



PROTECTING STORED GRAIN

Digital monitoring sensors protect grain investments

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For those who work in the grain industry, battling the natural elements to grow a bountiful crop is only half of the challenge. Monitoring and maintaining post-harvest grain stored in silos, flat storage warehouses and piles is a difficult process.

Although there are several factors to consider, this potential difficulty can be overcome with the right grain monitoring system in place.

Safe grain storage is essential for both large industrial grain producers and local farm operations. Advanced digital grain temperature, moisture and CO₂ sensors help to protect grain investments by continually monitoring stored grain conditions and sending alerts when conditions change or fall outside of desired parameters.

With this valuable data, facilities have the information needed to ensure a stable storage environment to prevent spoilage and unwanted growth in grain silos.

These solutions work to ensure superior product quality, prevent losses and achieve a high return on investment for grain assets.

It is difficult to maintain a crop's value after harvest. Stored grain will change and deteriorate rapidly without proper handling. This is especially true when conditions are less than optimal at harvest and grain may not have been adequately dried prior to storage.

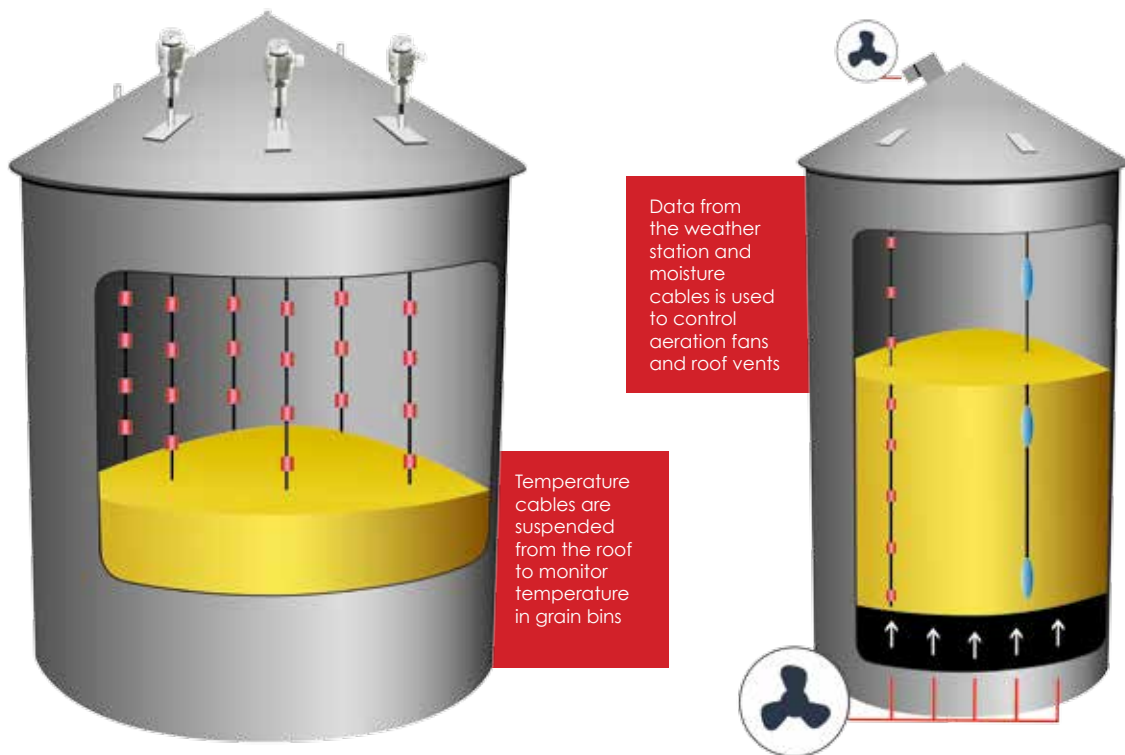
Sensor systems are designed to monitor and control storage conditions and report temperature levels and moisture. This data can be used to limit guesswork and make informed decisions. Advanced software can provide information from multiple bins at an operation and can improve the ability to optimise operation of aeration fans.

Temperature cables help eliminate the estimation and ambiguity involved with grain storage by monitoring the temperature of grain using digital sensors encased in a rugged cable. These cables are suspended from the roof in steel or concrete grain silos, with the cable length depending on each silo's height.

The number of sensors encased in the cable depends on the length of the cable. There are multiple sensors in each cable, generally spaced six to 10 feet apart. Temperatures are reported for each sensor in the cable, enabling better detection of developing hot spots.

If temperatures begin to rise, the grain can be sold, moved or blended to help optimise its value. Digital temperature sensor technology offers precise readings and low maintenance over a lasting life span.

Similarly, digital technology in moisture sensing cables helps to accurately measure the ambient relative humidity at several points in the grain bin. The data is used to calculate grain moisture based on the Equilibrium Moisture Concentration



Data from the weather station and moisture cables is used to control aeration fans and roof vents

Temperature cables are suspended from the roof to monitor temperature in grain bins

(EMC) curve, which is when the grain's moisture content balances with the air in its environment over time.

The top sensor is located just under the silo's roof to monitor the relative humidity in the head space. Additional sensors are located at high and low levels along the cable to detect the grain's moisture level. These digital sensors provide accurate moisture measurements, which help control potential losses due to grain shrinkage caused by a lack of moisture or grain spoilage related to excessive moisture levels.

In most applications, a single moisture sensor cable will be sufficient to monitor the grain moisture content of the entire silo and avoid product waste.

Another method to detect grain spoilage and prevent unwanted biologic activity is to monitor the carbon dioxide levels in silos. An increase in CO₂ gas can indicate unwanted biologic activity that is caused by fungus, insects or other infestations in the grain.

As a gas, CO₂ easily travels through grain mass and as a result, can be detected at low levels. Spoilage detection at an early stage increases the number of available options to confront this problem and minimise losses.

Portable sensor lances used with handheld instrumentation can

also improve grain management in piles, flat storage warehouses and other temporary structures that are used to store grain.

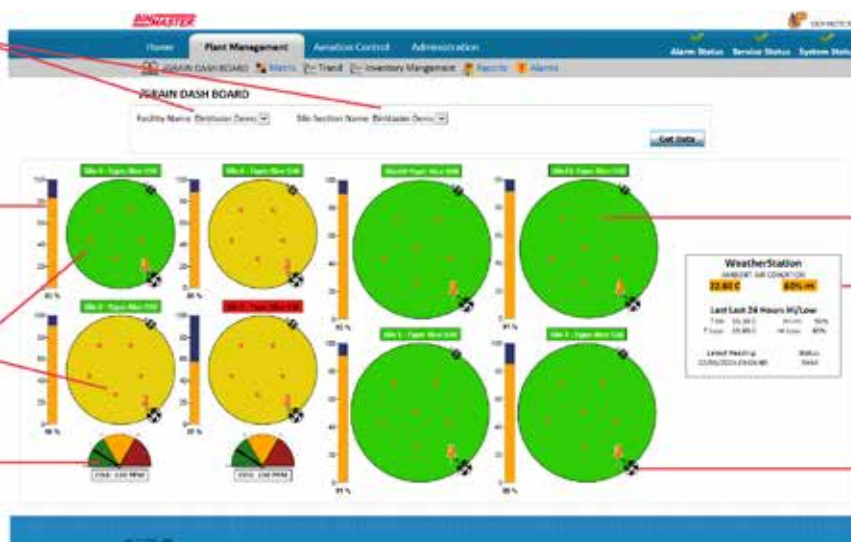
Grain is not always stored in bins or silos, but limiting grain spoilage is still a priority. Portable sensor lances are an alternative solution for temperature monitoring in flat storage warehouses, piles or smaller storage sites. Digital sensors are packaged in a compact, portable spear that is easily inserted into the grain where temperature readings are needed.

To monitor changes in grain temperature over time, the lances can be left in place. The lances connect to a portable handheld reader where data for several lances can be viewed and transferred to computer software.

External weather conditions are also a factor in grain storage and its longevity. A weather station that monitors conditions outside of the bin can provide valuable information to ensure aeration fans are run when they will provide the most benefit. Safe storage practices allow for crops to be stored for a longer amount of time in silos, warehouses or piles with reduced spoilage, shrinkage or quality loss.

Weather stations provide rapid information about the ambient temperature and air moisture in grain silos that is precise and

Facility and silo section



Crop-Protector™ Dashboard Manager software displays all the grain storage and monitoring data

Grain level

Silo color indicates grain temp

CO₂ level

Temp/moisture cable

Weather station data

Aeration fan off/on status



reliable. Weather conditions, such as rain, freezing temperatures and sunrise determine when and how long aeration fans should run to maximise the grain's market potential and protect the value of the crop.

The information from weather stations helps secure grain investments, but is also used for more efficient aeration control and integrated with automated aeration control software.

Hotspots and mold can become problems for grain that has a higher moisture content and is at warmer temperatures. Aeration control software works with the weather station to activate or deactivate aeration fans, in order to create a climate inside the bin that helps maintain the condition of the grain.

Only running the aeration fans when they are necessary will also increase efficiency, reduce operational costs, save on energy bills and prevent grain shrinkage, especially in industrial size grain operations where multiple aeration fans are active.

Large facilities utilise a combination of different stored grain control solutions throughout several silos. The data from each sensor and silo is displayed clearly on a PC or touch screen offering easy accessibility and networking capabilities.

Comprehensive data gives an overview of grain temperature, grain moisture, weather data and approximate grain level, among other detailed information. With wireless technology, information can be accessed via smartphones, tablets, computers or other devices for managers to monitor and control grain storage.

The software also features programmable alerts, so that grain facility managers can receive real-time data about the conditions of their silos and act quickly to prevent further grain spoilage. Staying up to date with the conditions of grain storage warehouses, piles and silos can be the difference between solving problems and losing product.

After receiving an alert, prompt responses mean more operational options are available as solutions. One option to

manage the data from multiple sensors and multiple silos is through Crop-Protector™ Dashboard Manager Software.

BinMaster offers Crop-Protector™ Dashboard Manager Software, and other grain monitoring products, through their new strategic alliance with Eye-Grain of Denmark. Crop-Protector™ products have already been successfully applied in Europe, Asia and Africa and will now be offered in the North and South American markets exclusively by BinMaster.

These innovative post-harvest grain storage systems benefit the industry on all levels, from major industrial customers to local farmers. BinMaster will manufacture, sell and service the Crop-Protector™ product line from its facility in Lincoln, Nebraska, USA.

Crop-Protector™ and other similar products work to simplify post-harvest grain storage and remove the guesswork by implementing safe grain storage systems. The grain industry is moving beyond analog to advanced technology, integrating digital sensor systems, such as temperature and moisture cables and portable temperature lances. These monitoring systems offer accurate readings that help grain operators manage the conditions of their stored grain.

Real-time data and convenient options for a detailed display of the conditions in grain silos, storage warehouses and piles increase efficiency at grain facilities.

The information from stored grain monitoring systems better equips grain facility managers to make the best decisions in regards to grain storage and handling. Informed decisions can lead to improved grain management and increased profits. In the grain industry, there are always variables that cannot be controlled. However, monitoring the conditions of stored grain does not have to be one of them.

Digital sensor solutions provide the information that keeps grain workers in control. ☺