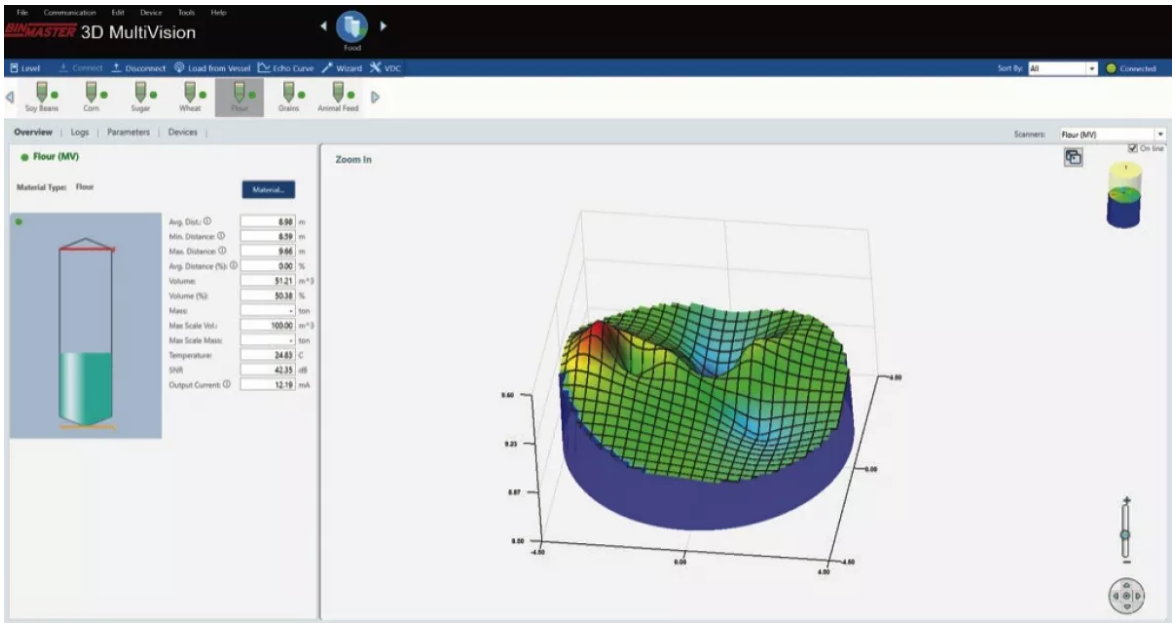
Inventory management affects multiple departments across a food processing organization. Plant personnel need adequate inventory for production, purchasing needs to know what to order and when, and finance needs accurate valuation for financial statements. To provide corporate-wide visibility, the optional 3D MultiVision software enables users to view data for multiple bins in a single

window. And since it is Windows-based, it can be configured for 24/7 access via an organization’s Local Area Network (LAN).



This example shows how the user can view multiple silos on a single screen, getting an overview of inventory for their operation.

MultiVision software can be used with all versions of the non-contact, dust penetrating 3DLevelScanner including the RL, S, M, MV and MVL models. By clicking on a single bin, users can zoom in on detailed information for the bin including minimum, maximum, and average levels. For the MV and MVL models, they can also see the 3D visualization of bin contents. The software allows multiple users at multiple locations to view bin level and volume data on a permissions basis.



Upon selecting a single tank, the user can get specific details about minimum, maximum, and average volume and view the 3D visual.

3D MultiVision software makes it easy to share real-time bin data across the entire organization (or with vendors using VMI) to improve purchasing, logistics, operational decisions, and financial management. With user-friendly setup and intuitive operation, each user can customize their screen to view all bins or a group of bins and color-code bins by material type. Users can set high and low-level alerts to be notified when bins reach critical levels. Because the software is installed on the LAN, there are no third-party applications or data access fees.

Teflon-Coated Sensor for Clingy Materials

Reduces maintenance in powders and sticky granules

For materials that want to cling to the sensor, a Teflon-coated transducer can be a great option. The Teflon coating resists buildup of dust, ensuring the scanner performs optimally in challenging materials such as powders or solids that generate excessive dust when the bin is filling or active. This special finish also extends the maintenance cycle by significantly reducing the need to clean the device after prolonged periods of use.

Some common applications for the Teflon-coated transducer include meals, sugar, starches, brans, and other similar materials that are prone to cling to surfaces. It is especially appropriate for food processors in industries such as baking, pasta, and candy where non-contact technology is a requirement for food safety. Grain millers will also find measuring ground soybeans, wheat, rice, or corn less troublesome when using the Teflon-coated model of the 3DLevelScanner.

Detect and Alert to Center of Gravity Danger

Prevent silo collapse or damage using 3DLevelScanners

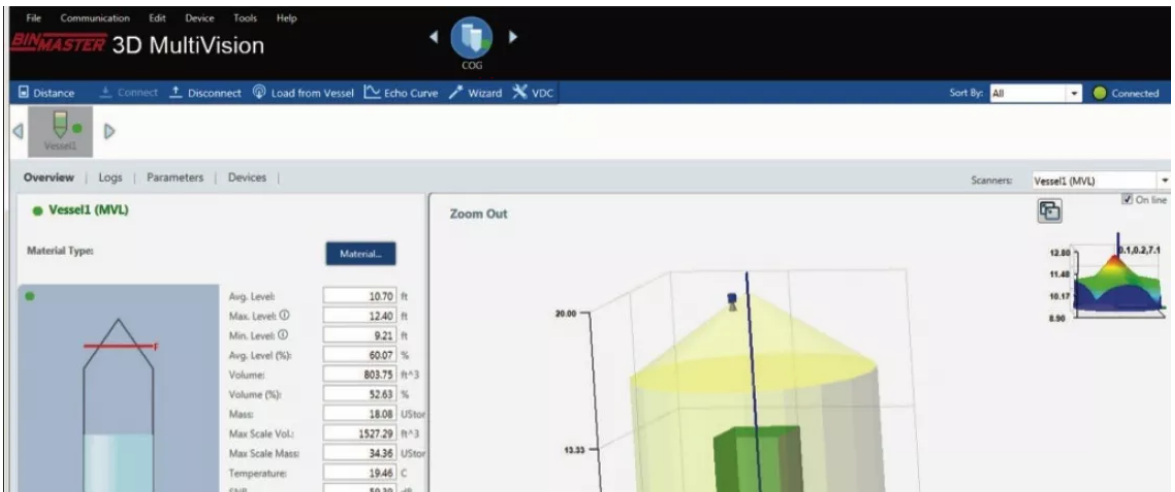
Many powdered and solid substances used in food processing tend to clump, pile unevenly, and flow unpredictably from storage vessels. Not only does this make monitoring the volume of material inside the vessel challenging; uneven disbursement of material can also take its toll on the storage vessel itself.

Over time, the walls of steel or concrete silos have been known to wear or fail causing cracking, denting, buckling, and bending. In the most severe cases, it can lead to catastrophic silo collapse. This has been seen in grain bins worldwide, where the walls of large storage vessels give way to the weight of grain that has built up on one side of the bin over time.

For plant operations that want to detect uneven loading of silos that contributes to structural wear or failures, there is now a software option that uses 3DLevelScanners to identify the location of the center of gravity, display it graphically, and alert when the center of gravity falls outside of a predefined area.

A 3DLevelScanner is mounted on the roof of the silo in an optimal location to view the material surface in the silo. Level measurements are used to determine the X, Y, and Z coordinates of the center of gravity based upon the material topography. The coordinates are processed in 3DMultiVision software via a proprietary RS-485 communication protocol. Users define the alert parameters and accepted area into which the center of gravity must fall. A 3D visual will indicate where the center of gravity is located and show if the current center of gravity falls in the acceptable area.

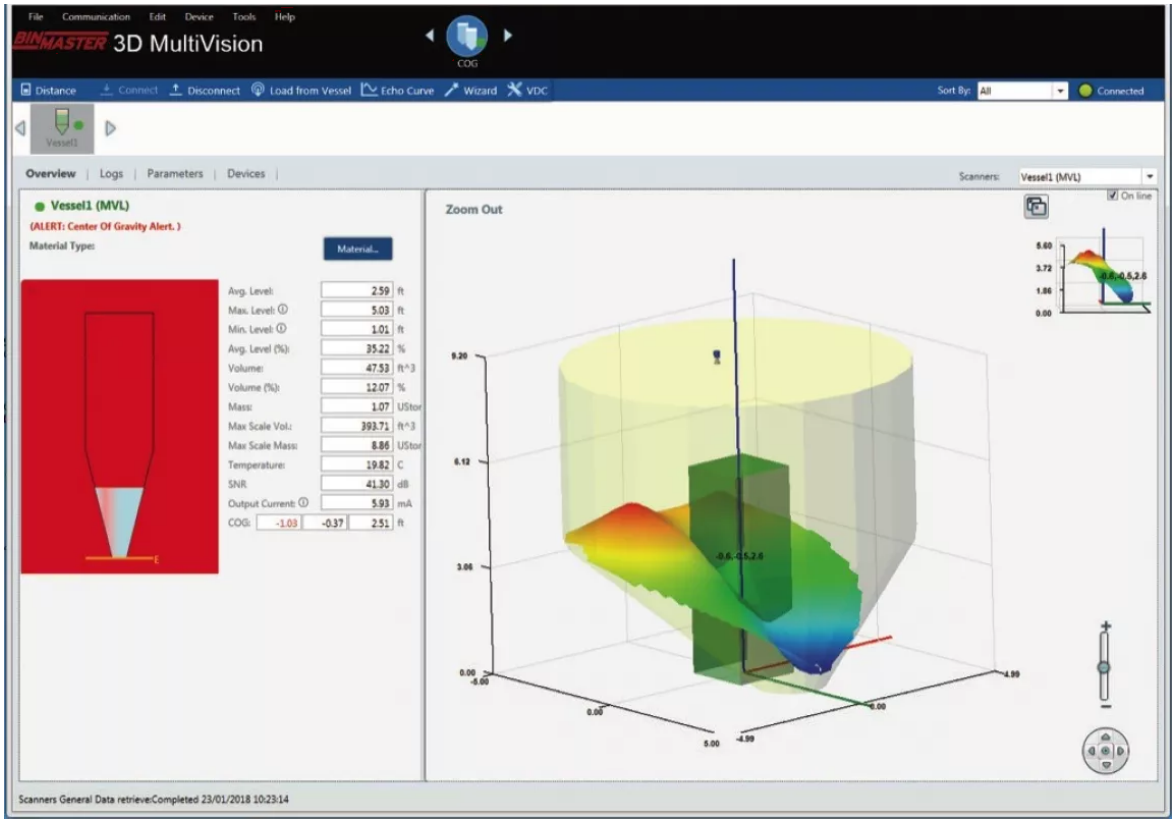
In this first example (see image below), it is evident from the 3D graphic that material is disbursed evenly and the cone is up. The average, minimum, and maximum levels are displayed along with the volume and mass. Also, volume as a percentage full and the maximum volume are displayed in the software. The acceptable zone for the center of gravity is indicated in green and the Center of Gravity of 0.05 along the bottom of the readings falls clearly in the acceptable zone.



It is evident from the 3D graphic that material is disbursed evenly and the cone is up. The average, minimum, and maximum levels are displayed along with the volume and mass.

Operations can use this unique solution to help reduce structural stress when loading or emptying a silo. It is a valuable preventive maintenance tool that can alert to the need for inspection or cleaning. Use over time can prolong silo integrity and create a safer environment by alerting to potential structural stress caused by uneven loading.

The second example (see image below) indicates an alert status, displaying the vessel in red on the screen. The 3D visual indicates that as the vessel has been emptied, material has built up on one side of the vessel. The center of gravity has fallen outside of the set parameters and is displayed in red as -1.03. A red Center of Gravity Alert is displayed at the top of the screen. Plant operations or maintenance can be alerted to aerate or clean the vessel before damage occurs.



Alert status: the 3D visual indicates that as the vessel has been emptied, material has built up on one side of the vessel.

Measure Volumes in a Wedge- or Pie-shaped Silo

Accurate inventory for ingredients in segmented silos

Food processing operations routinely handle many ingredients, some of which can be stored in segmented silos. Tracking inventory by volume in these irregularly-shaped spaces can be tricky, especially for powders or granules that want to build up along the interior walls or the outer silo perimeter. Plant operations or purchasing personnel burdened with managing inventory in pie- shaped segments of silos now have a solution that provides very accurate volume data.

This illustration shows material piled unevenly in a silo segment and how the 3DLevelScanner measures mul- tiple distances across the material surface to account for irregularities when calculating volume.

The 3DLevelScanner measures and models the topography of material contained in these unusual pie-shaped wedges. This newest release of 3DVision software update then applies the measured distances to a 3D model of vessel dimensions and converts it to a highly accurate volume measurement.

Other measurement sensors, such as non-contact radar, guided wave radar, or weight-and-cable style sensors measure only a single distance in these formidably-shaped segments. The location of the filling or emptying points or lack of material flow may cause uneven piling of material, which could cause inventory estimates based upon a single measurement to be inaccurate. By comparison, the 3DLevelScanner maps the material surface accounting for variations or buildup then factors in the radius and height of the segment being measured, making the volume accuracy very precise.

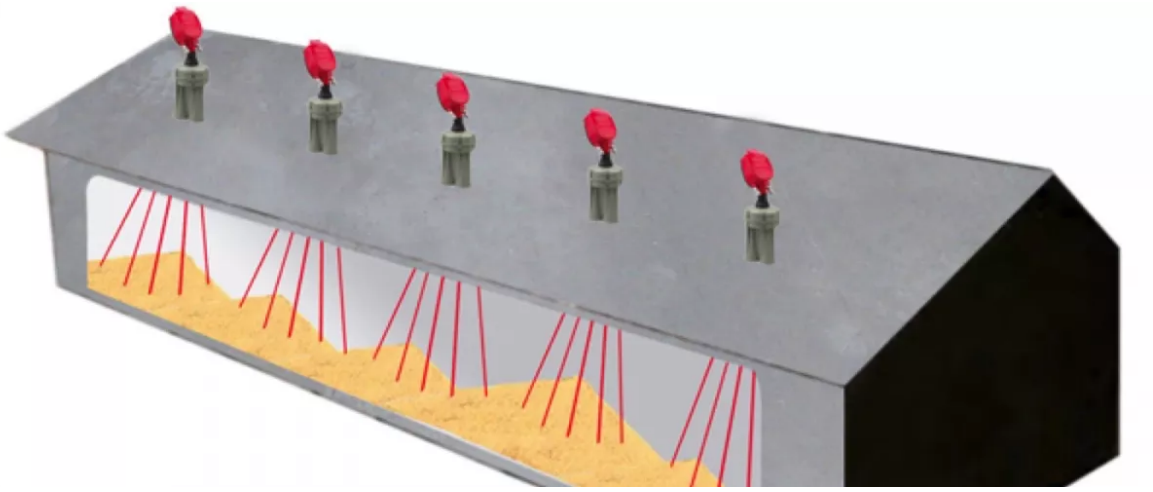
Using a system that provides accurate data about the amount and dollar value of material on hand can help reduce safety stocks, increase inventory turns, and pay for itself by freeing up cash that could be tied up in inventory. This can be especially true for high-dollar ingredients being used in many contemporary food

products. Additionally, buildup on the outer perimeter of the silo segment or along on the interior walls of each segment can be detected, accounted for in inventory, and addressed by maintenance if needed. The same 3DLevel Scanner can be used for either segmented or round silos, making it a versatile choice over its long sensor life.

Level Monitoring in Flat Storage Warehouses

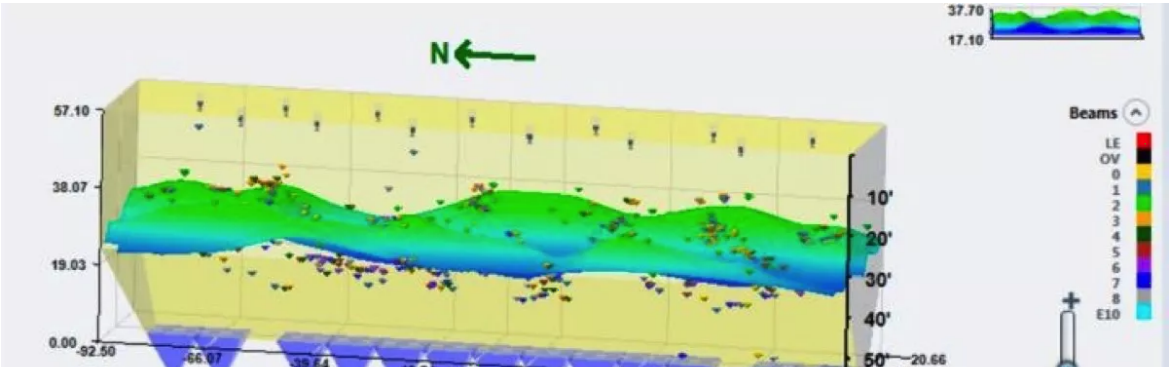
Breakthrough technology measures level per section

With grain production worldwide reaching record levels, there is a shortage of grain storage as valuable commodities await further processing. An intermediate step to protect grain is the use of large covered storage buildings where grain is piled us- ing overhead conveyors or vehicles. However, due to irregular piling, it is extremely difficult to estimate the amount of grain in these temporary warehouses.



Several 3DLevelScanners are strategically mounted on the roof with each scanner measuring multiple points in a 70-degree beam angle.

Another revolutionary advancement not offered with any other inventory management system is a new software option that can measure the level of materials piled under structures. Multiple sensors measure and map levels across the material surface, while MultiVision software separates the piled material into virtual sections. Minimum, maximum, and average levels per section are reported for up to 99 unique sections. The data is aggregated to output a visual showing the topography of the entire storage building.



In this screen image, the topography of material is displayed and used to detect level per section.

This first-of-its-kind solution is used to estimate inventory and improve production efficiency. Identifying high and low sections allows for automating process control and managing the filling or extraction of materials. In proven installations, up to 20 3DLevelScanners have been mounted in the upper structure of the warehouse roof. The building is virtually divided into sections as small as 1.5 by 1.5 meters with 3D sensors continuously measuring changes across the surface and providing unique visual and data reporting of inventory in the massive structure. This cutting-edge technology is ideal for corn or other grains stored in covered warehouses. In 2009, 3D scanner technology started a revolution in precise inventory management. Their evolution continues to address the unique needs of industry as the worlds of sensor hardware and software intersect with new solutions.