



Innovative Turbidity Design for Filtration Monitoring – Tailored to Brewers Needs

Working in close cooperation with brewers METTLER TOLEDO developed a new innovative scattered light turbidity system for brewing applications, particularly filtration monitoring. A fully hygienic design combines high accuracy and repeatability with low maintenance and easy operation. The unique design includes a compact version tailored to system integrator's needs.

Benefits of turbidity measurement in beer filtration

It is necessary to filter finished beer prior to packaging in order to remove yeast cells and other particulate matter. This filter step guarantees a brighter beer with a better taste and longer shelf life. Filtration is mainly accomplished via “Kieselguhr” or membrane filters. In order to guarantee success, the filtration system is monitored through the measurement of turbidity level in the beer leaving the filter. If the turbidity level in the filtered beer is too high, shelf life of the beer is reduced and a quality problem arises due to the agglomeration of colloidal particles influencing the taste and reducing the brightness of the beer. In such case, an expensive re-filtration process would be needed or even result in a recall from the retailer. By

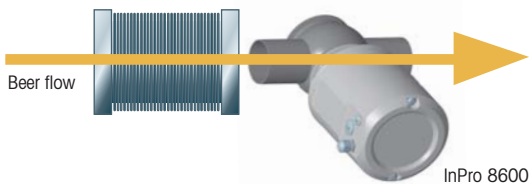
monitoring filter Kieselguhr, the pre-coating process can be optimized, yeast and Kieselguhr breakthrough controlled, and the dosing of Kieselguhr into the raw, unfiltered beer precisely regulated. An accurate and efficient turbidity measuring system is essential for correct Kieselguhr dosage into the unfiltered beer. In the case that membrane filters are used in- and outlet streams are monitored: the goal is to protect the membrane modules from early blocking with bigger particles as well as to measure beer brightness after filtration.

Listening to the brewer's needs

METTLER TOLEDO listened to many brewing experts and developed a new sensor concept for turbidity measurement to fulfill a whole catalog of key requirements:



- Simplified operational concept for brewers
- Improved accuracy of measured values
- Repeatability of measurements
- Compliancy to MEBAK recommendations (Middle European Commission for Analytics in Breweries)
- Low maintenance along with extended lifetime
- Customizable for system integrators



Innovative dual-angle turbidity measurement

The new INGOLD turbidity sensor InPro 8600 is based on a multiple angle light scattering principle recognizing two different types of signals:

- The 90° scattering signal gives evidence of the beer quality in respect of the presence of colloidal particles.
- The 25° scattering signal serves as an alarm function if filter breakthrough occurs, e.g. if Kieselguhr particles or yeast cells break through the filter.

This combined measurement principle of the InPro 8600 makes the sensor superior and allows following combined control functions:

- Trend monitoring of particle size for optimum filter control
- Quality assurance measurements for longer shelf life of beer

Brewer's benefit

This novel dual-angle turbidity sensor InPro 8600 will undoubtedly represent a new generation providing significant more value to brewers through several key features:

- **Measurement angle 90°/25° at 650 nm (red light):** Compliant to MEBAK recommendation and well comparable to common laboratory turbidimeters
- **Hygienic design:** Fits into standard Tuchenhausen Varivent housing
- **Sapphire windows without O-rings:** Withstands easily process and cleaning conditions; no maintenance needed
- **Pulsed LED lamp with approx. 50000 hours life time:** Extended life time; no lamp replacement required; no downtime of the process
- **Digital data processing:** More precise and accurate measurements
- **Single sensor approach with fixed optical path length:** Same characteristics independent of pipe size and enhanced accuracy in low turbidity applications in larger pipe sizes compared to other instruments
- **ISM concept:** Ensures optimal sensor diagnostics

Measurement principle of the sensor

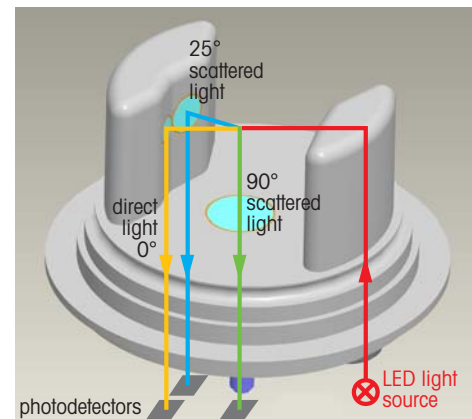
The InPro 8600 is a particularly compact inline turbidity sensor that measures 90° and 25° scattered light simultaneously using a single sensor head and a single light source. The dual angle measurement enables compensation for color changes, possible light and some intensity changes

and optical window fouling. More information can be gathered using two detectors at different angles since the spatial distribution of scattered light depends on the particle size.

Two concepts tailored to user needs

1. Classical measurement system

The new InPro 8600 turbidity sensor is for



use preferably in combination with the 4-wire transmitter Trb 8300D. In this classical setup, the transmitter offers a comfortable user interface for display of turbidity values, sensor setup, run and calibration purposes, and is equipped with multiple current outputs and relays for the integration into a process control system.

2. Tailored system integration version

Listening to the needs of system integrators, e.g. for filtration skids, METTLER TOLEDO will also offer a highly competitive compact unit with two 4–20 mA current outputs integrated into the sensor. A innovative PDA based on handheld configuration tool for the reason based Bluetooth wireless technology allows to carry out configuration, service and diagnostics.

 www.mtpro.com/turbidity

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New ISM[®] Technology Facilitates pH and Oxygen Measurement

In everyday use, pH- and dissolved oxygen sensors are subject to wear so that significant maintenance is required or reliability of the inline measured values declines over time. The new Intelligent Sensor Management (ISM) protocol from METTLER TOLEDO significantly improves sensor availability and operational performance at the measuring point.

A problem common to wort acidification

Inline pH measurement in connection with the acidification of wort during cooking is particularly a challenging task. The addition of acid has to be controlled so that the pH of the wort adjusts itself to a value of about 5.0. This pH adjustment improves the storage life of the finished beer in respect of chemical/physical properties and flavor. The wort can be a harsh process environment. The sensor is exposed to a temperature of 100 °C/212 °F. Wort constituents can deposit on the sensor which will impair or even completely block measurement capability.

A problem common in wort aeration

High turbidity levels and frequent CIP cycles are also challenges to successful inline measurement of oxygen during wort aeration. However, this particular measurement provides important information to be able to maintain a stable fermentation process and ultimately to increase the stability of the flavor of the beer.

Handicaps of inline measurement

The advantages of inline measurement to solve the above mentioned problems would seem to be clear: immediate and permanent availability of measurement data offers the option to intervene correctively in the process. Other than with laboratory instruments which analyze already

conditioned samples, direct inline measurement sensors are exposed to a certain amount of “natural stress”. It is clear that this “stress” can influence accuracy of the measurements. Normally, pH and oxygen measurement points in the brewery process require a higher degree of maintenance. Correct measured values depend not only on adequacy of the sensor design for the process in question but also on regular maintenance and calibration of the sensor. Only then does inline measurement make sense in respect of the advantages presumed above. But how does one know that a measurement point is still in an optimal condition or that preemptive maintenance could prevent an imminent stoppage?

ISM[®] with Plug & Measure

ISM (Intelligent Sensor Management) supports proactive measures to significantly increase reliability and availability of a measurement point. ISM facilitates the preparation of a maintenance plan, is able to increase the length of maintenance intervals, and ensures that replacement sensors are at all times ready to hand, even for simple replacement by semi-skilled personnel.

ISM[®] small but clever

The key element of ISM is a microchip integrated in the plughead of the sensor (Fig. 1). This chip communicates static identification data as well as dynamic

process data to the transmitter. The information is processed in the transmitter and subsequently presented on the display in the form of graphic elements arranged for easy interpretation by the user.



Fig. 1 pH and oxygen sensors with ISM[®] Chip.

Advantages for everyday routine

Clear sensor identification by the transmitter minimizes the risk of operating errors, since sensor-specific data such as type of temperature probe incorporated in the sensor no longer has to be gleaned from a menu list (Fig. 2) and manually entered into the transmitter. The sensors can be precalibrated under the most suitable and clean conditions in the lab. Zeropoint and slope data are stored in the sensor chip and, on connection, immediately transferred to the transmitter. There is no longer a need to clean and calibrate sensors at the measuring points, this often

under difficult or even dangerous conditions. In addition, precalibrated and ready-for-use sensors can be stored in a depot with easy access by maintenance personnel, ensuring round-the-clock availability in the event of emergency.

Diagnostic functions and a wear indicator continuously provide information about sensor status (Fig. 3). Preventive maintenance requirement is rapidly recognized, either at the transmitter itself or through an alert at the central control room.

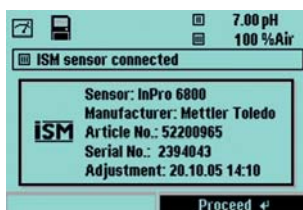


Fig.2 Rapid and easy installation thanks to "Plug & Measure".

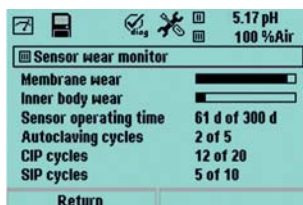


Fig.3 Optimization of maintenance due to a wear indicator .

Summary and perspectives

Inline pH and oxygen sensors with integrated microchip for storage of sensor-specific data and information on sensor wear provide rapid and graphic information on measurement capacity. This ensures that even in demanding applications at high temperatures and/or with frequent exposure to aggressive CIP solutions, preventive maintenance action is diagnosed and indicated in good time. This increases reliability and availability of the measuring point. **Maintenance effort can be reduced and the risk of unplanned plant downtimes due to incorrect measurement values diminished.**

And it is just precisely the measurement of pH – which breweries feel needs excessive maintenance attention – that offers further potential for almost full automation of the measuring point.

METTLER TOLEDO supplies alongside ISM® technology for sensor precalibration in the lab, other special equipment designed to eliminate practically all maintenance effort surrounding inline measurement. EasyClean systems for automated cleaning and calibration of sensors fully control the movement of a pH electrode between the measurement and the maintenance position. This system also controls sensor flushing and calibration cycles, using solutions drawn from appropriate media containers. Such systems have already been installed by METTLER TOLEDO in many famous breweries, leading to a marked reduction in process costs and assisting in achieving increased productivity.

www.mtpro.com/pH



New Trends in Process Analytics for Brewing Processes

Dr. Stefan Bardeck at METTLER TOLEDO, is a proven expert for process measuring systems in breweries. In this function he is traveling around the globe consulting our customers to optimize their processes and to improve profitability.



Dr. Bardeck, the art of brewing beer has been practiced since ancient times. Despite this, one today still hears and reads quite a lot about improvement potential for the brewing process.

That is correct. The brewing sector is basically very traditionally-minded. However, in addition to just water, malt, hops, yeast, and a committed brewing team, it is also necessary to employ the most modern processes in order to produce beers and innovative mixed beverages to meet consumers' expectations in a progressively global and ever more severely competitive market. These modern automated processes are optimized and monitored with the help of our process analytical systems.

What chief benefits does the customer stand to gain through selective process optimization and monitoring?

By using inline analysis, relevant measurement data is instantly available to the brewery, 24 hours a day. This makes it possible to reproduce individual process stages and to increase productivity. At the same time, our systems contribute to the consistent, uninterrupted monitoring of the quality of the wort and of the beer, thereby pre-

venting costly plant standstills due to quality deviations being recognized too late.

You talk about improved beer quality. Which process stages is it particularly important to monitor and control?

Our equipment is used for measurement of the parameters oxygen, turbidity, pH and conductivity, both in the brewhouse and in the cold area, right through to actual filling. Our portable oxygen measurement meters have met with particular success here. Any unwelcome oxygen ingress into the beer is immediately detected and quantified, and only beer with a very low oxygen content is then packaged. This ensures that the consumer receives a beer with long storage life and improved flavor stability.

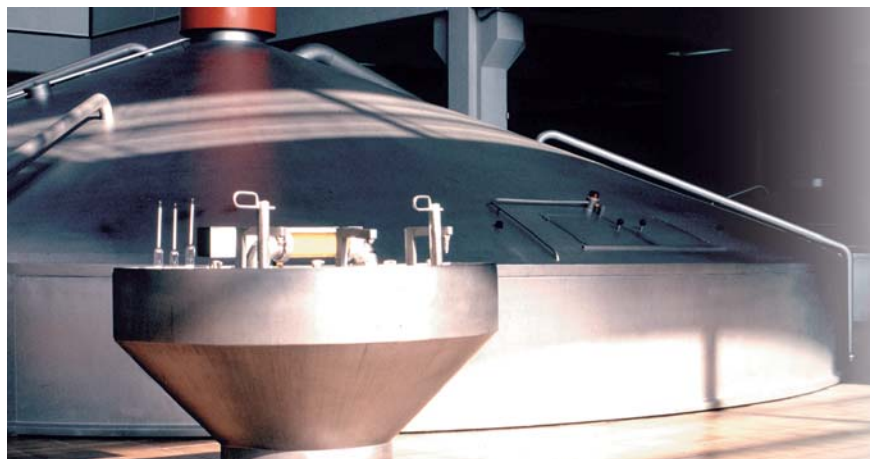
What demands do customers place on process analytical systems in order to be able to meet these objectives?

In the main there are three points: reliability, ruggedness and service-friendly de-

sign. This means that for instance 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-capability, and modularity. Moreover, we design our transmitters such that they are easy to operate, and also available in current fieldbus versions suitable for trouble-free, smooth integration. It is this last point that makes our equipment so highly interesting for brewery plant constructors.

Does this information apply to both small and large breweries, and are there any regional or other differences in this respect?

In the case of large breweries – here I'm thinking of ones with an output of 500,000 hl/year and over – inline 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 of those without any own laboratory at all,



a relatively easy-to-install inline measuring point can provide valuable information for identifying potential savings opportunities. Regionally there are certainly some differences relative to market growth and sharpness of competition. In Eastern Europe and Asia, beer consumption is growing annually at a two-digit rate, whereas in Central Europe there appears to be a slight decline. Increased productivity and reduced costs are synonymous as arguments in favor of the employment of process analytics.

Alongside quality criteria, you now also mention operative and financial improvements. What do you understand by these?

I have already mentioned avoiding unnecessary plant standstills. However, at the same time it is also important to be aware of the consequential (running) costs of a measurement system after it has been installed. Particularly in brewery circles, where pH measurement is considered to be a high-maintenance element, it pays to critically question assurances given about

potential sensor life and maintenance intervals before deciding on any specific measurement system. The costs for spare parts and servicing can vary strongly from supplier to supplier.

As specialist at METTLER TOLEDO for process measurement technology in breweries, you are certainly able to provide some practical examples to illustrate this statement.

Well, yes. I have in mind for instance, our pH electrodes, their design and the material they are made of. According to the widespread opinion of customers, these electrodes are among those with the longest serviceable life available on the market. Indeed, lifetime and maintenance intervals of the electrodes can be extended even further by using them in conjunction with one of our retractable housings and by employing new ISM technology – as explained elsewhere in this Newsletter. The same also applies basically to our oxygen sensors, their modular design making part-replacement to child's play.

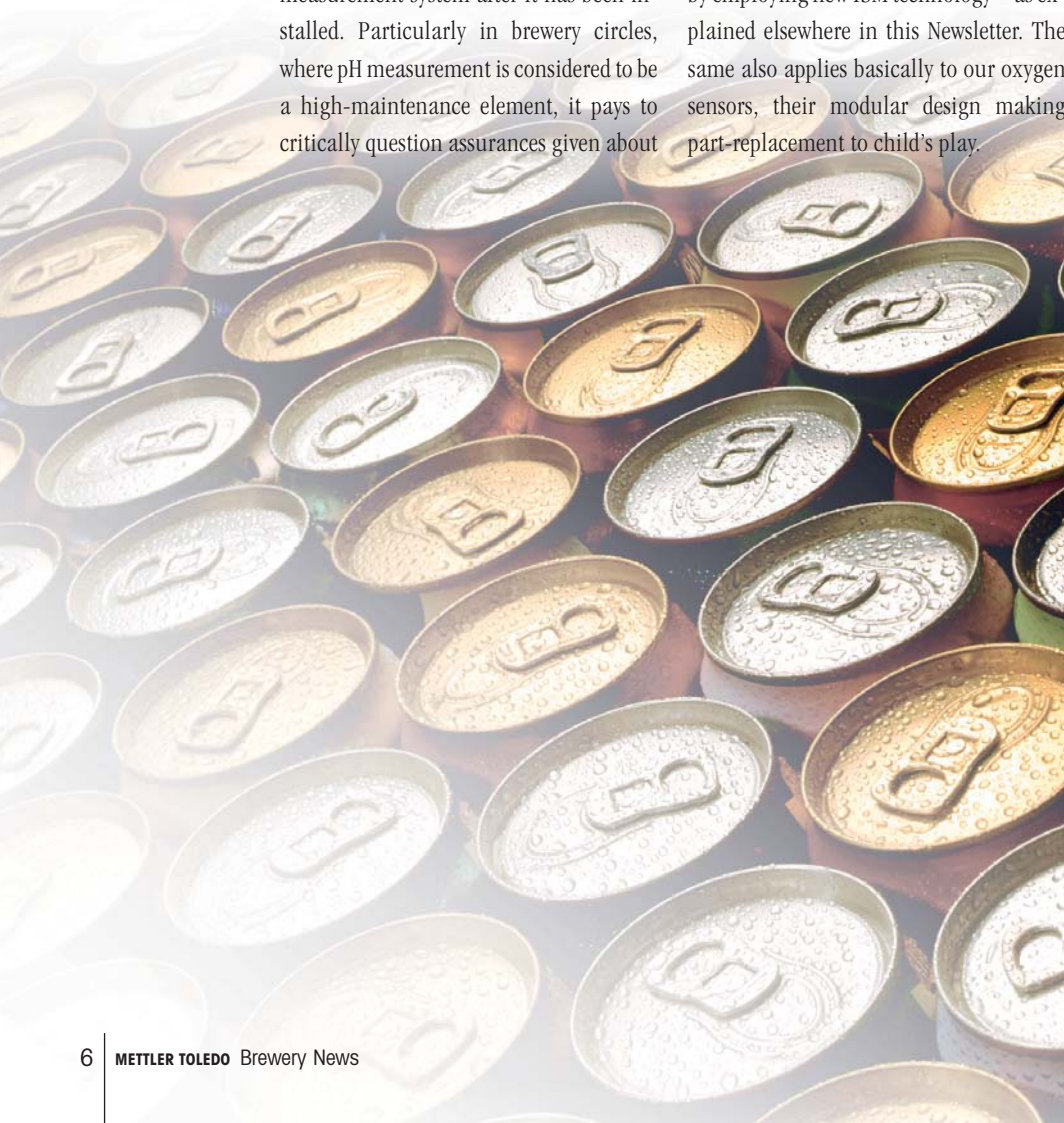
In those areas where brewing skills will continue to develop, process analytics will certainly continue to develop, too. What trends do you recognize?

I see two focal areas. Firstly, in an ever increasing number of process steps, certain relevant parameters, currently non-measurable with present-day techniques, will become accessible inline through the development of new or improved devices. Secondly, the measuring point will become increasingly more intelligent, i.e. it will be able to perform self-monitoring and inform plant operators in an easily understood way about the actual operational state, or how this can be improved.

I assume that METTLER TOLEDO is also active in this respect. Can you already reveal what we can expect from you?

As far as "intelligent measuring points" is concerned, we have already taken a first step with our ISM technology. We will resolutely proceed with this concept and expand it step by step to include our other parameter measurement equipment. Concerning the first point mentioned, we will, as in the past, also continue to develop solutions in cooperation with customers. You can therefore certainly reckon on a continued flow of innovative products and systems from our company well into the future.

Dr. Bardeck, thank you for this interview.



Turn Your Storage Tanks into a Long Lasting and Reliable Inventory Monitoring System

METTLER TOLEDO is the world's largest manufacturer of weighing instruments. Below you will find an example of our involvement in the brewing industry.

Effective inventory control is a vital function to help insure the success of your production facility.

A recent article in "The Manager"¹⁾ states that "in virtually all manufacturing companies, there is a direct correlation between inventory levels and overall business performance. Very often CEO's and CFO's believe that their companies consistently carry 25-40 percent more inventory than needed".

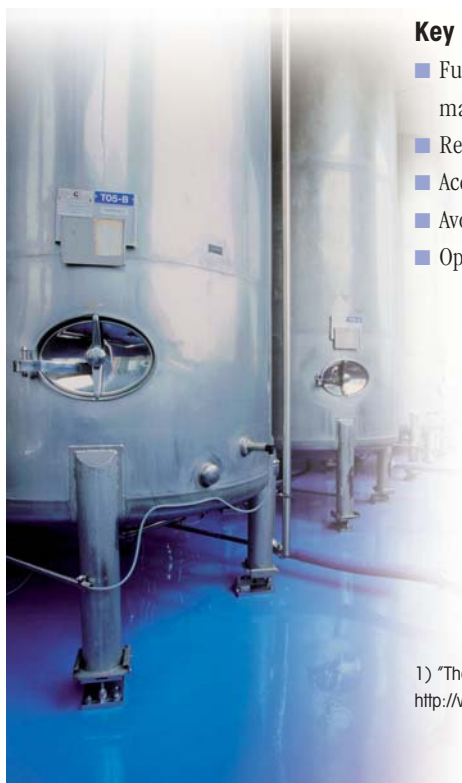
However, improvement of business performance does not necessarily imply squeezing inventory to the bone. Such draconian measures can have a negative impact because the needed material is not stocked in inventory.

Keep your inventory under control

Designing an efficient inventory monitoring strategy includes utilizing the right hardware to ensure that the stocked materials such as solids, liquids, and gases are quantified accurately. If it comes to the crunch, quantifying your inventory means weighing them accurately and reliably, whether they are stored in tanks, big bags, or barrels. Starting with weigh modules and data transmitters, then combining them into expert weighing systems: with solutions from METTLER TOLEDO you are laying the foundation stone for an efficient inventory monitoring strategy.

Key benefits

- Full transparency of your stocked material
- Real-time inventory data availability
- Accurate planning of material usage
- Avoidance of material shortages
- Optimized material turnover



1) "The Manager": <http://www.refresher.com/undercontrol.html>



PLC.

IND130

- RS 232, Profibus® DP, Allen-Bradley® RIO
- Up to four 350 Ω load cells
- CalFREE™ calibration without test weights
- TraxDSP™ digital vibration filtering



IND130 weight transmitter.

Flexmount/Flexmount® HD weigh modules

- Anti-lift device restrains tank from tipping
- Carbon steel and stainless steel design
- Accuracy: 3000d OIML & NTEP 10000d CIHL
- Flexmount capacity range: 220 to 20412kg (250 to 45000lb)
- Flexmount HD capacity range: 22000 to 90000kg (50000 to 200000lb)
- Hazardous Area: ATEX and FM approvals



Flexmountweigh module.

Process Analytics Product Catalog and SpecBook

The Process Analytics Catalog and the SpecBook of METTLER TOLEDO are proven, frequently consulted reference books either to get an overview of all products on offer or to provide plant engineers with the relevant information to design their plant architecture.

Process Analytics Catalog

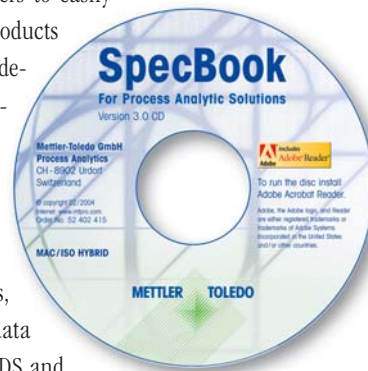
The catalog offers comprehensive overview on Process Analytics Measurement Solutions key products features, customer benefits, recommended application areas, order numbers and much more. The catalog comprises complete measuring solutions for the following parameter

- pH
- Dissolved oxygen and O₂ in gases
- CO₂
- Conductivity
- Turbidity



SpecBook

The SpecBook allows engineers to easily define and select the right products for their process during the design stage of a plant and during preparation of the relevant technical specification. The SpecBook technical CD version 3.0 also provides comfortable navigation aids, product manuals, technical data sheets, application notes, MSDS and others.



Please contact your METTLER TOLEDO representative to obtain these documents.

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Visit for more information