CASE STUDY JANUARY 2024

Leveraging inline Brix measurement for wastewater monitoring in food and beverage manufacturing

HOW THE VAISALA INLINE PROCESS REFRACTOMETER ENABLES ACCURATE BRIX AND CONCENTRATION MEASUREMENTS AND CONTROL TO OPTIMIZE WASTEWATER MONITORING

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Overview

One of the world’s most successful food and beverage industry cooperatives needed to maintain stellar quality control and optimize operations at one of its facilities for maximum efficiency. As businesses across the F&B sector strive to maintain product consistency, reduce waste, conserve resources and lower their environmental footprint, the ability to precisely measure different parameters is vital.

The challenge: Real-time monitoring to ensure compliance and optimize operations

The cooperative believes food can help improve the health of both people and the planet. Part of that commitment to sustainability involves building efficient, eco-friendly operations and supply chains.

Regular audits of the cooperative's manufacturing facilities ensure its business has meaningful and impactful labor, ethics, health and safety, and environmental practices. Additionally, the cooperative is constantly seeking new ways to improve its processes to provide accessible, affordable and nutritious food to people worldwide.

Producing 24 million cases of products annually, the cooperative's manufacturing factory monitors wastewater streams from production for excess sugar levels. Facilities like these must monitor and control the organic load in streams because excess organics (e.g., sugars) in wastewater streams can incur fines, penalties and even closures.

Water's quality must be defined before it can be treated and recycled. Traditional methods for measuring water quality include total organic carbon (TOC) and chemical oxygen demand (COD) tests. Usually determined alongside COD in wastewater treatment, biochemical oxygen demand (BOD) is another critical measurement for industrial authorities to understand.

BOD is the measure of the amount of dissolved oxygen required to remove organic waste matter from water via decomposition over a studied period. Organic pollutants are problematic to the environment as their decomposition process consumes the oxygen contained in the receiving water. A higher BOD value typically indicates a higher level of water pollution, while lower BOD levels suggest less polluted, cleaner water.

In the food and beverage sector, BOD is tied primarily to sugar content. By measuring the sugar content of wastewater streams, operators can ensure organic waste materials are not going into the finished product but down the drain. Facilities like the cooperative's must divert negligible wastewater for internal treatment before allowing it to enter municipal waterways. If sugar levels are too high on-site, wastewater has to be stored and shipped to a third-party treatment facility, increasing operating costs.

In line with previous industry standards, the facility's wastewater stream was not being monitored in a continuous manner. Consequently, the cooperative's leadership team sought to glean information regarding the facility's organic material discharge and how its engineering, maintenance and operations teams can better monitor high-strength waste events to ensure no issues arise in the future. Using information from a five-day BOD test, the cooperative could recognize a composite over certain days with discharges, but with the time between testing, the information was already outdated, making determining the root cause of an event incredibly challenging.

Ultimately, the cooperative's various teams at the facility opted to install a monitoring system that could automatically segregate wastewater flow based on incoming Brix levels.

The solution: Using the Vaisala inline process refractometer to detect the sugar in wastewater

The cooperative's manufacturing facility used instruments from Vaisala in various applications on the production side for more than 15 years, having "great success with the instruments and their capabilities."

A senior project engineer at the facility recognized that another of the cooperative's plants used this type of instrumentation for a wastewater application and was curious whether the refractometer could be used to detect the sugar in wastewater.

As BOD monitoring is critical to warning the treatment plant about excess organic concentration, the cooperative needed to know the incoming BOD to keep the treatment process in proper operation and compliance. To effectively control wastewater streams and warn the wastewater treatment plant of exceptional loads, the measuring instrument must be reliable and in operation at all times.

Enter the Vaisala Process Refractometer

Ideal for applications where inline monitoring and control can help to improve product quality and reduce costs, the process refractometer enables accurate inline Brix and concentration measurements and control.

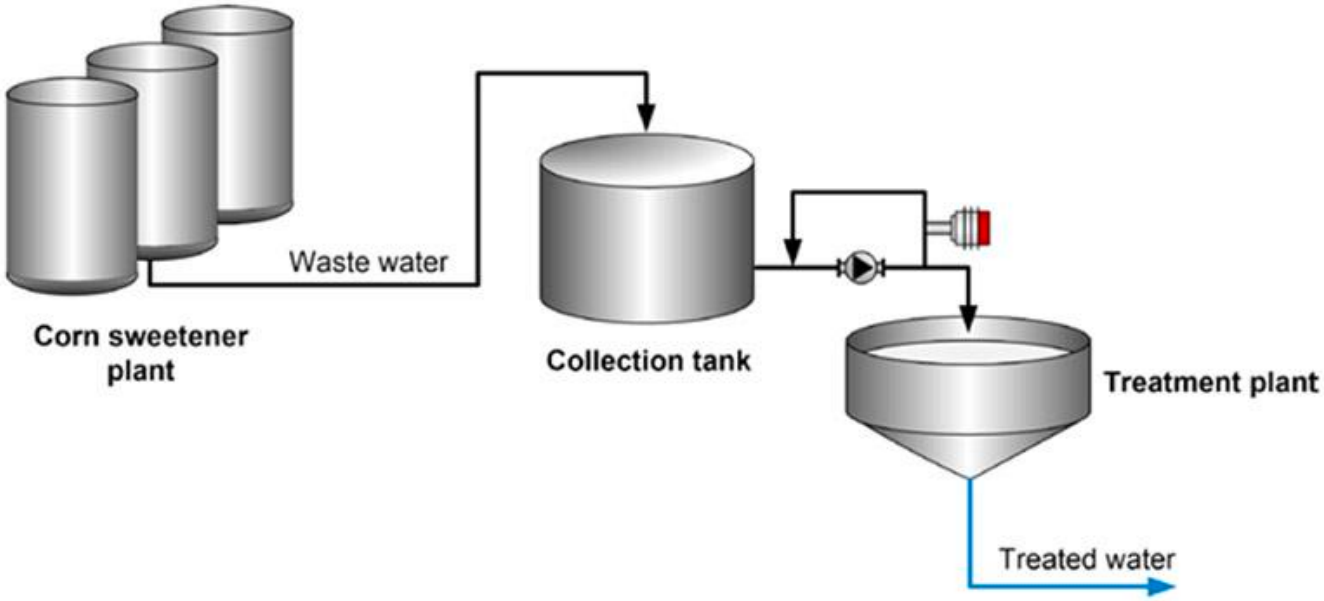
The standalone device measures, refines, manages, and indicates Brix and diagnostic information, ensuring the following benefits:

- Robust product quality control.
- A quick response to product quality deviations.
- Elimination of product contamination.
- Accurate product labeling.
- Optimized energy and raw-material consumption.
- Improved overall production sustainability.
- Higher production efficiency, capacity and yield with minimal maintenance requirements.
- Reduced waste.
- Reduced risk of product recalls, lost sales and legal expenses.
- Products that conform to consumer expectations regarding appearance, mouthfeel and taste.

Leveraging knowledge from the other facility and discussions with the Vaisala team and their distribution partner, the F&B coop concluded the Vaisala refractometer would be ideal for BOD monitoring in wastewater streams.

The benefits: Real-time continuous process control without compromising measurement accuracy

Once the sensor mating flange was added to the existing piping, the Vaisala inline process refractometer came online and easily integrated with the on-site PLC system without issue.



“The Vaisala refractometer provides real-time information on what’s happening inside the plant,” said Michael Kohlmann, Regional Sales Manager at Vaisala. “Once the Vaisala meter was installed, it allowed their team to pinpoint specific timeframes where process disruptions or upsets occurred to more accurately diagnose the root causes of those issues and eliminate waste.”

Since wastewater generated from the production needs to be monitored to ensure compliance with environmental regulations, the primary benefit for the cooperative at this facility has been the percentage reduction in BOD.

Thanks to the Vaisala inline process refractometer, the cooperative has experienced a significant six-figure cost avoidance at this facility alone. The cooperative has also been able to avoid surcharges, reduce material loss and optimize its operational procedures. Having a more accurate monitoring system that allows its teams to know when those process upsets take place empowers the cooperative to solve its critical challenges in F&B production.

The cooperative recognizes that the sustainability of its production facilities is directly related to its wastewater treatment practices. Since high concentrations of organic materials must be quickly detected to ensure proper operation of the water treatment system, the Vaisala refractometer is ideal for monitoring and treating effluent streams at the cooperative's manufacturing facility before discharge.

Providing reliable alarms for high levels of incoming organics concentration, the Vaisala refractometer helps manufacturers successfully improve the efficiency of processes, make more sustainable use of resources and maximize capacity while maintaining quality, reducing product waste and eliminating costly unplanned shutdowns.

Benefits of Vaisala Process Refractometer

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HANLEY CONTROLS
CLONMEL

For inquiries, contact us.

www.hccl.ie
info@hccl.ie
+353 5261 22722