

White paper

# ENY, MEENY, MINY MO...

Proper sensor selection too important to leave to chance

Point-level sensors are inexpensive, easy to use, and durable, but you gotta choose the right one for the right situation. Proper level measurements, alarms and inventory control should involve more than eny, meeny, miny, mo and BinMaster representatives can help.



## **Plugin** **binmaster.com**

**KEYWORDS**

level sensors, bulk inventory,  
bin, silo, tanks

**OBJECTIVE**

Learn to combine sensor and  
software technology to auto-  
mate level measurement.

**CONSIDER**

Manual bulk measurement is  
risky, material overflow costly,  
and labor short.

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# ENY, MEENY, MINY, POINT LEVEL SENSOR SELECTION

Point-level sensors are inexpensive, easy to use, and durable, but you gotta choose the right one for the right situation. Proper level measurements, alarms and inventory control should involve more than eny, meeny, miny, mo—and BinMaster representatives can help.

“Within each type of point-level sensor, there are so many options; it can be overwhelming. You don’t want to use a baseball bat to hit a hockey puck,” said Scott Bonine, a sales manager and industry veteran. “We’re one of those rare companies where you can dial a phone and talk to a human. We’ll come up with just the right sensor with you.”

In real estate, people chant, “location, location, location.” Bonine says this could apply to sensors as well, and material and location must be considered.

## LOOKING FOR BACKGROUND?

Some appreciate research, and Bonine says the best place to start is with an understanding of the difference between point-level and continuous inventory sensors.

“Point-level sensors alert you when material in the bin reaches a certain point,” he said. “You’ll want stop filling a vessel when it’s almost full, and this alert is great for that. You’ll also want a low-level alert to know when to add more material, or order more stuff.”

Continuous inventory sensors include non-contact and guided wave radars, cable-based sensors, ultrasonics, or 3DLevelScanners. They continuously measure as levels change.

“Continuous-level sensors are a step up for ongoing inventory management,” says Bonine, “But it’s always a good idea to use point-levels as a backup.” He said point-level sensors are inexpensive and usually used to do high-level shut off to prevent overfilling. “It’s peace of mind,” he said.

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## ROTARY LEVEL INDICATORS

Rotaries are one of the most popular devices for high- or low-level point level indication in bins, tanks, and silos. Rotaries are versatile and used for nearly any material, from powders and granules with a minimum bulk density of 2 lb./ft.<sup>3</sup> to coarse, lump materials with bulk densities up to 150 lb./ft.<sup>3</sup>.

“There is nothing to calibrate, and rotaries work in about any dry solid material,” Bonine said. “You might not realize how versatile a rotary can be and how many options there are. We offer 19 different paddles for very light to heavy materials, vertical, horizontal, and flexible extensions, heat tubes for high temperatures, and stainless-steel connection options for sanitary or corrosive applications. Mini versions of rotaries are good for small vessels and tight spaces.”

Rotaries are simple. The paddle rotates continually until material reaches the paddle. Material presses the paddle, causing it to stop rotating and send an alert to a control room or alert via a horn, light, or alarm panel. When tied to process control, rotaries with a fail-safe feature ensure you are alerted in the event of a failure.

For high-level detection at the interior of a vessel, a vertical extension on a rotary can allow it to be extended as far as 12 feet down into the bin, tank, or silo. This configuration is recommended for a center-fill vessel when the operation requires a specific amount of headroom.



## CAPACITANCE PROBES

"I always joke that the capacitance sensors have a special 'spidey sense'," said Bonine. "They don't move, but they can feel when material hits the probe."

Capacitance sensors operate by detecting the presence or absence of material in contact with the probe. It senses tiny changes in capacitance (change in electrical charge) experienced when the dielectric constant (ability to store electrical charge) of the material differs from the air. Capacitance sensors come in a huge selection of sizes, with extensions if necessary. Some are produced with stainless steel and others are coated in Delrin for high temperatures and chemicals.

Bonine suggests keeping the probe as short as possible to avoid the possibility of material bending it. He said heavy-duty probes are available for places like power plants and mining. When materials are changed often in a silo the probe may need recalibration in which case, he'd recommend a rotary.

Capacitance probes are made for a multitude of purposes. These probes can be modified to operate in areas with excessive vibration or high process temperatures. They are mounted on top of tanks, sides, narrow spaces and even extended into the vessel. Bendable probes are available when obstructions within tanks cause a challenge.



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## VIBRATING RODS

Some sensors use the piezoelectric effect to measure pressure, temperature, and force, and convert changes to an electric charge. BinMaster has harnessed this action within its vibrating rod level sensors to accurately measure dry bulk solid materials in bins, silos, and hoppers. A vibrating rod is the only point-level sensor that can detect sediment at the bottom of a tank.

"Some materials, like sawdust, are super light, and that's when we start to think about vibrating rods," Bonine said. "Stuff like styrofoam won't cause enough resistance to affect a rotary, so we point people to the vibrating rod. The trick is to make sure the material isn't sticky or clingy, because that might cause false signals."

Vibrating rod sensors can detect extremely light, fluffy materials such as powders and flakes (as light as 1.25 lb./ft.<sup>3</sup>) or can be used for heavy materials such as granules or pellets.

These sensors vibrate when no material covers the active rod. When the rod is covered with material, vibration is restricted, and the sensor sends an alert.

When material falls away, the vibration restarts, and the relay will switch back.

BinMaster has tweaked and advanced its product offerings to the point that most vibrating rods do not require calibration and easily adjust to the desired sensitivity level.

Vibrating rods include fail-safe alerts when power is interrupted. Some models are made for high temperatures (up to 482 degrees) or with remote electronics. Some vibrating rods can be extended (up to 13 feet) to a custom length, allowing the vibrating sensor to be used in a top-mounted application for high-level detection. Hazardous locations can be equipped with vibrating rods or forks manufactured with FM or CSA approvals.



## DIAPHRAGM SWITCH

A diaphragm—or pressure—switch was the earliest type of point-level sensor and is still popular today. These switches are affordable and are highly reliable when used in free-flowing dry and granular materials. Models are available for ordinary and hazardous environments with a risk of combustible dust. They work by activating a sensitive microswitch when material reaches the level of the switch in the bin. It sends a signal that can be used to start or stop a process or alert to a high, medium, or low-level in the vessel. Diaphragm switches are offered for either internal or external mounting and with a variety of diaphragm materials. They can be wired to a light, horn, alarm, or into a company's PLC.



## TILT SWITCH

A tilt switch is an affordable and reliable high-level indicator that is easy to install and requires no routine maintenance. A hanging tilt switch is installed by suspending it from a flexible cable over a control point. Its principle of operation is quite simple: as material rises below the switch, it will tilt and activate a microswitch when the tilt reaches 15 degrees. Tilt switches are routinely used in bins or silos or over a conveyor belt or open pit. A hanging tilt switch can also be used for plugged chute detection.

Alternatively, a fixed-mount tilt switch mounts from the outside on the top of a vessel through a process connection. It operates by utilizing an angular motion transferred into linear motion to activate an electrical microswitch that can be used for a direct input to a control system or to activate an external alarm. A fixed-mount tilt switch can be custom-made in lengths from one to eight feet, depending on the distance from the top of the bin an alert should be activated. Newer, patented models are available in a mercury-free design for applications that prohibit the presence of the substance in their operations.



## MYRIAD MOUNTING OPTIONS




Flexibility is a key attribute of point-level sensors. While more commonly used for high-level indication, they can trigger an alarm anywhere along the vessel wall, in the cone, or a hopper—alerting to low levels for timely refills and adjusting for variances in seasonal high-level inventory fluctuations.

## STILL “ENY, MEENY, MINY, MO?”

The easiest way to avoid mistakes, other than “Eny, Meeny, Miny, Mo” is to connect with any BinMaster representative. More than sales, these professionals hold years of experience and will point you to the correct solution appropriate to your material and storage vessel setup.

Ultimately, your sensors should tell the story... of your bulk inventory. Understanding the level in your bin affects everything along the supply chain from ordering to production to transportation. BinMaster provides BinCloud® software to configure your inventory data into easy-to-understand reports that tell your inventory story.



| Industry   | Bulk Material  | Sensors   | Software  | Applications   |
|--|--|---|---|--|
| <br>Agriculture<br>Farming<br>Livestock | Grain<br>Flour<br>Beans<br>Fertilizer<br>Seed<br>Liquids<br><br>Bins, silos, tanks,<br>piles, domes                          | Rotary level indicator<br>Capacitance probe<br>Vibrating rods<br>Diaphragm switch<br>Tilt switch<br>Radar<br>SmartBob<br>3D sensors<br>Ultrasonic<br>Flow detector  | BinCloud<br>BinView<br>AgriView<br>Binventory<br>FeedView<br>3D Multivision | Prevent overflows<br>Process control<br>Inventory management<br>Remote monitoring<br>Monitor piles<br>Flow detection<br>Bin aeration<br>Dust detection<br>Aeration<br>Ag Chemical Storage  |
| <br>Bioenergy                           | Corn<br>DDG<br>Biomass<br>Wood pellets<br>Wood fiber<br>Forest residue<br><br>Bins, silos, tanks,<br>piles, domes            | Rotary level indicator<br>Capacitance probe<br>Vibrating rods<br>Diaphragm switch<br>Tilt switch<br>Radar<br>SmartBob<br>3DLevelScanner<br>Ultrasonic<br>Flow detector  | BinCloud<br>BinView<br>Binventory<br>3D Multivision<br>ResinView            | Prevent overflows and outages<br>Process control<br>Inventory management<br>Remote monitoring<br>Flow detection<br>Slurry tank detection<br>Measure DDGS   |
| <br>Cement                              | Sand<br>Gravel<br>Clinker<br>Rock<br>Powder<br><br>Bins, clinker silos, tanks,<br>piles, domes, chutes,<br>crushers          | Rotary level indicator<br>Capacitance probe<br>Vibrating rods<br>Diaphragm switch<br>Tilt switch<br>Radar<br>SmartBob<br>3DLevelScanner<br>Ultrasonic<br>Flow detector<br>Plugged chute detector<br>Airbrator<br>Diffuser air pad | BinCloud<br>BinView<br>Binventory<br>3D Multivision<br>CementView           | Prevent overflows and outages<br>Process control<br>Inventory management<br>Remote monitoring<br>Monitor piles and bunkers<br>Inventory domes<br>Plugged chutes<br>Measure crusher levels<br>ESPs or clinker silos<br>Prevent conveyor overloads<br>Silo aeration      |
| <br>Food processing                   | Brewing<br>Foodstuffs<br>Solids<br>Slurries<br>So much more...<br><br>Silos, mixers, batching tanks,<br>conveyors, pipelines | Rotary level indicator<br>Capacitance probe<br>Vibrating rods<br>Diaphragm switch<br>Tilt switch<br>Radar<br>SmartBob<br>3DLevelScanner<br>Ultrasoni<br>Flow detector<br>Airbrator<br>Diffuser air pad                            | BinCloud<br>BinView<br>AgriView<br>Binventory<br>3D Multivision             | Prevent overflows<br>Inventory management<br>Remote monitoring and VMI<br>Process control<br>Sanitary level measurement<br>Detect levels in mix or slurry tank<br>Detect levels on conveyors<br>Flow detection<br>Silo aeration  |
| <br>Mining                            | Lump coal<br>Ores<br>Aggregates<br>Fine alumina powder<br><br>Silos, crushers, conveyors,<br>domes                           | Rotary level indicator<br>Capacitance probe<br>Vibrating rods<br>Diaphragm switch<br>Tilt switch<br>Radar<br>SmartBob<br>3DLevelScanner<br>Ultrasoni<br>Flow detector<br>Airbrator<br>Diffuser air pad                            | BinCloud<br>BinView<br>Binventory<br>3D Multivision<br>CementView           | Inventory management<br>Monitor piles<br>Prevent overfills or outages<br>Detecting plugged chutes<br>Measuring inventory in domes<br>Level measure in crushers or bins<br>Prevent overloading<br>Process tanks<br>Remote monitoring<br>Silo aeration<br>Dust detection |
| <br>Plastics                          | Resins<br>Flakes<br>Powders<br>Granules<br>Regrind<br><br>Silos, bins, containers,<br>hoppers, tanks                         | Rotary level indicator<br>Capacitance probe<br>Vibrating rods<br>Diaphragm switch<br>Tilt switch<br>Radar<br>SmartBob<br>3DLevelScanner<br>Ultrasonic<br>Flow detector<br>Airbrator<br>Diffuser air pad                           | BinCloud<br>BinView<br>ResinView<br>Binventory<br>3D Multivision            | Prevent silo overflow<br>Eliminate outages<br>Inventory management<br>Remote monitoring<br>Vendor managed inventory<br>Flow detection<br>Bin Aeration<br>Dust Detection  |

