

# Brewery

Perspectives in Liquid Process Analytics



# 23 News

**INGOLD**

Leading Process Analytics

## Less Hassle and Easier to Use Dissolved CO<sub>2</sub> Sensor for Just the Right Sparkle

**Different beers may have different levels of dissolved carbon dioxide. So, during production breweries need a CO<sub>2</sub> sensor that not only provides accurate measurements, but is also easy to handle between products. For Boulevard Brewing, an intelligent CO<sub>2</sub> sensor provides the answer.**

### Large specialty brewery

Boulevard Brewing Company is the largest specialty brewer in the US Midwest, with full or partial distribution across 25 states. Since its founding in 1989, the brewery has remained dedicated to the craft of producing fresh, flavorful beers using traditional ingredients and the best of both old and new brewing techniques. Their selection of fine ales and lagers include the Midwest's best-selling craft beer, Boulevard Unfiltered Wheat Beer. In 2013, Boulevard was acquired by Duvel Moortgat Brewery and currently produces over 185,000 barrels of beer annually.

### Controlling the level of dissolved CO<sub>2</sub> is essential for product quality

Steven Pauwels, Boulevard's Brewmaster,

understands the importance of giving consumers just the right effervescence for its various products, and so the brewery monitors dissolved CO<sub>2</sub> levels to control carbonation and ensure proper dosing.

Boulevard's production regime means regular changes to beer types to meet market demands, and time spent reconfiguring measurement equipment is a significant hindrance. The infrared (IR) technology dissolved CO<sub>2</sub> system that was installed required calibration before every product change, resulting in high handling efforts. Mr. Pauwels needed a new system for dissolved CO<sub>2</sub> monitoring that would not require frequent calibration, be fast and easy to maintain, and be extremely dependable.



**METTLER TOLEDO**



### Highly reliable measurement technology

Unlike the IR technology Boulevard had been using, METTLER TOLEDO's InPro 5500 i sensor uses thermal conductivity (TC) for partial CO<sub>2</sub> pressure determination. The measurement is achieved by determining the thermal conductivity of the gas present in a measuring chamber separated from the liquid stream by a gas-permeable membrane. The TC principle is immune to the presence of background

gases which results in high CO<sub>2</sub> selectivity. Also, it has a high comparability with established reference methods.

METTLER TOLEDO has enhanced this well-established principle by improving sensor handling and refining the cap that holds the membrane. The single-piece cap has been designed for fast, simple replacement, and high cleanability to prevent contamination.

### Predictive maintenance for greater process safety

The InPro 5500 i combines enhanced TC measurement with Intelligent Sensor Management (ISM®) technology. ISM simplifies sensor handling, enhances reliability and reduces sensor lifecycle costs. Plug and Measure installation and predictive maintenance tools, such as an indicator for falling membrane integrity, increases measurement point uptime and improves process safety.

### Time saved and simpler operation

Boulevard tested an InPro 5500 i for several months before it was fully installed. Mr. Pauwels is very pleased with the sensor's ease of installation, reliability, and the fact that it measures quicker and more accurately than their previous system. More importantly, the InPro 5500 i does not require calibration between product changes, therefore saving time and simplifying operations.

If you want to simplify CO<sub>2</sub> measurement at your brewery, visit:

► [www.mt.com/InPro5500i](http://www.mt.com/InPro5500i)

ISM®



InPro 5500 i CO<sub>2</sub> sensor

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## Now for All Major Bus Networks the M400 Transmitter

**By enabling real-time monitoring of sensor assets, fieldbus networks can add long-term value to production facilities. With the M400 series of multi-parameter transmitters, advanced sensor diagnostics information is available over HART®, FOUNDATION fieldbus™ and now PROFIBUS® PA; helping to improve process reliability and safety, and lowering operating costs.**

### Fieldbuses are prolific

The adoption of fieldbuses in the world of automation continues to grow rapidly across all process industries. It is a very well accepted technology and is installed by all major manufacturers worldwide.

Benefits including reduced wiring and installation costs are obvious. Less apparent are the long-term advantages of fieldbus networks that become clear many months after a facility has been commissioned. According to research by the ARC Advisory Group, the greatest benefits of fieldbus networks are realized in relation to maintenance and operation. This means fieldbuses themselves are often not a lasting cost-saver directly, but merely

allow a higher level of asset management that can significantly reduce operating costs.

As an example, a fieldbus can simplify the collection of device data for Plant Asset Management systems that track the condition of the connected field devices and sensors. METTLER TOLEDO, as a manufacturer of intelligent sensors and transmitters, rose to the challenge of providing real-time information on the installed sensor base.

### Remote diagnostics avoid needless maintenance trips

We fulfill this requirement with our unique Intelligent Sensor Management

(ISM®) technology. Contrary to conventional analog sensors, digital ISM sensors offer flexible integration of key diagnostics data into control systems for remote monitoring. Besides the transmission of the process variables via common communication protocols, sensor identification as well as the diagnostics can be directly accessed via control systems or standard asset management tools. Due to this direct access to information on fieldbus instruments, unnecessary trips to the field can be avoided.

### M400 – a common platform for all applications

Our successful M400 transmitter series exemplifies our commitment to continuous improvement in order to meet customer requirements, especially in the area of digital communication.



### Highlights of the M400 PA

- PROFIBUS PA communication
- Covers wide range of parameters including (optical) dissolved oxygen
- Multi-parameter capability reduces inventory
- Mixed mode for easy transition from analog to ISM technology
- Available approvals for hazardous area use: NEPSI, ATEX/IECEx Zone 1.

The M400 is already available with HART and FOUNDATION fieldbus communication protocols. Now, we have completed the portfolio with the introduction of our PROFIBUS PA version.

Across all process industries the M400 provides excellent reliability and reduced total cost of ownership by offering diagnostic utilities and a wide range of communication capabilities.

Find out more at:

► [www.mt.com/M400](http://www.mt.com/M400)



## Reduced Waste, Greater Process Safety Optical Product Monitors

**Compared with sight glasses, optical product monitors offer a highly cost-effective way of quick and accurate phase and product change determination. Here, we look at four applications that can reduce beer waste and increase process safety.**

### Consistent and efficient performance

Traditionally, sight glasses have played a significant role in brewery processes. But using the human eye to determine when a valve should be switched relies on operator skill, which can vary among operators and often results in product being wasted.

InPro 8300 Reflection Absorption Multi-Switch (RAMS) are optical product monitors that utilize LEDs to detect in real time changes in turbidity and/or color (yellowness) in liquids. They offer a highly efficient way of pinpointing yeast/beer transition, and for identifying water and different products in filling lines.



InPro 8300 RAMS optical product monitor

### Fermentation tanks

Yeast sediments to the bottom of cylindro-conical vessels after fermentation. The yeast is collected from the tank cone before the beer is transferred to downstream process steps. The InPro 8300 is installed in outlet pipes of the tank and is operated in its turbidity measurement mode. The turbidity signal is available on a standard 4–20 mA output and is integrated in a setup to control a three-way valve. The turbidity signal is high as long as yeast flows through the outlet pipe and the yeast is transferred to the recovery plant. Once the yeast is replaced by beer in the pipe the turbidity decreases. At a defined set point the valve is switched to transfer the beer to the maturation tanks.

### Storage tanks

A similar setup is possible in the outlet of storage tanks. The residual yeast is removed from the beer in order to avoid an overload of the downstream filtration unit which would lead to an unwanted decrease of the operating time of the filter.

In both the above cases the automated control of the separation process based



on the turbidity signal provided by the InPro 8300, leads to accurate and reproducible yeast/beer separation. Beer losses are minimized and the yield of yeast for the recovery process is increased.

### **Separators**

Typically, two ways for an InPro 8300 operated in its turbidity mode are common to optimize separator performance. The turbidity signal of a unit installed in the inlet pipe is used to control the flow. If yeast concentration is too high the inlet flow is reduced in order to avoid yeast overloading the separator. The turbidity signal of a second unit installed in the beer outlet is used to trigger the self-desludging mechanism of the separator. Compared to an inflexible time-controlled triggering, the loss of beer is significantly lower.

### **Product identification in filling lines**

Reliable and reproducible product identification in filling lines helps to increase process safety and can be implemented in charge traceability documentation for quality assurance purposes. Also here, an

in-line monitor based on the interaction of different light sources with differently colored products is a cost-efficient solution. In addition, the monitor detects the phase transition between rinse water and colored product for optimized phase separation control of water to beverage. Especially if the difference in conductivity of the two phases is too low for reliable separation, e.g., in separation of light beverages from water.

### **Simple installation, minimal maintenance**

All members of the InPro 8300 RAMS product family are easily installed on Tuchenhausen VARINLINE housings. They are further characterized by a reduced maintenance requirement thanks to the use of long-life LEDs and CIP-resistant materials. A PC software package is available for the product identification functionality via the integrated RS 232 interface. The only calibration procedure necessary for all InPro 8300 RAMS versions is a simple in-line zero point correction.

### **Benefits of the InPro 8300 RAMS**

Minimal product loss:

- Instant recognition of pure product or water ensures neither is wasted.

Low installation cost:

- Fast and easy installation on Tuchenhausen VARINLINE housings.

Reliable operation:

- Use of silica gel capsules in optical housings eliminates error-prone usage of air purge installation.

Fast, easy calibration:

- Simple in-line calibration correction with clear water.

Very low maintenance cost:

- Uses long-life LEDs, not bulbs.

Excellent value:

- Extremely attractive price/performance ratio.

Learn more at:

► [www.mt.com/InPro8300RAMS](http://www.mt.com/InPro8300RAMS)



## How an Intelligent DO Sensor Can Improve Wort Aeration

**The dissolved oxygen level during wort aeration has to be controlled to prevent the beer being adversely affected. For a major Thai brewery, use of METTLER TOLEDO's optical DO sensor, with its almost zero drift, has led to improved wort aeration and increased process uptime.**

### Thailand's biggest brewery plant

The brewery industry in Thailand started in 1934, and despite competition from major international brands, local producers have successfully established themselves in their own country and abroad. Our customer is one of Thailand's three major beer producers. In the north of the country they operate a facility with a production capacity of 10 million hectoliters, making it Thailand's biggest brewery plant.

### Controlling aeration for better beer

The brewery has two lines for cold wort aeration. Control of the process through

dissolved oxygen (DO) measurement is a very important step as excessive aeration causes oxidation of wort ingredients and insufficient aeration slows fermentation. Both situations lead to reduced production and poorer beer quality.

DO measurement systems using amperometric probes were installed in both lines. Due to plant design, retractable housings that would allow the sensors to be removed during CIP cycles could not be installed. Exposure to the CIP caustic solution, hot water, and the high sugar content of the wort was taking a heavy toll on the probes. Measurement accuracy of new sensors would quickly fall which meant regular

and time-consuming maintenance to replace sensor membranes.

Our customer was looking for an alternative solution that would be durable and low maintenance and that could be installed in the same measuring positions. METTLER TOLEDO suggested a system based around the InPro 6960 i optical DO sensor.

### Optical technology means almost zero drift

The optical technology in the InPro 6960 i offers many advantages over other sensor designs. Unlike amperometric probes, the InPro 6960 i requires no polarization before it can begin measuring; therefore, sensor start up is almost immediate. Very low drift is another feature of optical sensor technology, so measurement stability remains high over a long period. Servicing is quick and simple as no electrolyte solution is involved. The only part of the probe that requires periodic replacement is the OptoCap sensing element which contains an oxygen-sensitive layer. The OptoCap is more robust than the membranes of amperometric probes, and its lifetime can be extended by selecting a longer sampling rate and automatically turning off the sensor's internal LED during CIP cycles.

### Intelligent by design

The InPro 6960 i is one of METTLER TOLEDO's expanding portfolio of Intelligent Sensor Management (ISM®) instru-





ments. ISM brings benefits to process analytics by simplifying sensor handling and reducing maintenance. Thanks to ISM technology, the InPro 6960 i automatically detects CIP cycles via an integrated temperature probe. The number of CIP cycles, sampling rate, operating time, and other wear and tear related data are used to predict the remaining lifetime of the OptoCap. This is displayed on the con-

nected transmitter as the Dynamic Lifetime Indicator (DLI). When the DLI approaches zero, the measurement system generates an alarm for OptoCap replacement. As a result, unwanted use of a potentially failing sensor is avoided.

The M400 was selected as the partnering transmitter for the sensor. The M400 is a versatile multi-parameter transmitter se-

ries that offers full support for ISM functions. It accepts analog sensors as well as digital ISM sensors, adding to its flexibility.

#### **More process uptime**

Once installed and operating, our customer was pleased to find that lab measurements closely agreed with those from the InPro 6960 i, proving that the influence of CIP cycles on the sensor were minimal.

Our customer is extremely satisfied with the performance of the system. The longer maintenance intervals and DLI have significantly increased process uptime. Of more importance to the brewery, the reliable values from the InPro 6960 i have led to improved wort aeration, smoother production, and are helping them brew beer of the highest quality.

Find out more about the InPro 6960 i and ISM at:

► [www.mt.com/InPro6960i](http://www.mt.com/InPro6960i)



InPro 6960 i dissolved oxygen sensor

## Accurate Batching Reduces Waste by Tons

**Heavy Seas craft brewery does not want to waste a sip of its high-quality beer due to inaccurate weighing. Now, with the help of a new batching system, the Maryland-based brewery saves about a ton of materials every two weeks.**

The company, founded in 1995, has been growing rapidly. What began as a small regional brewery is now selling beer in 18 states. The brewer of specialty beers creates about 40,000 barrels of craft beer annually using the finest ingredients. Those ingredients are expensive, and for Heavy Seas, wasted ingredients means less profit.

To make Heavy Seas' supreme brews, all ingredients must be precisely measured.

"We were operating with another brand of old load cells which were not giving us the degree of accuracy required for our high-end beers," says Director of Brewing Operations, Joe Marunowski. "Our batch weights varied and we had a lot of lost opportunity in the brewhouse."

With less sophisticated batching systems, brewers bear the burden of manually measuring and monitoring all inputs. That increases the opportunity for errors and takes time away from tank preparation tasks.

Heavy Seas purchased the IND 560 with Ringmount weigh modules from METTLER TOLEDO to improve weighing performance while alleviating some of the monitoring burden on the brewing staff. The new system allows the brewers to use the Target Table to save different targets and load the target they need. This ensures the right amount of grain is used for the recipe, and it shuts itself off when the correct amount has been allocated. "We have also reduced the amount of usage variance with a much higher degree of accuracy, thanks to the



### Ringmount

- 250 kg to 10,000 kg capacities
- Dynamic or static loading
- Tanks and vessels
- 316 Stainless steel load cell, IP68

Designed for high hygienic requirements without exposed threads.

► [www.mt.com/ind-ringmount-dia16](http://www.mt.com/ind-ringmount-dia16)





METTLER TOLEDO load cells,” says Marunowski.

While brewers previously had to manually control ingredient amounts, the new METTLER TOLEDO system only requires brewers to enter the target value, and the system takes care of the rest. With exceptional accuracy, batch variability is eliminated, ensuring a high-quality brew every time.

Heavy Seas enjoys the versatility of the IND 560. With the ability to connect directly to PLCs, LANs, WANs and PC communication interfaces, the brewery has options when it comes to connectivity. Fast, precise and repeatable results are guaranteed in manual, semi-automatic or fully automatic processes. The IND 560 is suitable for the harsh wash-down condi-

tions required in food and beverage applications.

Heavy Seas chose a METTLER TOLEDO batching system due to its reputation for quality. “I’ve used METTLER TOLEDO products throughout my career in the food and beverage industry, and I feel that the quality of engineering, service support and price point make METTLER TOLEDO the obvious choice for this system,” says Marunowski.

[www.hsbeer.com](http://www.hsbeer.com)

## Tips & Tricks

### White Paper: Safety by Design Weigh Modules

Design of modern weigh modules with no compromise on safety is described in a white paper.



Download the white paper at:

► [www.mt.com/ind-wp-weigh-module-design-dia16](http://www.mt.com/ind-wp-weigh-module-design-dia16)



## Intelligent Sensor Management (ISM®) 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 easy, and process uptime is increased.**

The benefits of ISM translate into substantial gains for breweries in relation to process reliability, sensor lifecycle management, and cost of ownership.

Unlike analog probes, ISM sensors output a robust digital signal and retain their own calibration as well as process data. Thanks to diagnostics tailored to brewery applications, ISM sensors even predict

when they will need maintained or replaced. And the new mobile app provides a quick sensor check on the go.

In dissolved and gas O<sub>2</sub>, dissolved CO<sub>2</sub>, turbidity, pH, and conductivity systems ISM gives you much more than just a measurement.

### Greater process reliability



#### Increased operational uptime

ISM provides real-time information on sensor condition, helping to increase production uptime.

Read the white paper on achieving greater process integrity:

► [www.mt.com/ISM-brewery-wp](http://www.mt.com/ISM-brewery-wp)

### Easy sensor handling



#### Convenient lifecycle management

With ISM you can pre-calibrate sensors for error-free exchange at the process.

Discover the new iSense software for ISM sensors:

► [www.mt.com/iSense](http://www.mt.com/iSense)

### Reduced maintenance



#### Low cost of ownership

ISM reduces sensor lifecycle costs and enables higher sensor use.

Get our free guide to in-line analytical measurements for breweries:

► [www.mt.com/pro-beer-guide](http://www.mt.com/pro-beer-guide)



### Systems for your processes ...

From the brew house to the filling line to effluent monitoring, your entire brewery benefits from the unsurpassed reliability, simplified sensor handling, and low maintenance requirement of ISM solutions.

**ISM®**



### ... adaptable to your requirements

Our ISM transmitter portfolio covers single-parameter, single-channel units for maximum process safety, to multi-parameter, multi-channel devices for greater convenience and flexibility.

Incorporating ISM solutions into your asset management or plant control system via transmitters or converters allows seamless integration of sensor diagnostics information for remote monitoring.



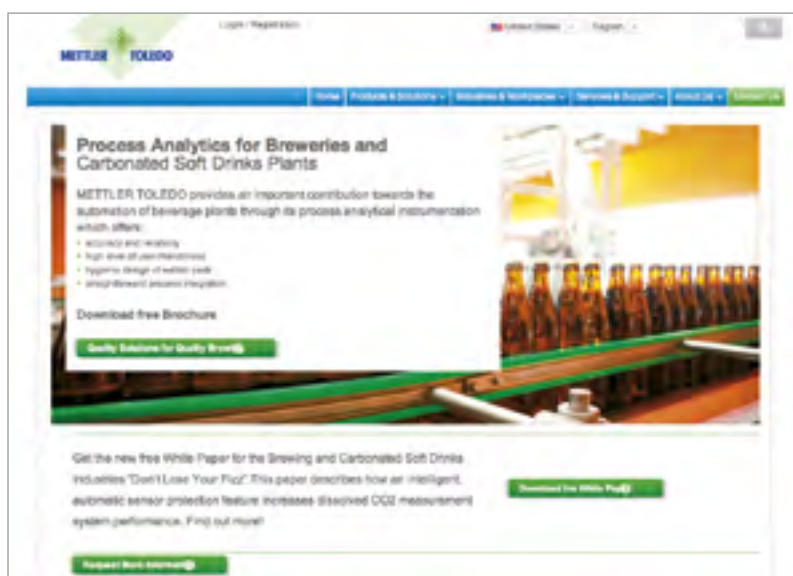
Discover how ISM can help you at:

► [www.mt.com/ISM-brewery](http://www.mt.com/ISM-brewery)

M800 transmitter showing iMonitor sensor diagnostics utility.



# Get in-line with METTLER TOLEDO



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