

Danish Brewery Improves Wastewater Treatment by Optimizing Nutrient Dosing

Problem

Harboes Bryggeri A/S was facing challenges with the performance of its wastewater treatment plant, due to the highly variable Chemical Oxygen Demand (COD) load in the inlet. For many years, the high COD load and low Nitrogen (N) content has required external N dosing to be able to fully reduce COD and meet the discharge limit.

Solution

Harboes Bryggeri A/S adopted a totally integrated solution from Hach®. They used a BioTector to measure online TOC in the treatment plant feed, analyzers to measure online ammonia and nitrate in the process tank, and Claros Real-Time Control Process Management software for Nutrient Dosing (RTC-C/N/P) to provide the ideal nutrient balance.

Benefits

This comprehensive solution immediately allowed full COD and Total Nitrogen (TN) treatment to take place, greatly improving both compliance performance and sludge settleability in the clarifier.

Operations at Harboes Bryggeri A/S

Harboes Bryggeri A/S is a well established Danish brewery founded in 1883 in Skælskør, Denmark. Harboe itself produces beer and soft drinks for more than 90 markets around the world, and besides the focus on product quality, also has a strategy for improving their environmental footprint by optimizing water resources, CO₂ emissions, and wastewater treatment.

Harboes Bryggeri A/S has its own wastewater treatment facility which discharges directly into a small watercourse. This watercourse is highly sensitive to Nitrogen, Phosphorous, and BOD/COD loads.

Strict Danish Wastewater Requirements

Denmark has some of the world's strictest discharge limits for wastewater. In general, most industrial and municipal wastewater treatment plants must meet compliance in the area of 5-8 mg/l Total Nitrogen, 0.1-1.5 mg/l Total Phosphorus, up to 75 mg/l COD, and up to 12 mg/l BOD.

These compliance limits can be difficult to meet, even with relatively stable domestic sewage. Unpredictable, highly variable industrial loads place even greater pressures on the biology and onsite treatment plant performance.

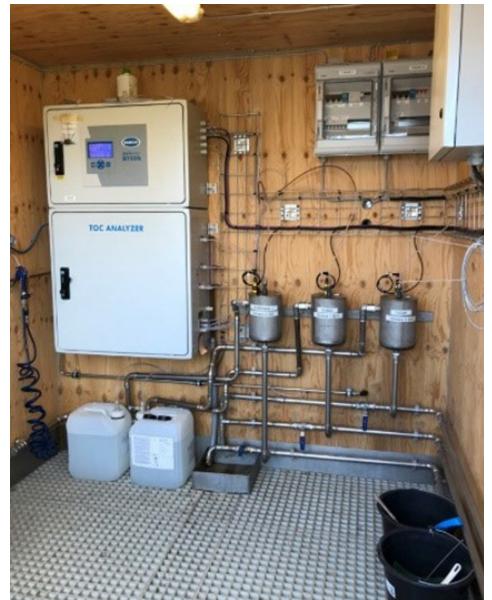


Figure 1: Hach BioTector measuring online TOC in the treatment feed.

Brewery Improves WW Treatment with Real-Time Dosing

Manual Dosing Pitfalls

For most breweries and food industries, high COD load and low N content pose a challenge to biological wastewater treatment. Additional Nitrogen dosing is needed to balance the biological requirement of the bacteria responsible for treating the industrial waste.

Many breweries and food industries are adjusting N dosing manually, based on laboratory analysis of grab samples and/or composite samples from the inlet. Grab or composite samples rarely reflect the true variation of load conditions to the treatment plant, and even the best plant operators often have difficulty keeping pace with the required adjustments.

Evidence of problematic nutrient dosing often can be indicated by frequent cases of "foaming" or sludge settleability issues. Unexpected high COD, Total N, or phosphorus levels occur in the final effluent.

This manual dosing issue was the situation for Harboes Bryggeri A/S, which was looking for a solution to reduce manual laboratory analysis, automate N dosing, and improve outlet compliance.



Figure 2: Hach Amtax sc Ammonium Analyzer, Nitratax sc Nitrate Sensor, and SC1000 Controller Probe Module.

An Automated Dosing Solution

Harboes Bryggeri A/S chose a comprehensive suite of Hach solutions that included all required Claros Process Management software (RTC-C/N/P) and online resources necessary to automate N dosing and thereby optimize the brewery's wastewater composition.

This solution includes:

- An online ammonia and nitrate analyzer to measure process tank levels.
- Online Claros RTC-C/N/P software to optimize P and N dosing based on the BioTector's TOC measurements.
- Commission and customization of the system by Hach optimization specialists.
- Better regulatory compliance and reduced risk of costly fines from poorly predicted wastewater volume or levels.

Brewery Improves WW Treatment with Real-Time Dosing



Figure 3: The Hach BioTector B7000i TOC Analyzer pairs with Claros RTC-C/N/P software for feed-forward nutrient dosing control.

BioTector + Claros RTC-C/N/P Software for Real Time Measurements

The BioTector measures TOC online in the wastewater treatment facility's inlet and outlet. The Claros RTC-C/N/P software then uses the TOC values to determine accurate feed-forward nutrient dosing control.

More About Claros Process Management for Real-Time Wastewater Treatment

Nutrient Dosing (RTC-C/N/P)

Having the correct C/N/P balance is critical for biological wastewater treatment. Hach's RTC C/N/P system optimizes the dosing of nutrients like urea and phosphoric acid in industrial wastewater treatment plants, ensuring compliance on COD / BOD, NH_4^+ and PO_4^{3-} . Costs for effluent discharges and for chemicals added are driven to an absolute minimum.

Amtax + Nitratax + SC1000 Controller for Optimized Dosing

The online ammonia and nitrate measurements automatically account for variation in biological activity and generate a feedback value to fine tune the brewery's nutrient dosing. This real-time control strategy helps prevent nitrogen and COD peaks in the outlet.

This sophisticated solution has performed reliably to fully automate nutrient dosing and reduce the compliance risk at Harboes Bryggeri A/S.



Brewery Improves WW Treatment with Real-Time Dosing



Figure 4: Hach Amtax sc Ammonium Analyzer



Figure 5: Nitratax sc Nitrate Sensor



Figure 6: SC1000 Controller Probe Module



Figure 7: Filtrax (eco) Sample Filtration System

The analysis report below shows the Claros RTC-C/N/P software's impact of improved dosing. Note the reduction in undesirable COD and TN peaks in the outlet.

OUTLET ANALYSIS

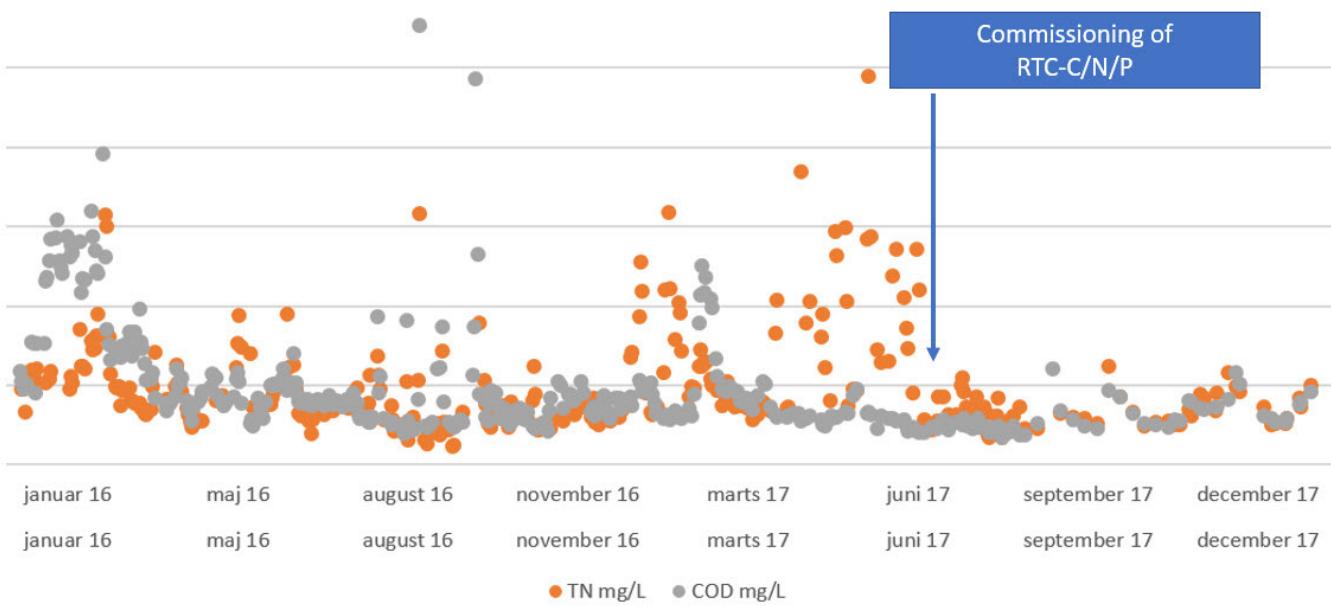


Figure 8: Analysis report before and after real-time dosing with Claros RTC-C/N/P software.

Brewery Improves WW Treatment with Real-Time Dosing

A Strategy With Potential

Harboes Bryggeri A/S and Hach's strategy for nutrient control in wastewater represents an approach which has great potential for other industrial wastewater facilities.

The Brewery's installed base includes the following Hach solutions:

- BioTector B7000i TOC Analyzer
- Nitratax sc Nitrate Sensors
- Amtax sc Ammonium Analyzer
- Filtrax (eco) Sample Filtration Systems
- Claros Process Management RTC-C/N/P – Software Module

Benefits

Benefits of reduced dosing and better compliance:

- Discharge compliance security
- Automation of nutrient dosing
- Exact (and reduced) dosing of nutrient compound
- Improved sludge settlement quality
- Reduced reliance on manpower for process adjustments
- Reduced laboratory analyses
- Full capability of treatment plant realized

Conclusion

The optimized system from Hach has been in place since June 2017, and Harboes Bryggeri A/S confirmed that it has successfully provided continuous improvement during that time. Most importantly, the brewery's nutrient dosing challenges—now under control—are a thing of the past, and process stability is the new normal.

About the Customer

Harboes Bryggeri A/S

Application + Industry: Waste Water Treatment, Beverage

Region: Skaelskoer, Denmark



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