

Phosphorus Limit Compliance, Optimise Chemical Dosage & Process Control

Problem

A major soft drink manufacturer has a limit of 2mg per litre of total phosphorus in their final effluent. With production spills and scheduled discharges of non-conformance product, a local plant was at risk of not meeting their phosphorus limits.

Solution

Real-time analysis from Hach®'s RTC-P system, combined with ChemTreat's 8200-L precipitant, helped reduce the manufacturer's phosphorus levels to below their allowable limit.

Benefits

The manufacturer has been able to meet their compliance limits. Their phosphate discharge values are now controlled at less than 2 parts per million total phosphorus.

Total suspended solids and turbidity readings are also reduced by approximately 10 %.

Background

The beverage facility in Mexico with 500 cubic meter/day capacity functions under a 2 mg/L total phosphorus consent limit for the on-site wastewater treatment plant's (WWTP) final effluent.

Operators at the facility previously carried out manual sampling, but did not chemical dose. They were running the plant with conventional treatment stages; solids screening, homogenising tank, anaerobic/aerobic, clarification and chlorination, while operating above of the 2 PPM total phosphate limits for several years.

Without carrying out continuous online measurement of Phosphorus, the company was experiencing difficulties adjusting to unexpected, sudden spikes in phosphorus load due to issues such as spills during production or disposal of non-conforming product. High Flow (1,250 cubic meter/day) and phosphorus concentrations (40 mg/L) occurred during the initial set up test. Due to this, the company faced compliance risks. To improve operations and meet their compliance, they looked for solutions to provide continuous phosphate analysis and chemical dosage optimisations in real time.



Fig 1: RTC-P system

CASE STUDY: RTC-P IN BEVERAGE APPLICATIONS

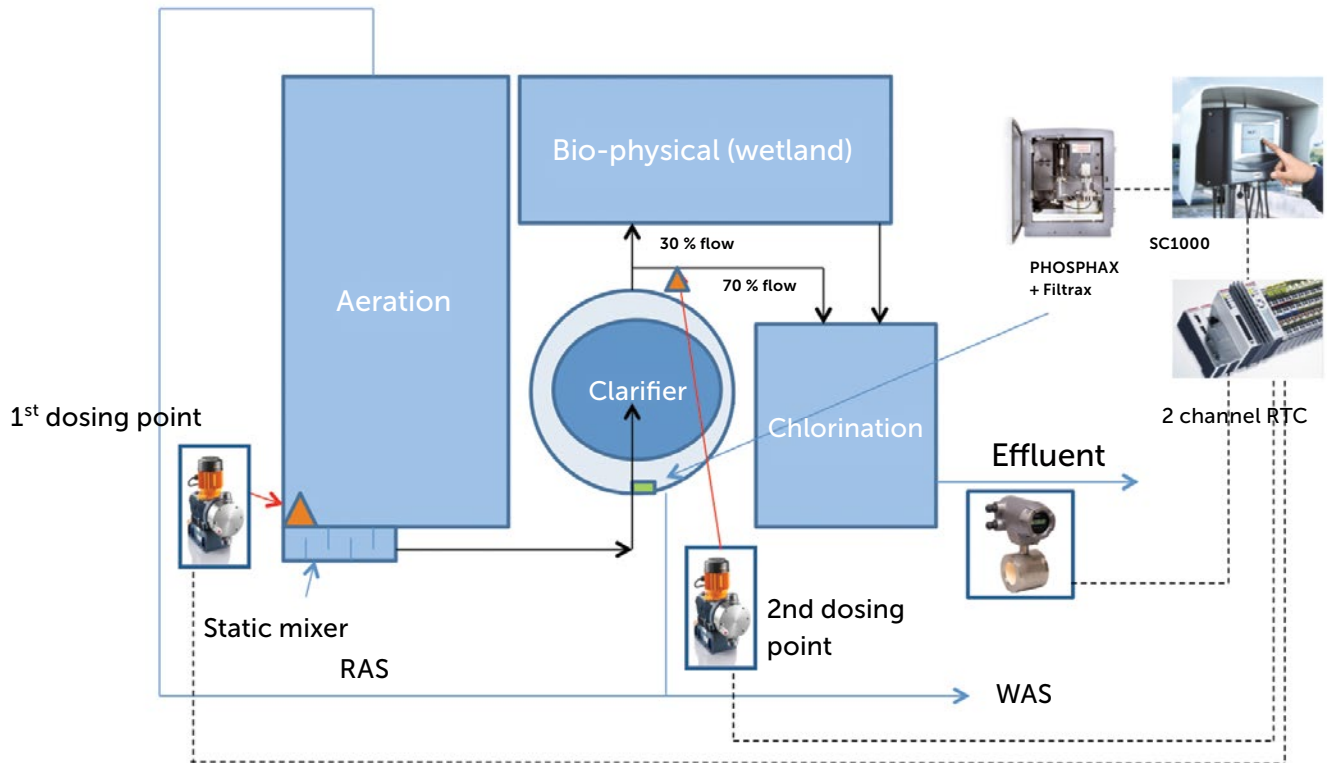


Fig 2: RTC-P Solution

Solution and Improvements

The Hach Real-Time Control System for phosphorus measures ortho-phosphate and flow rate in real time to dose the exact amount of precipitation chemical needed to meet your desired phosphorus set point. The reduction in chemical dosing also means less sludge and less sludge handling costs. Prior to installing the RTC-P, Hach and the soft drink manufacturer performed various tests to assess how to best address phosphate removal and which chemical precipitants would provide the best results for phosphate removal.

Hach commenced a month trial with the bottling group, setting up the RTC-P with a Chemtreat P8200-L precipitant (this has the ability to remove phosphate using less volume than traditional iron and aluminium based coagulants.) The objective of the trial was to stabilise the system and maintain the total phosphate readings below 2 PPM during a week at final effluent.

Dosing commenced at the outlet of the anaerobic process and the outlet of the second aeration stage, adjusting dosages based on flow total phosphate load calculated by RTC algorithms. At first the expected total phosphate load was 11 PPM and 1,000 cubic meter/day, but during the trial we experienced peaks of 20 % overflow and almost 400 % total phosphate readings at the outlet of the anaerobic process. Despite the higher than expected flow and readings, we were able to meet the changes to achieve the project goal.

Results

Hach presented a weekly report with results and trends during the testing period (See Fig 3a, 3b). The results showed the plant achieved reduced levels of total phosphate, achieving less than 2 ppm at final effluent without affecting the other critical parameters that could unbalance the process. Project Leader for the WWTPs says, "We are convinced RTC-P adjusts the precipitant dosage in real time based on flow and phosphorus concentrations, optimising the processes and helping us to comply with our internal regulations."

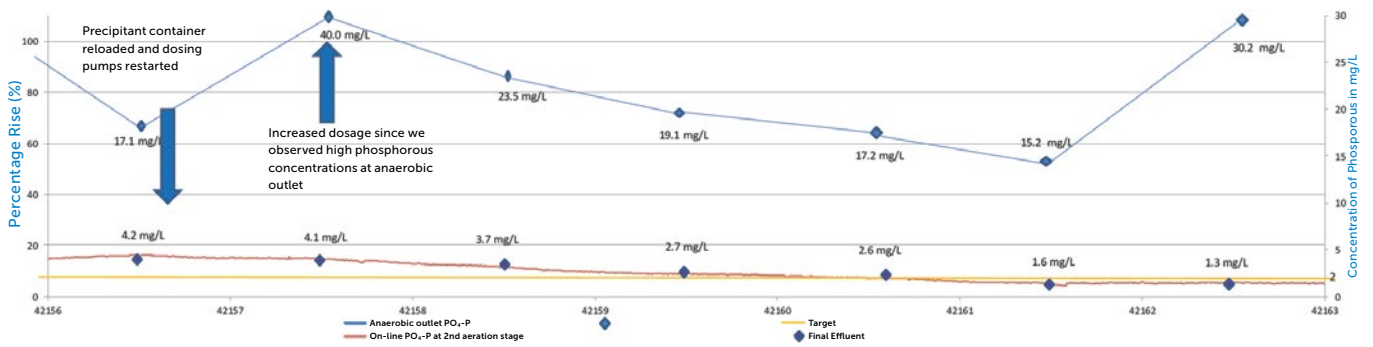


Figure 3a: Concentration of phosphorus percentage increase (June 1-7)

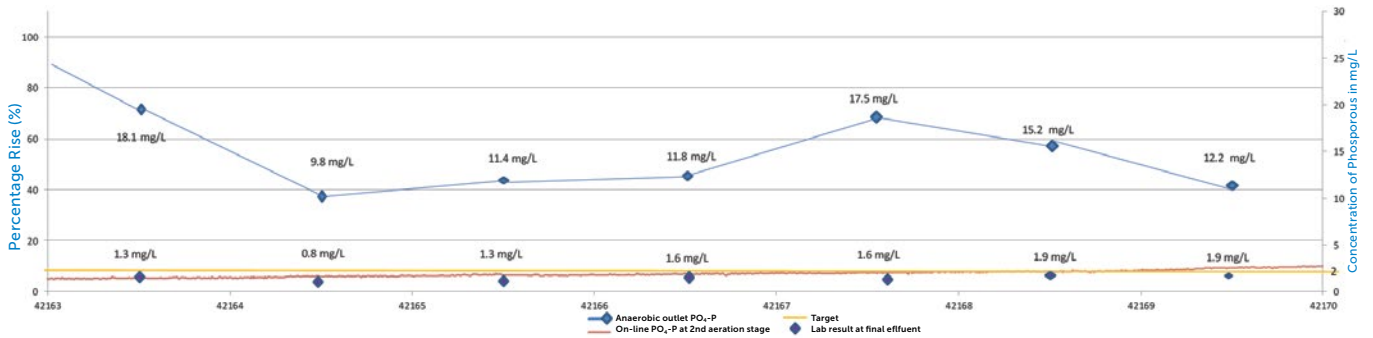


Figure 3b: Concentration of phosphorus percentage increase (June 8-14)

Conclusion

After achieving the required phosphorus concentrations to uphold consent limits during the trial, the company chose to keep the RTC-P solution in place at the site. Beyond improvements to process control and optimising chemical consumption, they identified additional benefits of RTC-P. By using available inputs on the installed Hach SC1000 Controller, the facility could fully optimise other critical parameters such as total suspended solids and dissolved oxygen at the aeration tank and sludge level at the clarifier. Through these process improvements, the company achieved 10 % improvement for total suspended solids and turbidity.

The Environmental Supervisor of the plant, says, "Besides the success of RTC-P achieving the results at final effluent of less than 2 ppm total phosphate, the real-time system is ready to add other sensors to control/monitor other critical parameters such as pH, dissolved oxygen and total suspended solids."



Figure 4



Figure 5



Figure 6

First dosing point at the inlet of first aeration stage (Fig 4); the second dosing point at the second aeration stage (Fig 5), and water quality at the post clarifier (Fig 6).

Summary

The soft drink manufacturer received onsite and remote monitoring support from Hach specialists, keeping operations running smoothly. Hach paired the RTC-P with its Prognosys predictive diagnostic system to ensure compliance by preventing unexpected instrumentation emergencies. Pairing RTC-P with Prognosys allowed the plants to manage phosphorus removal regardless of flow fluctuations, load peaks, or instrumentation issues.

The RTC-P system was implemented, the WWTP is now benefiting from:

- Stable phosphate discharge values controlled at < 2 ppm Total Phosphorus
- Reduced total suspended solids and turbidity readings by around 10 %
- Optimised load-dependent dosage
- Low level of sludge generation
- Improved water quality at the final effluent

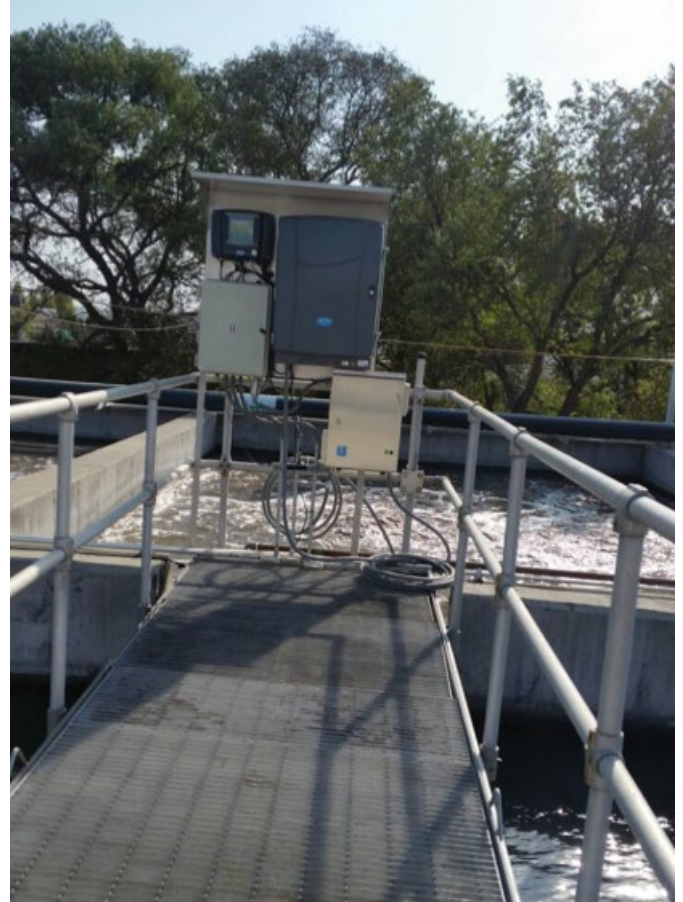


Fig 7. RTC-P installed and running