

Automating Inventory Control In Bins

by: Jenny Nielson Christensen

With just-in-time manufacturing and companies looking to minimize inventory levels, effectively managing material supplies is more important than ever before. Monitoring bin levels helps companies optimize material storage and save money. Furthermore, climbing to the top of bins presents a potential employee safety issue, to say nothing about the time and people it takes to scale a yard full of tall bins. Point level controls can provide simple alerts to prevent bin overfills. Continuous bin level management systems can help optimize inventory levels, virtually eliminate the need for employees to climb bins, and save valuable time by allowing bin measurements to be read from a personal computer or other centralized location.

Before implementing a solution, first consider what you are looking to accomplish with level control devices and what data you need to best manage your operation. To determine the type of device best suited for your needs, ask yourself the following questions:

- Do I need a simple high level alert during filling, or a continuous measurement system?
- What is the nature of the material needing to be measured? Is it dusty, sticky or corrosive?
- How often do measurements need to be taken?
- How accurate do measurements need to be?
- Is it important to know inventories during filling and emptying?
- Does the application require a non-contact device?

Multiple-Point 3D Bin Volume Measurement

The newest technology on the market today is a non-contact, dust-penetrating bin volume measurement system that uses patented acoustics-based technology to measure bin contents at multiple points within the bin. It is proven to work in dusty environments – even flour and cement – where technologies such as radar and ultrasonic have failed. Software loaded on a local PC generates detailed log reports enabling the user to easily monitor inventories remotely from the comfort of an office. It offers very low maintenance and is self-cleaning, making it ideal for high-dust environments.

This technology uses a two-dimensional array beam former that sends very low frequency acoustical pulses (which can penetrate dust) and receives echoes of the pulses from multiple points within the bin. Unlike standard ultrasonic, radar or cable-based units that are measuring one point and determining a single distance, this technology takes measurements from



3D non-contact device in bioenergy operation

Multiple-Point 3D Bin Volume Measurement

multiple points within the bin and uses these points to determine not just the level, but also the volume of material in the bin.

The 3D device provides the user a scaled 4 - 20 mA output that can represent either the product or headroom volume. Using an optional HART or RS-485 connection, the user can connect to the scanner using the custom software. The advanced software allows the user to view real-time data from the scanner and make configuration changes remotely from a personal computer. Configurations integrating Modbus / RTU or TCP / IP can be implemented, if required by an operation.

The benefit of multiple point measurement is that inventories are far more accurate. Say there is an up or down cone, multiple filling points, or the material is prone to buildup and ratholing. This can result in a very uneven topography where there are points in the bin that are lower or higher than the majority of the bin contents. If just one measurement is taken at a random point, it may not be truly representative of the volume of material remaining in the bin. 3D technology solves this problem.

3D Measurement Benefits

3D Measurement Benefits	
Multiple Point Accuracy	Takes measurements from multiple points versus a single point, taking into account variations that can occur on material surfaces.
Non-Contact Measurement	Ideal for sanitary applications such as food, chemical or pharmaceutical processing. No risk of moving parts coming into contact or being buried by bin material
Dust-Penetrating Technology	The acoustical-based, low frequency technology is unaffected by dust
Virtually Any Material Type	Can be used in most any material with a bulk density greater than 12 pounds per cubic foot, including a variety of powders, granulates, pellets and other solids with no need for special calibration
Self Cleaning Sensor	Stays clean, resisting build-up of material on the sensors in even the dustiest environments, resulting in very low maintenance.
Long Measurement Range	Appropriate for tall bins (taller than they are wide) and is able to measure a range up to 200 feet.
Measures in Many Storage Vessels	Works in bunkers, hoppers, storage pits, open bins.

Weight & Cable-Based Inventory Management Systems

A cable-based system is a lot like doing a manual measurement with a tape, but it is safe, automated, precise, and without the risk of human error. Many materials behave predictably and feature only slightly variable bin material surfaces. In many industrial applications, operators require bin level measurements just a few times a day, but still desire a very reliable, repeatable, and easily understood measurement system. When the sensor is positioned properly on the bin and given correct parameters, calculated values from a cable-based system are very accurate.

Around for more than a decade, this technology is highly reliable and easy to understand. When prompted, a cable drops and the weight comes into contact with the material surface and immediately retracts, taking a very precise measurement. The technology is non-intrusive as minimal contact is made with the stored material when taking a measurement. The measurements are sent in real time to a control console at the base of the bin or in more advanced systems – to a personal computer equipped with a software program that displays data for multiple bins at one time.

Dependent on the model and manufacturer, cable-



Rotaries are often installed as a high level alert.

based sensors can be used in bins up to 180 ft. tall and can be networked to up to 120 bins at a single location. Cable-based sensors are very easy to install, can use wired or wireless communications, and do not require any special calibration. Explosion-proof models can be used in volatile environments. Dust, temperature and humidity do not affect the sensor, so a cable-based system is ideal for all types of operations such as food or chemical processing, pulp and paper plants, cement and aggregates, power plants, and all types of mining operations ... just to name a few.

Point Level Controls Alert to Bin Conditions

Often an operation simply needs to know if a bin is empty or full. These types of situations can be easily addressed with point level controls which are a safe, simple, reliable and inexpensive solution to climbing bins. Two of the most basic devices are diaphragm switches and rotaries, also known as "paddle wheel" sensors.

For some applications such as plastics or powders, capacitance probes or vibrating rods may be appropriate. Point level controls work by sending an alert when material comes into contact with or covers a device. Commonly wired to a light panel, horn or other types of alarm, these devices are ideal for preventing bin overfills. When mounted intermittently on the side of a bin, they can be used for low, mid and high level detection. These point level controls are also often used as high level alerts or for redundancy in conjunction with advanced inventory systems such as 3D, cable-based, radar and ultrasonic devices.

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Cable-based system using a wireless transceiver at a cement block manufacturer.