

Treating the hard to treat

Biochemical Process Helps Manufacturer Meet Wastewater Standards

The Challenge

A manufacturing facility was notified by its regulatory agency that, upon the upcoming permit renewal, nitrates would be added to the list of regulated metal discharge parameters. The new limit would cap nitrate discharge at 3.13 lbs per day. Removal of nitrates can be extremely difficult as they do not respond well to chemical treatment.

Upon reviewing historical data from their existing treatment process, the company discovered that nitrate discharges ranged from 4.64 lbs to 6.85 lbs per day, significantly exceeding the proposed limit.

The facility's existing 300-gallon batch system was designed for heavy metals removal and performed very well for their existing process. Due to the capital investment made on this existing system and the financial cost to haul waste, an approach was needed to treat nitrates in house.

In search of a more viable method, the company turned to Hubbard-Hall for assistance.

The Approach

Given the tight timeline for demonstrating compliance, equipment upgrades were ruled out. Instead, Hubbard-Hall's technical team explored possible biological treatment options. Nitrate removal by biological means can be very effective but environmental conditions must be established and controlled.

Executive Summary

A manufacturer struggling with elevated nitrate and metal levels in its wastewater achieved regulatory compliance in just seven days with the help of Hubbard-Hall's bioaugmentation treatment.

- Faced strict nitrate discharge limits of 3.13 lbs/day to meet compliance requirements
- Implemented BCT-BAS, a specialized bacterial blend for high-COD industrial wastewater
- Reduced nitrate levels to 2.08 lbs/day within one week of treatment
- Continued optimization led to even lower nitrate discharge and reduced chemical usage

For this application the technical team identified four environmental factors of concern: chemical oxygen demand (COD), pH, dissolved oxygen (DO) levels, and initial heavy metal levels. COD is a measure of the available organic strength of the waste stream and functions as a "food" source for bacteria in biological treatment. pH must be maintained at neutral (between 6.0 – 8.0) to promote efficient biological activity. DO must be maintained at a 1.0 mg/L minimum to allow bacteria to "breath". High heavy metal levels can be toxic to bacteria.

Initial test results for these environmental factors were found to be mixed. COD measurements showed sufficient organic levels to support biological activity. However, pH greatly fluctuated, DO was insufficient, and metal concentrations of copper, nickel, and fluoride were above the published thresholds for biological toxicity. However, a plan was developed to improve environmental conditions and explore a biochemical treatment approach.

The technical team determined that the most flexible location for treatment would be the existing system's 1,000 gallon equalization tank as this tank could be slightly modified to adjust pH and would give sufficient detention time for biological treatment. An air line from existing plant air was installed to function as an aerator and help maintain a 1.0 mg/L residual.

Hubbard-Hall recommended the use of BCT-BAS, a proprietary bacterial blend designed to treat high-strength industrial wastewater. This product contains a diverse mix of microorganisms capable of breaking down biologically resistant and quasi-toxic compounds.

Dosage of BCT-BAS was initially set at a high level to combat the heavy metal toxicity. Dosage was recommended at 5lbs for the first week (1lb per day) to establish the bacteria cultures, followed by a 1lb per week continuous maintenance dose. While some bacteria would be made unviable by the metals, the net residual bacteria would be high enough to consume nitrates.

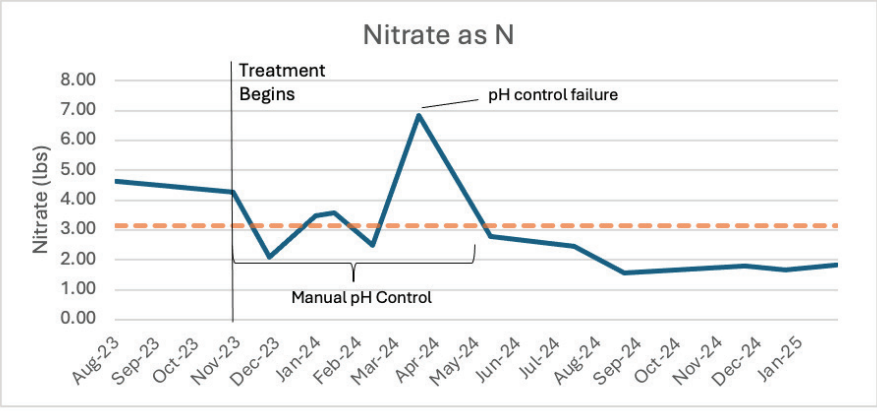
"We were facing a major compliance hurdle and had no room for trial and error. Hubbard-Hall's team brought a solution that worked almost immediately—and without overhauling our existing system."

Environmental Manager, U.S. Manufacturing Facility

The Outcome

By following Hubbard-Hall's microbial dosing protocol and implementing pH adjustment and aeration to improve environmental conditions, the manufacturer achieved a non-detectable nitrate level on the first post-treatment analysis.

However, the above environmental factors for COD, DO, and pH must be maintained. During the initial trial period, pH was adjusted by hand. This resulted in a steady decline in nitrate levels, but tighter pH control was required. An automated system was installed, but an early equipment failure resulted in very high nitrate levels.



Once system equipment issues were addressed and the dosing scheme was optimized the facility was able to reduce microbial input while maintaining nitrate discharge levels between 1.67 lbs and 2.66 lbs per day, well below the regulatory limit of 3.13 lbs/day. The implementation of the biological treatment step did not effect normal operation and results of the existing metals removal system.

"Our goal was to create the right biological environment for BCT-BAS to thrive. Once we dialed in pH, oxygen, and metal control, the bacteria did the rest—safely, efficiently, and within spec."

Jeremy Morgan
Technical Specialist
Hubbard-Hall

Our people. Your problem solvers.

Expertise you can trust.
32% of Hubbard-Hall associates are in tech support, customer service, or sales. This means that you get answers fast while the rest of our team gets your order delivered on time and in spec.

HubbardHall.com

CS-0725

563 South Leonard Street, Waterbury, CT 06708
Phone: (800) 648-3412 · HubbardHall.com