TECHNOLOGY SPOTLIGHT: TURNING CITRUS PEELS INTO BIOETHANOL

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INSIDE:

Instrumentation & Controls

Material Handling & Storage

Testing & Analyzing

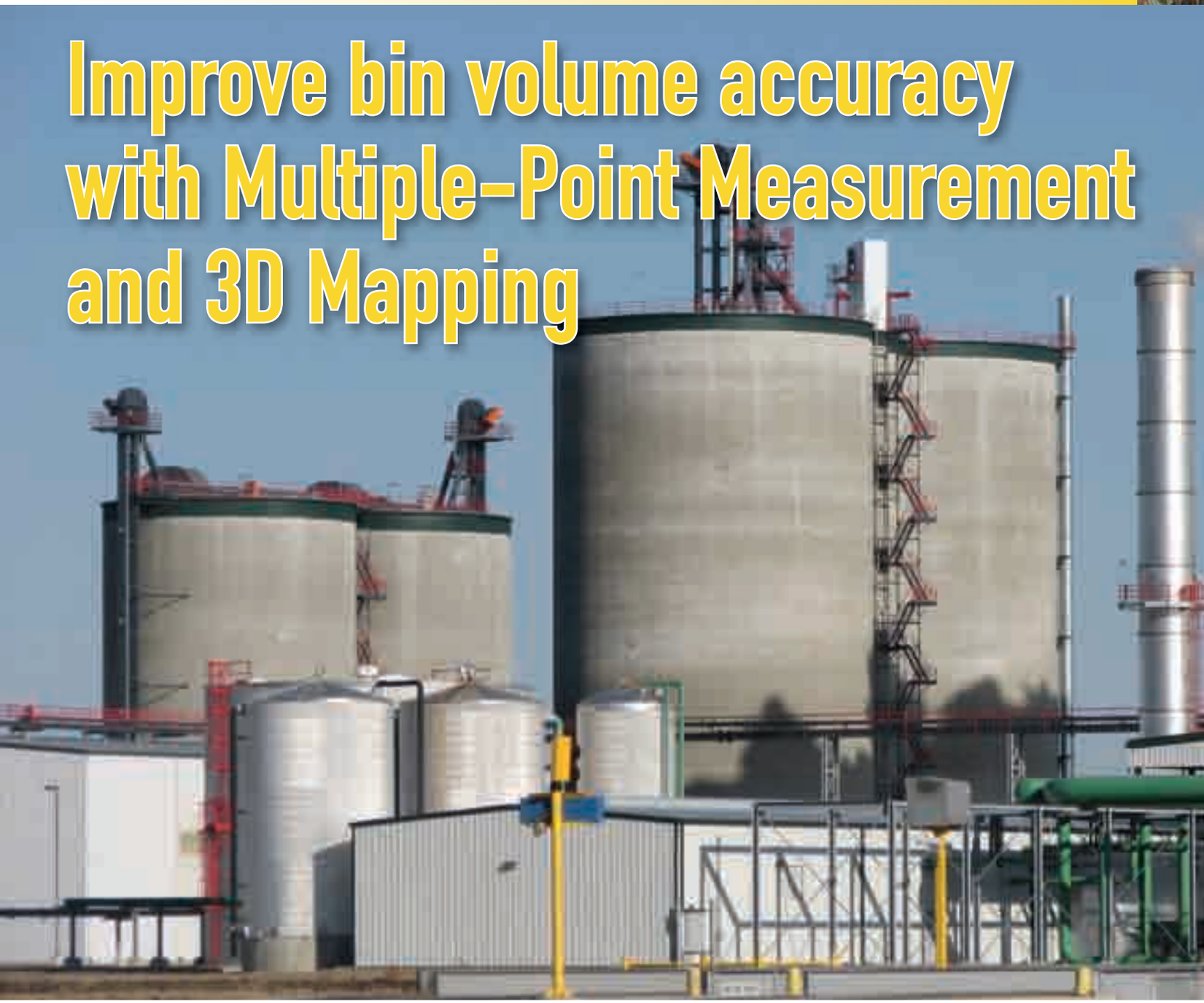
ALSO:

- *Emissions Control & Environmental Compliance*
- *Mixers, Sifters, Filters & Sieves*

PLANT PROFILE:

Improve the accuracy of your bin volume measurements

Improve bin volume accuracy with Multiple-Point Measurement and 3D Mapping



BY JENNY NIELSON CHRISTENSEN

"We need better inventory accuracy."

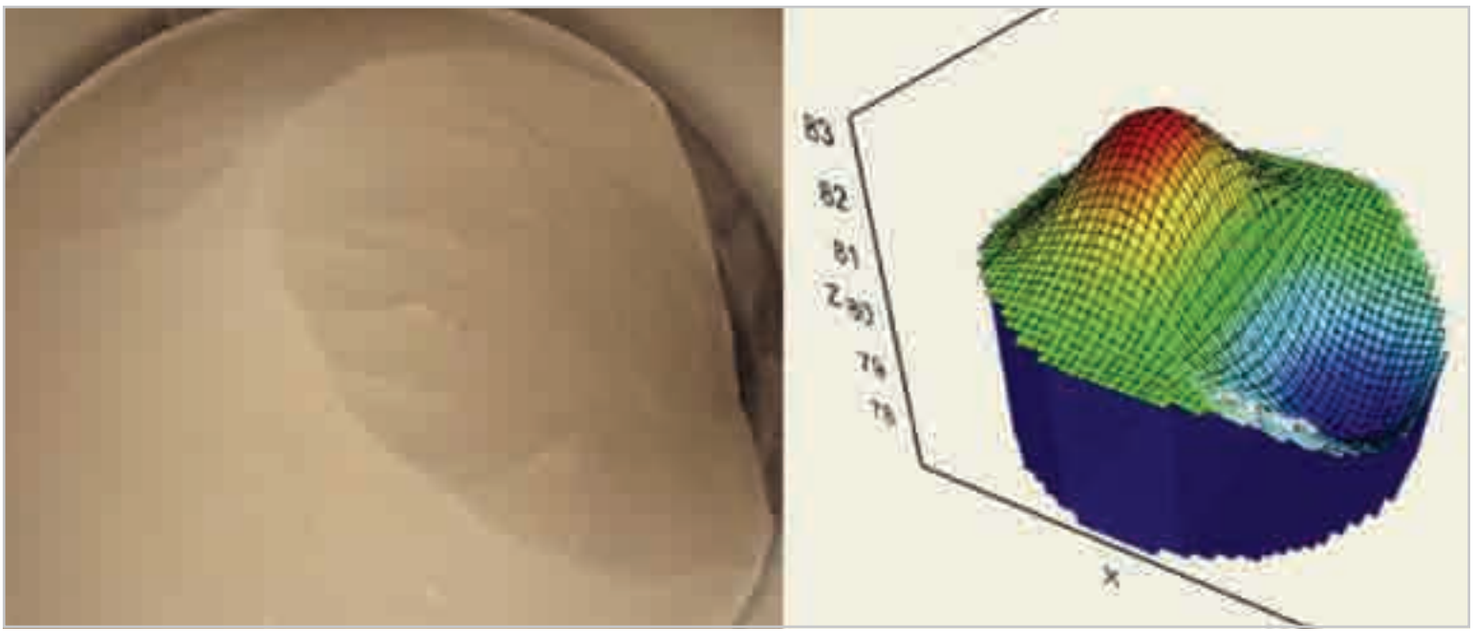
If you work at an ethanol facility, chances are you have heard those words or said them yourself. Ethanol plants are challenged with large silos that are constantly emptying and filling. These active silos also are very dusty, so taking measurements and continuously tracking inventory is a challenge. Having reliable, highly accurate inventory data is essential to help ethanol plants optimize operational efficiency, schedule deliveries and accurately report their inventory value.

Corn silos used in ethanol production can be problematic. The inside of the silo can be very dusty when it's being filled, and the material surface in a silo can be uneven due to multiple fill or discharge sites, "cone up" during filling, "cone down" when emptying, or material that can bridge or form buildup on the sidewall. Using multiple-point measurement technology and 3D mapping capability, the BinMaster 3DLevelScanner is designed to take a more accurate estimation of silo volume.

Multiple measurements means increased accuracy

By taking multiple measurements in the silo, the BinMaster 3DLevelScanner will improve the accuracy of the estimated volume of material in the silo. Although a single-point measurement device can be highly accurate in center-fill, center-discharge silos, the topography of corn in bins at many ethanol plants can be irregular due to multiple filling or discharge sites, bridging, side wall buildup, or "cone up" or "cone down" during filling and emptying cycles. By measuring and mapping the material surface at multiple points, and then using an algorithm to determine the average height from all of those points, the

Page top: 3DLevelScanner now installed on 4 large silos.



The image on the left shows uneven bin material. The graphic representation generated by the mapping software is on the right.

BinMaster 3DLevelScanner calculates a volume estimate that is more accurate than single-point devices.

Properly applied, the BinMaster 3DLevelScanner has achieved accuracy of 0.5-3 percent in silos with multiple fill and discharge sites. Contrast this with a single point device that is typically 5-7 percent accurate in a center-fill, center-discharge silo. When using a single point device in silos with multiple filling and discharge sites, estimating accuracy is extremely difficult and often reported as being off by 15 percent or more.

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Immunity to dust ensures reliable measurements

The BinMaster 3DLevelScanner uses a low frequency acoustical signal to penetrate dust generated during filling and emptying. By ingoring dust, it takes highly accurate distance measurements. These measurements are determined by how long the signal takes to "travel to" solid material and "return to" the device. These very low frequency acoustical signals are able to penetrate suspended dust, unlike other technologies whose signals become "lost" when attempting to take measurements in dusty environments. The pulsing of the acoustical signals prevents material from adhering to the internal workings of the device, ensuring long-term reliable performance, while a non-stick material inside the unit reduces buildup inside the device and reduces the need for preventive maintenance.

Non-contact reduces contamination risk

The BinMaster 3DLevelScanner uses a non-contact, acoustics-based technology, ensuring no equipment comes into contact with material, as it does with a radar-on-a-rope device. This eliminates the risk of equipment breaking off or becoming trapped in material and potentially causing damage to sweepers or conveyors in the bottom of the silo, causing unwanted downtime.

Mapping software detects uneven material

3D technology takes multiple measurements

within the bin and then maps the topography in it. This creates a computerized visual representation of the material in the bin, which can indicate bridging, as well as material built up on the sides of the silo. By detecting irregularities in the material surface, excessive buildup can be accounted for in volume calculations. With single point devices, a measurement might show that the bin is almost empty, even when a significant amount of material remains in the bin.

The images generated by the mapping software can be used to alert the need for preventive maintenance in the silo. By detecting sidewall buildup early, silos can be cleaned and serviced before material hardens and becomes even tougher to clean out of the silo. Preventive maintenance can be performed early when it is an easier and less expensive undertaking.

3DLevelScanner mounted on top of cement silo.

Self-cleaning for minimal maintenance

The scanner automatically cleans itself, which reduces the frequency of preventive maintenance in even the dustiest environments. Suspended dust tends to adhere to the surface of some types of devices, requiring cleaning or maintenance at

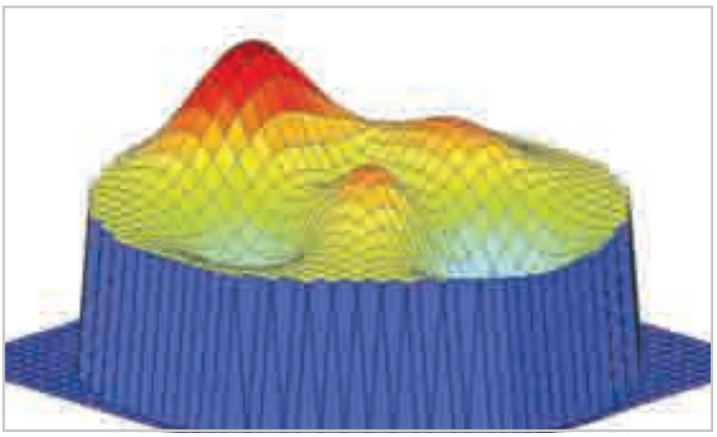
Conveyor fill on top of the silo.

frequent intervals in order for the instrument to continue working. However, the BinMaster 3DLevelScanner's acoustical pulses – that ticking sound you will hear during operation – are proven to be effective in preventing dust from adhering to the transducers. The BinMaster 3DLevelScanner should be inspected and wiped clean at approximately 6-month intervals for optimal, continuous operation.

An actual application of 3D technology

This ethanol plant faced three different types of challenges – dust, accuracy and reliability. There were extreme amounts of dust, especially during fill rates of up to 580 tons per hour, which made it extremely difficult to track the filling and emptying processes. They had been using guided wave radar – a single point measurement technology – in a very large bin of uneven topography. Using just a single measurement was not providing an adequate level of accuracy, since the level of material varied significantly in different areas of the bin. Also, the sensing cable on the guided wave radar was breaking, which made taking measurements impossible and caused operations to shut down until the cable could be recovered from the material contents and then replaced.

The MV model of the BinMaster 3DLevelScanner was mounted on a 150´ tall, 75´ diameter, concrete silo containing whole corn. The silo is extremely dusty and



The 3DLevelScanner uses non-contact, dust penetrating technology to create a visual map of the material surface in storage and process bins.

noisy during filling. It also has multiple discharge sites, which create uneven material levels in the silo. Therefore, the multiple-point measurement in the bin would prove helpful in accounting for uneven material levels and the MV model with mapping capabilities could visually depict where the high and low points were in the silo.

To ensure measurements could be taken when dust was present, the advanced parameters of the 3DLevelManager software were set so the device was optimized to track during a rapid and extremely dusty filling cycle. With multiple discharge sites and empty rates of up to 150 tons per hour, the BinMaster 3DLevelScanner was able to provide a far more accurate volume than the previously installed, single-point guided wave radar device.

The BinMaster 3DLevelScanner was able to meet the challenge of a dusty environment and was optimized to track during the filling and emptying processes. The low frequency, acoustic waves are able to penetrate the dust generated during fill. Using the MV model, which takes multiple measurements within a 70 degree beam angle, the inventory accuracy was improved, which enabled the plant to optimize its filling and emptying schedules and railcar traffic. The non-contact device eliminated the risk of breaking cables, which prevented work stoppages and provided plant personnel inventory measurement data when it was needed. After the success of the first unit, the plant purchased additional units for its other large silos.

Jenny Nielson Christensen is director of marketing for BinMaster – a division of Garner Industries. She has 30 years of experience in business-to-business and business-to-consumer marketing for the industrial products, communications, food industry and consumer packaged goods markets. Nielson Christensen has a bachelor's degree in business from Bryant University and an MBA in marketing from Keller Graduate School of Management.