



INGOLD

Leading Process Analytics

Reliable pH Control With Automated Cleaning System

With the implementation of the cleaning system EasyClean 200 e a large sugar cane processor in Thailand eliminated any coating of the pH electrode improving purification process and reliability of pH measurements.

Sugar production in Thailand

Thailand is established as one of the world's leading sugar exporting countries. During 1995/96 to 2005/06, sugar exports ranged between 2.3 and 5.1 million tons and averaged 3.8 million tons per year. For this reason, sugar production is one of the major economic sectors in Thailand. Sugar is grown all over the country.

With a share of domestic consumption of 27.8%, only around 2 million tons of sugar is used for domestic consumption. The rest of around 5 million tons of sugar is exported to the world market, mostly to Asia. Our customer is in one of the top 5 sugar producers in the Northeastern region of Thailand with a processing capacity of 18,000 tons cane/day. Its main

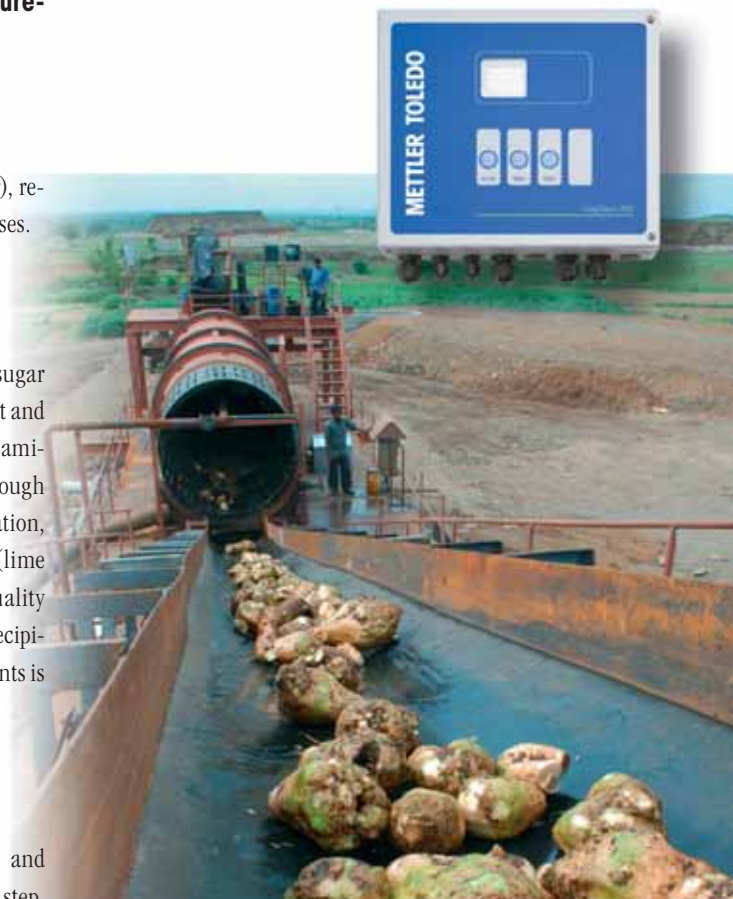
products are raw sugar (brown sugar), refined sugar (white sugar) and molasses.

Quality requirements in juice purification

When juice is extracted from the sugar cane it may be contaminated with dirt and other unwanted substances. The contaminants are removed from the juice through a combination of mechanical filtration, heating, and chemical treatment (lime addition). To achieve the required quality of the finished product, effective precipitation and removal of the contaminants is of the utmost importance.

pH control during the purification process

Accurate, reliable pH measurement and control is critical to the purification step.



METTLER TOLEDO

The challenge for this application was caused by the lime particles coating the pH electrode resulting in inaccurate measurements and poor process control. The deterioration of the pH measurement typically occurred within 7 days of the operation. Consequentially the quality of the syrups was below specification showing a turbid liquid instead of the desired clear juice. In addition, the yield after the evaporation step was significantly reduced. Resulting in product quality that was below expectations and higher costs due to reduced yields and increased maintenance costs.

Process conditions

Process temp.: 75 to 80 °C (167 to 176 °F)
 Process pressure: 1 to 1.5 bar (14.5 to 21.75 psi)
 Batch time: 2 hours
 Measuring range of sensor: 7.5 to 7.8 pH
 Cleaning of electrodes with water

Customer's expectations

The customer wanted to improve the reliability of the pH measurement to increase product quality and increase the purification yield, and to also reduce the maintenance required to support the pH measurement loop.

METTLER TOLEDO's solution

After investigating the situation we proposed a total solution that included a retractable housing with an automated flushing system to prevent any coating of the pH electrode. In addition, this system would enable the cleaning of the electrode without interrupting the process. Our system utilized the following components:

- pH electrode: InPro 3250/225/Pt 1000,
- pH transmitter: pH 2100e,
- Cleaning and calibration system: EasyClean 200e,
- Pneumatic retractable housing: InTrac 777 P.

Our promise

After the installation of this system the customer confirmed that our solution delivered:

- High accuracy of the measured values
- Increased reliability as no shifting or drifting of values took place
- Dramatic reduction in required maintenance

EasyClean 200e – the secret of success

The key for this success was indeed the implementation of EasyClean 200e. It comes with an individual sensor flushing and cleaning for heavily contaminated processes. An integrated diaphragm pump

feeds the cleaning agent to the flushing chamber. The adjustable soaking time of the cleaning agent ensures an optimal cleaning effect. The cleaning cycle can either be triggered by the wash contact of the transmitter or released manually at the EasyClean control unit as desired. EasyClean 200e features strict separation of the electronics from all wet areas.

Some characteristics of EasyClean 200e:

- Automatic sensor flushing with water
- Additional cleaning with cleaning solution
- Free choice of cleaning agent
- Reliable components for harsh conditions.

Customer's satisfaction

The customer was very satisfied with our solution and stated "that whenever he is thinking of process analytics solutions, he will remember METTLER TOLEDO". Now that this customer has the confidence and trust of the EasyClean 200e, he can focus on other important topics. The electrodes now last 4 times longer than the previous system and calibration of the pH electrode – the only maintenance work – is done only once each month!

➤ www.mt.com/cleaning

Publisher / Production

Mettler-Toledo AG
 Process Analytics
 Im Hackacker 15
 CH-8902 Urdorf
 Switzerland

Illustrations

Archive MarCom
 CH-8902 Urdorf
 Switzerland
 Archive Midwesco Filter Resources
 Archive Syngenta
 Archive Symtec

Subject to technical changes.
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 Printed in Switzerland.

InPro 3250.

InTrac 777 P.

pH 2100e transmitter.

EasyClean 200e.



Yield and Quality Improvement in Yeast Production

On-line measurement of the pH and dissolved oxygen (DO) values is an effective way to monitor the primary and secondary fermentation, with the added bonus of improved yield and quality.

Production of baker's yeast

A large French company group specializing in the production of baker's yeast (fresh/compressed and dry yeast) recently carried out a series of tests aimed at optimization of the different stages of yeast fermentation. These tests employed the pure yeast strain *Saccharomyces cerevisiae* together with molasses (a byproduct of sugar rich in saccharose). The influence of critical process parameters such as pH and DO values was investigated in a 100 liter pilot fermenter. The optimal values for these parameters at each stage of production were determined as exact as possible.

Measurement of pH and dissolved oxygen values

A fundamental prerequisite for correct process flow is assurance of dependable, continuous (real-time) pH and DO measurement values which will allow rapid intervention in the fermentation process and timely adjustment of external parameters.

The solution provided by METTLER TOLEDO consisted of:

- pH measurement system:
pH 2100 e transmitter, pH electrode InPro 3100 and static housing InFit 761 CIP for insertion of the electrode into the fermenter.
- DO measurement system:
4100 e transmitter in combination with DO sensor InPro 6800.

Special design features that effectively prevent clogging and fouling, make the InPro 3100 pH electrode ideal for use in this process since contamination by bac-

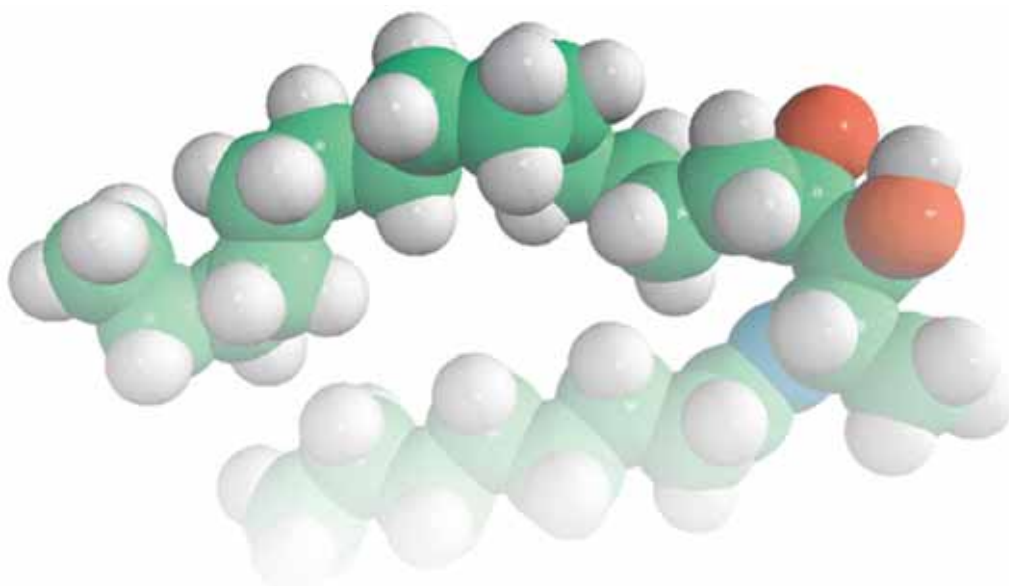
teria represents the greatest risk factor during all stages of fermentation. It is however essential to maintain a slightly acidic pH value and to sterilize the measuring equipment and culture medium (molasses) in order to prevent any bacterial growth.

The same requirements can also be fully met by the DO sensor InPro 6800, which combines hygienic design (sterilizable or autoclavable, surface roughness N5) with high measurement accuracy.

The use of these two measurement systems from METTLER TOLEDO guarantees accuracy and dependability of the measurement values as well as full process reliability.

Results

Precise pH and DO measurement values were established enabled considerable improvement in production efficiency and product quality. The test



showed that for optimal process results, pH values should lie between 4.5 and 8.0 (between 4.5 and 5 during preparation of the molasses, and between 5 and 8 during the different fermentation stages). It was possible to determine the exact amount of dissolved oxygen required in relation to the exact amount of substrate added during the course of the reaction phase. This prevents formation of ethanol (and other volatile dissolved substances) during the transition from the aerobic to the anaerobic fermentation stage.

Forecast

It was possible to extrapolate the values established in the pilot phase for direct application in larger volume production fermenters (10,000 liters and 15,000 liters). As a result, the pH and DO measurement systems from METTLER TOLEDO are now being used to monitor the different fermentation stages for smooth running of the processes.

InPro 6800 – basic benefits

- Detection limit down to 6 ppb
- Service in seconds due to the “Quick Disconnect” system
- Accurate measurement
- Long lasting membranes
- Hygienically polished surface finish
- Autoclavable and steam sterilizable
- FDA positive listed materials of construction
- EHEDG certified and 3-A compliant
- Wetted O-rings comply with FDA and USP Class VI standards

InPro 3100 – basic benefits

- In-situ fully autoclavable or sterilizable
- Reduces maintenance due to gel electrolyte
- Resistant to poisoning substances
- Pressure resistant up to 6 bar (87 psig)
- Watertight process connector VarioPin (IP 68) for easy connection and excellent signal transmission
- Automatic temperature compensation due to integral temperature sensor
- EHEDG certified

Thanks to the various options offered by METTLER TOLEDO transmitters, it is now planned to introduce automation of the dissolved oxygen feed in line with the values established during the pilot tests. This will enable real time control of the fermentation process as well as

more precise dosing of additive substrates.

► www.mt.com/pro-pH

► www.mt.com/DO



InPro 3100.

pH 2100e transmitter.



InPro 6800.

O₂ 4100e transmitter.

Robust pH Measurement Improves Lime Addition

A perfectly executed pH measuring system allows control of the process for sulfur and lime addition. The key element of the solution is the automatic cleaning system EasyClean 150 for high performing electrodes.

No sugar without process analytics

When sugar cane arrives in the process, it is washed to remove insects and sand. Following this wash, cleaning and pH control is necessary. Its juice is extracted and goes through further steps. An analytical measurement is necessary in essentially every part of the process.

Sulfitation process

Sulfur is added in the cane juice to obtain that characteristic white color. The measurement of pH is very important because it defines how much sulfur must be added to the juice. The pH value, after the sulfur addition in sugar cane juice, is in a range from 2 to 3.

Liming process

In order to raise the solution pH to the desired value, lime is added. The measurement is challenging, as the lime tends to adhere to the electrode as well as some particles that are still in the sugar cane juice. Due to high solids content in the measurement media, the pH electrode needs regular cleaning.

METTLER TOLEDO's recommendations

These processes – sulfitation and the addition of adequate quantity of lime – are of highest importance in the sugar manufacturing process.

METTLER TOLEDO has been confronted with the control of these processes for several times. Following systems have

successfully been implemented in each application:

For the sulfitation process:

- pH electrode InPro 3250

Thanks to the reference system Argenthal® which has been patented for METTLER TOLEDO, the electrode possesses an ionic barrier which prevents any silver sulfide deposition and reducing the precipitation at the diaphragm.

For the liming process:

- InPro 4800 electrode
- InTrac 777 P housing
- pH 2100 e transmitter
- EasyClean 150 for automatic cleaning

Automatic cleaning with EC 150

In order to improve the system performance and to reduce the downtime of the process, METTLER TOLEDO developed an automated electrode cleaning system (EasyClean 150) allowing easy and automatic maintenance handling. The fully automated cleaning system increases the life time of the electrode and helps to simplify the handling procedures resulting in less risks of breaking the electrodes.

The pneumatic housing InTrac 777 P

The cleaning of the electrode takes place in the cleaning chamber of the retractable housing InTrac 777 P. Water or chemical cleaning agents, like 5% nitric acid solution (in EC200), can be used. The cleaning cycle as well as the cleaning itself is programmed with the pH transmitter pH 2100 e.

Robust pH electrode InPro 4800

The reference system of the pH electrode InPro 4800 is characterized by its long diffusion length and its PTFE external diaphragm. As a result, the good response time and accuracy allow good control of the lime addition. Last but not least this system is designed to save money as the chemical addition can be controlled very accurately.

Clear customer benefits

- Reliable measurements
- High and stable accuracy
- Minimal down times
- Low maintenance
- Long electrode life time



InPro 3250.

InPro 4800.



EasyClean 150.

► www.mt.com/pro-ph

► www.mt.com/cleaning

New Developments in Process Analytics

METTLER TOLEDO delivers powerful solutions to optimize your processes and reduce maintenance costs. Recently, we introduced new intelligent technologies that allow you to improve handling and optimize maintenance thus addressing your most pressing needs.

ISM – the next generation of intelligent process analytics!

With the groundbreaking ISM technology METTLER TOLEDO provides another milestone in process analytics measurement!

Dissolved oxygen sensors and pH electrodes with integrated preamplifier are using a new technology with “Plug and Measure” and intelligent diagnostics functionalities. The Intelligent Sensor Management (ISM) technology simplifies all maintenance operations of the sensor. Process interruptions are shorter or even avoided, leading to enhanced productivity.

iSense – the key to maximize the benefits of the ISM technology

iSense ISM Asset Suite allows efficient and easy verification and calibration of METTLER TOLEDO digital ISM pH and DO sensors in an instant with an intuitive software application that includes advanced analysis and documentation functionalities to support your sensor management.

Digital transmitter line M300

The digital M300 transmitter represents an easy-to-use version of the M300 transmitter line. Its unique “Plug and Measure” features enable a fast start-up and robust measurements for digital pH/ORP and dissolved oxygen sensors. Its versatility and reliability make this instrument the ideal choice for a wide range of applications.

If you want to take advantage of these advanced products ask your local METTLER TOLEDO representative or visit www.mt.com/ISM.



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