Optimised processes in beverage production thanks to optical turbidity measurement

The targeted use of appropriate turbidity measurement technology in beverage production increases process reliability, minimises the use of resources and opens up potential for cost optimisation.

Regardless of whether it's in fruit juice processing or in breweries, aspects such as quality assurance, cost and process optimisation, and conservation of resources number among the highest priorities in beverage production. In recent years, turbidity measurement technology has taken great strides with regard to accuracy and reproducibility of the measured values. This type of turbidity determination thus constitutes a technology which is not only reliable, but also economical. In order to exclude colour influences in the medium to be measured, a near-infrared light source is generally used here.

If sensors for turbidity measurement are used in the specified areas, these are generally devices for absorption or backscatter measurement, depending on the application. Use of the latter measuring method is preferred in particular for medium to high turbidity values such as are prevalent in the field of yeast management in breweries, for example. In backscatter measurement, the intensity of the light returned from the medium is measured. Here, both the sender (light source) and the receiver (detector) are in a single plane. This means, the light is reflected at an angle of 180 degrees. In contrast to this, transmitted sensors which are based on the principle of absorption measurement are used for low to medium turbidities. Here, a beam of light is conducted through the medium at an angle of 180 degrees and the light loss is determined on the opposite side by means of a detector. The following applies here: the higher the absorption, the lower the transmission of the medium. However, this measurement method reaches its physical limits with high turbidity values. The absorption method is therefore predestined, among other things, for adjustment of beer clouding by means of a separator, for media monitoring in CIP processes or for the detection of filter breaks in filtration processes.

Wide range of applications in the field of beverage production

With regard to beverage production, the widest range of areas of application for turbidity measurement technology arise predominantly in the production of beer, but also in the production of fruit and vegetable juices. Thus, this is used in beer production for controlling separators in the fields of yeast removal, clouding adjustment or green beer clarification, for example. Particularly for wheat beer, which generally does not use secondary fermentation in the bottle and undergoes secondary fermentation in storage tanks, turbidity adjustment is generally done before bottling. Here, the brewery specifies the desired turbidity value for the finished beer and the plant control system monitors the yeast concentration through turbidity measurements in the inflow and outflow for the separator. The flow rates in the machine and thus the desired degree of separation are adjusted according to the measured value. A continuously consistent turbidity is thus achieved after the separator.

In juice production, depending on the desired "clarity" of the juice, it may be necessary to remove relevant turbidities and suspended particles using centrifuges or filters. So-called processing aids (e.g. gelatine) are used to some extent for this. These must likewise be removed again together with the attached particles before bottling.

But it's not just during the actual production process that optical turbidity measurement can provide a valuable service. Sensors, predominately working in accordance with the transmitted light principle, also make their contribution to process optimisation and conservation of resources in the cleaning of storage tanks, transport containers or pipes. A reduction in the time taken for the process can be achieved in comparison with time-controlled processes through active switching once the desired degree of cleanliness is reached. Optimised cleaning is made visible through the reduction in wastewater costs owing to a lower wastewater burden as well as through the reduction in fresh water consumption, through the reduction of plant downtimes and the minimisation of the use of cleaning agents, among other things, and all without having a negative effect on the product quality.

Conclusion

In conclusion, it can be stated that the use of appropriate turbidity measurement technology can not only allow for the realisation of cost and process optimisations, but is also associated with corresponding conservation of resources. At the same time, it is possible to increase the product yields and reduce the product loss. Turbidity sensors can be used in a wide variety of process steps for this. These include the control of separators through determination of the turbidity at their inlets and/or outlets, monitoring or cleaning during the flushing of tanks and pipes, detection of filter breaks, monitoring of phase separation or colour-independent concentration measurement, for example.

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