Dosing Control from Hach: A Double Win! Vogt Plastic: Better Plant control and Significant Savings in Chemical Usage

Problem

Due to fluctuations in the inflow loads, manual plant control was difficult. The manual dosing of coagulants and flocculants resulted in additional effort and costs. The plant's potential could not be fully utilised, as it was not possible to react quickly to changes in wastewater loads.

Solution

Hach measurement technology and Hach control technology were integrated, and the dosing of precipitation and flocculation chemicals was adjusted to the respective current level of contamination. A TSS probe was installed at the plant's inlet, and a TSS probe and a BioTector series TOC analyser were installed at the plant's outlet. In addition, the software for the Hach RTC-DAF dosing controller was integrated into the existing control system.

Advantages

The optimised real-time dosing control system ensures an immediate, automatic response to changes in the feed. The chemical consumption has been reduced by approximately 40%. The target values are reliably maintained, and foaming in the system is no longer a problem.

Background

Vogt-Plastic GmbH produces at its Premnitz site in the Havelland region regranulate from used packaging (yellow bag). The raw material is sorted, shredded, cleaned, washed, dried and processed into granules. This regranulate is used in industry as an alternative raw material. Shampoo bottles, detergent bottles, storage boxes, furniture and many other products are manufactured from this regranulate.

The processing of regranulate generates wastewater which is subject to fluctuations in both its volume and its composition.

The wastewater is pH-neutralised and pre-treated by precipitation and flocculation in a decanter before being indirectly discharged into the local industrial wastewater treatment plant.

Vogt-Plastic GmbH Located Premnitz in Havelland

As the charges are calculated based on the inflow COD values, the plant manager, Michael Stechert, is constantly on the lookout for ways to improve the treatment plant's performance: "We need to operate our plant in a cost-effective manner. With manual measurement and control, we did not have sufficient control over the consumption of additives, and the effluent values also fluctuated".

Frequent changes in the composition of the influent flow

Both the level of contamination and the composition of the wastewater are subject to constant change. The raw wastewater contains a high organic load.

Solution

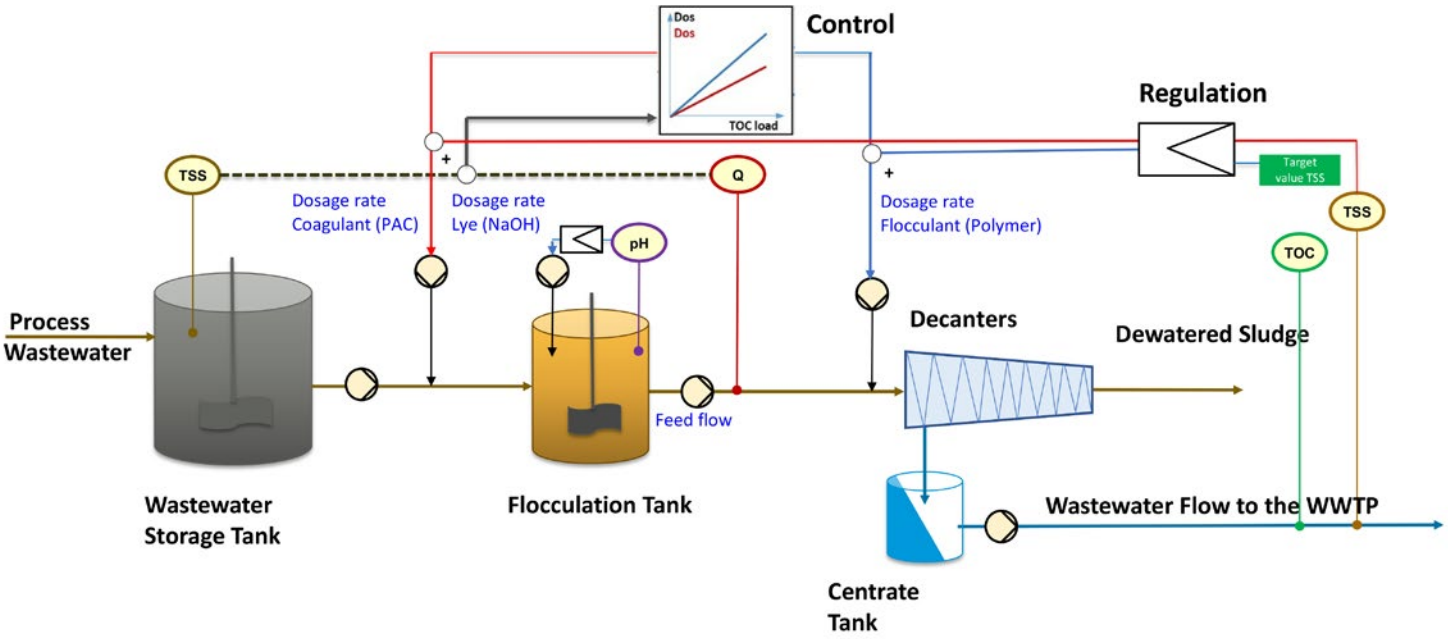
Andreas Vogel, the wastewater manager at the Premnitz site, opted for the RTC-DAF dosing optimisation system offered by Hach. The control module determines setpoints for the dosing of coagulant and polymer based on the degree of contamination. Based on the current solids load and the feed rate, the dosing rates for coagulant and polymer are set and automatically adjusted. In addition, the control module also manages the dosing of caustic soda to optimally adjust the pH value for flocculation.

To this end, a TSS probe has been installed at the plant's inlet, and a TSS probe and a BioTector B7000i TOC analyser at the outlet. The required dosing quantity is calculated based on the current value of the inlet measurement. The values from the outlet measurements are used to monitor the degree of separation and provide further insight into the properties of the effluent. This allows both the plant performance to be optimised and the dosing of precipitants and flocculants to be decoupled from one another. The logic and algorithm of the dosing control system are always transparent and adaptable for the user.

In the event of a failure of the measurement technology (TSS/TOC concentrations or feed rate), dosing would be ensured by a fallback mechanism using default values for the dosing quantities.

Hach BioTector B7000i and Sampler Bühler 3011

RTC-DAF Installation at Vogt Plastic



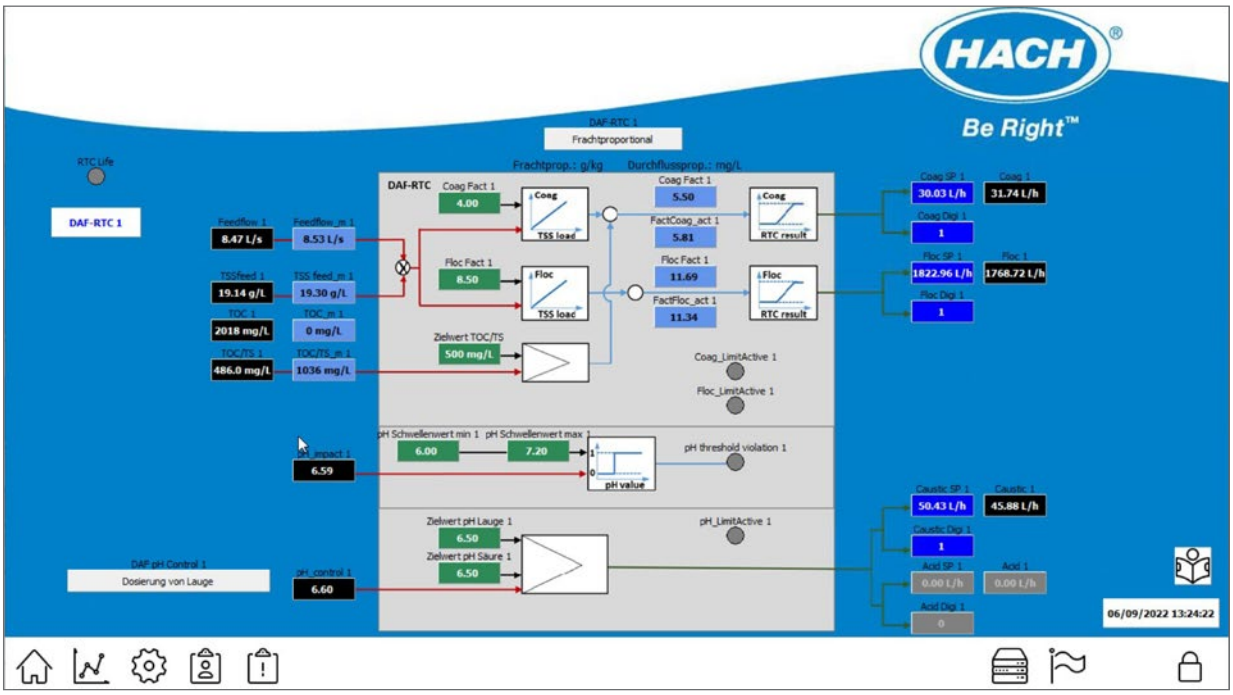
Installation Overview: Measuring Points and Dosing Points

Improvements in the COD removal efficiency and cost savings through reduced chemical consumption

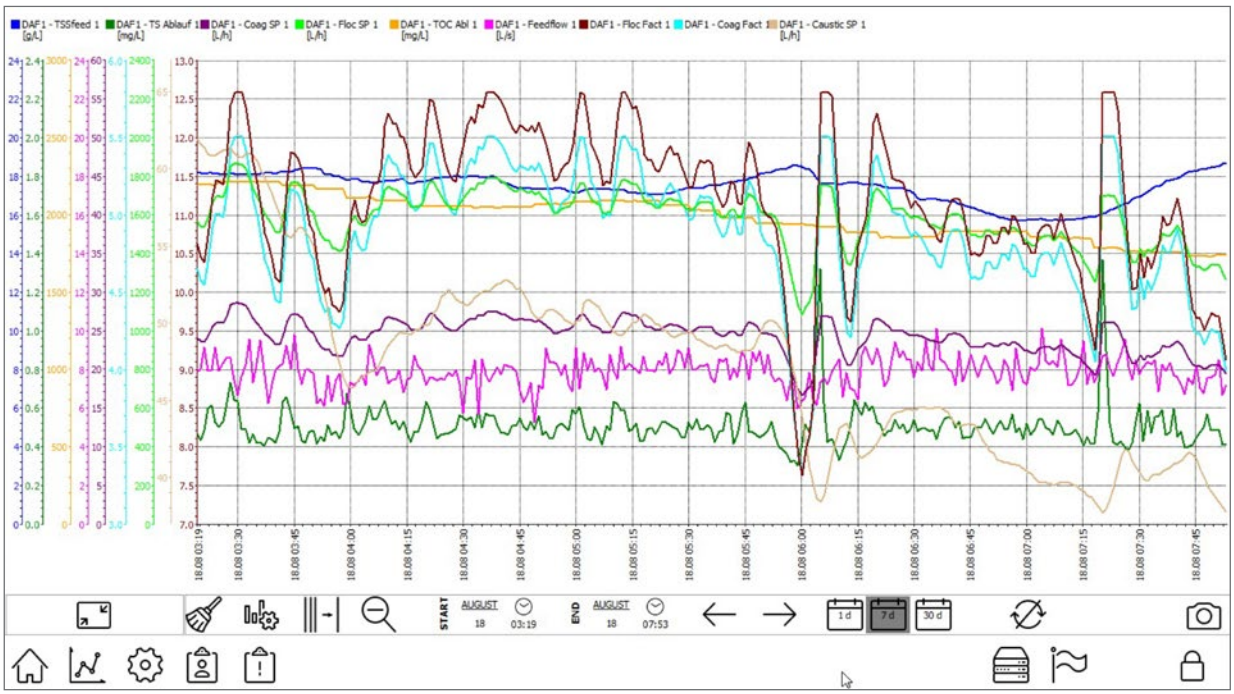
"In the past, we were only able to plan and control our COD effluent value to a limited extent. Now the plant is running much more stably, and we have been able to significantly reduce the amount of monitoring required," says Andreas Vogel. Initially, there were doubts as to whether control based on real-time measurements could work at all, given the fluctuations in the influent. "However, it has become clear that the fluctuations in the effluent are precisely the reason why an algorithm-based solution was needed, rather than having to adjust the dosing rate several times a day." The COD value in the effluent proves him right: the COD removal efficiency has stabilised considerably. This then created the scope to determine the optimal balance between chemical and discharge costs. In a second step, the focus was on optimising chemical consumption.

"With manual dosing, we were using up to four tankers of PAC and four tankers of caustic soda per month. The system enabled us to carry out trials and switch to other additives. This has reduced consumption of PAC to two to three tankers and of caustic soda to one to two tankers per month.

As this is a complete solution with predictable investment and running costs, we can easily weigh up the investment against the savings. It has become clear that the switch paid for itself financially in just over a year; since then, we have been making regular savings."



RTC User interface: Process Overview Screen



RTC- User interface: Path Plot

Conclusion

The dosing of coagulants and flocculants is a delicate process, as it depends on so many factors: inflow rate, degree of contamination, water characteristics, and much more. As a result, the required chemical dosage is constantly changing. Although, in theory, manual operation can be effective, in day-to-day operations there is often not enough time to devote the time and effort that such a system requires. To ensure that all precipitable substances are precipitated, nearly every facility tends to overdose on precipitants and flocculants. However, this leads to subsequent problems: The wastewater to be treated is partially contaminated by the overdosing and loaded with organic carriers, which in turn increase the COD effluent value. Additionally, the plant operator incurs avoidable costs, which are further exacerbated by current price trends in the chemical market.

Load-based dosing control is state-of-the-art

The process measurement technology offered by Hach for total solids and organic matter concentrations provides precise information and a reliable basis for this decision—not just on an ad hoc basis, but continuously. “Hach’s measurement technology performs very well. In particular, the BioTector B7000i, which measures organic load, has provided very reliable measurements from the very beginning, even with our wastewater and high salt loads,” says Andreas Vogel. Through integration with Hach RTC control modules, the dosage is calculated according to defined rules and continuously verified via a feedback signal.

Full control over the plant and costs

Plant Manager Michael Stechert weighs the costs and benefits: “Thanks to the installed measurement technology, we have a better understanding of our wastewater and our plant. Thanks to the RTC control module, we can find the best balance between COD removal and chemical costs. In the months following the optimisation, we determined which dosage is most cost-effective for which influent load and were able to automate this logic using the RTC module.”

Maintain control over changes to the dosing logic

Plant Manager Stechert: “It was impossible to predict exactly how much efficiency we would gain from the changeover before it took place. We are very satisfied with the control we now have over the system.”

Hach control modules are not designed to take control of the system, but rather to support the plant personnel. “We can adjust the dosing logic up or down at any time or make additional settings, for example, when we are testing different dosing chemicals. In routine operation, however, we sometimes let the module run for weeks at a time.” For complex requirements, such as polymer dosing independent of aluminum salt dosing, the Hach Solutions team provides support by phone and video call. “When we request support from the Hach team, we grant remote access to our controller. Then the engineers can help us adjust the logic, and we learn from the process.” After all, control of the system remains with the plant personnel.

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