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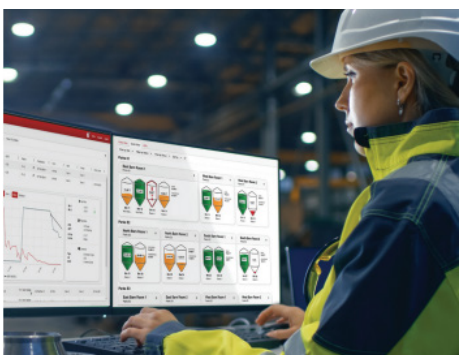
Whitepaper

IoT & SENSOR SELECTION

Inventory balancing, planning, control

IoT (Internet of Things) is booming. It prescribes a wireless network of devices embedded with sensors for the purpose of connecting and exchanging data. Global spending on IoT will reach $1.1 trillion by 2023. Binmaster technology falls into the IoT world with cloud sensors and cloud software monitoring bulk products like grain, plastic pellets, and aggregates stored in bins, silos and other storage vessels.



BULK, COST, INDUSTRY ON IoT

affects smart decisions on level measurement

As industries move data from sensor to cloud-based databases, better decisions on everything from inventory use, ordering and accounting are paying benefits. World-wide organizations continue to increase a move to IoT (Internet of Things) where sensors connect data to the cloud. Spending on IoT will reach $1.1 trillion by 2023, according to Statista. Binmaster technology falls into the IoT world with sensors and cloud software monitoring bulk products like grain, plastic pellets, and aggregates stored in bin, silos and other storage vessels.

IoT inventory sensors and software:

- Provide insights for data-driven decisions to increase efficiency and drive down costs
- Shorten lead times for production
- Reduce carrying costs and last-minute purchases
- Reduce waste on bulk inventory that could spoil
- Feed accurate inventory data to Enterprise Resource Planning systems
- Streamline transportation and timely ordering

From a business standpoint, inventory management serves a great purpose for inventory balancing, planning and control. For balance, it's important to have the right amount of inventory to avoid lost orders and money tied up in safety stock. Selecting sensors is critical for success. Consider the pros and cons of each.

SMARTBOB WEIGHT & CABLE SENSOR

Pros

- Not affected by dust or other adverse processconditions
- Not affected by material buildup on sensor
- Can be used in extremely light, signal-absorbing materials
- Measures bins up to 150 feet
- Not affected by material characteristics such as low dielectric constant or angle of repose
- Remote sensor requires no calibration
- High temperature models available up to 500°F
- Very simple setup and installation
- Consistent, repeatable, and accurate measurements
- Compatible with Binventory® and BinCloud® apps
- A variety of digital and analog outputs available
- Cable replacing, wireless communications available
- Hazardous location approvals available

Cons

- On-demand system, does not provide an instantaneous response to change in the material level
- Seasonal maintenance may be required to clean out mechanical cavity in very dusty conditions, if air-purge is not used
- Not recommended in high pressure bins
- Minimal contact with stored material

GUIDED WAVE RADAR SENSOR

Pros

- Continuous level measurement in powders, granules, bulk solids, and liquids
- Measuring distance up to 100 feet
- For light to heavy bulk solids
- 4-20 mA and Modbus RTU communications
- Performs in vessels prone to high dust
- Suitable for vessels of most any shape or diameter, including narrow tanks
- Immune to condensation
- Virtually maintenance free
- Reliable accuracy within 0.08”
- Hazardous location approvals
- BinDisc simple setup and configuration
- Compatible with eBob software
- Very simple setup and installation
- Cable replacing, wireless communications available

Cons

- Sensing probe is in constant contact with material
- Minimum dielectric constant of material must be above 1.3
- Material like large rock may damage probe and be difficult to sense

3DLEVELSCANNER

Pros

- Continuous level measurement
- Non-intrusive, non-contact design
- 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 due to mapping the surface of the material with multiple measuring points.
- Measuring range up to 200 feet
- Self-cleaning with minimal maintenance
- High temperature applications up to 365°F
- Automatic compensation for temperature changes
- Analog and digital communication options
- Leading-edge 3D MultiVision networkable PC software available for multiple vessel monitoring
- Can generate a 3D image of material surface
- Cable-replacing, wireless interfaces available
- Approved for hazardous locations
- Not affected by material characteristics or low dielectric constants
- RL model compatible with eBob software

Cons

- The 3DLevelScanner is an acoustic device and elevated background noise can have an affect on its performance.
- Setup requires care in mounting the sensor in the proper location, and mapping the vessel
- Time required to process multiple pulse echoes limits the sample rate
- Not recommended for liquid applications
- Corrugation on small vessels can cause false echoes
- Not recommended for materials with a bulk density under 11 lb./cu. ft. due to absorbing the acoustic pulse

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ULTRASONIC SENSORS

Pros

- Measures in a very tight 1° beam with no beam divergence
- Accuracy of +/- 1 inch with range up to 160 feet
- Can track during fill in low dust environments
- Ideal for very narrow vessels or constrained spaces
- Unaffected by corrugated bin walls
- Can be precisely targeted to avoid structure inside vessel
- Use for plugged chute detection or monitoring sidewall buildup
- Versatile for bulk solids, pellets, granular materials, and opaque liquids
- Can be used in most any dielectric material
- Unaffected by heavy vapors and pressure
- Adjustable 10° mounting flange for precise aiming
- Integrated dust protection for minimal maintenance
- Easily configured in the field using a USB port
- Configuration can be performed without filling or emptying vessel

Cons

- Single point measurement will not take into account material topography
- Laser will penetrate clear liquids
- Dusty environments will diminish performance
- Air purge may be required to keep lenses clean in dusty environments

NCR-80 NON-CONTACT RADAR FOR SOLIDS

Pros

- Powerful 80 GHz radar significantly outperforms old 26 GHz technology
- 4° versus 10° beam angle for better precision and targeting
- Substantial 393 foot measuring range
- Same sensor technology used by self-driving cars
- Strong signal performs well in dust
- Fast reaction/update time tracks filling or emptying activity
- Versatile for use in solids, liquids, and slurries
- Signal not affected by corrugation
- Loop power capability
- Compatible with eBob software
- 4 - 20 mA and Modbus RTU communications

Cons

- Single point measurement will not take into account material topography
- Minimum dielectric constant of material must be above 1.3

Sensors and software for YOUR industry

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

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