

Inline cold wort measurement to optimize the brewing process

Process safety comes first

While in the brewhouse of a brewery the wort is produced from malt, water and hops, the preparation of the wort for the following fermentation is performed in the downstream fermenting room. In order to avoid building beer-spoiling microorganisms, the hot wort must achieve the pitching temperature as soon as possible. Typically, the hot wort will be cooled down to 7 to 9 °C so that the yeast can ferment efficiently. Most of the breweries use closed cooling systems. A plate heat exchanger (plate cooler) consisting of thin, closely spaced metal plates ensures the rapid cooling. They are alternatively passed through wort and cooling water. This process causes a cold break with tiny particles in the first plain wort. The turbidity has an influence on the velocity of fermentation and maturation, because particles attach themselves to the yeast cells that become smeared. Repeated use of yeast, the cold break will be removed to avoid an increasing smearing. In addition, the velocity of fermentation depends on the oxygen content in the wort. The ventilation of the cold wort for increasing yeast occurs only once during the entire beer production with a targeted oxidation. Sterile air is atomized finely and mixed with cold wort in a turbulent manner. The oxygen consumption is caused by the yeast and does not influence the wort quality.

When the cold wort leaves the cooling chamber, the actual beer production with fermentation, maturation and filtration is taking place. Before starting this process, an inline measurement of cold wort concentration is offered for ensuring process safety and optimal wort quality. In addition, the inline measurement provides a reliable wort-water-separation in case of rinsing processes. In order to cope with these tasks, the Colbitzer Heidebrauerei decided to use the inline measuring system called LiquiSonic® Plato manufactured by the company SensoTech.



LiquiSonic® Plato application at the wort cooler

In this case, an immersion type sensor with Varivent connection was installed after the cooler directly in a DN50 pipe by meeting the requirements of hygienic and bypass-free installation.

“Before mixing the wort with yeast („pitching“), it is important to check the original gravity content again due to quality reasons. If this is ensured, the beer production can run in the fermenting room. Additionally, valuable liter of beer can be gained by detecting an overdosing, explains Brew Master, Birgit Diesing. “But also the exact phase separation of first and last running is mandatory.”

The immersion type sensor of the LiquiSonic® Plato system is completely made of stainless steel and is working maintenance-free for a long period. A special highly efficient technology provides reliable measuring values even at high contents of gas bubbles. The determination of concentration is based on the sonic velocity measurement that guarantees a precise, drift- and failure-free measurement. With the help of a proven mathematic model, it is possible to calculate precisely the wort concentration resulting from the value of sonic velocity. The controller included in the system performs the calculation. Controller and sensor are connected via a bus cable, whereas the controller can handle up to four sensors and so four measuring points can be connected. Further inline measurements of original gravity are possible, for example, at the lauter tun, wort boiler, filter or filler.



Immersion type sensor and controller of the inline analytical system "LiquiSonic® Plato"

The controller visualizes the measuring data and is used for making settings and configurations done by the user. The TFT color display with high contrast enables an intuitive and clearly structured menu navigation. Calibration can also be performed, even by remote access to the controller via modem or Internet. This remote access option allows the user to monitor and configure the system from everywhere.

The controller can manage up to 256 types of beer with the appropriate calculation models. For each type of beer, it is possible to define a tolerance range with displaying an alarm in case of exceeding the limits. When connecting the controller to the PCS, measures can be taken afterwards.

Process trends can be monitored with the trend view provided by the device. It is connected to data log that stores up to 15,000 datasets. Therefore, processes and measuring values are documented traceably and can be analyzed afterwards. The Colbitzer Heidebrauerei installed a controller with a stainless steel housing.

"Not only the high measuring accuracy of ± 0.05 °Pl and the reliability of LiquiSonic® Plato convinced us, but also the user friendliness. After installation of the sensor, the controller showed immediately the actual wort concentration. We are so satisfied that we decided to install further measuring points, for example, at the filler for monitoring and controlling the phase separation", emphasizes Birgit Dising.

SensoTech:

Since over 20 years SensoTech GmbH has been engaged in the development, manufacturing and sales of inline analysis systems for process liquids. With worldwide installed, highly precise and innovative measuring systems for monitoring of concentrations, compositions and changes of chemicals as well as properties directly in the process, SensoTech has significantly contributed to the enhancement of the state of the art. In addition to the measurement of concentration and density, the phase interface detection as well as the monitoring of chemical reactions like polymerization and crystallization are typical applications. SensoTech inline analyzers set standards in the technological and qualitative valence, user friendliness and reproducibility of process values. Special calculation methods and sophisticated sensor technologies enable reliable and precise measuring results even under the most difficult process conditions. The knowledge and the experiences of the highly motivated and committed SensoTech staff are the result of many different applications supported by well-known customers from the chemical and pharmaceutical industry, food technology, semiconductor technology, automobile and steel industry as well as many other industries. In addition, these experiences also open up unimagined solution possibilities for new measuring challenges.

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