

# Brewery

Perspectives in Liquid Process Analytics



# 15 News

**INGOLD**

Leading Process Analytics

## Suntory Reduces Waste of Carbon Dioxide with In-line, Real-time Monitoring

**Recovering and re-using CO<sub>2</sub> greatly reduces beer production costs. To ensure the quality of their recovered CO<sub>2</sub>, Suntory chose a METTLER TOLEDO system.**

### Leading brand in China

Established in 1998, Suntory Brewing (Kunshan) Co., Ltd. is another successful development of Japanese Suntory Co., Ltd. in China. It is located in Kunshan City, Jiangsu Province and has an annual beer production capacity of 200,000 tons. The beers manufactured by the company are widely sold in the north-eastern Chinese market and it has become a leading brand in the region.

### Reduced cost of CO<sub>2</sub> use

CO<sub>2</sub> is an extremely important raw material in beer production, and in the past the brewery had to spend a vast amount of money to purchase high-purity CO<sub>2</sub> from external sources. However, a substantial amount of high-quality CO<sub>2</sub> is generated as a by-product during the beer fermenta-

tion process. By recovering and re-using this portion of CO<sub>2</sub>, production costs are greatly reduced.

### Application

The CO<sub>2</sub> recycling system of Suntory Brewing (Kunshan) previously measured the purity of CO<sub>2</sub> by means of manual sampling in the laboratory. It was usually calculated four times per shift, and once unqualified CO<sub>2</sub> was found it would be discharged or processed again. This method had two problems: firstly, manual measurement errors arose, and secondly, determining when to measure could not always promptly discover a change in CO<sub>2</sub> purity, so appropriate measures could often not be adopted in time to avoid a waste of CO<sub>2</sub>.



**METTLER TOLEDO**

CO <sub>2</sub> Purity	Residual O <sub>2</sub> Concentration in CO <sub>2</sub>
99.998 %	5 ppm v/v
99.99 %	20 ppm v/v
99.98 %	40 ppm v/v
99.97 %	60 ppm v/v
99.90 %	200 ppm v/v
99.70 %	600 ppm v/v

Figure 1: Comparison table between CO<sub>2</sub> purity and oxygen density in CO<sub>2</sub>.

To counteract this, Suntory took the decision to install in-line oxygen measuring equipment to monitor the processing efficiency of the CO<sub>2</sub> recycling system. After comparing products of different brands the brewery chose a METTLER TOLEDO in-line oxygen measuring point comprising the InPro 6950 Gas sensor and M700 transmitter. From the information obtained from the system, engineers can easily calculate the purity of the recovered CO<sub>2</sub> (Fig. 1).

### Installation

The InPro 6950/M700 measuring point was installed at the CO<sub>2</sub> dryer outlet to conduct in-line monitoring of oxygen content. The system can automatically issue an alarm in the event of abnormal

quality in order to prevent a substandard CO<sub>2</sub> supply on the one hand, and on the other, to alert engineers to take corresponding measures in the event of abnormal purity of recovered CO<sub>2</sub>.

At the outset, after the instrument's installation and implementation, it was discovered that the in-line data fluctuated unpredictably and that the measurement was unstable. From the tracking record of the site measuring data and through discussions with METTLER TOLEDO engineers, it was realized that when the number of CO<sub>2</sub> recovery compressors in use altered, the pipeline pressure would also change, causing a distinct fluctuation of measuring data (Fig.2).

Based on discussions with our engineers, a flow-regulating and pressure-adjusting device was installed at the sample exhaust port and a pressure sensor was installed on the sample pool for in-line pressure compensation. After the improvement the measuring data became significantly more stable, and now when the pipeline pressure changes there is no obvious deviation of measured data.

### Precise and continuous results

The improved in-line oxygen measuring system monitors the purity of CO<sub>2</sub> more precisely than the previous off-line method. The METTLER TOLEDO system measures O<sub>2</sub> continuously in real time and removes the errors that had been seen with manual measurement. And when the CO<sub>2</sub> purity is low, the transmitter issues an alarm to prompt the operator to take countermeasures, thus ensuring the quality of supplied CO<sub>2</sub> is always met and waste of CO<sub>2</sub> is minimized.

If you want to minimize CO<sub>2</sub> waste at your brewery, go to:

- ▶ [www.mt.com/InPro6950](http://www.mt.com/InPro6950)
- ▶ [www.mt.com/M700](http://www.mt.com/M700)

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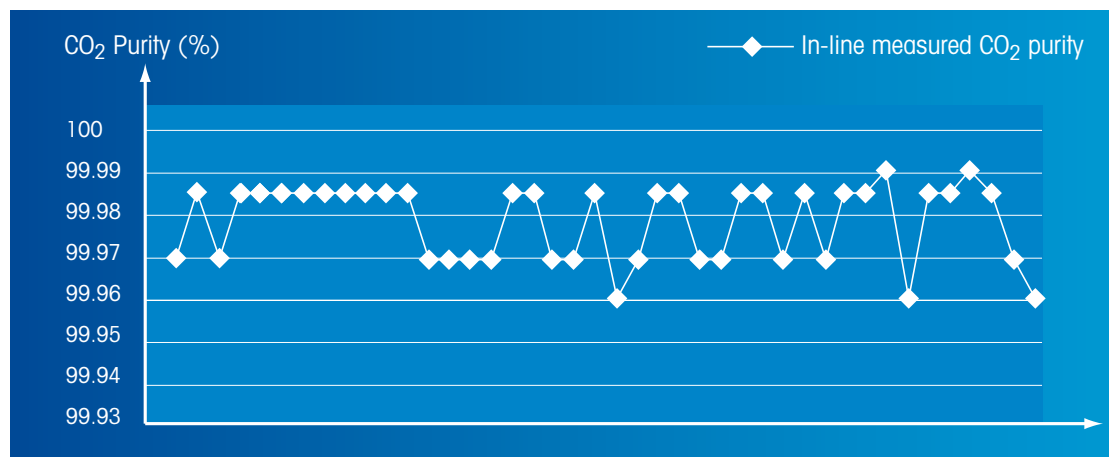


Figure 2: In-line CO<sub>2</sub> measurement before pressure adjusting device fitted.



O<sub>2</sub> sensor InPro 6950



“After having installed the in-line device, the purity of CO<sub>2</sub> can be monitored more promptly and CO<sub>2</sub> waste due to untimely manual measurement is avoided. In addition, the METTLER TOLEDO analyzer is simple to use and maintain.”

Meng Fanwu, instrument engineer at Suntory Brewing (Kunshan)

## Turbidity Solution for Effluent Treatment Plant Lowers Flocculant Costs

**Turbidity monitoring is important for liquid/solid separation in effluent treatment. A backscatter turbidity solution has helped to control flocculant dosing at a brewery ETP installation.**

### Flocculation

Flocculants are chemicals that promote the clumping together of substances by causing suspended particles in liquids to aggregate, forming a ‘floc’. Use of flocculants in wastewater treatment is important for removing contaminants, as they improve the sedimentation or filterability of small particles in the waste stream, and thereby ease their removal.

Common flocculants often include cationic species such as aluminum, calcium, iron and magnesium. Commercially available long-chain polymer flocculants, such as modified polyacrylamides, are

widely used in wastewater treatment. They usually have a number of functions besides flocculation such as coagulation, break up of emulsified oils in water, pH alteration and encapsulation of metals. These processes all help to separate solids from the waste stream by formation of a waste sludge that easily precipitates out of solution. The treated water can then be safely discharged to drain or reused.

Flocculation also allows a reduction in process time, which means wastewater can be treated faster so throughput can be increased.

In recent times, naturally-based flocculants that produce environmentally benign floc are becoming increasingly popular, as this helps to reduce disposal costs.

### Why use turbidity?

A UK brewery was looking for a way to monitor the levels of flocculants added to wastewater so that it could be dosed correctly and prevent wasteful over-dosing and potentially ineffective under-dosing. The turbidity sensor would also be used to monitor the efficacy of the flocculants to ensure they were producing the desired effect.

Turbidity is the ideal measurement for this application as the resulting flocs from turbid sediments can easily be measured using backscatter turbidity techniques. METTLER TOLEDO backscatter sensors have a wide measurement range that provides great application flexibility. In addition, the low maintenance and robust turbidity sensors are beneficial for use in continuous and often unmanned processes, such as ETP installations.

### Low-maintenance solution

The brewery required a sensor suitable for medium to high levels of total suspended solids (15 g/l) that could be retracted from a pipe installation to allow easy sensor cleaning whilst the process was still running.

The METTLER TOLEDO solution comprised the InPro 8200 turbidity sensor, InTrac 779e retractable housing and Trb 8300 transmitter. The InPro 8200 sensor is a dual optical fiber turbidity sensor that is designed for a wide variety of industrial applications, including liquid/solid separation. Due to the nature of the customer's process, it was important that the sensor be resistant to fouling and easy to maintain. The InPro 8200 was

therefore a wise choice as it requires little maintenance and has a uniform structure that reduces fouling on its scratch-resistant sapphire window. This prevents build-up of contaminants, allowing for error-free measurement.

Combined with the InTrac 779e retractable housing complete with flushing connections, the customer is able to retract the sensor at regular intervals and perform cleaning or calibration of the sensor without interrupting the process.

### Reduced costs

By installing the InPro 8200 turbidity sensor with the Trb 8300 transmitter and InTrac 779e retractable housing, the brewery is now able to monitor the dosing of flocculants with precision and ease.

This has helped to reduce costs as only the necessary amount of flocculant is added. Subsequently, the process has become more efficient as throughput of the effluent treatment plant can now be increased.

If you want to reduce your effluent treatment costs, visit:

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

## Better quality and less waste

Precise control of turbidity, pH, dissolved oxygen and conductivity in your production processes greatly assists in ensuring your products are of optimum quality, and that product loss and water use are minimal.

METTLER TOLEDO supplies complete measurement solutions covering the water treatment stage right through to the filling station.

Find out more at:



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



Turbidity sensor  
InPro 8200

## The Lower the Oxygen the Better the Beer

**Oxygen in beer reduces shelf life and can adversely affect flavor. Advanced optical measurement technology combined with intelligent sensor diagnostics ensure you are keeping oxygen to a minimum, simply and dependably.**

### Minimizing oxygen

Oxygen in the brewing process is monitored because of its importance on the quality, taste and shelf life of the beer. After fermentation, beer is close to being oxygen free and maintaining this very low oxygen level is important for quality assurance. Therefore, O<sub>2</sub> uptake during the following separation, filtration, storage and filling processes has to be minimized.

To reduce the risk of contamination, permanent and precise oxygen monitoring is required.

Continuous measuring of oxygen concentration places high demands on an in-line O<sub>2</sub> system. Such equipment must be easy to install and operate, require minimal maintenance and, most importantly, always measure accurately.

Using advanced diagnostic tools, the quality of the sensing element and all sensor components are permanently monitored. Early signs of sensor ageing or failure are immediately displayed to the user.

Thanks to Plug and Measure, the sensor can be connected to an M400 transmitter, and all data, including calibration and information about the sensor history, e.g. the stresses that the sensor has been exposed to, the number of CIP cycles and much more, are transferred to the transmitter. The system becomes ready for use within a few seconds, and no complicated configuration or failure prone calibration at the point of use is required.

### Intelligent optical sensor

The latest development in optical oxygen sensors, the InPro 6970 i from METTLER TOLEDO, delivers outstanding performance at low oxygen levels down to 2 ppb. Based on fluorescence quenching technology, it combines high measurement performance with Intelligent Sensor Management (ISM) functionality.

### A new standard – ISM and optical DO

The combination of high performance, ease of use and benefits of ISM and the iSense calibration and documentation software tool, make the InPro 6970 i the most advanced oxygen sensor available today. Indeed, some of the biggest breweries in the world have already introduced the InPro 6970 i as a new standard for all low ppb applications in their brewing processes.

Optical oxygen sensors offer many advantages over amperometric sensors; reduced and easier maintenance, and long term stability resulting in reduced cost of ownership being only two of them. The only consumable, the OptoCap, has a significantly longer lifetime than amperometric membrane bodies and can easily be replaced within a few minutes. No polarization or liquid handling is necessary. Once the sensor is calibrated it is ready to use.

To benefit from optical measurement technology and ISM in your brewery, go to:

- ▶ [www.mt.com/InPro6970i](http://www.mt.com/InPro6970i)
- ▶ [www.mt.com/ISM](http://www.mt.com/ISM)



Transmitter M400 and  
optical DO sensor InPro 6970 i

ISM technology adds to these advantages by simplifying maintenance planning and documentation of all sensor data.

## Benefit from Process Analytics from Wort to Bottle

**In-line process analytics saves time and increases productivity for a medium-sized German brewery.**

### Family-owner brewery

The privately owned M.C. Wieninger brewery is a medium-sized, regionally established brewery in Teisendorf in Upper Bavaria, Germany. It has a long tradition, being first mentioned in a document in 1666 as the "Prince Bishop's Court Brewery". It is now in its 7th generation of family ownership. The brewery produces an annual 120,000 hL of beer and 100,000 hL of non-alcoholic beverages.

### Hot wort

While participating in a workshop in 2006, the first brew master, Mr. Meier, attended a presentation by METTLER TOLEDO on pH measurement in hot wort. Up to this time pH was being measured in M.C. Wieninger's laboratory. This was a time-consuming process and, because of the temperature difference, the pH level of the wort in the pan and the sample drawn often differed.

Mr. Meier decided in favor of a test installation of a METTLER TOLEDO pH measurement system comprising the InPro 3250 pH electrode with pre-pressurized liquid electrolyte and the M700 multi-parameter transmitter. Despite the heavy stressing by 100 °C temperatures, and pH and temperature fluctuations between cooking the wort and CIP, the electrode demonstrated an impressively long lifespan and measurement reliability. The results of the test so convinced Mr. Meier and second brew master, Mr. Löw,

that pH became the first in-line measurement employed in the brewery.



pH electrode  
InPro 3250

### O<sub>2</sub> measurement

Mr. Löw and Mr. Meier then looked at in-line oxygen measurement, as oxygen incursion in the beer can adversely affect beer quality and is of considerable interest for breweries both large and small. Measurement systems using the InPro 6800 oxygen sensor and M700 transmitter were installed in CO<sub>2</sub> recovery, filtration and filling.



Dissolved oxygen sensor  
InPro 6800

### Turbidity

The next measurement that was transferred from laboratory to in-line was turbidity measurement in filtration. The brewery decided on the InPro 8600 sensor. It is equipped with dual-angle technology (25° / 90°) that makes it possible to measure particle size trend, so checking for filter breakthrough and beer quality is monitored in parallel. Further, the measurements can be compared with laboratory instruments that measure at the same angles and wavelengths.

Optionally, in addition to turbidity, the InPro 8600 can measure beer color in EBC. This translates into reduced equipment and installation costs as turbidity and color can be measured with the one instrument.

The InPro 8600 is factory-calibrated and is immediately ready for use when installed. The scratch-resistant sapphire optical windows are built in without O-rings. This reduces maintenance costs because complicated O-ring replacement and re-calibration of the sensor is eliminated. The sensor head, which is situated in the beer, is thermally uncoupled from the electronics to prevent heat damage.

The brewery decided in favor of the wireless variant of the sensor. This allows setting sensor parameters, adjusting laboratory reference measurements and checking diagnostic functions all via



Bluetooth using a laptop or PDA. Transfer of the measurement data is by a direct cable connection between the sensor and the control system – no transmitter is required.



Turbidity sensor  
InPro 8600

The next measurement system installed at M.C. Wieninger is situated in the outflow line of the lauter tun. An InPro 8300 RAMS TCS is currently being tested here to determine when the wort is sufficiently clear to pass to the wort copper.

The InPro 8300 RAMS TCS is an optical measurement instrument for monitoring turbidity or color changes in liquids. The main area of application is identification of phase transitions when changing products or product ejection. The turbidity or color trend is sent to a PLS via a 4...20 mA analog output. At the time of installation it is determined at which mA signal the switch from lauter tun to wort copper should take place. This way the switch point can be more accurately determined than by using a sight glass. This has two distinct advantages: it lightens the workload on brewery staff and ensures only blander worts, which have a positive influence on the fermentation activity of the yeast and consequently on beer quality, pass to the next process.

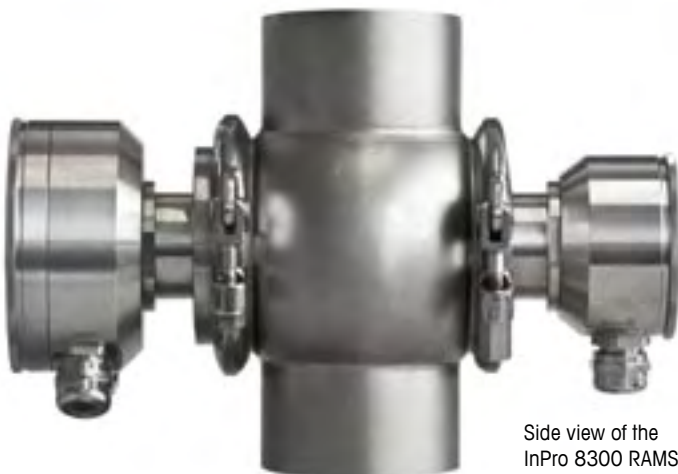
#### Future plans

Mr. Löw and Mr. Meier are planning to purchase an InPro 8300 RAMS TCS for the lauter tun in 2010.

In addition, another test with an InPro 8300 RAMS TCS is planned to determine precise yeast dosing.

To find out how in-line process analytics can improve your brewing processes, go to:

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



Side view of the  
InPro 8300 RAMS TCS

# The Information you Want is at [www.mt.com/pro](http://www.mt.com/pro)

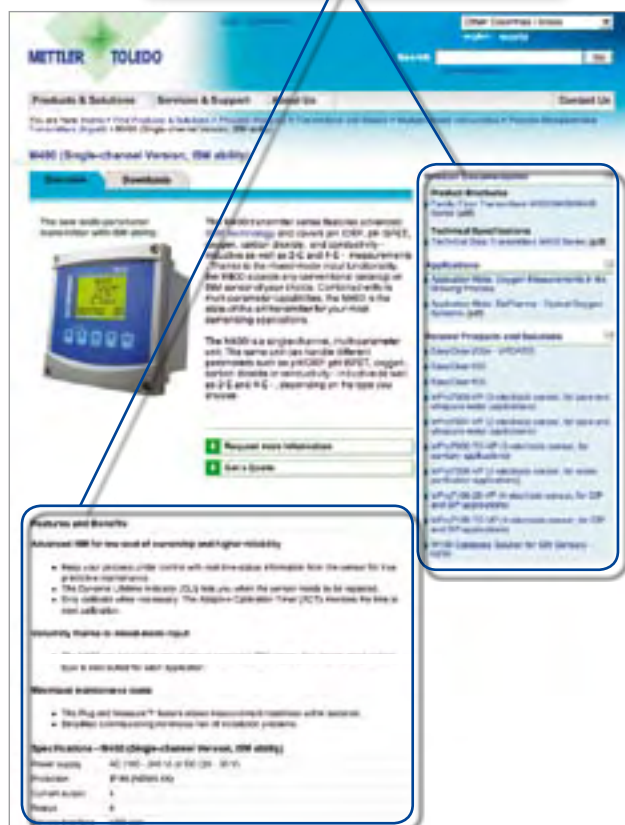
**The METTLER TOLEDO Process Analytics website contains a vast amount of up-to-date information on all our products and services.**

Content is localized for your country and tailored to suit your selections.

Simple layout allows you to quickly find the information and features you are looking for.

- Learn about our most recent product developments
- Register for free webinars
- Request further information on products and services
- Obtain a quote quickly and easily
- Download our latest white papers
- Read case studies relevant to your industry
- Access buffer and electrolyte solution certificates
- and more...

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- Access our Newsletter archive
- Find out when our next Trade Show or Exhibition is in your area
- Register for free webinars presented by our industry experts
- Download our White Papers



# Intelligent Sensor Management

## Reduces Life Cycle Costs and Improves Process Safety

### Intelligent Sensor Management (ISM)

ISM reduces the installation, maintenance and calibration effort for METTLER TOLEDO's digital sensors to a minimum. This considerably improves process reliability, productivity and system availability.

### Reliable installation

Digital communication between sensor and transmitter means signal is always reliable and unaffected by moisture.

### Intelligence – starts in the head

ISM sensors are equipped with integrated electronics in the sensor head that store all relevant sensor parameters and includes algorithms for enhanced sensor diagnostics.

### Predictive maintenance

Intelligent diagnostics information is calculated and displayed on the sensor's transmitter and tells you if the sensor needs maintenance or replacement – no more downtimes due to sensor failure!

### System integration

Key ISM parameters can be fully integrated in a process control system via PROFIBUS® PA or FOUNDATION Fieldbus™.

## Plug and Measure

- Sensors are immediately recognized when connected to the transmitter – eliminating difficult configuration procedures.
- Operational availability of measurement point within seconds.
- Wireless module available for transmission from sensor to transmitter – no need for costly cable installation.
- Sensors can be pre-calibrated in the lab and stored for later use, saving time and increasing operational availability.

### METTLER TOLEDO's ISM product range includes...

... a wide range of sensors for

- pH
- dissolved and gaseous O<sub>2</sub>
- conductivity
- turbidity





## Diagnostics

- Any sensor maintenance requirement is recognized at an early stage, reducing downtimes and minimizing plant operation costs.
- Dynamic Lifetime Indicator estimates in real time the remaining lifetime of the sensor.
- CIP/SIP cycles counted automatically.
- Sensor spider diagram for fast troubleshooting.



## Maximum Performance

- iSense Asset Suite software offers you a unique means of optimizing the performance of ISM sensors for enhanced reliability and process safety.
- Key Performance Table enables you to evaluate the condition of an ISM sensor at a glance, without the need of a transmitter.
- Documentation of every calibration as well as the entire sensor history – documentation requirements to regulatory standards are easily met.

... advanced single- and multi-channel transmitters

- 4-wire
- 2-wire
- wireless module

... software applications

- iSense Asset Suite
- pH data logger



# Get in-line with METTLER TOLEDO



## Reduced Costs Thanks to Two-in-One System

Visual parameters such as beer brightness and beverage color are evaluated by the quality-conscious consumer even before they start to drink. Consequently, in-line monitoring of turbidity and color after filtration and blending supports your effort to produce beverages of consistent quality. The unique design of METTLER TOLEDO's turbidity/color system allows the simultaneous measurement of these two important parameters in one cost-effective unit.

► [www.mt.com/InPro8600](http://www.mt.com/InPro8600)

### **Mettler-Toledo Ingold, Inc.**

36 Middlesex Turnpike  
Bedford, MA 01730, USA  
Tel: +1 781 301 8800  
Fax: +1 781 271 0681  
Toll Free: 1 800 352 8763  
Email: [mtprou@mt.com](mailto:mtprou@mt.com)

[www.mt.com/pro](http://www.mt.com/pro)

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