

Brewery

Perspectives in Liquid Process Analytics



24 News

INGOLD

Leading Process Analytics

Intelligent DO Measurement System Ensures Craft Brewer's Product Quality

Cutting-edge process analytics are not just for major breweries. When a US craft brewer required a dissolved oxygen measurement system, a digital optical sensor and PC software provided a flexible, low maintenance solution that can be quickly deployed wherever it is needed.

Flourishing craft brewer

The MadTree Brewing Company of Cincinnati, USA was started by three self-proclaimed home brewing fanatics who believe strongly in the creation of beers that stand up to the best craft brewers in the US. The company's approach is simple – create high quality beers, educate the consumer, and run a responsible business.

MadTree Brewing is planning to increase its production from 12,000 barrels in 2014 to 24,000 barrels in 2015. And although the size of MadTree's operation makes it difficult to justify dedicated in-line measurements, Jeff Hunt, one of the three founders of the company, understands the importance of process analytics in brewing good beer. He wanted a portable system to measure dissolved oxygen at the filler line,

pre/post centrifuge, brite tank, and on a can piercing line. According to Mr Hunt, the DO measurements were required to "improve the overall process, maintain consistency and ensure quality of product".

Flexible DO monitoring

MadTree needed a low maintenance, highly dependable system that would provide flexibility without breaking the bank. The solution they selected was a METTLER TOLEDO optical InPro 6970i DO sensor with Intelligent Sensor Management (ISM®), connected to a computer running iSense software for ISM sensors. iSense is primarily for sensor maintenance tasks but it also provides a measurement from a connected ISM sensor. This allowed MadTree to construct an easily portable



METTLER TOLEDO



system that can quickly be deployed at any of the various access points they configured in their production.

Low maintenance sensor

The InPro 6970 i is highly suited to this set up. Its optical technology requires very little maintenance, and it has a quick response time. These features ensure high availability of the system and an accurate and rapid DO reading when the probe's installed in a process.

Guided servicing

Advanced sensor diagnostics in the

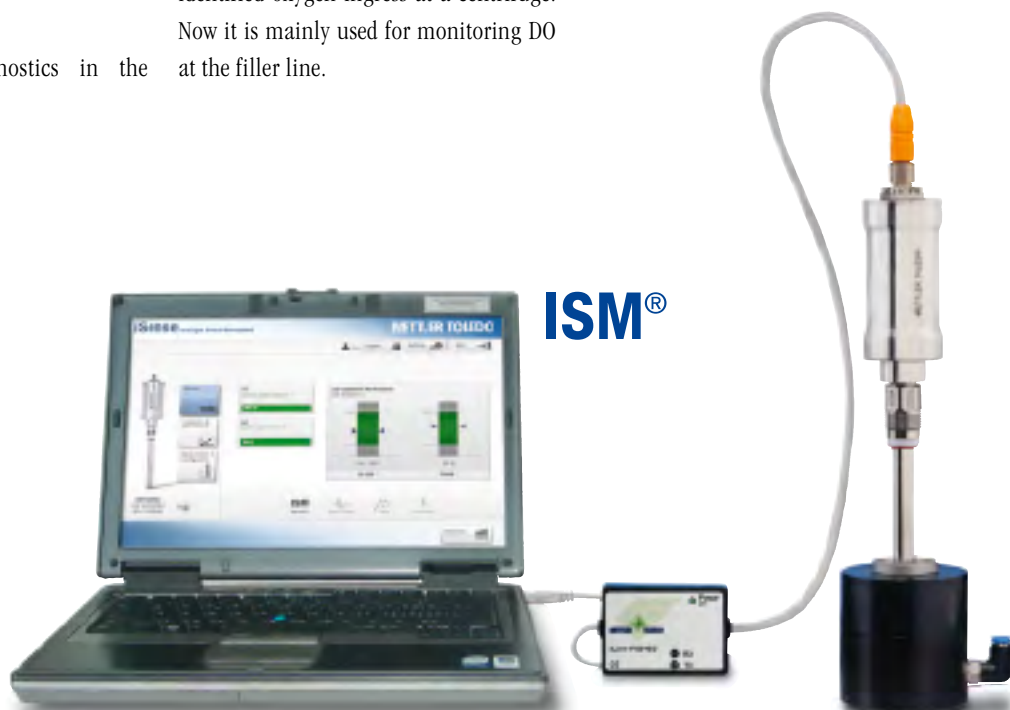
InPro 6970 i show when calibration or replacement of the probe's oxygen-sensing element will be required. These diagnostics are clearly displayed on iSense's iMonitor screen. If any sensor maintenance is required, guiding animations ensure the procedure is performed reproducibly and without mistakes or missed steps.

Rapid detection of oxygen ingress

The system started paying for itself almost immediately. Once it was in use, it quickly identified oxygen ingress at a centrifuge. Now it is mainly used for monitoring DO at the filler line.

MadTree is delighted with the performance of the system and the benefits of ISM. Also, the InPro 6970 i and iSense provided a simple way of introducing digital measurement technology into their brewery. Jeff Hunt is now looking to install ISM pH and conductivity probes in their CIP equipment.

► www.mt.com/InPro6970i



ISM®

iSense software and InPro 6970 i optical DO sensor

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Less Water Use and Greater Product Safety Conductivity During CIP

Conductivity measurements are an excellent indicator of contaminants. A single conductivity sensor for Clean-in-Place monitoring can save costs by minimizing water consumption, and ensure product safety and quality.



Water consumption and time management in CIP processes

In many cases, a CIP rinse cycle is based on a programmed timed sequence. This method typically results in longer than necessary rinse times, increasing water costs. Concern for water conservation is driving breweries to look at ways to reduce water consumption.

the line is properly rinsed. To prevent time spent in taking multiple samples, technicians tend to wait until they are fairly certain the caustic cleaning solution has been thoroughly flushed through. This can mean the sample is taken some time after rinsing is no longer required, resulting in water being wasted and reduced production uptime.

Conductivity measurement to optimize rinse cycle

At the end of a CIP process, many breweries manually sample the fluid to ensure

In-line conductivity measurement is an excellent indicator of contaminants in fresh water. It can also be used to monitor the concentration of caustic during CIP to

confirm that the cleaning fluid is of sufficient strength.

One sensor for medium to high conductivity

The METTLER TOLEDO InPro 7108 has been designed for conductivity measurements throughout the CIP process. WideRange technology means a single InPro 7108 can accurately measure caustic concentration as well as confirming the absence of caustic after rinsing.

Data from the in-built temperature sensor allows the connected transmitter to adjust the conductivity signal so that the true conductivity measurement is displayed.

Reduce costs and protect product

Confirmation that rinsing is complete the moment it happens minimizes water use, allows increased production, and prevents cleaning fluid contaminating product.

To improve efficiency of your CIP processes, go to:

► www.mt.com/conductivity



Developments in Process Analytics for the Brewery Industry

Dr. Stefan Bardeck at METTLER TOLEDO is an expert in the deployment and use of process analytical measuring systems in beer production. He travels around the globe advising breweries on how to improve their processes and increase profitability. Brewery News spoke to him about developments in process measurements.



Dr. Bardeck, what do you see as being the current trends in the brewery industry and do they affect process analytics?

The growth of craft breweries is probably the most significant trend. Also, consumers are on the lookout for something new. Of course, these two trends go hand-in-hand as craft brewers are better able to change production to meet market demands. Major brewers are responding to

this by also bringing out more products and finding ways of being more flexible in their production.

Modern process analytics has a lot to offer here in terms of sensors that are easier to handle and maintain, faster in response and generally more adaptable to a wider range of products. For example, turbidity sensors that provide a reliable measurement independent of beer color.

What demands do customers place on process analytical systems?

In the main there are three points: reliability, ruggedness and service-friendly design. This means that when developing a sensor, attention has to be paid not only to achieving high measurement accuracy but also to fulfilling the criteria surrounding hygienic design, CIP tolerability, and modularity in order to simplify maintenance.



I think most breweries would love to see the back of maintenance, but of course to keep a dissolved oxygen or pH sensor operating reliably maintenance is necessary. A lot has been done though to make maintenance quick and simple. At METTLER TOLEDO we've got our digital ISM technology which tells you when and what maintenance will need to be done.

Are in-line analytics equally relevant to both small and large breweries?

In the case of large breweries – here I'm thinking of ones with an output of 200,000 hl/year and over – in-line analytics is an ideal supplement to laboratory measurement methods as it clearly reduces the burden on laboratory personnel. But also in the case of smaller breweries, possibly even those without any laboratory facilities, an easy-to-install in-line measurement point can provide valuable information for identifying potential savings opportunities; for example, CO₂ measurement in post carbonation.

Are there any regional differences in this respect?

There are certainly some differences relative to market growth. In Asia and Africa, beer consumption is growing annually at high single-digit rates, whereas in Central Europe there appears to be a slight decline. Increased productivity and reduced costs are strong arguments in favor of deploying process analytics.



So there are operative and financial improvements to be gained. Can you provide an example?

It's important to be aware of ongoing running costs of a measurement system after it has been installed. Particularly in brewery circles, where dissolved oxygen measurement is considered to be a high-maintenance element, it pays to critically question assurances given about potential sensor consumables and maintenance intervals before deciding on any specific measurement system. The costs for spare parts and servicing can vary widely from supplier to supplier. Optical measurement technology has a real advantage in this respect as it's very low in maintenance and such sensors are much easier to use than the polarographic type.

Also, CO₂ measurement systems vary widely in terms of service requirements due to their functional design and number of moving parts.

You mentioned digital technology. Will that become the accepted standard in the brewery industry?

Without doubt. The advantages are just too great. Analog-to-digital conversion directly in the sensor provides a robust signal which suffers no interference from humidity and allows longer cable lengths. This is a big improvement in sensor signal transmission.

Another major benefit of ISM technology is the possibility to do bench calibrations. No longer do you need to carry calibration gases around the brewery. 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 downtime due to some unreliable measurement or failing process equipment. That's why sensor diagnostics are so valuable.

Watch the webinar on "State-of-the-Art Operating Cycle Management"



► www.mt.com/pro-CO2webinar

Giving Beer a Better Sparkle Monitoring Oxygen in Recovered CO₂

Using recovered CO₂ has become a common process in most breweries. Monitoring purity of the gas is essential if CO₂ of defined purity is to be used in different applications. An intelligent measurement solution from METTLER TOLEDO is providing a major UK brewery with final product quality assurance.

CO₂ recovery in the brewing process

The recovery of carbon dioxide from the offgas of fermentation vessels is an important process in large scale beer manufacture as it has many cost and efficiency benefits. If the carbon dioxide produced is of sufficient purity (i.e. very low oxygen content) it can be utilized in other areas of the plant, such as in post carbonation and as inert gas in filling lines. If the CO₂ is less pure it can contribute to neutralization of caustic in the waste treatment plant. Therefore, measurement of carbon dioxide purity is an important procedure.

METTLER TOLEDO oxygen sensors for low oxygen levels are highly effective in this application. By measuring the O₂ concentration levels in the vessel or pipe, it is possible to extrapolate the concentration of carbon dioxide present. It is this technique that is used by a major UK brewery in their carbon dioxide recovery processes.

Strict limit in O₂ level

The brewery wanted to monitor the CO₂ quality in the maturation vessel ventilation lines and bright beer tanks. The target was for CO₂ with an oxygen level of no more than 0.1 vol% oxygen to be used at

the filling line. If this value was exceeded, the gas would be automatically diverted to the effluent treatment plant.

Dependable oxygen monitoring system

As low level oxygen detection was required with a fast response to guarantee accurate monitoring, METTLER TOLEDO's InPro 6950 iG oxygen sensor was selected. With its measurement accuracy down to 0.0005 vol%, immunity to interference from moisture, and robust construction, the InPro 6950 iG is ideally suited to in-line monitoring of oxygen content in CO₂.





Sensor maintenance such as membrane exchange and calibration are all straightforward procedures requiring minimal specialist knowledge. In addition, replaceable inner bodies for the sensor prevent the need for complete sensor replacement and increases the usable lifetime of each sensor.

The multi-parameter M700 was chosen as the accompanying transmitter. The unit has three module slots (two for measurement modules and one for a communication module), making it very simple to configure for particular requirements.

Completing the system is an InFit 761 e sensor housing. The wide range of materials, O-rings, process connections and insertion lengths makes it one of the most versatile housings in the METTLER TOLEDO portfolio.

An intelligent solution

The InPro 6950 iG is a member of METTLER TOLEDO's expanding range of Intelligent Sensor Management (ISM) probes. ISM offers breweries a number of valuable benefits:

Predictive diagnostics: The Dynamic Lifetime Indicator (DLI) is derived from a sophisticated algorithm that uses current and past process conditions to accurately

forecast a sensor's remaining lifetime. The DLI prevents a sensor that needs to be replaced from being used in the process. Based on the DLI, the Adaptive Calibration Timer predicts when calibration is next required in order to maximize measurement reliability. The Time to Maintenance tool indicates when the next electrolyte or membrane replacement should be done to maintain the best possible measurement performance.

Plug and Measure: Using METTLER TOLEDO's iSense Asset Suite software running on a PC or laptop, or an ISM transmitter, sensors can be pre-calibrated in a convenient location and stored until they are needed. When sensor exchange is required it is a simple matter of attaching a pre-calibrated probe. Calibration data is automatically uploaded to the transmitter and the system is ready to measure in a few moments.

Digital signal: Unlike conventional analog measurement systems where the process measurement is calculated by the connected transmitter, ISM sensors calculate the measurement in the sensor head and send this digitally to the transmitter. Digital signals are unaffected by electrical interference or degradation caused by long cable runs; therefore, measurement stability is very high.

Ensured product quality

Technicians at our customer's brewery report that the METTLER TOLEDO solution is operating extremely well. They have greater confidence in the purity of the recovered CO₂ that is being used at the filling lines, helping to ensure final product quality. In addition, the predictive diagnostics of ISM have resulted in less maintenance. Our customer intends to install additional ISM O₂ systems in the near future for further carbon dioxide recovery and monitoring applications.

► www.mt.com/o2-gas

Multiparameter Beverage Analysis Saves 10 Minutes per Sample

Beverages undergo multiple quality control tests to ensure that consumers enjoy their juices and sodas. Acidity, pH and Brix measurements are the common, daily analyses for beverage producers. METTLER TOLEDO's InMotion™ Autosampler has automated and sped up quality control at Ramseier Suisse AG, a leading Swiss beverage producer.

Ramseier Suisse AG holds a solid position in the Swiss beverage market thanks to selling their own product brands, including Ramseier, Sinalco and Elmer and producing under private label. The strict quality standards in the industry require running several quality control tests before beverages reach consumers.

Tedious multi-instrument testing

The most important QC tests performed on any beverage before it reaches the market

are density, sugar content (Brix), acidity, pH and, for carbonated beverages, the CO₂ content. Originally Ramseier measured all these parameters on discrete instruments and carbonated beverages were degassed using a separate vacuum pump and magnetic stirrer after the CO₂ determination. Although results were accurate, the procedure was time-consuming since several separate instruments were required in order to perform all these analyses.

All parameters in a single run

Instead of carrying out daily, routine analysis on separate instruments, METTLER TOLEDO demonstrated a more efficient, automated system. This system combines a DM40 density meter, RX50 refractive index cell and a T90 Excellence titrator, all automated with the new and innovative InMotion™ Autosampler. Also the degassing of the carbonated beverages is automatically done directly in the sample beaker.



Mr. Kunz, Quality Manager at Ramseier Suisse AG, in the QC Laboratory



InMotion Autosampler for automated multiparameter analyses

Low complexity, high efficiency

The system was designed so that the operator only needs to place the samples on the autosampler rack and to choose the product to be measured via the OneClick™ shortcut on the touchscreen of the DM40 density meter. All parameters (pH, acidity, Brix, density, acidity:sugar ratio) are then determined fully automatically. So while the multiparameter system with InMotion™ is doing the routine job, the lab technicians have more time to focus on other specific analyses (e.g. microbiology, vitamin C, etc.)

Even cleaning is simplified. At the end of the day or between different sample series, the system can be cleaned and calibrated with a single click.

Not only has this single, automated system made testing less complicated, it reduces the total time required per sample. Mr Kunz, the Quality Assurance Manager at Ramseier Suisse AG told us, “With the fully automatic combined analysis we have saved at least 10 minutes per sample and results are highly repeatable.”

With multiple instruments running in parallel, based around the InMotion Flex Autosampler, Ramseier Suisse AG is enjoying increased efficiency and repeatability, easy operation and even a simple cleaning process.

Text: Daniel Buchmann
Density and Refractometry Product Manager

► www.mt.com/InMotion-Beverage



Higher Turbidity Accuracy and Time-Saving Start Up

The InPro 8600 series accurately measures turbidity through highly sensitive scattered-light detection. With a measurement range of 0 to 100 EBC, the sensor identifies unwanted particles, even in apparently clear liquids.

Reliably measuring the cloudiness of low turbidity beers and beverages requires sophisticated optics.

The innovative InPro 8600 sensor combines accurate optical technology with advanced measurement electronics in one compact sensor head, and provides highly dependable measurements of low turbidity values.

Turbidity and color combination is ideal for monitoring filtration quality.

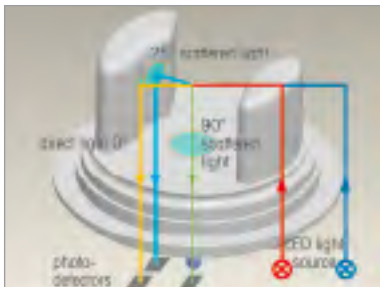
Simple and fast configuration with the M800 transmitter saves significant time at the measurement point.

Find out more at:

► www.mt.com/InPro8600



Your benefits



Attractive price/performance ratio
Available in combined turbidity and color monitoring unit.



Minimal maintenance
Sapphire optical window and absence of O-rings means maintenance is very low.



Wide range of measurement options
Measures in EBC, FTU, ASBC, ppm, and EBC color units.



InPro 8600
turbidity sensor



► www.mt.com/InPro8600

Get in-line with METTLER TOLEDO

Intelligent Sensor Management for Brewing Processes

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.

Find out more in the brochure

Product Information on ISM

Greater process reliability

Easy sensor handling

Reduced maintenance

PRODUCT MODELS

- Digital CO2 Brew Analyzer 8000
- CO2 Sensor 8P-1000
- Gravity Sensor 8P-1000
- CP Sensor 8P-1000
- Multiparameter Transmitter MDT

Sense Software

Get it here

Increased operational uptime
ISM provides real-time monitoring sensor diagnostics, helping to increase production uptime.

- Continuous assessment of sensor "health"
- Proven logic testing and trigger notifications between sensor and software
- Download the White Paper "Sensor Process Reliability with Sensor Sensor"

Streamlined lifecycle management
With ISM you can pre-configure sensors for error-free exchange in the field.

- Calibration is a supervised activity with an ID
- Plug-in identification tag
- Select the ID to inform you about easy sensor handling
- Download Sense Log Software for PC

Low cost of ownership
Self-healing and remote diagnostics reduce repair costs and extend longer sensor life.

- Minimize any effect of sensor "false" diagnostic diagnosis
- Smart prediction mechanisms reduce sensor life
- Get Complimentary Best Practice Guide for Brewing Processes
- Watch "State-of-the-Art Operating Capabilities Management Webinar"

Intelligent Sensor Management for Brewing Processes

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.

See the complimentary brochure, white papers, and software on our website for the brewery industry and discover how ISM delivers:

- Greater process reliability**
- Easy sensor handling**
- Reduced maintenance**

► www.mt.com/ISM-brewery

ISM®

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