BINMASTER

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Taking Control ...To A

HIGHER LEVEL

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"BinMaster will provide the most thorough and exact solutions to the challenges and opportunities presented by the customers we serve."

Accurate and Reliable Bulk Solids Level Measurement

With the widespread interest in automated inventory management, reliable bulk solid level measurement has become an important requirement. Measurements must be made autonomous to changing material characteristics such as dielectric constant, moisture content, bulk density, or particle size. The type of sensor you select must be unaffected by the angle of repose, dust, temperature, or other adverse conditions found in bulk solid applications.

Field service and affordability is also a high priority requirement and for those technologies that are intrusive, special attention must be paid to abrasive products and those that tend to build-up. Bearing this in mind, the SmartBob II has become a standard solution in bulk solid applications. It is an improved and proven technology based on the principle of lowering a tape measure to the material surface.

The SmartBob II uses a heavy-duty direct drive motor with electronic torque control to provide maximum pull strength throughout the entire measurement cycle. The shaft of the motor is connected directly to a supply pulley in the mechanical cavity of the housing. When the SmartBob II silo top remote is asked to take a measurement, the motor releases a strong Stainless Steel aircraft cable from the supply pulley and a weighted sensor probe descends to the surface of the material. During the descent, the SmartBob II remote measures the cable dispensed. A microcontroller counts the pulses from an internal encoder that produces 80 pulses per foot.
When the sensor probe touches the material surface, measurement information is transmitted and pulse generation is momentarily stopped. The absences of these pulses immediately cause the motor to reverse and retract the sensor probe. Should the sensor probe ever slide down an angle of repose in an active vessel or sink in light material, a special mechanical brake on the back of a spring loaded idler arm will release and brake the slotted timing pulley, instantly stopping it. The timing pulley is what generates the pulses and when stopped, reverses the motor to retract the sensor probe. An electronic control reduces the motor torque during the last 6" of the retract cycle and the pulses again stop when the probe makes soft contact with the flange. The seated probe then seals the unit, alerting the microcontroller to shut-down the motor. The retract distance is also measured and compared to the descent measurement in order to assure that the sensor probe has fully retracted.

SmartBob II Remote

- Point Level Sensors
- Inventory Measurement
- Flow Detection
- Dust Detection
- Aeration & Vibration

Comparison of Level Measurement Technologies In Bulk Solids

Method: Ultrasonic

Principle of Operation: An acoustic pulse is generated by a transducer on the top of the vessel. The material level is determined by the "time of flight" of the acoustic pulse as it travels to the material, reflects off of it's surface, and then travels back to the sensor.

Advantages:

⇒ Non-Contact sensor
⇒ Instantaneous reaction to changes in the material level
⇒ Often cost competitive

Downfalls:

⇒ Has difficulty reading through dusty environments, aromatic chemicals, foam, and applications where temperatures fluctuate greatly
⇒ Pressurized vessels and noise can have a negative effect on the acoustic pulse
⇒ Some materials may absorb the acoustic pulse, rather than reflecting it
⇒ Uneven material surfaces can obscure signal reflection
⇒ Proper aiming of sensor is critical
⇒ The taller the vessel, the more difficult it is to get a clear signal down and back, especially if any of the factors listed in downfalls 1 and 2 are present

Method: TDR, or Time Domain Reflectometry

(sometimes referred to as radar on a rope)

Principle of Operation: Energy pulses are sent down a stainless steel cable. The signal encounters an impedance change when it reaches the surface of the material and energy is reflected back along the cable. The distance to the material is calculated based on time of signal travel.

Advantages:

⇒ Instantaneous reaction to changes in material level

Downfalls:

⇒ Intrusive
⇒ Downward pull on cable/rod cannot exceed the pull strength of the unit, or physical limitations of the vessel
⇒ Cable wear over time
⇒ Extremely low dielectric constants are difficult to sense
⇒ Particle sizes over 1/2" are difficult to sense
⇒ Heavy buildup on cable/rod can cause false readings

Method: Phase Tracking

Principle of Operation: A sign wave is sent down a coated stainless steel cable. The signal encounters an impedance change when it reaches the surface of the material and energy is reflected back along the cable. The unit's electronics measure the phase shift in the reflected signal and it is used to calculate the distance to the material surface.

Advantages:

⇒ Instantaneous reaction to changes in the material level

Downfalls:

⇒ Intrusive
⇒ Abrasive material can damage cable
⇒ Extremely low dielectric constants are difficult to sense
⇒ Particle sizes over 1/2" are difficult to sense
⇒ Heavy buildup on cable/rod can cause false readings
⇒ Downward pull on cable/rod cannot exceed the pull strength of the unit, or physical limitations of the vessel
⇒ $$$

Method: Open Air Radar

Principle of Operation: Pulses of electromagnetic energy are transmitted through an antenna toward the surface of the material. Echoes are reflected off the material and the level is determined by the "time of flight" of the signal.

Advantages:

⇒ Non-Contact sensor
⇒ Instantaneous reaction to changes in material level

Downfalls:

⇒ Designed for use in liquids and slurries
⇒ In materials with low dielectic constant signal will penetrate through the material to the bottom of the vessel
⇒ Height limitations
⇒ $$$

Method: SmartBob II

Principle of Operation: A weighted sensor probe is lowered into the vessel on a cable. The probe stops when it reaches the surface of the material and retracts back to a neutral position at the top of the vessel. The distance traveled by the sensor probe determines material level.

Advantages:

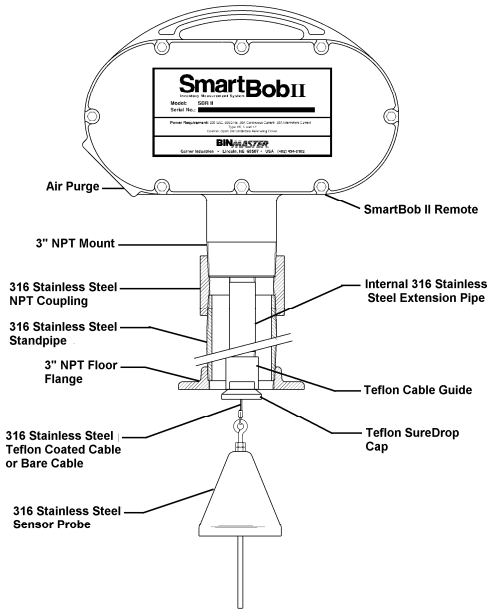
⇒ Not affected by dust, humidity, temperature, dielectric constant, fumes, foam, or turbulence in the vessel
⇒ Relatively low cost
⇒ No calibration required
⇒ Minimal material contact
⇒ Works on virtually any material regardless of particle size
⇒ Measurements are taken when the sensor probe is both descending and retracting. The two measurements are then compared to guarantee every measurement is exact

Downfalls:

⇒ Semi-Intrusive
⇒ Electromechanical
⇒ On-demand, not continuous

SmartBob II High Temperature Sensor

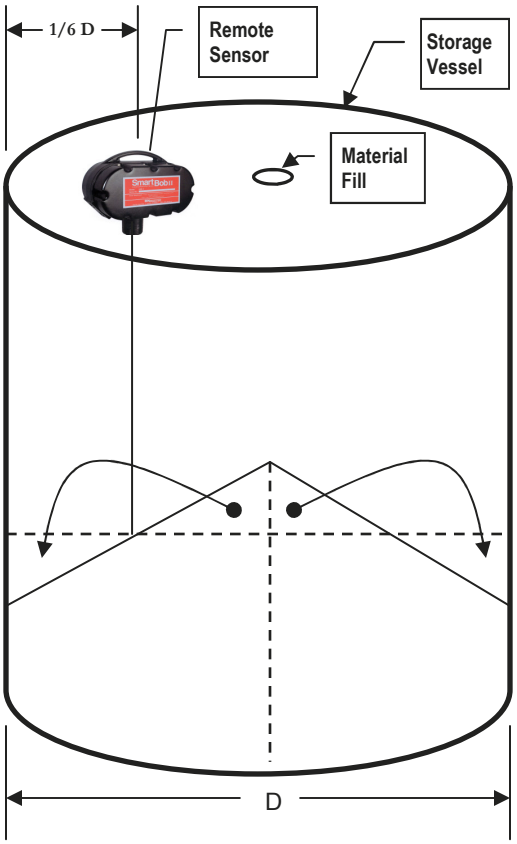
The SmartBob II High Temperature remote is for applications where the process temperature is between 240° and 500°. This model is built with components designed to safely operate in temperatures up to 500°. A stainless steel standpipe is used to extend the sensor away for the heat source and a stainless steel pipe extension, fitted with a Teflon cable guide, keeps the sensor probe out of the standpipe and level with the vessel top. An air purge nipple is standard to allow a small amount of air to circulate through the mechanical cavity of the remote.



Location of Level Sensor When Mounting on a Center Filled Vessel

For a cylindrical vessel with a center fill and a center discharge, the location for mounting the remote sensor is one sixth of the vessel diameter in from the outside edge. This approximates the average level when considering the material's angle of repose.

If you refer to the 1/6th rule drawing, you will see a horizontal line drawn where the sensor probe comes in contact with the material surface. There is a peak at the center and voids at the sides. If you take the peak and fill-in the voids it will flatten out the angle of repose. This represents the most accurate level reading for this vessel.



New BinMaster SmartSonic Sanitary Ultrasonic Level Transmitter

Check out our new SmartSonic Sanitary Ultrasonic Transmitters that are built specifically for Food Grade applications where Sanitary Standards apply. The range of transmitters allows you to read levels from 0.4 to 30 feet in liquid and 0.4 to 15 feet in specific bulk solid applications.

BinMaster Contacts

Scott McLain - President
Todd Peterson - Sales Manager
Jennifer Brazda - Customer Service
Matt Virgillito - Sales & Applications
Nathan Grube - Inside Sales
Dave Etherton - Electrical Engineer
Don Becker - Electrical Engineer
Steve Schaefer - Mechanical Engineer

To submit an article please contact Todd Peterson

The Benefits of Having A Reliable Inventory Measurement System

1. **SAVE LABOR COST:** The labor required to check bin levels on a regular basis can be significant. Through automation, the inventory measurement process is instantaneous.
2. **SAFETY:** Safety is always an issue when having to climbing atop tanks to check the level. Automating you inventory measurement greatly reduces the user's risk of employee injury and Workman's Compensation claims.
3. **REDUCE MISTAKES:** Reduce the risk of mistakes and accidents due to overfilling or running out of materials that can result in excessive downtime.
4. **CONFIDENCE BUILDER:** Gives you the confidence in knowing that your bulk storage is continually being monitored, and is error free.
5. **RESPONSIBILITY SHIFT:** With automated inventory management, responsibility for maintaining adequate levels of inventory can be shifted to the supplier. The user no longer needs to have someone check the tank levels and report to purchasing on a regular basis. Tank levels are checked automatically by devices that do not forget or call in sick. The vendor or supplier can control the amount delivered and the time of delivery.

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WWW.BINMASTER.COM

BINMASTER
Taking Control...To A Higher Level
P.O. Box 29709
Lincoln, NE 68529
(800) 278-4241
(402) 434-9101
Fax: (402) 434-9133