

pH Measurement

in-line Monitoring in Brewery

Notes



pH non-glass electrode InPro®3300/ISFET: **ISFET technology opens a wide range of pH in-line measurement opportunities in beer analysis.**

Following the current trend in the food and beverage (F&B) industry, breweries are now also turning more and more to the use of non-glass electrodes for in-line pH measurement. The intention is to establish control of production processes as well as monitoring of product quality during the entire process. METTLER TOLEDO's InPro 3300 electrode for F&B, based on innovative ISFET technology, allows both, and was therefore tested by our customer, a well-known German brewery.

With an output of nearly 5 Mio. hectoliters, our customer is one of the most important breweries in Germany. Since sustainability, quality, and continuous improvement are important guidelines for our customer, he invests nearly 10 % of his total turnover in protection of the environment and further development of technology. His intention is therefore to establish more and more in-line control of parameters such as pH, turbidity and oxygen, in order to monitor the processes in real time and to be able to react within seconds.

pH is an important parameter to assure constant quality of beer prior to bottling

Although brewing is a traditional process, well known for many hundreds of years, every brewer has his own secrets for slightly refining several of the process steps to achieve a characteristic flavor of his product.

Process Analytics **Success Story**



Monitoring of quality parameters increasingly gains in importance in modern breweries.

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Malt from barley, the grain most commonly used for brewing beer, is milled and then brought together with brewing water in the mash mixer. After mashing, the liquid malt extract, the wort, is filtered in the lauter tun and then transferred to the brew kettle, where hops and corn syrup are added several times during the boiling process to add flavor. In the whirlpool tank, the wort is clarified before being transferred via a cooler to the fermentation tank. During fermentation, which lasts from five to twelve days, the added yeast transforms the sweet wort into alcoholic beer.

The beer is then centrifuged, filtered, and bottled. In order to assure that no active yeast from the fermentation remains in the beer, or that damaged filters cause contamination in the final product, our customer intended to establish inline pH measurement.

“Breakage of glass, particularly at a late stage of our production process, would be an economic disaster for us”, explains the master brewer. “Therefore it was clear to us to call up METTLER TOLEDO in Germany. We already knew their product portfolio for process control and were curious to test the new non-glass ISFET sensor, InPro 3300”.



Collection of samples in the brew process is time-consuming and therefore costly.

METTLER TOLEDO's InPro®3300 demonstrates good accuracy and a short response time

The InPro 3300 was tested in a newly established automatic beer analysis unit directly before filling. Data acquired was compared to the pH values in samples taken from the process and transferred to the laboratory for measurement with a glass electrode. *“Results were very promising”,* summarizes the director of the brewery plant. And the master

brewer adds, *“During a two-week period, we calibrated daily and had a constant deviation between ISFET inline and glass offline in the lab of around 0.15 pH units. Since we are monitoring pH as a quality parameter, and problems with the centrifuges or filters would have a significant impact on pH, this accuracy is sufficient by far”.*

The customer also understands the reason for this small deviation. ISFET technology differs completely from conventional, glass electrode technology. In the ISFET sensor, a highly sophisticated semiconductor chip takes over the role of the glass membrane.

In his statement, the customer further considers the response time of the electrode to be very good, and confirms compatibility with the applied conditions relative to pressure (1...2 bar) and the cleaning agents.



In-line quality monitoring via pH measurement eases automation of the brewing process and final bottling.

Recently, METTLER TOLEDO in Asia reported that the InPro 3300 in brewery applications is not only appreciated for monitoring of quality during production, but also in research and development (R&D) dealing with the optimization of processes.

The R&D department of a major Asian beverage company intends to study the optimization of the output of yeast cultures. After a two-month evaluation phase, they purchased a non-glass pH system, consisting of the InPro 3300, a static housing InFit 761, and an Advanced Line transmitter pH 2100e. (Refer to METTLER-TOLEDO Brewery News, No. 2, 07/2003).

Advantages and benefits for the customer

- InPro 3300 eliminates the risk of glass breakage and subsequent contamination.
- This allows safe inline measurement for the customer and therefore saves time and money.
- InPro 3300 is compliant with existing (FDA) and possible future regulations.
- The InPro 3300 displays high accuracy in comparison with glass electrodes, and is superior to competitor ISFET products.
- Long lifetime of the electrodes saves customers money.
- The 45° design of the tip of the electrode prevents air bubble coverage of the sensor surface, assuring measurement reliability.
- FDA compliant materials facilitate process validation.
- VP connector IP68 makes cleaning of the electrode easier.



Non-glass pH electrode Inpro 3300/ISFET front view.

Technical specifications InPro®330

pH range	0...14
Temperature range	0...80 °C (130 °C)
Pressure range	0...6 bar
Reference system	gel electrolyte
Diaphragm	one ceramic diaphragm
Shaft	PEEK (FDA compliant)
Connector	VarioPin (VP), IP68
Insertion length	120 mm
Temperature sensor	Pt100, Pt1000



pH transmitter 2100 e



Cable VP6-ST/ISFET



The non-glass pH electrode InPro 3300:
a successful tool for modern breweries.

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