

Case Study



REINVENTING INVENTORY MANAGEMENT

Jenny Nielson Christensen, BinMaster, outlines the role of level sensors and cloud-based software in helping cement plants to manage their silo inventory and streamline the supply chain.

Truck driver shortages have been in the international spotlight since the pandemic began. The costs, and societal and supply impact have been widely publicised with examples including the United Kingdom's food and fuel shortfalls, as well as the bottleneck of containers at ports in the United States, now requiring freight unloading operations to run 24/7.

Quarries, cement plants, construction suppliers, and building contractors who rely on trucks to move goods have not been immune to the chaos COVID-19 has placed on the supply chain.

Shortages hindering plant productivity

Tight supply chains and driver shortages are making real-time inventory management at cement plants critical to prevent material shortages and downtime. Labour shortages are impacting staffing in most positions in the plant; there is no one with time available to climb silos and take manual measurements.

Instead, both level sensors and CementView® Cloud-based software, designed for the cement industry with a specialised 'truckloads' feature, are helping cement plants manage dispatch, drivers, orders, and deliveries.

Truckload information is critical to dispatchers and drivers

Dispatchers are overwhelmed managing the inventory contained in cement powder, sand, and fly ash silos and are often coordinating deliveries between locations. Dispatchers scheduling deliveries need truckload information to prevent delays and to ensure drivers are properly routed. They need to know current silo levels, so they can schedule truckload deliveries where the need for material is greatest.

If a plant is not automated, dispatchers are working with data transcribed from handwritten manual measurements from plant workers climbing silos and taking measurements using tapes measures. Dispatchers often rely on silo level information reported remotely from plants and are unsure if the measurement data provided is current or accurate.

Drivers need to be sure that an entire load fits in the silo when they arrive at each plant. If there is inadequate space, they risk overfilling a silo. This can create a hazardous situation that could impact employee health due to breathing in cement or fly ash dust. Plus, a spill can create a mess that needs to be cleaned up, and plants are already short staffed.

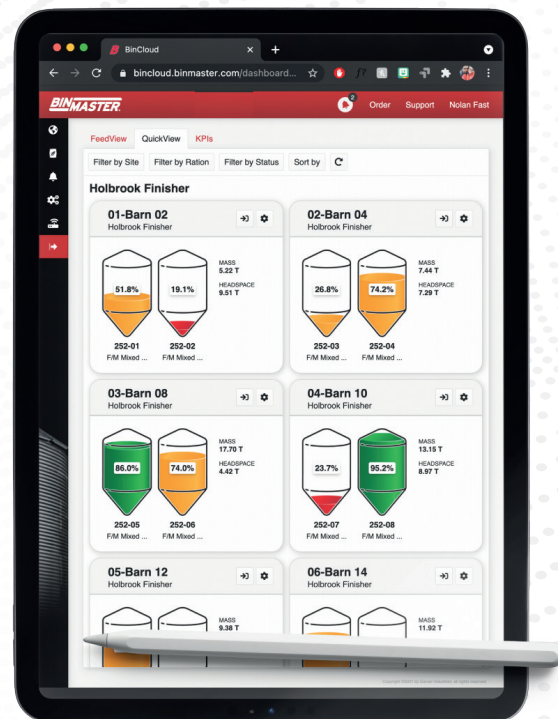
Truckload management and software

The 'Truckloads' feature in CementView removes the need for complex volumetric calculations and takes the guesswork out of estimating how many trucks are needed to maintain production levels.

- ▶ Truckload management begins with assigning a unique number to each truck in the fleet. Most fleets already have truck numbers assigned, so it is simply a matter

of entering each truck's unique identifier or number.

- ▶ Users can create trucks as a calculation of mass per compartment or volume per compartment. For trucks with multiple compartments, the mass or volume for each compartment is entered separately. The software will then calculate the truck's total capacity.
- ▶ If a fleet has more than one of the same type of truck, once the first truck of a



Silo inventory information is graphically displayed on a phone, tablet, or PC.



Non-contact 80 GHz radar level sensors measure accurately despite heavy dust.

particular model is entered, setting up additional trucks of the same model is as easy as duplicating the first truck and changing the truck identifier or number.

- ▶ Users assign primary and secondary trucks for each silo. The software uses the primary truck when calculating 'Truckspace' and 'Trucks Until Empty' on the main dashboard and in the QuickView. Secondary trucks are only displayed on the dashboard when viewing the master details for a silo.
- ▶ Trucks are displayed in two ways on the dashboard and in QuickView. The software shows 'Truckspace', which is the number of trucks it would take to fill a silo. It also shows 'Trucks Until Empty', which is the volume of material currently in the silo calculated for the primary truck assigned to it.



Digital panel meters provide a local display of silo levels to plant personnel.



Gateways help to simplify installation and send inventory data to the Cloud.

Automating silo level measurement and ensuring accuracy with sensors

As speed and accuracy of inventory are imperative for cement operations, 80 GHz non-contact radar level sensors using the Modbus protocol are often recommended for silo level measurement. The technology is proven to work in dust and measurements are updated in seconds.

Pre-wiring of the silos for sensor installation is easily carried out by a plant's maintenance staff. Commissioning is performed using a BinDisc device that can be moved from sensor to sensor for setup. Alternatively, sensor setup can be done using a Bluetooth application on a phone.

Each silo receives a unique name or number and is assigned a location. The dimensions of the silo are entered to enable calculation of silo mass or volume. The type of material contained in the silo is also recorded. This enables dispatchers and managers to review inventory by material type or silo location.

It is also recommended that silos have rotary level indicators installed as a redundant high-level alert, which is a best practice for any active silo that gets filled rapidly and frequently. The rotary serves as an extra layer of protection from overfilling the silo, or having the material rise to the level of the continuously operating radar level sensor and potentially damaging it.

Connectivity

A BinCloud® gateway can be used to push data to the Cloud through an ethernet connection, to access via the CementView programme. Other devices such as analogue expansion hubs for connecting analogue sensors and HART consolidator modules can help connect existing sensors to the Cloud at a minimal cost. At large plants, wireless devices such as 900 MHz or LoRa long-range transceivers help to save substantially on wiring costs, ensuring material and labour savings versus running wires or the expense of paying licensed electricians.

With construction booming, concrete companies cannot afford to run out of material or risk messy overfills, as time is limited and there are a limited number of workers to clean up. Many construction contracts provide incentives for meeting deadlines and the company could face fines if deadlines are missed.

Real-time inventory management

Keeping watch over inventory levels at multiple plants is essential for dispatchers to maintain adequate material levels during times of

high demand. Access to CementView software is provided to dispatchers at corporate headquarters, plant managers, purchasing and other production personnel at any plant location. There is no limit to the number of users for the software, which is charged per silo at a flat annual subscription rate.

Using CementView allows authorised personnel to monitor, order, and distribute cement, sand, fly ash, or other materials for all locations. Users may be restricted to viewing only certain data for limited locations as desired by the administrator. Users can view and sort silos by material, monitor trends, and generate usage reports by selecting report criteria such as date range, location, or material. Each user can create and save a custom view in the software that only includes the information they need.

Reports are available as an excel export or as a PDF.

Plants and central dispatch can receive inventory updates every 10 minutes, which is a benefit since plants are so active.

Using the CementView software ensures that everyone has access to the same inventory data at the same time, including dispatchers, drivers, and plant managers. Out-of-stocks and emergency deliveries can therefore be reduced. Better scheduling results in better profits.

Embracing new technology

During the pandemic, many people chose to retire, leaving the labour market for plant workers and truck drivers very tight. Many new employees have never worked in the industry. Younger people recognise the value of technology and appreciate that there is an easier way to get things done. With labour currently so short, plants are faced with trying to do more work with fewer people, and this aided by CementView.

Customers have added that the visualisation of what is going on inside silos is helpful. Dispatchers can look at inventory levels for all locations, just one location, or just silos that are desperate for a refill.

Local displays supplement drivers' needs for immediate data

Local displays for each silo may be installed at a central location at each plant. When they arrive,

delivery drivers can confirm how much head space is available in each silo, so they can unload their truck, confident that the entire load will fit. A Modbus-compatible control console or a DPM digital panel metre with Modbus-sensor compatibility can provide headroom readouts for every silo at each batch plant. Using hardwired local displays saves time and prevents messy spills caused by overfilling. ■

About the author







Jenny Nielson Christensen is Vice President of Marketing for BinMaster, located in Lincoln, Nebraska, USA. For the past 12 years, her mission has been to help people and plants all over the world get a better understanding of their inventory, and the sensors and software that help make their jobs safer and easier. She is a 40-year multi-disciplinary veteran of B2B and B2C marketing in the technology, industrial manufacturing, consumer packaged goods, and government/military industries.



Inventory can be monitored by truckloads assisting drivers and dispatchers.



Installation of an automated system eliminates the safety risks of climbing silos.

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 overflow Eliminate outages Inventory management Remote monitoring Vendor managed inventory Flow detection Bin Aeration Dust Detection

