



Sonoco Stainland Optimizes Effluent Treatment with Controlled Real Time Chemical Dosing System

Sonoco's Stainland Board Mill Optimization through RTC Chemical Dosing Control on Effluent plant

Problem

Due to unbalanced Carbon : Nitrogen : Phosphate ratio (C:N:P), chemical dosing of Carbon and Phosphorus was required to achieve adequate biological treatment. The control system used previously for nutrient dosing was based on visual inspection and spot sampling, leading to inaccurate dosing due to varying load from manufacturing.

Solution

Real time control using online Ammonium monitoring, to control specific dosing of the combined Phosphate and Nitrogen chemical, enabled optimum biodegradation efficiency independent of variations in the process.

Benefits

- Increase in stability of biological treatment process
- Minimize secondary settlement tanks solids loss
- Avoid filamentous growth
- Reduced viscosity of sludge (reduce stress – no snot)

Background

Sonoco's Stainland Mill at Halifax Effluent plant processes waste water from a recycled based paper mill operation. The site manually adjusts urea/phosphorous dosing rates based upon daily lab testing.

Factory effluent discharge load varies over the course of a single day, but has common proportions – excess Carbon (BOD), low Nitrogen, and low Phosphorous, hence the requirement for dosing Nitrogen and Phosphorus to achieve optimal C:N:P ratio for ideal biological treatment.

In addition, the Aeration Tanks have large swings in viscosity (poor sludge) due to the nutrient imbalance mentioned previously. Sludge flotation and uncontrolled denitrification were identified in the secondary clarifiers.

Sonoco's primary focus was on minimising charges related to Chemical Oxygen Demand (COD) and solids within the effluent, as well as reducing chemical usage.



Sonoco Stainland Mill, Halifax, United Kingdom
(Photo credit: Google Map data – Imagery ©2024 Maxar Technologies)

Solution

The optimal solution was found to be the implementation of Hach's Real time control system – RTC-C/N/P – which provided feedback dosing control of Nitrogen and Phosphorus nutrient using one dosing pump. Most systems would require two dosing pumps for each parameter, but the customer's chemical had a single product to supply both P and N to the effluent.

The main mechanism for dosing set point was based on the feedback control, utilising signals from Hach Ammonium analyser and sample preparation system – AMTAX sc and Filtrax sc respectively – which was situated at a combined point post-aeration in the Polymer mixing tank. This was used to understand the Nitrogen load within the system and dose the chemical to meet the correct ratio.

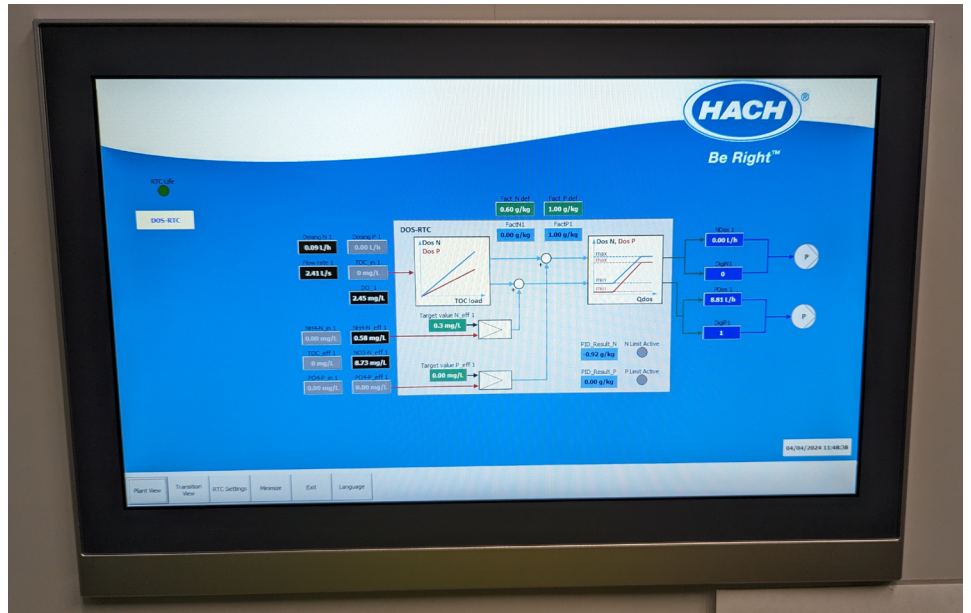
There was also an additional feedback control from a Hach Nitrate sensor – Nitratax sc – to combat excess nitrogen addition, which would reduce denitrification in secondary settlement, improving sludge level control.

There is room for further development to use TOC measurement to refine the chemical dosing, as increased understanding of the Carbon load can be monitored, but at present this was too costly an upgrade and an assumed carbon loading is in place.

Conclusion

It was determined that the actual chemical savings were not sufficient on their own to justify the spend at end of project, however Sonoco was able to demonstrate there were also a number of other significant improvements in treatment. There were markers to prove the project was a success, such as increased stability of biology, which helps to improve secondary settlement tank performance and reduce solids loss, reduction in filamentous growth, and reduced viscosity of sludge.

They also found stabilized treatment performance and a reduction in labour hours.



CNP-RTC Display (Photo credit: Oliver Lang)

In Closing

Even though the original cost driver was not fully realised within the time frame expected, there were a number of benefits across the complete process to ensure the project was a success overall and is reaffirmed by the site relying on the advantages the RTC has provided.

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