

On the level – Point and continuous level measurement for bins, tanks and silos

BY JENNY NIELSON CHRISTENSEN

Better materials management

Point level indicators detect when solid material reaches a certain “point” in the bin and send an alert via a light, horn or alarm panel. They notify personnel when a bin is full or empty, as a high or low level alert. With storage capacity at a premium in many plants, point level indicators help optimize storage capacity and improve inventory management.

Point level indicators prevent overfilling or running out of material – which also prevents messy spills, material waste and costly downtime. They also positively



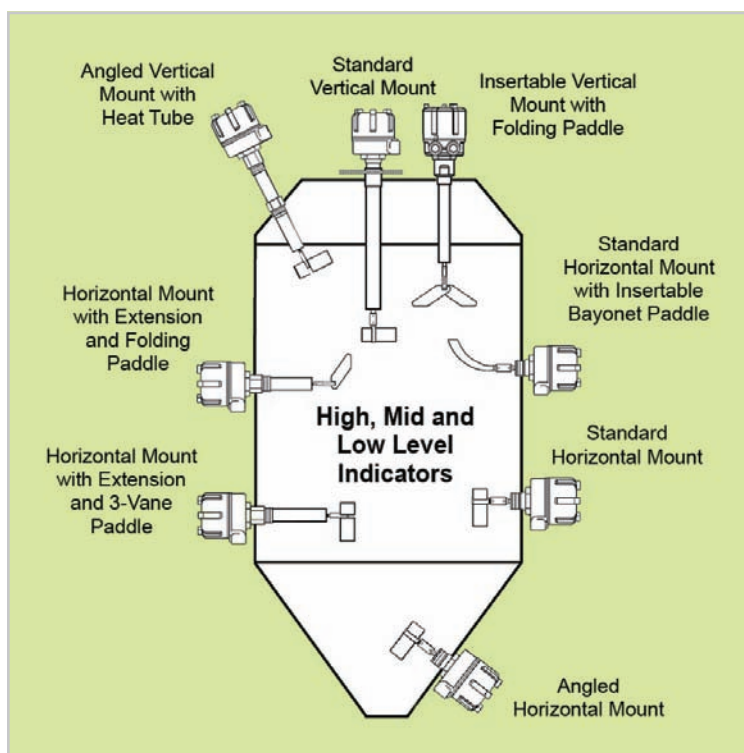
The vibrating rod has a single blade design to prevent buildup.

impact the staff at a facility – improving safety by eliminating the need to climb bins to check levels, and thereby also saving time. As point level indicators operate on simple principles, they are extremely reliable, long lasting and highly cost effective.

A new spin on rotaries

Rotaries are a tried and true technology and are a popular device used for point level indication. The principle of operation is simple. When used as a high level control while the bin is filling, the paddle rotates continually until material reaches the paddle. When the paddle meets resistance due to the presence of material, it stops rotating and sends an alert. Conversely, as a low level indicator, the paddle will begin turning when material drops below the level of the paddle and will send an alert or start up a process system.

Rotaries are used in a wide range of bulk solid materials and can be used in materials with a bulk density of 1 lb/cu ft³ to 150 lb/cu ft³, so it's ideal for light materials such as sawdust or shavings, or heavier materials such as wood chips or pellets. It also is used frequently in ethanol plants for materials such as corn or DDGS, or in soybean bins used in biodiesel facilities. The proper paddle for the rotary should be selected based on the weight and type of material, and there are plenty of choices. For example, BinMaster alone offers 14 different paddles for varying applications.



Different types of rotaries also are an important consideration. A standard rotary, like the BMRX from Binmaster, is designed to provide protection from system power failure and features a “de-energized” motor that automatically shuts down when material is present, which extends motor life. When it is crucial to confirm the continuous operation of the rotary, the BinMaster MAXIMA+ is a genuine fail-safe rotary that continually self diagnoses, and in the event of a failure, sends an immediate warning and instantaneous corrective response. It has all the features of the BMRX, plus an LED light on the top of the unit for visual monitoring of the motor status – blinking for uncovered, solid for covered and unlit for a failed condition.

For high level detection at the interior of a bin, a vertical extension for the rotary also can allow it to be extended up to 144” down into the bin. This is recommended for a center-fill bin when it’s necessary to allow a specific amount of headroom in it. Mounted on the top of the bin, it will alert when material is higher toward the center of the bin, vs. simply mounting a rotary on the sidewall where the material will be at a lower level.

For thick bins walls, such as those in cement silos often found at ethanol plants, a horizontal extension of up to 12” also is available from BinMaster. This design protects the bearing seal that installs at the end of the extension,

reducing the risk of material being packed in the shaft and giving a false alarm. Collapsible paddles also can be inserted through a 1½” or 1¼” NPT opening for installation of the rotary without entering the bin.

Vibrating rods a double-edged sword

A vibrating rod also can be applied for point level detection. For wood bioenergy, it can be used to detect the level of sawdust, wood shavings, wood chips or pellets. Due to its high sensitivity, the vibrating rod can detect very light materials, such as fine sawdust or shavings. It also offers unique advantages with its single-blade, double-edged sword design that prevents buildup



BinMaster BMRX genuine fail-safe rotary.

“From basic level indicators to advanced inventory management for my biggest bins, I call BinMaster.”

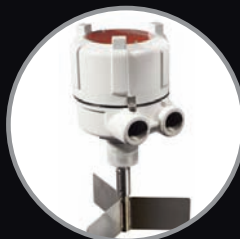


SmartBob2



Vibrating Rods

New MVL for big bins!



Rotaries



Diaphragm Switches

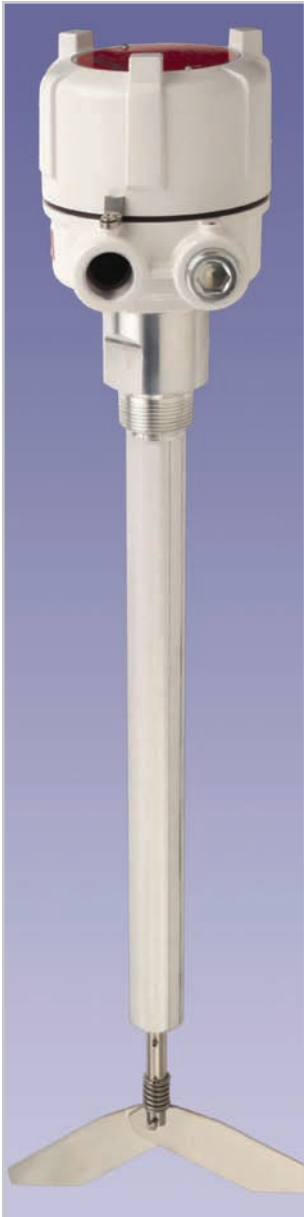


3DLevelScanner

BINMASTER LEVEL CONTROLS

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Vertical rotary extensions up to 144" for high level detection

on the rod, which eliminates the risk of bridging and false alarms that can occur with a tuning fork design.

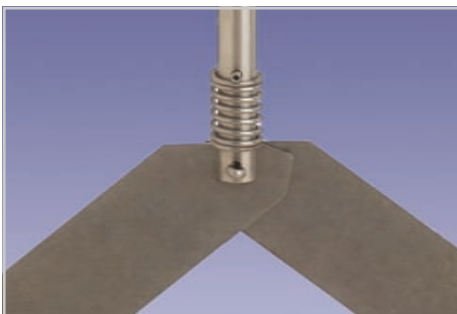
Vibrating rods can be mounted on the side of the bin for low-, mid- and high-level detection and also can be mounted on top of the bin, more toward the center for high level detection to prevent overfilling when the cone is up. For example, BinMaster offers a standard 7" vibrating rod, a rigid vibrating rod that can be extended up to 13' and a flexible vibrating rod that can be extended up to 19'. These extended configurations are factory-sized to the customer's specification, allowing the precise amount of headroom needed.

Advanced systems for continuous inventory management

Continuous level indicators are used for inventory management and process control. They measure the level of material and report the information to a control console or a personal computer on an ongoing basis, or at predetermined time intervals.

Continuous inventory management allows for greater inventory accuracy for day-

to-day operations or month-end inventory. With the high value of raw materials, better accuracy can help optimize inventory turns and carrying costs, while at the same time helping plant management optimize storage capacity and transportation logistics. An investment in a continuous inventory management system can pay for itself quickly, especially when a few percentage points of inventory represents thousands of dollars.



The vertical extension with collapsible paddle allows installation without entering the bin.

Weight and cable-based systems

The weight and cable-based system is applicable to many diverse applications in the bioenergy industry since it is not affected by

dust, humidity, temperature, dielectric constant or fumes that might be present in the bin. It makes minimal contact with the material and works in virtually any material, regardless of particle size or bulk density, by using a variety of probes for very light materials like sawdust, to heavy, dense materials like wood pellets.

These sensors can be used in bins up to 180' tall and can be mounted on the roof about 1/6 of the way in from the outer perimeter of the bin, which places it in the angle of repose on a center-fill bin. Properly mounted on a center-fill, center-discharge bin, the sensor consistently provides 5-7 percent accuracy. It works by releasing a cable with a weighted sensor probe that stops and retracts when the probe comes into contact with material. Redundant measurements are taken when the sensor probe is both descending and retracting to ensure accuracy.

Acoustical-based systems

Acoustical-based systems have a non-contact, dust-penetrating sensor that features acoustics-based technology. Its 3D mapping capabilities provide a visual representation of bin contents, detecting cone up or down, as well as sidewall buildup.

The system performs in materials with bulk densities greater than 12 lbs per cubic foot, so it is applicable to the bioenergy industry in materials like wood pellets, corn or DDGS.

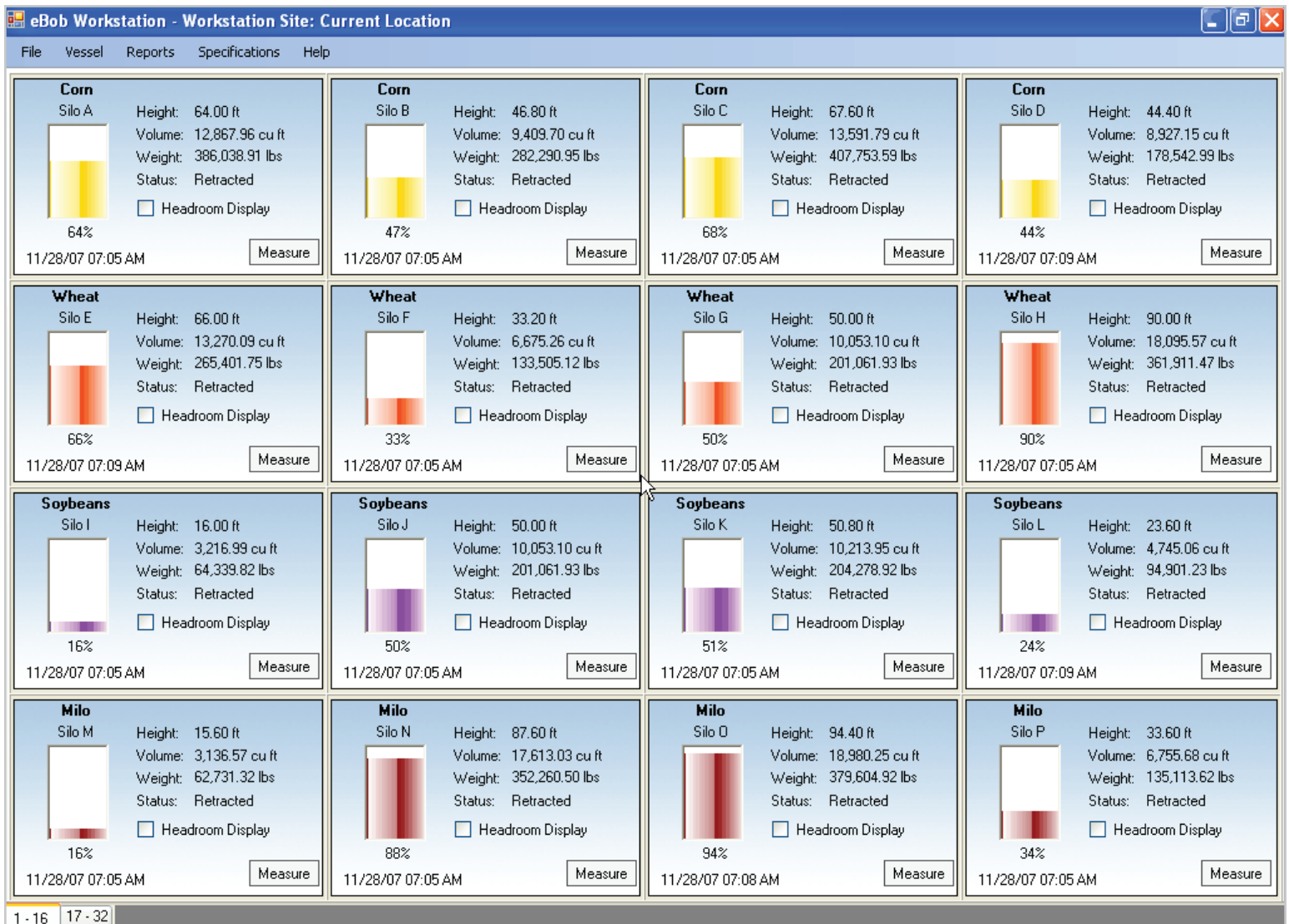
Facilities that install 3D technology want improved inventory accuracy, and the system can deliver 0.5-3 percent volume accuracy when mounted in the proper location and used in a bin that is less than 45' in diameter. For bins greater than 45' in diameter, a multi-scanner system can record measurement data from two or four 3D scanners and combine the data to report volume



SmartBob installed on a sawdust bin.



The protective bearing seal at the end of the rotary prevents material packing in the rotary shaft.



eBob software provides graphical inventory information.

to a personal computer and provide a single graphical representation of the bin contents.

The system is able to map the topography of the bin and create a computerized profile of the bin contents. This increases accuracy since it detects cone up, cone down, bridging and sidewall buildup and then accounts for these variations when it provides the volume estimate. By detecting buildup, the system also allows timely, preventive maintenance and cleaning, which during the long term can cause structural stress that could damage the bin. Perhaps the greatest benefit is better accuracy, which will lead to better profitability and operation optimization.

When making a decision about the right level controls for your operation, ask yourself these questions:

- Am I in need of simple point level detection or continuous inventory management?
- Am I using a level control to help start or stop a process?
- How accurate does my inventory level need to be?
- What are the characteristics of the material I need to measure?
- How tall and wide is the bin?
- How many bins do I need to measure? Do I need to network my bins?

- Is non-contact technology necessary?
- What is my budget?

There are level control solutions from just a couple hundred dollars to sophisticated systems that can cost thousands. With the robust selection of level control technologies today, climbing bins and tape measures are a thing of the past ... and that's a good, safe and smart thing.

Jenny Nielson Christensen is director of marketing for BinMaster – a division of Garner Industries. She has 30 years of experience in business-to-business and business-to-consumer marketing for the industrial products, communications, food industry and consumer packaged goods markets. Nielson Christensen has a bachelor's degree in business from Bryant University and an MBA in marketing from Keller Graduate School of Management. You may contact her by e-mailing bpteditorial@woodwardbizmedia.com