White Paper

INGOLD
Leading Process Analytics

Trouble-Free Calibration Procedure
for Dissolved Oxygen Systems

In breweries and beverage production sites, in-line dissolved oxygen (DO) measurement systems are installed for continuous monitoring of critical DO levels. Reliable performance and accurate readings from these instruments are ensured by calibrating them on a regular base. This is typically done by adjusting the in-line reading to a reference provided by a portable DO unit. An advanced workflow concept minimizes time spent on this task and eliminates the risk of operator error.

The importance of calibrating oxygen sensors

As is well known, the quality of beer and other oxidation-sensitive beverages is influenced by the concentration of dissolved oxygen. Excessively high DO levels adversely affect the taste profile and shelf life of packaged beverages.

Typical measurement points in the brewing process for monitoring unwanted DO intake are fermentation and storage transfer lines, filtration, blending and filling lines. In recent years in-line DO measuring systems based on optical sensor technology[1)] have been installed directly in production pipes. These systems feature accurate and reproducible measurement in the low ppb range, a fast response time and long maintenance intervals[2)]. Since these in-line sensors are exposed to harsh Cleaning-in-Place (CIP) cycles, they are routinely checked for their performance and recalibrated in case a deviation to a reference DO reading is detected. This process ensures measurement reliability and minimizes the risk of false readings that could lead to time-consuming troubleshooting.

METTLER TOLEDO

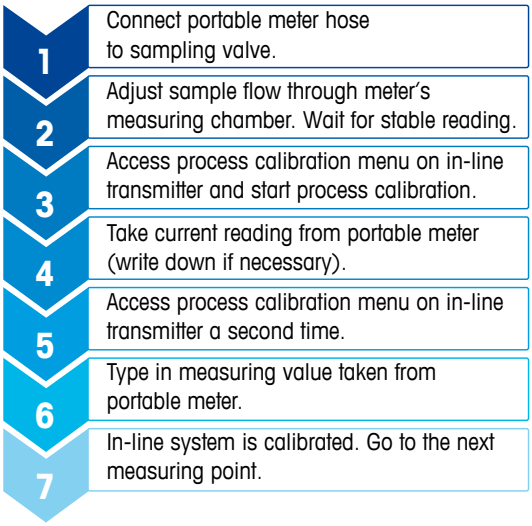


Fig 1. Typical workflow for calibration of an in-line DO system with a reference portable meter

Current workflow

Portable DO meters are typically used to check the performance of the in-line unit and to provide the reference (true) value. For this purpose such meters are connected with a non-oxygen permeable hose to a standard sampling valve close to the in-line sensor installation point. Once the sampling valve is opened, the beer sample flows through the measurement chamber of the portable meter and is analyzed for its DO content. If the in-line system shows a different reading to the portable meter, the in-line sensor is adapted to that of the portable meter by a one-point calibration (also called a process or sample calibration). This is done manually by the operator who needs to access the corresponding in-line transmitter calibration menu. The complete work flow of this process is shown in Fig. 1.

Operator challenges

The above described workflow bears several risks of human error occurring that may lead to an incorrect calibration of the in-line DO system and subsequent false readings that could jeopardize beverage quality and/or process efficiency. Especially the manual copying of the portable meter reading into the in-line transmitter calibration menu is prone to mistakes. Another aspect to be considered is that typically, several DO in-line units have to be checked during a routine inspection tour. The goal should be to finish such an inspection tour as efficiently as possible. Further, the same measurement technology should be used in the in-line sensor and portable meter to guarantee comparable and consistent measurements.

Smart workflow – METTLER TOLEDO solution

The portable InTap™ DO meter helps to improve routine inspection tours for in-line DO systems with regards to time savings and minimizing the risk of incorrect calibration of METTLER TOLEDO in-line DO systems (Fig. 2). It is the perfect reference instrument for installed optical DO sensors because it uses optical sensor components that are identical to the METTLER TOLEDO in-line optical sensors.

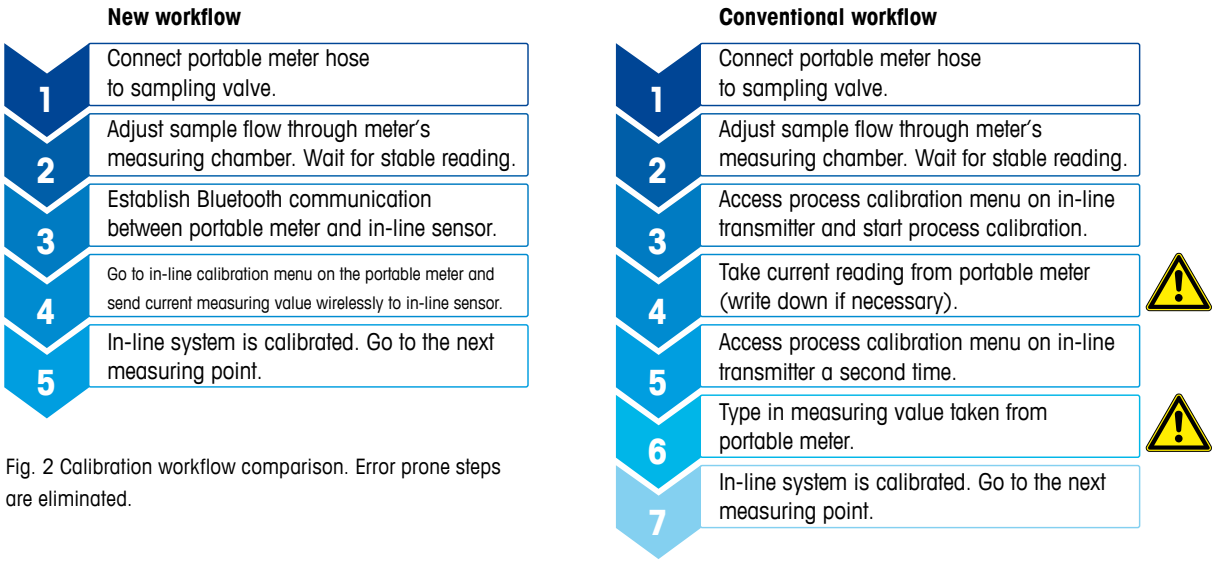
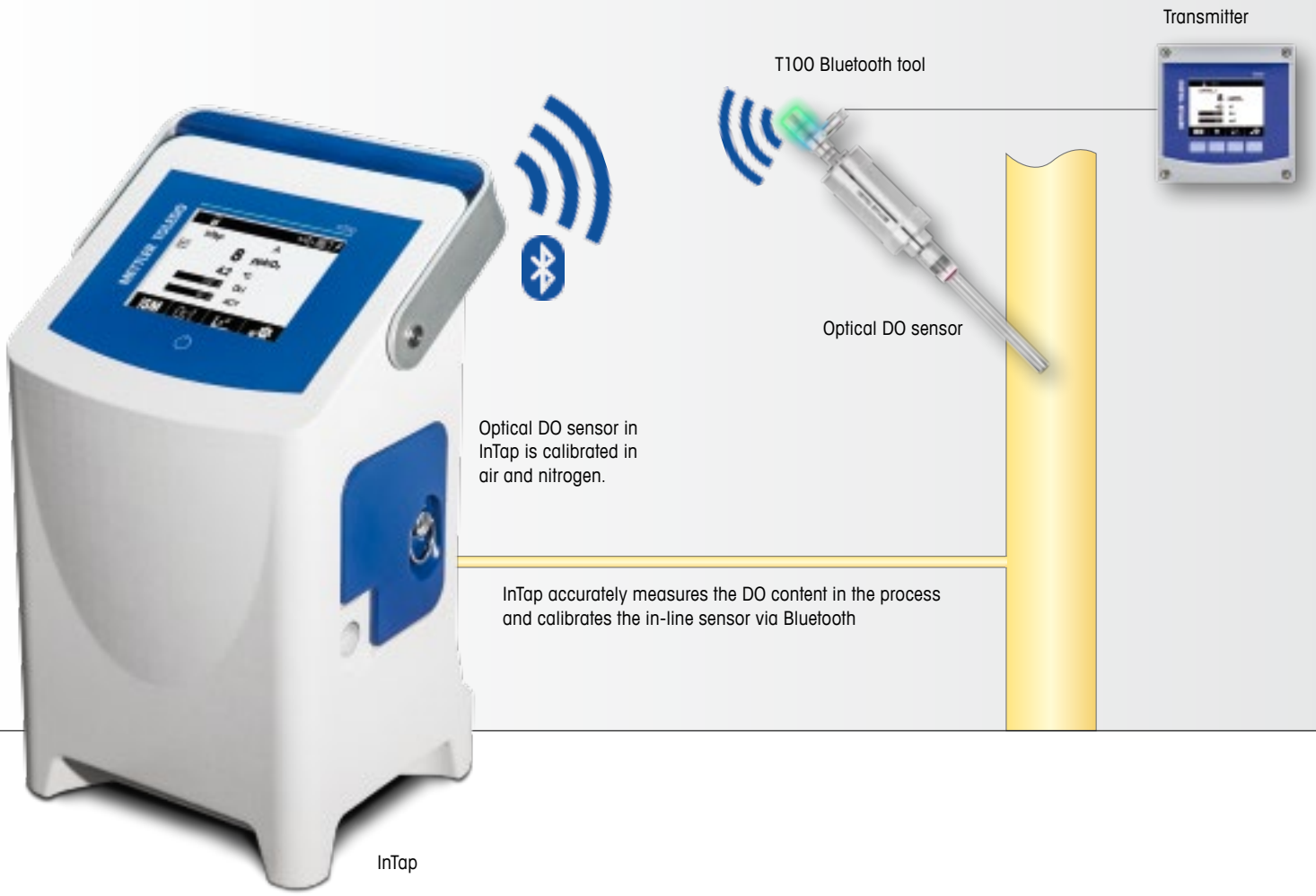


Fig. 2 Calibration workflow comparison. Error prone steps are eliminated.



InTap features Bluetooth communication technology that allows calibration information to be written safely and quickly from the InTap directly to in-line optical DO sensors that are equipped with a T100 Bluetooth tool. The risk of manual copying errors is therefore eliminated. Measurement point tracking in InTap allows operators to easily tie the measurement data to different places in production, and maintain records point-by-point for traceability and documentation purposes.

Trouble-free calibration of the portable reference meter

Since the portable DO instrument serves as a reference for the calibration of the in-line systems, its accuracy is of paramount importance. As with every measurement device, a correct calibration is the basic requirement to achieve high accuracy. The oxygen sensor in the InTap can be calibrated with a two-point calibration procedure[3]. Calibration media are: 1. ambient air (for the slope), 2. oxygen-free gas (for the zero point). For calibration in air, the local ambient air pressure and humidity must be known and accounted for. For example, using an ambient air pressure of 1,000 mbar instead of 1,020 mbar results in an error of 2 %.

Fact Box InTap

- Fast and accurate optical dissolved oxygen measurement
- Wireless communication with in-line sensors for calibration purposes
- Calibration report management
- 1 GB storage for data logging
- IP 67 enclosure resists harsh environments
- Touchscreen interface with convenient menu structure
- Reliable flow-through cell design for at-line sample taking

In order to achieve a correct and convenient calibration of dissolved oxygen sensors, METTLER TOLEDO offers the iLink Multi. This is a device for connecting optical DO sensors to a PC/laptop running METTLER TOLEDO iSense[4] software. When calibrating an optical DO sensor with the iLink Multi/iSense setup, calibration parameters such as ambient pressure and humidity are captured automatically using the built-in, physical parameter sensors. Dependence on external pressure and humidity sensors is eliminated, as well as errors

that can occur during manual copying of such values into the calibration routine.

Conclusion

Dissolved oxygen (DO) concentration in beer and other oxidation-prone beverages is an important quality parameter. In-line monitoring of DO concentration in critical process steps is realized with instruments using optical DO sensors which require recalibration at certain intervals. The METTLER TOLEDO offering of complementary in-line and portable DO instruments facilitates calibration procedures in both process and laboratory settings, and reduces the risk of operator error.

www.mt.com/InTap

iLink Multi


T100 Bluetooth tool


InTap

Literature

1) Analytica EBC, Chapter 9.37.1, Issued by the EBC Analysis Committee, 2015
2) S. Bardeck, Brewing and Beverage Industry International, No 1/2010, Verlag W. Sachon GmbH + CO, Germany
3) Oxygen Theory Guide, Mettler-Toledo GmbH, Process Analytics, 2016
4) www.mt.com/isense

www.mt.com/pro

For more information

METTLER TOLEDO Group
Process Analytics

Local contact: www.mt.com/pro-MOs

MarCom Urdorf, CH. PA5000en A