Analytical Measurement Solutions for Optimization of Your Brewing Process
METTLER TOLEDO – Commitment to Innovation and Quality

METTLER TOLEDO Group

Our organization specializes in the area of precision instrument equipment and related services for industry. In the business year 2008, the Group generated revenues of over US$2.0 billion. The company has been listed on the New York Stock Exchange since 1997.

Worldwide presence
We have a worldwide distributor network and a workforce of more than 10,000 employees. We support our customers in industry by providing comprehensive solutions for individual steps of their particular manufacturing processes — from receipt of material, over the separate production stages with in-line process measurement, through to final packaging control, logistics and shipping. METTLER TOLEDO solutions can be optimally integrated into an existing IT environment.

METTLER TOLEDO instruments are employed in research and development equally as much as for quality control purposes. The pharmaceutical, chemical, food & beverage, and cosmetic industries are among the principal users.

Innovation and quality
Our company enjoys an excellent reputation as an innovator, and currently we invest between 90 and 110 US$ million annually in research and development, having increased our overall R&D spending by an average of more than 10% each year for the past five years. The organization takes every effort to meet the highest quality standards, resolutely applying Total Quality Management at both product and process level, but particularly also as part of support for customers to comply with international guidelines.

Process Analytics Division
Within the METTLER TOLEDO Group, the Process Analytics Division concentrates on analytical system solutions for industrial manufacturing processes.

The Division consists of two business units, INGOLD and THORNTON, both internationally recognized leaders in their respective markets and technologies.
INGOLD – Leading Process Analytics

Ingold Ltd, founded in 1948 by Dr. Werner Ingold, and taken over by Mettler Ltd. in 1986, is today a core element of the Mettler-Toledo Process Analytics Division.

A leader in process analytics
Centered around INGOLD products, METTLER TOLEDO has established itself internationally as the leading supplier of process analytical measuring systems for the parameters pH, ORP, dissolved oxygen, oxygen in gases, conductivity, and turbidity/color – whether for applications in the chemical and pharmaceutical industries, in biotechnology, the food and beverage sector or in water and wastewater treatment facilities.

Customer-oriented developments
INGOLD products are characterized by high quality and intelligent, detailed technical solutions. Our aim is to develop innovative, reliable, easy-to-use process analytics in cooperation with customers. Innovations such as the first sterilizable oxygen sensors, automatic calibrations systems, hygienic retractable housings, and new intelligent pH electrodes and dissolved oxygen sensors, as well as integrated turbidity systems provide improved handling, and enhance the accuracy and reliability of the measuring point.

INGOLD stands for technological, high-quality measurement solutions tailored to specific applications in the area of process analytics.

Solutions for Breweries and Plant Engineering

Apart from the well-known basic ingredients used in the making of beer, modern automated processes are decisive for the market success of a beer or shandy.

INGOLD renders an important contribution towards the automation of beverage plants through its offering of process analytical instrumentation which includes outstanding benefits such as:
• accuracy and reliability
• high level of user-friendliness
• hygienic design of wetted parts
• straightforward process integration

One of the latest examples is our new, intelligent optical dissolved oxygen measuring system for monitoring of filtration, blending and filling processes.

An experienced team of application specialists and service technicians are ready to help you in:
• optimizing your process
• sustaining high product quality
• lowering maintenance costs
• increasing yield
From Brew House to Filling Station
the Advantages of INGOLD Measurement Technology

The beer market is currently experiencing an intense globalization process, reflected in escalating competitive and cost pressures. In addition to this, there is growing diversification into new, innovative beverages that demand maximum production flexibility. The time to market is becoming ever shorter, and product quality has to be guaranteed at a consistently high level, accompanied by an increase in productivity.
METTLER TOLEDO supplies complete measurement solutions – covering the water treatment stage right through to the packaging station – for the parameters:

- dissolved oxygen
- oxygen in gases
- turbidity
- color
- conductivity
- pH

Use of INGOLD measurement systems from METTLER TOLEDO in the brewing industry

<table>
<thead>
<tr>
<th>Process</th>
<th>Measurement position</th>
<th>Dissolved oxygen</th>
<th>Oxygen in gas</th>
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<th>pH</th>
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</table>

The measurement position numbers given in the above table correspond with the numbers in bold print on the following pages in this brochure.
In-line Measurements in the Brew House – Crucial to the Quality of the Wort

Proper process control plays a vital role in determining the flavor, foam stability, and color of the finished beer. The relative measurement sensors are exposed to high temperatures, and solid particles and turbidity constituents, and must be capable of surviving multiple CIP cycles.

Measurement of pH value during mashing
When acidifying the mashing-in water or when mashing at lower temperatures, it is advisable to employ an unbreakable ISFET pH electrode. This takes on particular significance if the spent grains are to be sold on the market.

Measurement of pH value during wort acidification
Maintaining the correct pH value during boiling of the wort is important in order to improve protein release. Due to the elevated temperature however, only low-maintenance glass electrodes can be taken into consideration.

The significance of a retractable housing
The use of a retractable housing prolongs the serviceable life of electrodes, since the latter are only brought into the actual measuring position during the decisive acidification phases, being afterwards retracted into the maintenance position without interrupting the ongoing process.

Mettler Toledo recommends
- For mash acidification
  Non-glass pH electrode InPro 3300: highest level of process safety.
- For wort acidification
  pH electrode InPro 3253 i: Accurate and robust.
- Retractable housing InTrac 777 e
  Maintenance of pH electrode without process interruption.
- Transmitter M400
  High versatility thanks to mixed-mode input for conventional and intelligent sensors.
- ISM (Intelligent Sensor Management)
  Facilitates start-up, and signals imminent maintenance requirement based on the actual sensor status.
- iSense Asset Suite
  PC software for pre-calibration and management of ISM sensors in a safe and clean environment.

Mettler Toledo measurement systems are completed by a user-friendly transmitter that enables extremely cost-effective operation of the measuring point.
Turbidity measurement in the lauter tun and whirlpool

Turbidity measurements are employed to optimize filtration of the lauter tun and mash filter run-offs, and/or to document charge traceability at the whirlpool. In line with a MEBAK (Central European Brewing Technology Analysis Commission) recommendation, an optical forward light scattering measurement using dirt-resistant sensor technology is required.

METTLER TOLEDO turbidity measurement equipment meets this requirement with a compact, 25° forward scattered light system using fouling-resistant sapphire optics. The resulting, error-free measurements guarantee highest productivity and optimal quality of the wort.

METTLER TOLEDO recommends

- **Turbidity sensor InPro 8600**
  The compact and robust construction guarantees easy and safe installation.
  State-of-the-art manufacture using low-wear components reduces maintenance costs.

- **Transmitter Trb 8300 D**
  Intuitive operator control enables time-saving during start-up and configuration.

- **Wireless communication option**
  One PDA or laptop in conjunction with Bluetooth wireless communication can be used to configure and check out several different sensor units. Alternatively, transfer of measurement data can be realized through a direct wiring connection between sensor and control system. This is a cost-effective alternative for consideration during plant design.
Measurements in the Fermentation and Storage Cellars – where Hygiene is Imperative

At standard fermentation temperatures, propagation of microorganisms is detrimental to the beer. In order to prevent this from occurring, hygienic plant design and use of materials resistant to CIP solutions are important criteria, as they are for in-line sensors.

Measurement of dissolved oxygen (DO) content
The quality and vitality of the yeast strongly influence the stability of the flavor of a beer. Correct oxygen concentration during the fermentation process ensures the desired concentration of aromas and of those substances which prevent premature aging of the beer.

Measurement of residual oxygen content in CO₂ gas
Recovery of carbon dioxide from the fermentation off-gas is an important aspect relative to cost saving. Before utilization, the CO₂ must undergo purification treatment in order to arrive at the required low residual oxygen concentration. The purified CO₂ gas is also used for post-carbonation of beer. Consequently the residual oxygen content in purified CO₂ gas must be as low as possible.

Phase separation yeast/beer
Reliable and reproducible detection of phase transitions in yeast/beer separation processes after fermentation and storage leads to a higher yield of recovered yeast and beer.

METTLER TOLEDO recommends

- **For yeast propagation and wort aeration**
  DO sensor InPro 6850 i: high process safety due to hygienic design – EHEDG certified. Also, the intelligent sensor version convinces with extremely short maintenance times due to its modular design.

- **For CO₂ gas phase measurements**
  O₂ sensor InPro 6950 i: intelligent sensor with low detection limit.

- **Transmitter M400/ISM**
  Highly versatile – for oxygen measurements in liquids and gases. The transmitter fully supports METTLER TOLEDO’s ISM technology for easy system start-up and preventative maintenance requirements.

- **For phase separation yeast/beer**
  The optical product monitor InPro 8300 RAMS is easy to install and operates almost maintenance-free.

METTLER TOLEDO instruments are maintenance-friendly and provide clearly displayed diagnostic functions. This leads to greatly improved performance and operational availability.
Measurements during Filtration and Filling
improved Flavor Stability and Shelf Life

Crucial to the quality of beer is that during storage, as well as afterwards when proceeding to final packaging, there is very little oxygen ingress and no liberation of substances that can cause haze formation. Supplementary measurements of pH values support Quality Assurance procedures.

Dissolved oxygen (DO) measurement during water deaeration, blending, filtration and filling

Oxygen concentration values below 25µg/liter (ppb) represent standard limits for beer before packaging, as well as for the evaluation of plant components regarding possible oxygen uptake.

For use in the above mentioned process stages, METTLER TOLEDO offers high-precision and maintenance-friendly in-line DO measurement systems. The newly available optical DO systems based on fluorescence quenching technology set the benchmark regarding easy sensor handling and longer operational availability. The unique combination with ISM (Intelligent Sensor Management) technology provides further powerful tools for preventive maintenance requirements and minimized risk of unscheduled plant downtime.

METTLER TOLEDO recommends

For DO measurements:
- Transmitter M400
  Real-time monitoring tools of current sensor status like the Dynamic Life-time Indicator (DLI) and the Adaptive Calibration Timer (ACT) support predictive maintenance requirements.
- DO Sensor InPro 6970i
  The optical measurement principle leads to easy handling and extended maintenance intervals.

For product identification in filling lines:
- Optical product monitor InPro 8300 RAMS
  Easy installation, maintenance and calibration requirements are main features of this monitor thanks to its compact design.

Product monitoring in filling lines

Real-time identification of the current product in the filling line with optical product monitors, and an early alarm in the event of an unwanted product change, increase process safety.
Turbidity measurement during beer filtration

The visual appearance of a beer – its brightness and its color – is as much a quality criterion as is its fresh flavor. Optical dual-angle measurement instruments allow a prediction of whether the turbidity in the beer is caused by particles such as yeast and/or filter aids or through dissolved colloids such as proteins and/or glucans causing opalescence.

METTLER TOLEDO offers an innovative solution for all types of filtration methods such as Kieselguhr, Kieselguhr-free, membrane or stabilization filters. Optimal design features allow direct comparison with standard laboratory instruments, reducing the risk of any misinterpretation.

Optional color measurement in blending processes

Blending of beer with deoxygenated water, coloring beer or other additives influences the appearance of the final beverage. Beverage brightness and color – or to be exact, the yellowness – can be monitored with the combined turbidity/color unit.

METTLER TOLEDO recommends

- **Turbidity sensor InPro 8600**
  Scattered light measurement 25°/90° provides reliable recognition of filter breakthroughs and the detection of dissolved colloids.
  State-of-the-art design and manufacture using wear-resistant components reduces maintenance costs.

- **Turbidity/Color sensor InPro 8600/W/3**
  Simultaneous measurement of beverage brightness and color provided by one compact sensor reduces investment and installation costs.

- **Bluetooth communication for full integration**
  One PDA or laptop in conjunction with Bluetooth wireless communication can be used to configure and check out several different sensor units.
  Alternatively, transfer of measurement data can be realized through a direct wiring connection between sensor and control system. This is a cost-effective alternative for consideration during plant design.
Measurement of pH values in wort transfer and filling lines

To increase operational safety, pH measurement in these lines provides a valuable service. The immediate detection of residual caustic soda solution or breakthroughs into the product prevents filling of contaminated end product.

METTLER TOLEDO also offers EasyClean systems for automated sensor cleaning and calibration in order to achieve maximum equipment availability at minimum maintenance effort.

METTLER TOLEDO recommends

EasyClean cleaning and calibration system
- Optimal adaptation to the process conditions thanks to wide range of program sequences.
- Low maintenance costs due to minimal consumption of buffer and cleaning solutions as well as longer electrode life guaranteed.
- Linking to process control systems possible either conventionally or via PROFI BUS® PA.
Measurements in CIP Systems and in the Water Treatment Processes

The economic use of fresh water, as well as the multiple use of cleaning solutions, present a further basis for achieving overall cost reduction in line with the strive for greater efficiency of the brewing process. Here also, in-line systems are of help in monitoring and optimizing the relative sub-processes.

Measurement of conductivity and pH value in CIP plants and water treatment

When increasing the concentration of the caustic solution in the CIP batch tank and for separation of the cleaning solutions in return pipes, conductivity systems provide a proven service. The compact-design sensors can be installed without problem in pipes with a narrow cross-section. The user software of the pH and conductivity transmitter is easily understandable.

METTLER TOLEDO systems facilitate the initial instruction and training of personnel. The associated pH electrode is particularly cost-efficient due to its long operational life.

METTLER TOLEDO recommends

- **Conductivity sensor InPro 7108**
  Compact and hygienic design provide optimal results.

- **pH electrode InPro 3250**
  Long-life electrode with precision measurement performance due to unique combination of self-cleaning reference system and special membrane glass.

- **Transmitter M300**
  Reliable and user-friendly.
  Optional dual-channel measurement reduces investment and installation costs.
Measurements in Wastewater Treatment Facilities

Fouling of sensors in wastewater leads to uncertainty about the measurement results and can even result in measurement system failure. Here also METTLER TOLEDO provides efficient and practical solutions.

Measurement of pH value, oxygen concentration, conductivity and suspended solids in wastewater treatment facilities

Effective, automated cleaning of sensors increases their operational life.

METTLER TOLEDO offers an efficient sensor cleaning system covering the parameters pH, oxygen and suspended solids, which takes the burden off maintenance personnel and lowers operating costs. Conductivity can be measured using an inductive sensor insensitive to contamination.

METTLER TOLEDO recommends

- **EasyClean 100/InDip 550**
  For installation in open basins and channels. Effective sensor cleaning at application-specific intervals provides assurance of high operational reliability with minimal costs for maintenance and spare parts.

- **pH, O₂, conductivity, suspended solids**
  Inexpensive sensor alternatives in METTLER TOLEDO quality ensure reliable measurement performance.
Service Offerings Covering our Products –
for End-Users and System Fabricators

METTLER TOLEDO offers attractive services to customers, ranging from product guidance, through installation, to service contracts.

ServiceXXL – a METTLER TOLEDO service concept
Our comprehensive sales advisory and technical services have established us as a competent partner for our customers everywhere in the world. Many globally manufacturing companies trust in our competence and long-standing experience.

Services offering
METTLER TOLEDO offers very attractive service options, ranging from product guidance, over installation through to maintenance contracts. For the brewing industry specifically, we offer the following services:

- Repair work at service depot
- Sensor refurbishment
- Installation/commissioning
- Training/seminars
- Maintenance contracts
- On-site qualification/verification

Distribution network
Based at several global production sites, with more than 30 market organizations and numerous sales representatives, METTLER TOLEDO maintains a worldwide distribution network and is always close to its customers.

Online support for the brewing industry
METTLER TOLEDO offers the brewing industry a special interactive section on the Internet at www.mt.com/Beer, in which applications and useful information as well as some tips relative to process analytics can be found.

Plant engineering
Time is money. Our detailed product documentation (SpecBook) together with local support during specification, installation and commissioning contribute to on-schedule project realization.
Digital Communication

System Integration with PROFIBUS®
Easy – Fast – Cost-Saving

The fieldbus protocol PROFIBUS® enables you to fully benefit from the advantages of digital communication. METTLER TOLEDO supports integration of analytical measurement into PROFIBUS® process control systems via a range of appropriate, high-performance transmitters for pH, dissolved oxygen and conductivity.

In modern breweries, PROFIBUS® is widely used as a cost-saving technology to improve productivity. METTLER TOLEDO instruments are PROFIBUS® certified and therefore easy to integrate.

In addition, users are provided with state-of-the-art diagnostics technology in order to achieve enhanced process safety.

Advantages of the PROFIBUS® PA transmitter from METTLER TOLEDO

- The GSD files accompanying the transmitters enable complete integration of pH, O2 and conductivity solutions into the process control system.
- Power for the METTLER TOLEDO Advanced Line PROFIBUS® PA transmitters is supplied via the bus.
- PROFIBUS® transmitters from METTLER TOLEDO are fully integrated in the device library of SIMATIC® PDM. Straightforward integration and management during the entire lifespan save both time and money.
- ISM (Intelligent Sensor Management) Diagnostic information and maintenance requests from ISM sensors can also be integrated into your PLC via PROFIBUS PA thus leading to a unique integrated concept for optimized maintenance management.
www.mt.com/pro
Your Online Information Center

Whether you need fast access to product information or are interested in obtaining the very latest application news, visit the METTLER TOLEDO Internet homepage for guidance. Learn about the latest applications and about our newest products for process and cost optimization.

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