



Reliable grain inventory management

by Jenny Christensen, BinMaster, USA

Cable-based sensors help simplify grain storage - with harvest upon the northern hemisphere, the annual concern for optimising storage space plagues the grain industry. Sensors for monitoring the level of grain in bins help reduce labour and simplify the task.

Consoles, computer programs and cloud-based systems automate the process of monitoring and managing inventory. Furthermore, sensors eliminate the need for climbing bins, making grain operations safer and more efficient. Perhaps the most reliable, proven inventory management technology is one that automates the job of a tape measure.

The principle of operation is simple. The device works as an automated tape measure that repeatedly takes measurements from the top of the bin at a consistent location. This eliminates the need to climb bins to take manual measurements. When a measurement is taken, the sensor releases a cable with a weighted sensor probe that stops and retracts when the probe comes into contact with material.

The “brains” of the sensor convert the distance data to a measurement that can be displayed as either the height of the material or the distance to the material, referred to as headroom. The sensor takes redundant measurements, when the sensor probe is both descending and retracting, to confirm that every

measurement is precise. It makes only momentary and minimal contact with the grain surface, making it unobtrusive and able to perform consistently in high levels of dust. Proven for decades, a weight and cable-based sensor is a very economical and accurate continuous level measurement solution.

Cable-based sensors are designed for single point level measurements taken periodically throughout the day. Level measurements can be programmed to take place at predetermined time intervals or initiated as needed from a console at ground level or from a PC, depending upon the type of communication devices used. High-temperature and explosion-proof options make cable-based sensors suitable for most challenging applications.

Their versatility makes them well suited for the grain and milling industries where on-going inventory management and remote reporting is required for multiple small and large vessels containing a wide array of materials.

Suitable for grain and ingredient storage

Unlike some types of non-contact sensors that become unreliable in high dust or some types of grains, weight and cable-based sensors are an ideal level measurement solution for the grain and milling industries as they work in virtually any material regardless of particle size or bulk density. Immune to most material characteristics, they perform equally well whether the bin contains light materials or additives, pellets of all sizes, fine to coarse granules; or heavy, dense lump materials.



According to the needs of each client **SILOS CORDOBA** builds plants to store and transport your grain in the best conditions



www.siloscordoba.com

Industrial, agricultural and livestock facilities **Turn** key projects **Conveying** and handling equipment



Diameter: 16,81 m - Capacity: 3.395 T - Total capacity: 21.000 T

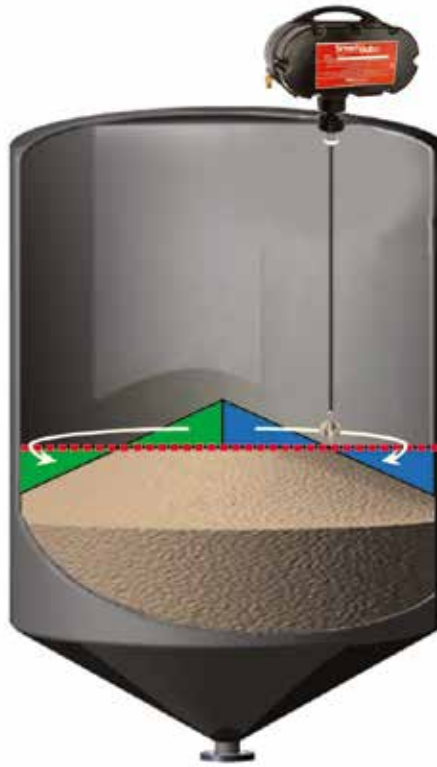
www.siloscordoba.com

Cable-based sensors are a proven technology that have been in existence for decades. These trouble-free, long-lasting devices require no calibration, even if the material in the bin changes. These sensors will perform reliably and are not affected by dust, humidity, temperature, dielectric constant or fumes that may be present in the vessel. The stainless steel probe at the end of the cable makes minimal contact with the material in the bin, so there's very little risk of contamination.

Versatility for all sizes of bins and a variety of applications

A network of multiple weight and cable sensors can meet the challenge of just about any bin measurement need in the facility. They are versatile and can be used in many types of materials in vessels constructed of steel or cement, of about any height or diameter. For example, if multiple bins containing different types of grains, ingredients, or waste materials need to be monitored, the sensor can be adapted to the needs of each particular bin. A cable-based sensor can be used in large bins up to 180-ft tall, but also are often used in smaller, active process bins under 40-ft tall.

While a stainless steel weight is commonly used with the sensor, a round stainless steel sphere float is an alternative for



bins containing light powders, slurries or liquids. A hollow, inverted stainless steel cone can be used in liquids or light powders or solids with a bulk density of at least 3 lb./ft.³. An economical choice that's often used in light or dense powders or liquids is a digestible bottle filled with paraffin wax or other compatible material that fits through a rotary valve or screw conveyor.

Mounting location is the key to accuracy

For the best accuracy, the sensor should be mounted on the roof of the bin about one sixth of the way in from the outer perimeter. When used in free-flowing material such as grains, this ideal sensor placement location accounts for the angle of repose on a centre-filled vessel. When a vessel is being filled, the material forms a "cone up" in which material is higher at the centre and lower near the sides of the vessel. If you draw

a horizontal line at the point the sensor probe comes into contact with the material surface one sixth, there's a peak at the centre of the vessel and voids at the sides. If you take the material in the peak and fill in the voids, it will flatten out the angle of repose.

The same is true when the vessel is being emptied and material is lower in the centre and higher on the sides forming a "cone down." Mounting the sensor one-sixth from the outer perimeter is proven



4B GROUP
www.go4b.com

**DOWNTIME IS
A RACE...**

TIME IS MONEY

**Bolt 'N' Go™
Drag Conveyor Chain**

Put Your Conveyor on Pole Position!

- Reduce Downtime & Maintenance Costs
- Quick and Easy Chain Assembly
- Bolt on Flight Replacement (No Welding)
- Forged and Hardened Chain Links



Proven Performance

4b-uk@go4b.com • www.go4b.com

BETTER BY DESIGN



your reliable storage
solution

www.symaga.com

symaga@symaga.com

New spiral, flight & roof stairs,
improved access to the top of the silo.



Offices and Factory:
Ctra. de Arenas km. 2,300
13210 Villarta de San Juan • Ciudad Real- Spain
T: +34 926 640 475 • F: +34 926 640 294

Madrid Office:
C/ Azcona, 37 • 28028 Madrid - Spain
T: +34 91 726 43 04 • F: +34 91 361 15 94

**symaga**

Growing together in all fields





academically to calculate the most accurate level reading for a vessel. Properly mounted on a centre-fill, centre-discharge bin, cable-based sensors will consistently provide five percent to seven percent accuracy.

Data accessible from a console, computer or the cloud

Cable-based sensor networks can be integrated utilising a wide variety of communication options dependent upon how you want to access and use the data. The most cost-effective and popular option is to mount a control console at ground level. A single console can be mounted at each bin, or more advanced consoles can report data from more than 100 bins at a single console. Consoles are easily programmed with bin size information and each bin is assigned a vessel number. Browsing through a pushbutton menu, the user can access information such as distance to product (headroom), height of product and percentage full. A console is a great tool for drivers to utilise to take measurements from a bin before they unload, to ensure the entire load will fit without overfilling the bin.

If the preference is to have level-measurement data sent to a personal computer, there is Windows-based software to report detailed data for multiple vessels simultaneously and generate a visual that shows bin levels as a percentage full. Bins can be named by location and labelled by their contents.

Alarms or alerts can be generated when a bin reaches a predetermined high or low level. Other communication options include the ability to send an automated email when bins reach an alert level. The measurement data can be stored on the computer and used to generate historical reports. LAN configurations are also possible to share a common measurement database with multiple users on a local area network. It's quite common for an operation to have both a console outside near the bins and software on a computer in the office.

Many grain and milling operations today prefer to access their inventory data from the Internet. This makes it easier to get bin level data anywhere and anytime, regardless of the location of the person that needs access to the data. Cloud-based programs are often compatible with many cable-based sensors as well as other sensor technologies to remotely monitor bins, storage tanks or silos. These systems allow monitoring of all of an enterprise's

storage of liquids or solids at one location or corporate wide. As grain managers are always on the move, alerts are sent via email or a text message. The web site can be viewed from any mobile device, tablet, or computer.

Once securely logged in, users are presented with an easy-to-use and read graphical interface that offers at-a-glance overview of all bins. With one click there is a full report of bin details. Users are provided current reading reports for any or all bins on site with the information presented in either distance to product, percentage full or bushels. There is the ability to set automated high and low level alerts and sort data by material, location, or alert status. Historical reports can be generated for any tank over a specified time frame or reports may be exported for analysis or sharing.

For facilities that prefer an analogue output to a PLC for monitoring bin level measurement data, some models of cable-based sensors offer an integrated 4–20-mA output. In this type of configuration, the sensor is installed on top of the bin and the measurement data is sent directly to a PLC, eliminating the need for either a console or software.

Accounting for compaction and irregular vessel shape

Due to the size of the bin and the nature of grains or ingredients, the material will have a greater bulk density at the bottom of the bin than near the top, due to the weight of material compressing downward as the bin is filled. By entering the weight of the material at different heights in the bin, a strapping table can account for the compaction of material in the bin.

By adding valuable weight-to-distance data into a table, the estimate of material in the bin can be tailored to exactly how material behaves in a particular vessel. Strapping tables are also a useful tool when measuring the contents of cone-bottomed bins, because they can take into account the amount of material in a tapered cone. Strapping table data also allows for more accuracy in measuring irregular tanks, such as a cylindrical tank installed on its side.

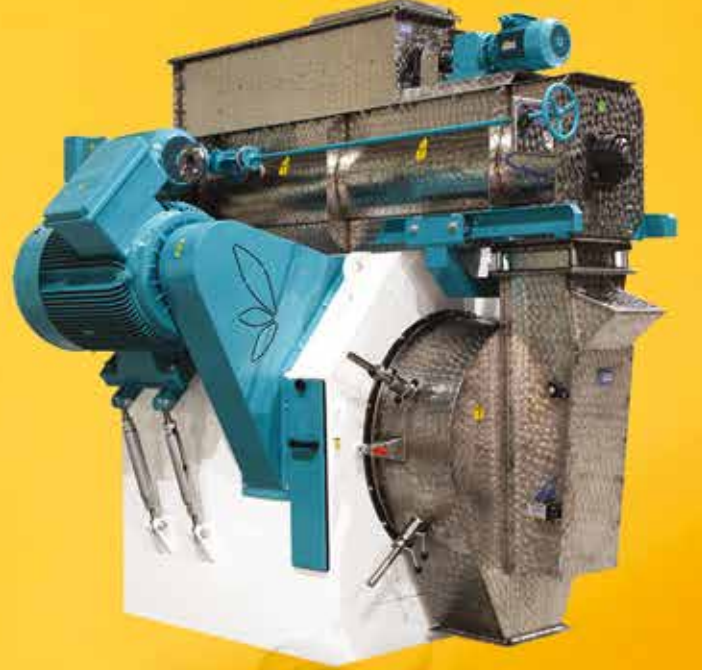
Many new, innovative level measurement technologies are available for monitoring grains or ingredients, but if you are looking for a proven, long-lasting, reliable, and hassle-free solution, a cable-based sensor ensures simplicity and repeatability. This robust

inventory management system can be networked using wired or wireless communications for up to a hundred vessels using just one license of software or one integrated console, making it an economical and uncomplicated choice.

Advances in software and Internet-based solutions allow users to initiate a measurement from a remote location and provide real-time inventory data from anywhere there's an Internet connection. Cable-based sensor networks cost less and present few headaches compared to other technologies, while providing a wealth of data for effective inventory management. ☺



The Future Technology From Unormak



**UNORMAK DEĞİRMEN MAKİNALARI
İMALAT SANAYİ ve TİCARET LTD. ŞTİ.**
Konya O.S.B. 7. Sokak No:3 Konya / TÜRKİYE
T: +90 332 239 10 16 (Pbx)
F: +90 332 239 13 48
unormak@unormak.com.tr

www.unormak.com.tr

OFFICE POUR LA FRANCE
STE EURODIS : 29 Rue des noyers
95200 SARCELLES
T : 33 0134194172 / 33 0139 32 1960
erodis@wanadoo.fr

**YEM MAKİNALARI TEKNOLOJİLERİ
ORYEM MAKİNA SANAYİ ve TİC. A.Ş**
O.S.B. 6 Sk No: 9 KONYA / TÜRKİYE
T: +90 332 239 13 14 / 239 13 20
F: +90 332 239 13 15
oryem@oryem.com.tr

www.oryem.com.tr

