BIONIC SYSTEM SOLUTIONS

Case study

Reducing Chemicals in Wastewater Treatment

The Problem

Wastewater treatment plants (WWTPs) in Denmark face strict requirements for phosphate amounts in the wastewater they produce. Further, they face greater sustainability demands for operation and establishment of new WWTPs. Due to budget constraints, plants are not free to invest in advanced treatment solutions or personnel and therefore end up using excessive amounts of chemicals, in order to reach their target outlet level for phosphate. This results in higher chemical dosage, operating costs, CO^2 emissions, and risks ecological damage.

Overview

To meet strict requirements regarding maximum phosphorous amounts in wastewater, Bionic System Solutions (BSS), In collaboration with Vand Center Syd Denmark (VCS), developed a Soft-Sensor utiilizing existing data and infrastructure, thus eliminating costly investments in training or hardware.

The solution was implemented at the Otterup WWTP and demonstrated an impressive **+20% reduction in chemical dosage**, lower carbon emissions and a significant reduction in operational costs.

Constraints

- **Limited Resources**

The solution must be very cost-effective and use existing data, sensor hardware, infrastructure as an assumption.

- **Chemical Usage**

The solution will predict the optimal dosage of chemicals for phosphorous removal within safety margins. There must be no risk of low dosing.

- **Safety**

Our solution must meet the safety requirements as presented by governmental bodies and regulatory offices. The solution must not be vulnerable to cyberattacks and be compliant with NIS2.

- **Integration & Maintenance**

The solution must be reliable, require little-to-no maintenance, accurate and easy to integrate into existing WWTP systems. Further, it must be able to receive additional functionality as needs arise.

Solution

To meet the resource constraints of the project, BSS developed a purely digital solution. a Soft-Sensor, In contrast to a physical sensor, is purely digital. It uses mathematical models and machine learning instead of physical hardware to translate existing data streams into actionable information. In the case of this project, the Soft-Sensor would predict the optimal dosage of ironsulphate for phosphorous removal to eliminate excessive use of chemicals.

To ensure the accuracy and reliability of the Soft-Sensor's predictions, the project team conducted extensive testing and validation at Otterup WWTP. The predicted phosphorus concentration data provided by the Soft-Sensor were then used to dynamically adjust the chemical dosing in real-time, ensuring optimal usage of chemicals and significant cost savings.

Continuous monitoring and data analysis were conducted to refine the Soft-Sensor's algorithms and enhance its performance. The collaboration between BSS and VCS was pivotal in the successful deployment and validation of the Soft-Sensor, with ongoing feedback and adjustments based on the performance data.

Result

The implementation of the Soft-Sensor at the Otterup WWTP led to more than 20% reduction in chemical usage. This reduction led to significant decreases in the plant's carbon footprint and lowered operational costs.

The Soft-Sensor project sets a precedent for the adoption of digital tools in the water sector, showcasing how data-driven solutions can enhance operational efficiency and sustainability under resource constraints. The success of this pilot project paves the way for wider adoption across other small WWTPs, contributing to more sustainable water treatment practices.

Reduced Chemicals/Cost

20% cost reduction in chemical dosage for phosphorous removal.

Ecological

Avoid unnecessary chemicals in wastewateroutlet, reduce associated CO2 emissions.

NIS2 Compliance Pending

Solution is pending compliancy with the NIS2 Directive

No Risk of Low Dosing

Precise predictions ensure no risk of low or excessive dosing

Objectives

Our main objective was to develop and implement a Soft-Sensor solution utilizing existing data and sensor hardware, capable of predicting phosphorus concentrations in wastewater inflows to optimize chemical dosing for phosphorus removal.

Contact

Emil Asgeirson
Product Manager / BSS Analytics
ea@bionic.dk | +45 20 87 75 60