

TOC monitoring with Hach BioTector B7000i Dairy and Vacuum Venturi sampling saves MEGGLE the need to expand its wastewater treatment plant

Problem

Product loss due to leaks in a milk-processing plant were only detected due to increased wastewater discharge values. The search for the causes was time-consuming and personnel intensive. As a result, the dirt load of the wastewater was often so high that the company's own wastewater treatment plant was working at its limits. In order to guarantee compliance with regulatory discharge values, an investment into the expansion of the plant seemed unavoidable.

Solution

A Hach® BioTector B7000i Dairy TOC-Online analyser with a vacuum venturi sampling system now permits the measurement of the TOC content at three different process effluents. The sample is reliably drawn to the analyser from a distance of up to 60 m and a depth of 6 m, with no need for a barrier system or mechanical pumps. Also, the wastewater treatment process is controlled using an additional Hach BioTector B7000i Dairy TOC analyser at the influent of the wastewater treatment plant.

Benefits

By detecting TOC peaks in the wastewater at three different factory drains, leaks can be quickly localised and eliminated, meaning the company can retain valuable raw material and product and the load of the company's wastewater treatment plant is significantly reduced. A reduced load also means decreased sludge disposal cost and eliminates the need to expand the wastewater treatment plant.

Background

MEGGLE AG is a milk and whey processing corporate group with a rich history. The headquarters in Wasserburg, Bavaria, mainly produces butter and butter specialities, as well as milk-based dry products. This site employs around 1000 staff involved directly or indirectly in the processing of milk and operates an in-house wastewater treatment plant with a population equivalent of 90,000. Hach online analysis solutions installed at MEGGLE include measurement devices for ammonia, nitrate and phosphate. Hach laboratory analysis systems are also used and trusted in Wasserburg.

The wastewater treatment plant at its limits

In 2014, the company's own wastewater treatment plant reached its limits as a result of the expansion and modernisation of the production facilities. To ensure compliance with regulatory limits, a major investment in a new aeration tank was imminent.

The solution

TOC monitoring with the Hach BioTector B7000i Dairy TOC Analyser
The situation has been improved with the installation of their first TOC online analyser, the BioTector B7000i Dairy, at the inlet of the wastewater treatment plant. The device has been monitoring the TOC load at this position since 2015. The measured values are used to control the aeration during the aerobic phase of the treatment process. Also, leaks causing TOC peaks are detected and repaired rapidly and the robustness and reliability of the BioTector B7000i Dairy impresses the operators of the wastewater treatment plant. The BioTector B7000i Dairy is a TOC analyser specifically designed to meet the requirements of dairy wastewater.



Hach BioTector B7000i Dairy with Venturi Vacuum Sampler at MEGGLE in Wasserburg

An important advantage in this application is that, in contrast to other TOC technologies, the Hach BioTector B7000i Dairy only detects dairy products in the wastewater, and not substances such as activated carbon used in production. This is due to its two-stage advanced oxidation (TSAO) technology. Activated carbon contains a high percentage of elementary carbon, which is not organically bound, and does not count towards the TOC (*total organic carbon*). TOC measuring methods that are based on other oxidation technologies, such as catalytic oxidation, cannot differentiate between activated carbon and TOC, and therefore record activated carbon within the amount of TOC. An important aspect here is that activated carbon is not metabolised during the biological treatment process, which means that recording it as part of TOC would result in mismanagement of the treatment process. Therefore, the BioTector B7000i Dairy also helps the operator ascertain that TOC peaks are indeed caused by product or raw material leakages and that action is required. False alarms caused by activated carbon peaks can be ruled out.

The reliability of the TOC data provided by the first analyser installed at MEGGLE—along with its real-time availability—convinced the company that it would make sense financially to install an additional BioTector B7000i Dairy. Since 2018, the TOC contents of three strategically important sewers have been monitored. Two of these come directly from production facilities, while the third comes from storage tanks for raw materials. If increased TOC values are detected here, the leaks can be localised immediately in a targeted manner and sealed as quickly as possible.

The BioTector B7000i Dairy analysers were able to significantly reduce the wastewater dirt load by avoiding the loss of raw material or product caused by long-lasting leaks and have enabled greater control over the treatment process. This in turn means that less energy is used during wastewater treatment, as less air must be injected. Lastly, the cost of sludge disposal has been reduced, as less sludge accumulates, and regulatory TOC limits are met with ease.

Hach Venturi Vacuum Sampler

Essential for the reliability of the TOC measurements at MEGGLE is the combination of the TOC analyser with a Hach vacuum venturi sampling system. In this sampling system, a vacuum is created by an air stream, which transports the sample even over long distances. The sample is collected in a riser tube. After a few seconds, during which heavy particles such as sand settle, the sample is ready for the BioTector B7000i Dairy TOC analyser. After the sample has been drained, the sample line is flushed with a mixture of microbubbles and hot water and then blown dry with compressed air to avoid contaminating or diluting the next sample and forming long-term blockages. This method ensures reliable and low-maintenance measuring operations in wastewater applications that are subject to high levels of particulate and fat contamination, as is the case with dairy production.

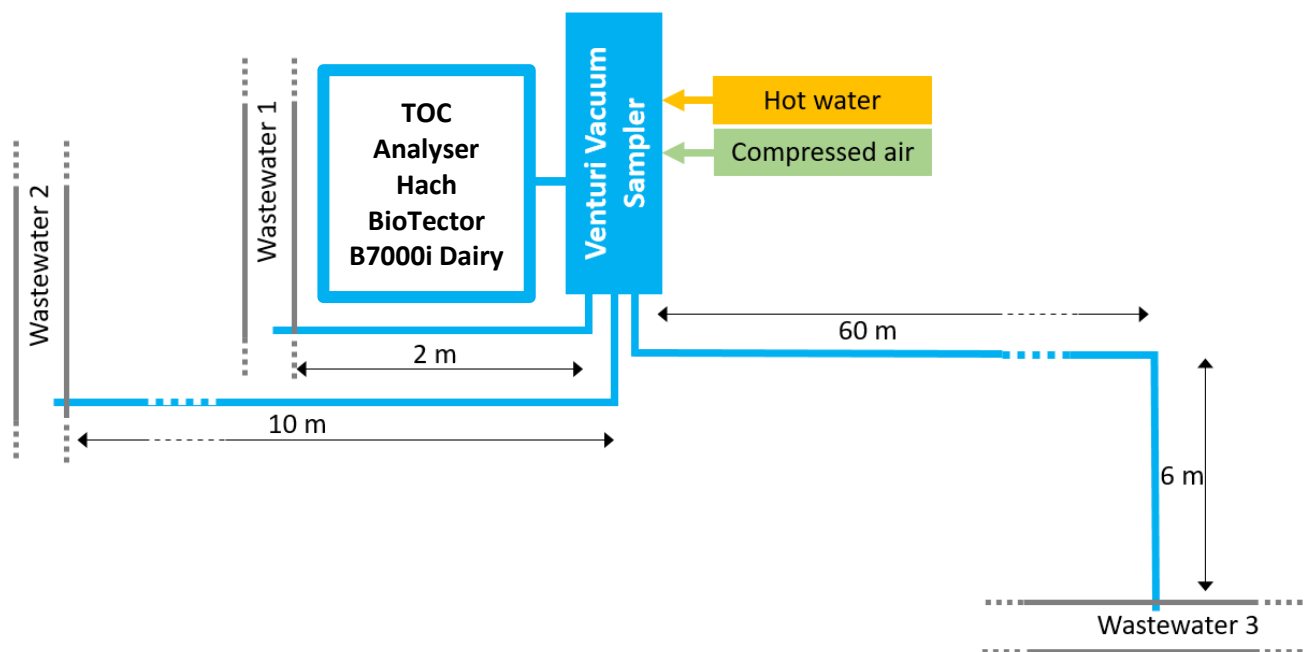


Diagram of the installed TOC measurement system at the Wasserburg site: Hach BioTector B7000i Dairy with Venturi Vacuum Sampler

Another advantage of this sampler is that sample can be drawn from a depth of up to 8 m and transported up to 80 m via vacuum without the need for a mechanical pump installed in the sewer. The sampling process is almost instantaneous and provides the device with a current and representative sample for each measurement, even from far away or difficult-to-access locations. In Wasserburg, for example, the wastewater is sucked in from the storage tanks over a distance of 60 m and from a depth of 6 m. The other two sampling points are about 2 m and 10 m away (see diagram). The Hach Venturi Vacuum Sampler is the ideal solution for the conditions at this dairy factory: For example, one of the wastewater streams has a very low water flow, which means that if a mechanical pump had been used, a barrier system would have needed to be installed, which would not have fitted in the channel. However, the Hach Venturi Vacuum Sampler was integrated centrally into the factory environment without major intervention and could be adapted to these conditions by simply adjusting the device. This also prevents pump parts installed in the channels from coming loose and being flushed further down, which is a well-known problem in wastewater management.

Maintenance of the devices

The two BioTector B7000i Dairy analysers are serviced by Hach every six months in accordance with a maintenance agreement. Other than the reagent replacement, which is performed every six weeks, MEGGLE is required to perform very few, or in some circumstances no further maintenance tasks.

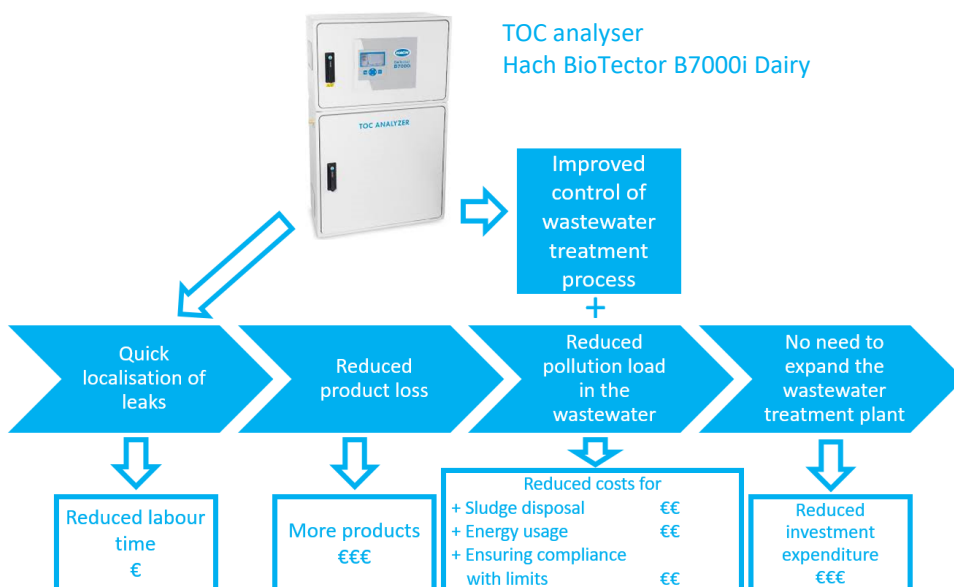
Conclusion

The in-house wastewater treatment plant at MEGGLE was working at its limit. To ensure continuous compliance with regulatory TOC limits, the company was going to make a significant investment to expand its wastewater treatment plant. However, the company decided to install Hach's TOC measurement technology (BioTector B7000i Dairy) at strategically important points to enable better control of the production process and wastewater treatment process.

In the first phase, the influent of the wastewater treatment plant was monitored for TOC peaks using a BioTector B7000i Dairy. The information provided a greater understanding of the TOC content in the wastewater, which was used to optimise the wastewater treatment process. The robustness, reliability and simple operation of the analyser convinced the company to install another BioTector B7000i Dairy, which now monitors the TOC content at three different production drains. As a result, the TOC peaks that are caused by leaks and result in the loss of products or raw materials can be identified, localised and fixed by employees quickly and effectively. As the amount of raw materials or products that leak out has been reduced, the pollution load in the wastewater is now significantly lower. In addition to saving energy, reducing sludge disposal cost and reducing product losses, the wastewater treatment plant can handle the dirt load and compliance with regulatory limits is sustainably ensured.

Summary

- TOC monitoring with the Hach BioTector B7000i Dairy
- Improved control over the wastewater treatment process
- Quick localisation of leaks
- Reduced product loss
- Reduced pollution load in the wastewater
- Compliance with limits
- No need to expand the wastewater treatment plant



Improvements and savings achieved by MEGGLE at Wasserburg through online TOC measurements using a Hach BioTector B7000i Dairy.

About the product:

The **Hach BioTector B7000i Dairy** is a TOC analyser specifically designed for the requirements of dairy wastewater. In conventional TOC analysers, the TOC measurement usually involves removing carbonates (TIC, *total inorganic carbon*) using acids. This leads to flocculation and blockages in the device when exposed to milk protein. To avoid this issue, conventional analysers generally measure TC (*total carbon*) instead of TOC. The BioTector B7000i Dairy prevents the sample from coming into contact with acid outside of the reactor, meaning TOC can be properly measured. The device also has a self-cleaning function that is executed after every measurement cycle to ensure the system stays clean for a long time. The device is available with remote control and monitoring functions.

Measurement method of the Hach BioTector

The BioTector removes the Total Inorganic Carbon (TIC) by adding acid directly into the reactor. The CO₂ produced in the TIC phase is measured and displayed as a TIC measurement value. This is very different from other TOC technologies. The advantage of the TIC being measured in this phase is that the TIC purge is automatically ended as soon as the CO₂ curve has fallen below a given threshold of the NDIR baseline. This is a standard safety check, as incomplete TIC removal might lead to the situation that TIC is carried over into the TOC measurement. This TIC carryover leads to erroneous TOC measurement.

First stage of TOC measurement:

By addition of base, the sample is brought to pH ≥11. The built-in ozone generator creates ozone, which is mixed-in continuously with the alkaline sample matrix in the mixer-reactor to form hydroxyl radicals (OH[•]). As very strong and powerful oxidising agents, these OH[•] radicals oxidise the organics in the sample, including 2µm of soft particles, to produce carbonates and oxalates.

Second stage of TOC measurement:

By addition of an acid, which includes a small amount of dissolved Mn catalyst, the sample is brought to pH ≤1, and all produced carbonates and oxalates are chemically converted into CO₂. CO₂ is then quantitatively measured by the NDIR detector and displayed as a TOC measurement value for the sample that was injected.



About the product:

Hach Venturi Vacuum Sampler

- Trouble-free, air-operated venturi pump
- Self-cleaning: The sample lines are cleaned with a mixture of hot water and air (micro-bubbles) during each measuring cycle and blown dry with compressed air to prevent contamination and dilution.
- Samples can be drawn from a depth of up to 8 m and a distance of up to 80 m.
- Can be easily integrated into the existing environment — central installation is possible.
- Avoids the need for current-carrying parts and potential ignition sources in the channel
- Up to six channels available



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About the customer

MEGGLE AG is a milk and whey processing corporate group with a rich history. The Wasserburg site produces butter, butter specialities and high-purity lactose.
Region: Bavaria, Germany

DOC043.52.30603