Sugar Starch & Yeast
Perspectives in Liquid Process Analytics

21 News

INGOLD
Leading Process Analytics

A Small Footprint in Your Plant

A Leap Forward in Analytical Measurement

Compact, head mount, temperature transmitters have been a common sight in production plants for decades. Calibration of analytical sensors requires a transmitter with keys and a display, which has prevented the head mount concept being used for pH/ORP, conductivity, and oxygen sensors – until now!

A world first

The average production facility contains hundreds or even thousands of field instruments, of which most are of the "fit and forget" type. They go unnoticed due to their inconspicuous design and absence of local human machine interface.

Analytical sensors, on the other hand, have not followed this trend and continue to require a transmitter large enough to include keys and a display due to their frequent need for calibration. METTLER TOLEDO has defied this convention. With the new M100, METTLER TOLEDO offers the world's first transmitter for analytical measurement based on a compact, head mount design.

Intelligence is the key

Thanks to METTLER TOLEDO's powerful Intelligent Sensor Management (ISM®) technology, the combined head mount transmitter/sensor concept has been applied to analytical parameters. This new approach enables METTLER TOLEDO to provide a solution for pH/ORP, conductivity, and oxygen measurement which has a very small footprint and is extremely easy to handle.

Plug and Measure means no local interface is required

This leap forward in field instrumentation is possible because ISM enables sensors to be calibrated away from the process in a convenient location such as a workshop. Calibrated sensors can then be swapped quickly in the field. This feature, called

METTLER TOLEDO

Plug and Measure, means measurement point start up is fast and error-free, and can be accomplished without complicated routines. Because of Plug and Measure, the M100 does not require a local operator interface.

Intrinsically safe

The new, 2-wire transmitter series is designed for use throughout the process industries and is certified intrinsically safe for installation in hazardous areas.

Online sensor diagnostics

The M100 can be easily configured over the HART® protocol. In addition, HART allows integration of ISM's advanced sensor diagnostics, such as the Dynamic Lifetime Indicator and Adaptive Calibration Timer, providing real-time data on sensor "health". These tools allow predictive maintenance, helping to ensure maximum plant uptime, measurement point reliability, and process efficiency and safety.

The support of all major asset management tools such as AMS (Emerson), PDM (Siemens) and the open standard FDT/DTM ensures the widest compatibility, and remote access to sensor diagnostics.

Find out more about the M100 transmitter:
▶ **www.mt.com/M100**

M100 transmitter mounted to InFit 761 e sensor housing

Available October 2013

ISM

Key features

- Small footprint
- Aluminum head and stainless steel body
- Intrinsically safe
- Plug and Measure start up
- Predictive sensor diagnostics
- No display
- HART® communication

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More Syrup, Less Downtime
pH Control in Starch Sweetener Deashing

Ion exchange columns are used to remove ionic impurities from starch syrups. When a column can no longer absorb impurities, it must be regenerated. This white paper extract explains how use of a high-performance pH measurement system with built-in intelligence leads to increased exchanger uptime.

Background

In order to meet purity and storage stability requirements of dextrose and fructose syrups, ionic impurities are removed in ion exchange columns. Ion exchange resins work by replacing one type of ion for another that has a greater attraction to active sites on the resin polymer. In syrup deashing, a bed of acidic cation resin is followed by a bed of alkaline anion resin to extract ionic loads made up of salts and mineral acids. In the cation resin, cations such as sodium, potassium, magnesium, and calcium are removed.

During this exchange step, hydrogen ions are released from the resin. Consequently, there is a significant drop in pH value when the syrup leaves the exchanger. In the downstream connected anion exchanger, the mineral and organic acids that cause the low pH are neutralized by the release of hydroxyl ions so that syrup pH is increased again.

Deashing systems consist of two or more unit pairs of a cation and anion exchanger. One unit pair is always in the process of being regenerated. Regeneration is necessary when the exchange capability becomes exhausted. This point, called breakthrough, is determined by measuring the syrup pH in the outlet of the exchange columns.

pH profiles during syrup service and regeneration

The changes in syrup pH in the outlets of the ion exchangers have to be monitored closely in order to minimize product losses. Once the breakthrough point is detected, the ion exchanger must be regenerated.

pH monitoring for the determination of the end point of column regeneration also plays an important role. A recommended regenerant for cation resins is 7 % hydrochloric acid, whereas anion resins are frequently regenerated with 4 % sodium hydroxide solution. In the case of cation exchangers, a dramatic drop in the pH value is observed when most of the active sites are occupied with hydrogen ions. A pH increase in the outlet of an anion exchanger indicates the end of the regeneration phase. In addition, the end of the final step, rinsing with pure water, can be determined by means of pH measurement in the column outlets.

The importance of in-line pH measurements

Compared to grab sampling, in-line pH measurement provides real-time and continuous information on the changing pH value during breakthrough point detection as well as for the determination of regeneration and rinsing end points. Early breakthrough detection is mandatory in fulfilling syrup purity requirements, and

reliable and reproducible end point detection optimizes ion exchanger service cycles.

pH sensors installed in ion exchanger outlets are exposed to significant pH and temperature changes, e.g., the pH in cation exchanger outlets can vary from neutral down to zero in 7 % hydrochloric acid, the pH in the anion exchanger outlet varies from neutral up to 14 in a 4 % sodium hydroxide solution, and the maximum regenerant temperature can be 90 °C (194 °F).

Extreme pH and temperature conditions directly influence the performance and lifetime of pH sensors. Therefore, regarding pH measurement, what is required is a system that not only performs reliably in the process conditions, but that continually informs the user of stresses on the sensor and the need for maintenance and calibration. Ease of installation and safe sensor replacement are also important factors in optimizing uptime of pH instruments.

pH measurement system fit for purpose

The InPro 3250 i pH sensor is METTLER TOLEDO's answer to demanding ion exchanger applications in the starch sweetener industry. It has been designed for use in harsh chemical process conditions where extremes in pH, pressure, and temperature are present.

The sensors high-alkali-resistant membrane glass safeguards precise measurement regardless of the pH level. Pre-pressurized liquid electrolyte minimizes the effects of diaphragm clogging and ensures long service life. Additionally, the sensor features Intelligent Sensor Management (ISM®) technology. ISM significantly improves sensor handling and maintenance through a number of valuable features.

Predictive diagnostics

Advanced diagnostics provide a continuous flow of status and maintenance information from the sensor to the transmitter. Along with monitoring glass and reference impedance, ISM bases its diagnostics on actual process exposure history. By constantly keeping track of process pH value, temperature, and operating hours, ISM diagnostics tools calculate when sensor calibration, cleaning or replacement is required. Any maintenance requirement is therefore recognized at an early stage, critically, before performance is affected.

Plug and Measure

Installation of a new pH sensor typically requires calibration as the first step. For analog sensors, this involves taking pH buffer solutions out to the field and performing a two-point calibration.

One particularly useful ISM feature is that sensors can be calibrated off-line using iSense software via a USB connection to a laptop or desktop computer. This means sensors can be calibrated in a convenient, comfortable environment such as the instrumentation workshop, and stored for later use. Such functionality eliminates the need to carry cleaning agents and buffer solutions through the plant to do tedious on-site calibrations.

Pre-calibrated sensors carry all configuration data on the integrated microprocessor and share it with the transmitter immediately upon connection. This avoids any possible configuration errors and means that the sensors are immediately ready for measuring.

Download the full white paper at:
► **www.mt.com/pro-syrup**

For more white papers, see page 9.

Remote Access to Sensor Diagnostics
New FF Transmitter

The M400FF transmitter with Intelligent Sensor Management (ISM®) technology provides the highest reliability and easiest handling in hazardous and non-hazardous area applications. Advanced sensor diagnostics data available over FOUNDATION fieldbus™ leads to reduced operating costs and helps improve productivity.

Outstanding reliability

With its rugged design and approvals for hazardous area use, the M400FF 2-wire-transmitter provides operating assurance even in the most challenging conditions. In combination with METTLER TOLEDO's advanced Intelligent Sensor Management (ISM®) technology, the M400FF offers greater process reliability in applications across the sugar, starch, and yeast industry.

Flexible and future-oriented

The M400FF transmitter is a multi-parameter, single-channel unit for pH / ORP, amperometric and optical oxygen, conductivity, and dissolved carbon dioxide sensors. Thanks to the mixed-mode input, which accepts traditional analog or ISM sensors, the M400FF offers a unique and smooth technology transition from analog to digital sensors and provides a future-oriented investment in your plant.

Compatible with your asset management system

Because of the implemented standardized FOUNDATION fieldbus (FF) interface, the M400FF supports corresponding asset management tools, such as AMS (Emerson) and PRM (Yokogawa), and field communication tools, including HH475. This ensures maximum compatibility with your asset management system.

Quick set-up and simplified sensor handling

Thanks to the M400FF's advanced ISM functionality, the transmitter offers additional, valuable benefits:

- Using our iSense software for ISM sensors, probes can be accurately calibrated in any convenient location and stored for later use.
- When a calibrated sensor is connected to the M400FF, the calibration data is automatically uploaded and the system is ready to measure in a few moments.
- This Plug and Measure feature minimizes the risk of installation troubles and simplifies sensor commissioning and replacement.

Improved process control thanks to sensor diagnostics

Measurement data and ISM sensor diagnostics tools, such as the Dynamic Lifetime Indicator (DLI), Adaptive Calibration Timer (ACT) and Time to Maintenance (TTM), can be integrated into the process control system. Due to the M400FF's communication capability, system integration is easily achieved, enabling more efficient maintenance of the measurement system. Unplanned shutdowns due to unforeseen sensor failure no longer occur, and the resulting increase in process availability and reduced maintenance lead to improved productivity and lower operating costs.

Find out more at:
▶ **www.mt.com/M400-2wire**

Prevent Boiler Problems
with On-line TOC Monitoring

Sugar in recycled condensate feedwater can lead to costly boiler downtime and maintenance. For Spain's largest sugar producer, continuous monitoring of total organic carbon is ensuring even ppb levels of sugar contamination are instantly identified.

Iberia's largest sugar supplier

AB Azucarera Iberia S.L.U is Spain's leading sugar producer. It supplies 50 % of the 1.6 million tonnes consumed annually in Iberia. They operate four refineries in Spain where they produce a range of products for industrial and domestic use. Azucarera became part of the UK-based AB Sugar Group in 2009.

Dangers of sugar in recycled condensate

Sugar in steam boilers causes the water to foam and the resulting increase in internal pressure can lead to accidents. At Azucarera's Cádiz facility, production equipment is kept in good order; therefore, large concentrations of sugar in the condensate do not occur. However, very small quantities of sugar can still enter condensate through defects in heating surfaces. Over time, these can cause corrosion and deposition in boiler tubes that necessitates production downtime and significant maintenance to rectify. Azucarera technicians were looking for instrumentation that would provide continuous measurements of very low sugar levels in the condensate and asked METTLER TOLEDO if we could provide a solution.

As sugar is an organic carbon, on-line total organic carbon (TOC) sensors are an excellent method of monitoring boiler feedwater for sugar contamination. The real-time measurements from such sensors means that rapid identification of an increase in TOC allows contaminated water to be diverted from boilers.

Continuous TOC measurements

METTLER TOLEDO Thornton's 5000TOCe provides fast, continuous measurement of ppb-level organic contamination. The sensor measures TOC by using high-intensity ultraviolet light to oxidize organics in the water to bicarbonate, which raises the conductivity of the sample. Conductivity sensors in the 5000TOCe take measurements before and after UV exposure. These are compared, and the difference between the two values is used to determine the organic content of the water. The simplicity of this technology yields a rapid and continuous measurement, and is very low in maintenance.

Fast installation and minimal maintenance

The 5000TOCe has no moving parts that could become polluted by contaminants, and the only routine maintenance the

sensor requires, aside from calibration, is the periodic replacement of the ultraviolet lamp; a procedure that takes a skilled engineer about three minutes to complete. In addition, the 5000TOCe features METTLER TOLEDO's Smart Sensor technology that minimizes installation and set-up time.

The 5000TOCe operates in conjunction with the 770MAX analyzer / transmitter. The 770MAX is a unique process monitoring tool that provides versatility through its multi-parameter, multi-channel functionality. Smart Sensors used with the 770MAX have sensor type, and other data stored on them, providing automatic configuration of the 770MAX when connected.

Dependable TOC monitoring

A 5000TOCe and 770MAX were duly installed just before the inlet of the boiler. Azucarera technicians are highly satisfied with the performance of the solution, its low maintenance requirement, and simple operation. The system instantly alerts technicians to divert contaminated water, preventing costly boiler problems.

If you need to monitor the quality of boiler feedwater, visit:

► **www.mt.com/toc**

5000TOCi

The latest version of the 5000TOC is now available. 5000TOCi improves the performance of the sensor still further with important new features and the inclusion of Intelligent Sensor Management (ISM) technology.

Main benefits of the 5000TOCi Sensor:

The 5000TOCi Total Organic Carbon Sensor with ISM delivers the power of an analyzer with the convenience of a sensor. This state-of-the-art ISM technology:

- Drastically reduces record keeping for the release of water through simplified data collection with innovative Peak and Average TOC measurements
- Improves the quality and consistency of calibration with a semi-automated process which eliminates external interference
- Reduces maintenance record keeping: Easily monitor instrument performance trends through storage of up to four calibration reports
- Rapidly determines maintenance requirements through convenient ISM diagnostics and sensor status
- Improves the reliability of continuous, real-time TOC analysis by eliminating sensitivity to system pressure changes using Automated Flow Control.

Verifying Moisture Analyzer
Performance within 10 Minutes

National Starch, the world leader in specialty starch technology, trusts Halogen Moisture Analyzers from METTLER TOLEDO. Trust is good, but as for all analysis devices, control is better. SmartCal is the new and quick way of verifying the performance of Halogen Moisture Analyzers.

The manufacturing site of National Starch Specialties (Shanghai) Ltd. uses two methods for Loss on Drying measurements. For routine control, and to cope with the large number of samples, the fast METTLER TOLEDO HG63 Halogen Moisture Analyzer method is chosen. Drying in the oven is used as reference. If the results of the Moisture Analyzer match the reference drying oven method, it is verified that the Moisture Analyzer is working correctly. Additionally, periodical instrument calibration assures valid results. Controlling the instrument performance is time-consuming and, for this reason, is performed at prolonged intervals. Long gaps between calibrations lead to a blind spot in instrument performance monitoring.

SmartCal eliminates blind spot

SmartCal, an innovative and temperature sensitive reference substance, verifies the performance of moisture analyzers in 10 minutes. During a normal measurement cycle, the reference substance releases a defined amount of moisture. If this moisture amount remains within the control limits, the moisture analyzer is confirmed to be functioning properly. Test frequency with SmartCal has been defined specifically for the process and quality requirements of National Starch with the help of METTLER TOLEDO's customer service. For National Starch, monitoring the status of its moisture analysis equipment has never been so quick and easy.

► **www.mt.com/smartcal**

HG63 Halogen Moisture Anlyzer

White Papers

Discover More
and Increase Your Refinery's Efficiency

Find out in our complimentary white papers how modern analytical measurement systems can help you increase productivity, while maintaining product quality and reducing operating costs.

Higher Yield, Greater Purity: In-line Analytics in Beet Sugar Production

Sugar juice liming, carbonation, filtration, storage, and crystallization are crucial in respect of final product quality. High process temperatures, a wide pH range, and the presence of abrasive suspended solids negatively affect the performance and lifetime of analytical sensors. METTLER TOLEDO has decades of experience in producing innovative, dependable, robust, in-line measurement systems that tolerate harsh sugar refinery processes. To this sensor technology we have added Intelligent Sensor Management (ISM®) to simplify sensor handling, and reduce maintenance and downtimes through predictive diagnostic tools.

In this white paper, we examine the beet sugar production steps and how sensors with ISM mean producing pure sugar of consistent quality can be easily achieved.

▶ **www.mt.com/pro-beet-sugar**

Intelligent pH Management in Bioethanol Production

In bioethanol production, more and more parameters are being measured directly in the process. Advantages of these real-time measurements include better plant control, leading to higher yield. In addition, in-line measurement data is of significance for quality assurance and batch traceability. In-line analytical systems with ISM increase system availability and considerably simplify sensor operations. Find out how in our white paper.

▶ **www.mt.com/pro-bioethanol**

More Syrup, Less Downtime: pH Control in Starch Sweetener Deashing

The use of ion exchangers for the removal of impurities in the production of dextrose and fructose syrups is a very common process step. Ion exchange columns are filled with resins which are characterized by a certain exchange capacity. Once this capacity is reached, the ion exchanger must be switched from syrup service to a regeneration cycle. In-line pH measurements are used to detect the correct switching time and for monitoring regeneration.

This white paper shows the advantages of ISM pH systems which result in a higher operational availability and hence improved productivity, and reliability of the in-line measurement system compared to conventional pH instruments.

▶ **www.mt.com/pro-syrup**

Greater Yield, Higher Product Quality
with In-line Conductivity Sensor

The extremely fast response, precise measurement, and instant availability of the InPro 7100 i will enable you to improve your process control – leading to higher product yield and quality.

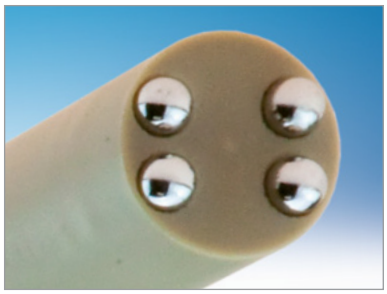
The quicker and more accurately you can measure conductivity, the faster you can respond to process changes. The InPro 7100 i conductivity sensor has been designed to provide outstanding performance in the sugar industry.

The InPro 7100 i features METTLER TOLEDO's Intelligent Sensor Management (ISM®) technology, developed to reduce sensor configuration and maintenance, while increasing process uptime and safety.

Installation is easy: ISM's Plug and Measure feature means that no configuration at the transmitter is required. Simply install the sensor in the process, connect it to the transmitter, and begin measuring.

Find out more at:
▶ **www.mt.com/cond**

Your benefits



Versatile
Extensive measuring range and choice of pin material for suitability in a wide variety of applications.

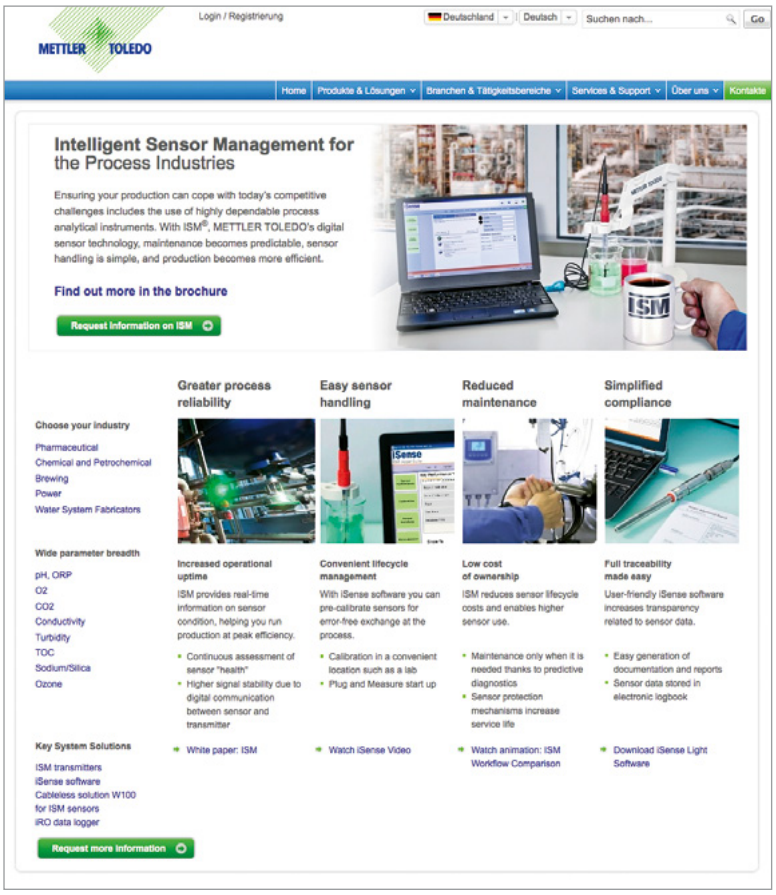
Convenient
Compact design is compatible with many housings.

Resilient
PEEK shaft material resists aggressive solutions.

InPro 7100 i
conductivity sensor

ISM

Get in-line with METTLER TOLEDO



Intelligent Sensor Management
for the Sugar Industry

ISM® is METTLER TOLEDO's digital technology platform for process analytical measurement systems. With ISM solutions, maintenance becomes predictable, sensor handling is simple, and process uptime is increased.

Visit our website and discover how ISM delivers:

Greater process reliability
Easy sensor handling
Reduced maintenance

▶ **www.mt.com/ISM**

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