EOSi

CASE STUDY

PROCESS CONTROL IMPROVEMENTS FOR INDUSTRIAL DENITRIFICATION

When an industrial protein and rendering plant suffers denitrification problems caused by irregular and variable plant-loading, an "adaptive denitrification" solution using EOSi's Nitrack® Program delivers precise carbon-source dosing, restores process stability, and eliminates permit compliance risk.

Location: Eastern Virginia, USA

Facility: Industrial protein and rendering facility

Flow Design / Actual: 1.5 MGD / 3 MGD

Treatment Technology: 4-stage Bardenpho

EOSi Solution: MicroC® 2000 + Nitrack® Program

Study Period: March - August

Variable Early-Week / Late-Week Plant Loading

The industrial protein and rendering facility located near Virginia's eastern shore typically handles more than 1 MGD flow highly concentrated with nitrogen. Like many industrial plants that pause treatment operations on weekends, irregular plant-loading variability combined with high loading and low nutrient limits create carbon-dosing process control challenges with little margin for error. In this case, even resorting to a manual-dosing strategy to compensate for the variabilities often resulted in both early-week carbon underdosing and late-week carbon overdosing — creating havoc with denitrification levels and putting the plant's permit compliance at risk.

Plant-Loading vs. Dosing Setpoints

Carbon-source supplementation in wastewater treatment directly impacts the denitrification process, so accurate dosing of carbon sources is vital for improving the quality of effluent from wastewater treatment. Adhering consistently to a well-chosen carbon-source dosing setpoint typically ensures the most efficient operation and lowest cost needed to meet wastewater-quality targets.

The plant had achieved good results with EOSi-assisted carbon source dosing control over the years, but recent increased loading variations at the plant began to trigger extended deviations from the dosing setpoint, resulting in a worrisome 1.39mg Nox /L mean deviation from setpoint over a nine-month period (*see figure 1 on page 2*). Returning process values to a mean error of below 1mg NOx/L from setpoint to remedy the situation required the help of a specialized process-control system like EOSi's Nitrack Program.

EOSi's Nitrack Program Optimization

EOSi's Nitrack Program is an automated controller system for automating, monitoring, and optimizing MicroC premium carbon sources dosing for biological nutrient removal in wastewater treatment denitrification, enhanced biological phosphorus removal (EBPR), and biochemical oxygen demand (BOD) addition applications. Nitrack's carbon-source dosing automation enables biological nutrient removal (BNR) to ensure permit compliance, while dispensing precisely the minimum carbon-source chemicals needed to meet effluent-parameter goals.

The Virginia plant operators had worked closely with EOSi specialists for years to continuously

improve MicroC dosing control as plant conditions changed. Analyzing existing historical plant data and new plant process data gathered by Nitrack's continuous system-monitoring and data-gathering produced vital analytical insights needed to support a new dosing strategy. The previous "feed-forward/feed-back" static model was abandoned in favor of a new dynamic-control model specifically customized to accommodate the plant's variable loadings. The result: improved carbon-dosing process control ensuring rapid system re-tuning in response to load changes, and reduced risk of unpredictable control output.

"Adaptive Denitrification"

The new dynamic-dosing model proved very successful in achieving the most accurate control yet seen at the plant (*as shown in the figure 2 to the right*). Mean error was reduced from 1.39mg NOx/L to .53 mg NOx/L over the five months following the dosing adjustment — a whopping 62% improvement far surpassing the original goal of 1 mg NOx/L mean error.

Today, the Virginia treatment plant can, and frequently does, alter their Nitrack Program-controlled carbon source dosing setpoint throughout each week — an "adaptive denitrification program" that automatically optimizes system performance, minimizes cost, and avoids future permit-compliance risk.

FIGURE 1: Nitrack Algorithm Static Model

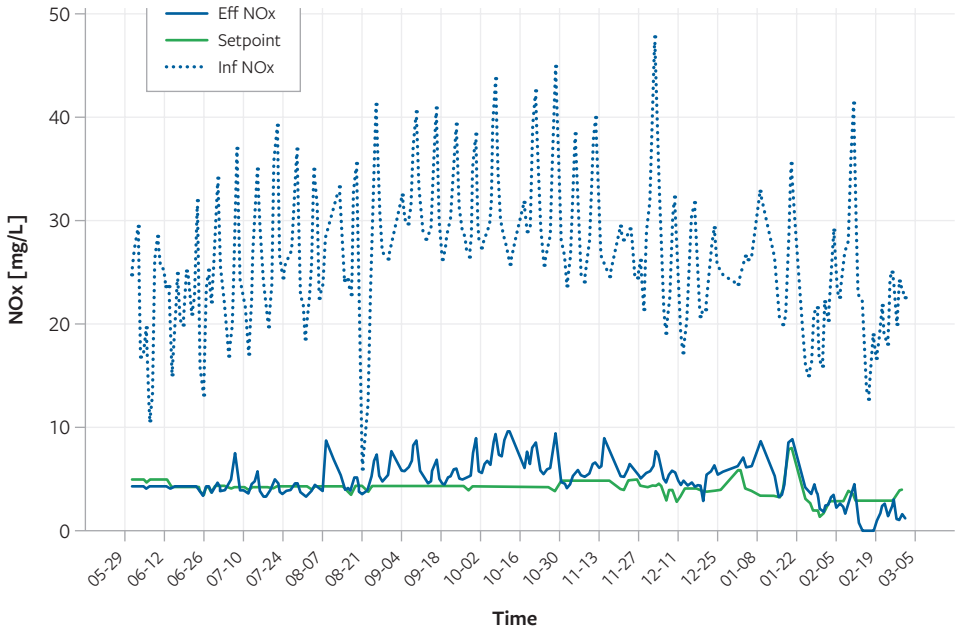
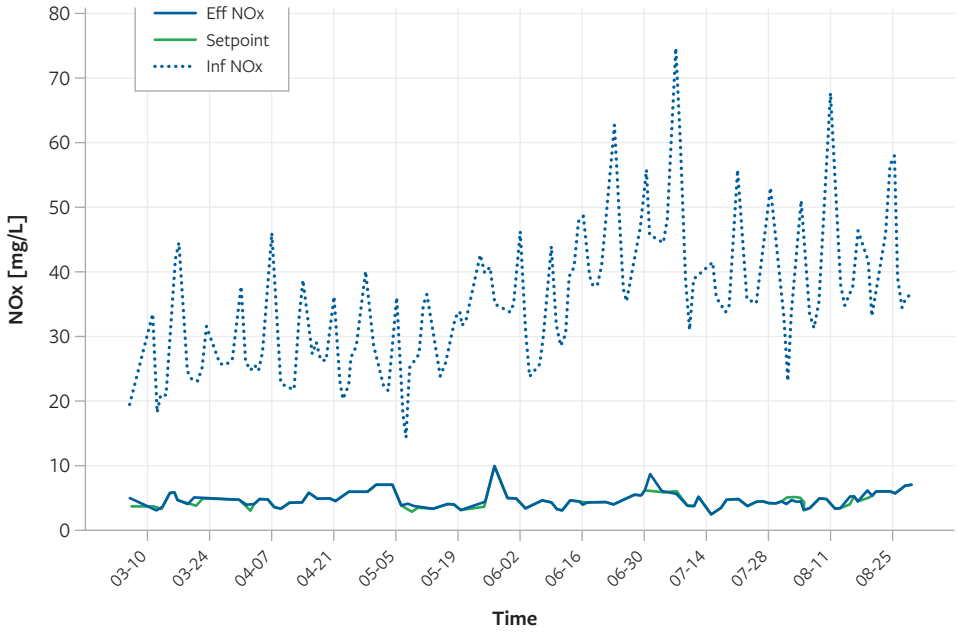


FIGURE 2: Nitrack Algorithm Dynamic Model



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