

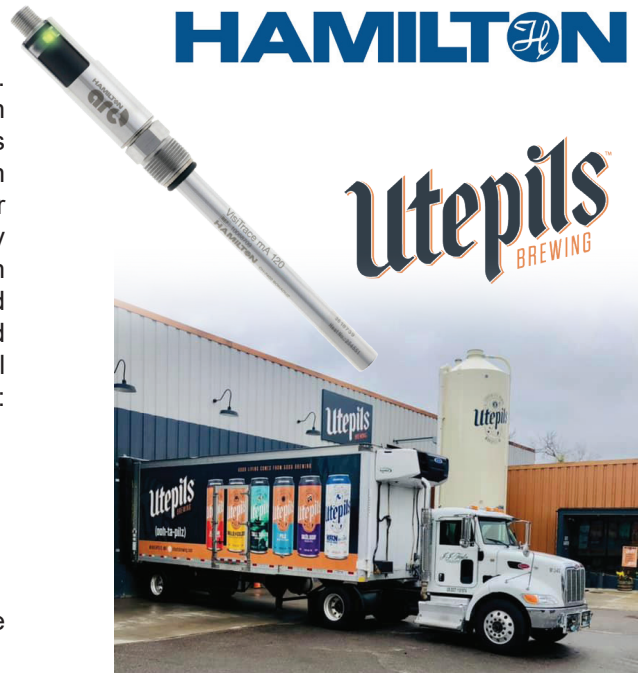
Why measure DO in Beer?

Hamilton Case Study at Utepils Brewing

Dissolved oxygen (DO) in finished beer is a recipe for disaster. While oxygen is required by yeast at the beginning of fermentation to create sterols and unsaturated fatty acids for the synthesis of cell walls, it has a detrimental effect on beer after fermentation is complete. Oxygen is highly reactive in beer and any time beer is moved there is a risk of exposing it to oxygen. Typical brewery operations such as transferring from the primary fermentation tank to a secondary maturation tank, centrifugation/filtration and packaging from a Bright Beer Tank (BBT) are all considered potential points of oxygen ingress. Through various chemical reactions, oxygen can negatively affect beer in the following manner:

- Increased Color
- Flavor (Wet cardboard, sherry, stale flavors)
- Haze Stability (Colloidal issues with metal ions, permanent haze)

Even a small amount of DO can have detrimental effects to the finished product.



Case Study – Hamilton VisiTrace mA DO Sensor Trial at Utepils Brewing - Minneapolis, MN

Utepils Brewing is a craft brewery located in Minneapolis, MN that primarily focuses on European style beers. Many of these traditional styles have a delicate balance of aroma, flavor and clarity, thus quality is of the utmost concern for the brewers at Utepils. To help achieve their quality goals, a trial was setup to measure DO inline post filtration.

The Hamilton VisiTrace mA was identified as the best sensor for this trial. The VisiTrace mA is designed to measure DO in the very low range of 0-2000 ppb and its robust design allows for frequent Sanitization in Place (SIP) and Cleaning in Place (CIP) procedures. The VisiTrace mA handles communication via Analog (4-20 mA) as well as Digital (HART) output signals which can be directly wired into a PLC or suitable power source, completely bypassing the need for a transmitter. In addition, the VisiTrace mA has integrated Bluetooth communication, allowing wireless connectivity when using the Hamilton ArcAir Software. The innovative Hamilton ArcAir software allows breweries to access the full functionality of the VisiTrace mA and other Hamilton sensors from their phone, tablet or PC. The ArcAir Software provides real time sensor results as well as the ability to trend data, perform calibrations and monitor sensor health.



Trial Process Conditions

Utepils Brewing uses a BUCHER Unipektin M-Synox candle filter to process many of their brands. The filtration speed was 40 hL/hr with a continuous body feed dosing of diatomaceous earth (DE) at a rate of approximately 3 kg/hr. The VisiTrace mA was CIPed with the filtration process equipment. A typical CIP includes a caustic wash (45 millisiemens at 85°C) followed by an acid wash (15 millisiemens at 15°C) which was completed prior to and after every filtration run. After cleaning, 80°C water was used to sanitize the filter prior to beer filtration.

Point of Measurement

The VisiTrace mA was placed inline after the BUCHER Unipektin M-Synox filter and prior to the BBT. The goal of the installation was to monitor DO ingress during the beer filtration process. Pre-coat and body feed of the BUCHER Unipektin M-Synox Filter was completed using deaerated water and DE. When filtration began, beer was introduced into the filter as the deaerated water gets pushed out to the drain. While the contents of the filter mostly remain stratified, beer and water were partially blended together as some beer is pulled through the DE membrane at the lower part of the chamber. The DO value of the filter output is used to determine when the blend was mostly beer and therefore when beer should start flowing into the BBT. Once the VisiTrace mA reads <100 ppb, the operator began filtration into the BBT.

Process Improvements

An out of specification DO value could indicate a number of possibilities such as loose connects, damaged gaskets or pump seals. High DO values could also be indicative of issues with the DE dosing tank, e.g. the DO concentration in the dosing tank is out of specification and either the flow of CO₂ needs to be increased or the dosing needs to be reduced while maintaining the differential pressure.

Throughout the filtration process at Utepils Brewing, the DO value was checked using ArcAir to determine oxygen pick up prior to exiting the filter. The VisiTrace mA installation at Utepils allowed the production staff to identify a more efficient and quality focused method to utilize deaerated water at the beginning of filtration which resulted in lower and more consistent DO values in the final product.



Benefits

Utepils Brewing identified that the largest benefit gained during the VisiTrace mA DO sensor trial was the reassurance that their beer was of the highest quality, thanks to consistently low DO values. Using real-time results allowed the production staff at Utepils to validate their existing Standard Operating Procedure (SOP) and improve both the shelf life and total quality of their product. In addition, the data logging capabilities of the ArcAir software helped trend DO pickup over the course of filtration to allow continuous improvement of the SOP. Lastly, the real-time data resulted in more strict but achievable benchmarks for allowable DO in process and in the final product.

“The VisiTrace was easy to install in our filtration line, and the Bluetooth connection to Hamilton’s ArcAir software made commissioning and calibrating the meter very simple.” explains Eric Harper, Head Brewer at Utepils. *“The filter operators now have access to real time, actionable data, that I believe makes an improvement in the quality of our beer.”*

In addition to the benefits identified during this case study, there are numerous quality benefits of using the VisiTrace mA inline and in real time. The ability to monitor sensor readings in real time and from a mobile platform using Bluetooth technology and the ArcAir software allows a brewer to identify, investigate and remedy issues before they manifest in a tank and cause potential quality issues. Calibration of the VisiTrace mA can be done at the point of installation using ArcAir which can reduce downtime. In addition, having the VisiTrace mA inline allows a brewer to check DO values prior to reaching the sample port of a BBT and there is no product waste such as with a portable meter.

During the trial period, no parts had to be replaced and no calibrations were required.



Important Note: Gusmer Enterprises, Inc. provides this information to the best of our knowledge. This information does not claim to be complete and Gusmer Enterprises, Inc. cannot assume liability for improper use. All users are advised to test products to meet their specific needs.