Sugar Starch & Yeast
Perspectives in Liquid Process Analytics

24 News

INGOLD
Leading Process Analytics

# Reliable Sulphitation
## Thanks to Intelligent pH Solution

**When poor pH sensor performance was affecting syrup quality at one of India's major sugar producers, they turned to METTLER TOLEDO for a system that would safeguard their sulphitation process. Now, sugar yield is higher, quality is more consistent, and sensors last twice as long.**

### pH control in sulphitation

K.C.P. Sugar and Industries Corporation Ltd. has been producing sugar from cane in India's Andhra Pradesh region since 1941. Its Vuyyuru Unit is an integrated sugar complex engaged in the manufacture of sugar, power, bioethanol and biofertilizer.

To ensure sugar whiteness and purity, the Vuyyuru mill uses the double sulphitation process; juice sulphitation followed by syrup sulphitation. pH control is important in both, not just for reasons of maintaining sugar quality and yield, but also to minimize fouling of tube surfaces in heaters and evaporators. Of the two processes, pH control is more critical in juice sulphitation. Here, a pH of 7 must be maintained throughout. Below this level inversion takes place, leading to increased production of molasses resulting in sugar loss. Above pH 7, color formation occurs, along with destruction of sugar into organic compounds, which also reduces sugar yield. During syrup sulphitation, the mill maintains a pH of 5 in order to regulate the quality of the final sugar.

### Installed system was affecting syrup quality

Engineers at the Vuyyuru mill were not happy with the installed in-line pH monitoring systems. Problems with measurement reliability, sensor failures, and the demands of regular sensor cleaning by hand were affecting syrup quality. METTLER TOLEDO was asked to supply a solution for monitoring juice sulphitation which would deliver dependable and ac-

METTLER TOLEDO

curate measurements, and be low in maintenance.

### Intelligent sensor that tolerates process conditions

We supplied a system based around the InPro 4260 i. This pH sensor is designed to tolerate applications with a high concentration of particulate matter. It features Xerolyt® Extra solid polymer electrolyte for precise pH measurement and longer sensor lifetime.

This diaphragm-less sensor features an open junction, allowing direct contact between the process media and the sensor's electrolyte. The absence of a diaphragm also means that the possibility of clogging from sugar crystals is greatly reduced.

Further, the "i" suffix indicates that the sensor is part of the METTLER TOLEDO Intelligent Sensor Management (ISM®) range. Miniaturized circuitry in the sensor's head monitors for signs of stress or degradation and transfers the information to the connected transmitter. The advanced diagnostics features of ISM interpret this data to inform the user as to when sensor cleaning, calibration or replacement will be required. Thus, maintenance can take place when it is needed, rather than waiting until measurement performance from the sensor is reduced, or conducting regular maintenance when it may not be necessary.

The sensor is connected to an M800 multiparameter, multi-channel, touchscreen transmitter which clearly shows the ISM diagnostic tools on its iMonitor display.

### Automatic sensor cleaning

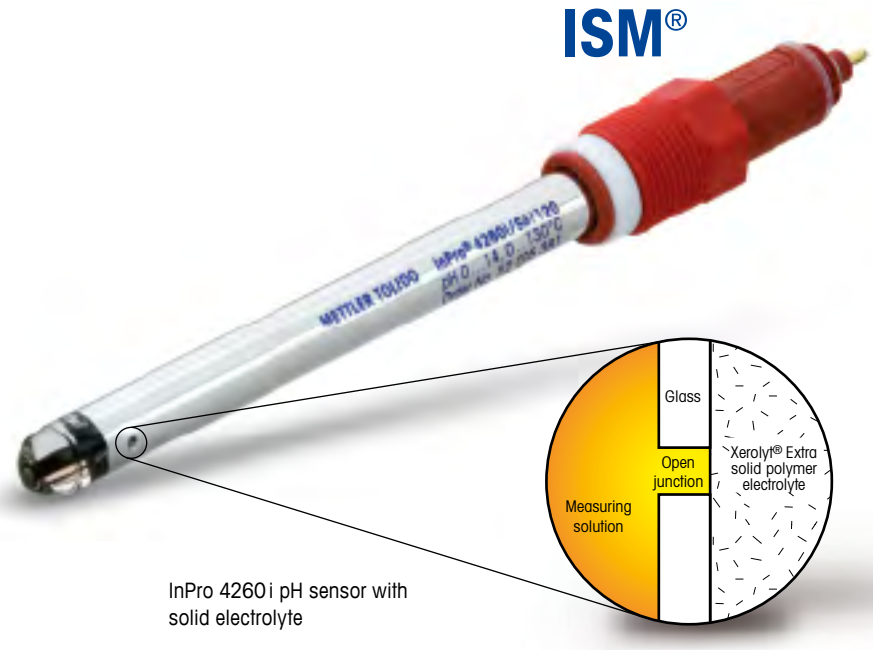
Thanks to the inclusion of an EasyClean 150 unit and retractable In Trac 777 housing, sensor cleaning is now conducted automatically. When cleaning's required, the sensor is withdrawn from the process into the housing's internal flushing chamber where the probe's washed with water before being reinserted in the process.

### Reduced operating costs

Vuyyuru mill engineers are delighted with the performance of the METTLER TOLEDO solution. Not only does the EasyClean unit keep the sensor clean and operating reliably without the involvement of production staff, the sensors survive twice as long as the probes used previously, so measurement point costs have reduced.

A second InPro 4260 i connected to the M800 transmitter has since been installed for monitoring syrup sulphitation.

▶ **www.mt.com/InPro4260**




InPro 4260 i pH sensor with solid electrolyte

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# Keep Silica at Bay
## with a Low Maintenance Analyzer

**Silica in boiler feedwater can very quickly lead to deposit formation in turbines. As it can only be removed during out-of-service cleaning, controlling silica in the water/steam cycle is the best course of action. The 2800 Si Silica Analyzer quickly detects trace level contamination and calibrates itself automatically, leading to accurate and reliable measurements while saving valuable operator time.**

Although it has no significant corrosive effect, silica's presence in water/steam is nonetheless very detrimental. It forms extremely hard coatings in water/steam passageways and on turbine blades, leading to reduction in heat transfer efficiency and unbalanced blades. If left unchecked, silica build-up can result in unplanned shutdowns and extra maintenance.

The 2800 Si is a highly reliable on-line instrument designed for water/steam cycle monitoring. It provides early detection of trace silica contamination with minimal operator supervision. Automatic zeroing after every measurement cycle ensures excellent stability and reliability of measurement.

### Your benefits

- Low maintenance: Large reagent containers enable a long service interval
- Robust design: Full enclosure protects components and reagent containers from the mill environment
- At-a-glance monitoring: Simultaneous display of silica and measurement timing provides convenient analyzer status, saving operator time

► **www.mt.com/Thornton-silica**

2800 Si Silica Analyzer

# Developments in Process Analytics
## for the Sugar and Starch Industry

**Dr. Stefan Bardeck at METTLER TOLEDO is an expert in the deployment and use of process analytical measuring systems in pulp and paper production. He travels around the globe advising companies on how to improve their processes and increase profitability. Sugar and Starch News spoke to him about the growing role of process analytics.**

**Dr. Bardeck, process analytics is playing an increasingly larger role in the sugar and starch industry. How do you explain this?**

I think there are several reasons. First of all, competition is pressurizing plants to do more with less. In-line analytics keep an eye on processes so personnel can concentrate on other tasks. Secondly, there is ever stronger environmental legislation that requires monitoring and control of waste effluent.

Thirdly, though being very conservative, the industry understands that in-line analysis has enormous benefits over laboratory analysis of grab samples. The value of a real-time continuous measurement at process conditions is so much higher than periodic analyses of samples that may have been taken hours beforehand and therefore no longer represent anything that's going on at the process side.

**Sugar and starch plants are very different places. Is process analytics valid in both?**

Of course, raw materials and processes are different. However – in both cases these processes are characterized by very demanding process conditions such as high temperature and pH values and the presence of undissolved particles which could lead to sensor fouling. Especially under these conditions a tight and reliable control of pH for reagent dosing and for purification steps is very important. Another example is the control and performance monitoring of ion exchangers with in-line pH and conductivity measurements which leads to higher operational uptime of the different columns through optimized purification and regeneration cycles.

**pH sensors haven't changed much in many decades. Why is that?**

That is and isn't true. There are now different ways of measuring pH, but glass-membrane electrodes still offer the best technology and I can't see that changing. Also, the reference system in pH sensors has improved a lot. Long diffusion paths and better electrolyte fluids to protect electrodes from poisoning means sensor lifetime is much longer than it's been in the past. And digital technology is making a huge change to sensors for pH and other parameters. Having a microprocessor inside a sensor opens up a host of advantages that normal analog sensors can't compete with.

**Where does digital technology have the greatest impact?**

There's a lot of moisture in sugar and starch facilities, and moisture is not good for process analytical systems because it

corrodes connections and interferes with measurements. Digital sensors simply don't have those problems, so the measurement at the transmitter is more reliable.

Also, with our ISM technology we offer predictive diagnostics. In-depth on-line sensor diagnostics provide a wealth of information with regard to the measurement and the condition of the probe. Now the maintenance technician knows when each sensor will need calibrated or maintained, so he's not servicing sensors when they don't need it, or worse, when it's too late.

**Do you think digital sensors will become the accepted standard in the sugar and starch industry?**

Without doubt. The advantages are just too great. It's not only about the diagnostics and the digitized signal. Another major benefit of ISM is the possibility to do bench calibrations. No longer do you need to carry buffer solutions around the plant. ISM allows you to take a sensor out of the process and calibrate it at your desk under controlled conditions. Bench calibration and sensor diagnostics reduce cost of ownership.

**And that's what matters most these days, isn't it?**

That and avoiding standstills. Nobody wants unscheduled shutdowns due to some unreliable measurement or failing process equipment. That's why sensor diagnostics are so valuable.

**White Paper: Quality Assurance in Beet Sugar Production**

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

Download your copy today.
► **www.mt.com/pro-beet-sugar**

# High-Performance pH Measurement
## in Liquid Sugar Production

**In developing countries, demand for liquid sugars is growing. For a customer in Brazil, a pH measurement solution that would tolerate the harsh process conditions was essential. We provided not just a robust, dependable system, but one that requires very little maintenance.**

### Growing demand

Liquid sugars are produced in a number of different formulations for use in the food and beverage, and chemical industries. Premium liquid sugar is a virtually clear sucrose syrup used in the manufacture of a wide range of beverages and food products. Standard liquid sugar is a light-yellow sucrose syrup used in the production of cordials and juices. Liquid sucrose can be used in non-food applications, for example in industrial fermentation processes as a substrate.

Production of liquid sugar can be achieved by adding distilled water to dry sugar, or by processing cane juice. The production process for liquid sugar from cane juice is simpler to that of dry sugar, and it also produces a product of a more uniform quality. However, unlike the extremely long lifetime of dry sugar, liquid sugar has a shelf life of only a few weeks. The sugar industry in Brazil has been investing heavily in liquid sugar production to meet increasing market demand. Our customer, a major sugar refiner in Brazil, manufactures liquid products purchased mainly by soft drinks manufacturers from local producers to multi-nationals.

### Tough conditions

The refinery's liquid sugar production process follows the same initial steps to that of dry sugar, namely: juice extraction, filtration, sulfitation and liming. pH measurement during sulfitation and liming is essential as the pH level in the first stage determines the quantity of sulfur dioxide that must be added to the juice to prevent discoloration of the liquor. The purpose of adding slaked lime is to increase the pH of the acidic sulfated liquor from approx 3 to 7. The high concentration of sugar in the juice and the addition of chemical products make it very difficult to measure pH during these processes, as

electrodes can become easily coated in precipitates.

In order to maximize production uptime, our customer was looking for a pH measurement system that would endure the process conditions, without requiring a great deal of maintenance.

### Cutting-edge solution

We installed a system based around the InPro 2000 i pH sensor. This probe is ideal for this application as it has been designed to function in extreme environments where quick, accurate pH measurement is required. Gradual outflow of the pressurized liquid electrolyte ensures fast response and long maintenance intervals, while the patented silver-ion trap prevents electrode poisoning from sulfides.

The InPro 2000 i is a member of METTLER TOLEDO's Intelligent Sensor Management (ISM) family of sensors. ISM reduces the maintenance requirement for pH systems by sending diagnostics data to the transmitter, informing the operator of required maintenance before measurement is affected.

### Predictive maintenance

The diagnostics information is displayed on the connected M400 transmitter as the Dynamic Lifetime Indicator which shows the remaining lifetime of the electrode based on the current process conditions, and Adaptive Calibration Timer which tells the user when calibration will next be required. For operational flexibility, the multi-parameter M400 also accepts analog sensors.

A suitable housing for the InPro 2000 i is the InTrac 776 e. Its retractable design includes a built-in flushing chamber in which the electrode can be cleaned and calibrated when required, without process interruption. For exceptional ease of use, an EasyClean 400 system attached to the housing and transmitter takes care of electrode cleaning and calibration, automatically.

The complete system: electrode, housing, transmitter, automatic cleaning and calibration system, and ISM technology provide a state-of-the-art pH measurement system; giving our customer process confidence and reliability, plus outstanding performance.

► **www.mt.com/InPro2000**

# Greater Output and Lower Production Costs
## in Juice Clarification

**Tight process control during juice clarification is vital for preventing unwanted reactions in downstream processes. Fast response, in-line turbidity monitoring during the process enables precise feeding of flocculating agents and makes repeated lab analyses unnecessary, saving both time and money.**

### Brazilian market

Brazil is the world's leading sugar producer. Sugarcane fields cover 8 million hectares of the country, and in 2013 sugar production exceeded 37 million tons. There are approximately 380 sugar and / or alcohol plants in Brazil, and over 20 new ones under construction. Investment in the sector has been boosted by the bright outlook for sugar and alcohol exports and increased domestic consumption.

InPro 8200 turbidity sensor

### Juice clarification

Our customer operates a number of refineries throughout Brazil. They approached METTLER TOLEDO for a solution for improving juice clarification at one of their facilities. The clarification (or decantation) process, for removal of unwanted lime salts and impurities, is made faster by dosing polymer flocculating agents. Our customer was concerned that dosing was far from being optimal.

At our customer's refinery, the control over clarification was being carried out by manually adjusting the polymer flow to the decanter based on juice transmittance values produced by lab spectrophotometer analysis. The delay between taking grab samples, lab analysis and consequent adjustment of flocculant dosing, was leading to impaired stability of the suspended solid contents of the clarified juice, and periodic over-dosing of the flocculating agents.

Refinery engineers wanted to improve the process by automating dosing of flocculants in response to in-line analysis of the juice. METTLER TOLEDO recommended turbidity measurement to monitor the suspended solids content. Installation of an in-line sensor directly in the production line would provide continuous, real-time determination of juice turbidity from which corrective adjustments to flocculant dosing could be easily achieved.

### Chosen METTLER TOLEDO solution

For this application, turbidity determination through the backscatter measurement principle is most suitable. METTLER TOLEDO recommended the following solution to set up a highly accurate and efficient measuring system:

### InPro 8200 turbidity sensor

This is a dual optical fiber sensor designed for use where high resolution is required. Its scratch-resistant sapphire window repels fouling and therefore reduces the need for cleaning.

### InTrac 779e retractable housing

With its integrated flushing chamber the InTrac 779e allows cleaning of sensors without process interruption. The Tri-Lock safety system prevents escape of clarified juice when the turbidity sensor is retracted.

### M800 transmitter

The versatile, easy to use M800 is a multi-parameter, multi-channel transmitter with a touchscreen display.

### Benefits from implementation

Engineers at our customer's refinery are very pleased with the performance of the system and have noted the following:

- Tests have shown a fast measurement response to variations in flocculant dosing.

- Excellent linearity of turbidity values has confirmed system efficiency.
- Through automation of flocculant dosing, the targeted performance is achieved using a reduced quantity of the agent, lowering production costs.
- Continuous monitoring of turbidity has also led to higher yield, since immediate action can be taken in the event of any process failure.

**www.mt.com/turb**

InTrac 779
retractable housing

M800 transmitter

# Greater Process Reliability
## and Sensor Life Extended up to 30 %

**Maintaining sensors at peak condition is important for performance reasons, and therefore process assurance. An automatic sensor cleaning and calibration unit frees maintenance staff for more important tasks. It can also significantly increase sensor life.**

Keeping sensors in prime condition can extend their lifetime by 30 % and provides greater assurance of process reliability. Conditions in the sugar industry mean the time spent on measurement point maintenance can be extensive. With the EasyClean 400, thorough sensor cleaning and accurate calibration are completely automated.

Allowing the EasyClean 400 to dependably clean and calibrate pH electrodes frees maintenance staff to concentrate on more important and skill-intensive tasks.

Find out how EasyClean systems can help your operations – go to:
► **www.mt.com/EasyClean**

### Your benefits


**Completely unattended maintenance**
Automatic cleaning and calibration of pH measurement points.

**Greater production efficiency**
Eliminates downtimes caused by insufficiently maintained sensors.


**Configurable to your requirements**
Time of calibration, and time and duration of cleaning are fully programmable.


EasyClean 400 automatic sensor cleaning and calibration unit

Discover how ISM can help you at:
► **www.mt.com/ISM-sugar-starch**

# 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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