



DERBY ST. SHOPS WWTF OVERCOMES TOTAL NITROGEN PERMIT COMPLIANCE WITH MOLEAER NANOBUBBLES

Client: Derby St. Shops

Treatment Plant Metrics:

- Influent Flow: 20,000 GPD
- RBC Process

Challenges:

- High concentrations of QACs and FOG
- History of permit exceedances for total nitrogen
- Limited process flexibility
- Regulatory restrictions on chemical additives

Results:

- Full nitrification was achieved
- Y-o-Y Effluent Ammonia: 65% decrease
- Y-o-Y Effluent TN: 33% decrease
- No longer using Quat blockers
- Plant in compliance with stable operations since nanobubble installation

The Challenge:

QACs Concentrations Inhibiting Nitrification

Derby St. Shops, a major retail center in Hingham, Massachusetts, houses over 60 businesses including numerous restaurants and food service establishments. The shopping center's onsite wastewater treatment facility (WWTF) faced a critical compliance challenge: persistent exceedances of total nitrogen (TN) permit limits that threatened operational continuity.

Root Cause Investigation

Woodard & Curran, the facility's operations and compliance management company, conducted a thorough investigation to identify the source of treatment disruption. Their analysis revealed the culprit: quaternary ammonium compounds (QACs) from restaurant sanitizing practices were severely inhibiting the nitrification process.

The severity of the contamination was significant:

- Influent QAC concentrations to RBC exceeded 30 mg/L
- These levels far surpassed the 2-5 mg/L threshold known to inhibit nitrification
- High concentrations of fats, oils, and grease (FOG) compounded the treatment challenges

Operational Constraints

The facility faced additional limitations that complicated potential solutions:

- Limited process flexibility within the existing infrastructure
- Regulatory restrictions on chemical additives—quat-blocking chemicals were not included on the local regulator's approved usage list
- Need for cost-effective, sustainable treatment enhancement

Initial Solution Attempts

Before exploring advanced technologies, the facility attempted traditional chemical treatment using quat-blocking compounds designed to neutralize QACs. While this approach produced modest improvements in treatment performance, it presented several drawbacks:

- Required maximum chemical dosages, significantly increasing operational costs
- Raised environmental concerns about potential impacts to the facility's leach field system
- Failed to achieve consistent permit compliance despite intensive chemical application

The chemical approach proved both economically and environmentally unsustainable while still falling short of regulatory requirements.

The Solution:

Nanobubble Pretreatment

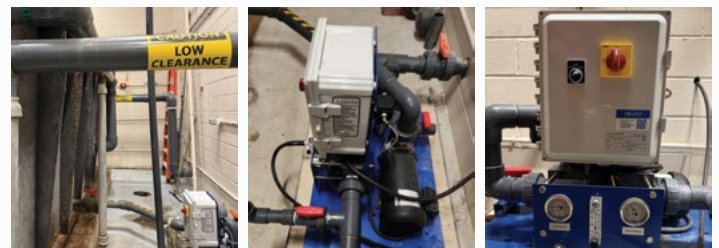
Recognizing the need for a more effective approach, Woodard & Curran partnered with Moleaer to implement nanobubble technology as a chemical-free alternative. This innovative solution offered the potential to address QAC inhibition without the drawbacks of chemical additives.

Implementation Strategy

The team initiated a comprehensive 90-day trial in March 2024 to evaluate nanobubble technology's effectiveness:

- ✓ **Equipment:** Moleaer XTB 100 nanobubble generator
- ✓ **Integration:** Seamless installation with existing infrastructure
- ✓ **Placement:** System installed at the influent of the first Rotating Biological Contactor (RBC)
- ✓ **Configuration:** Recycling capability back to Flow Equalization basins for enhanced treatment

The strategic placement allowed for optimal treatment of the biological process while maintaining operational flexibility.





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Results & Performance Improvements

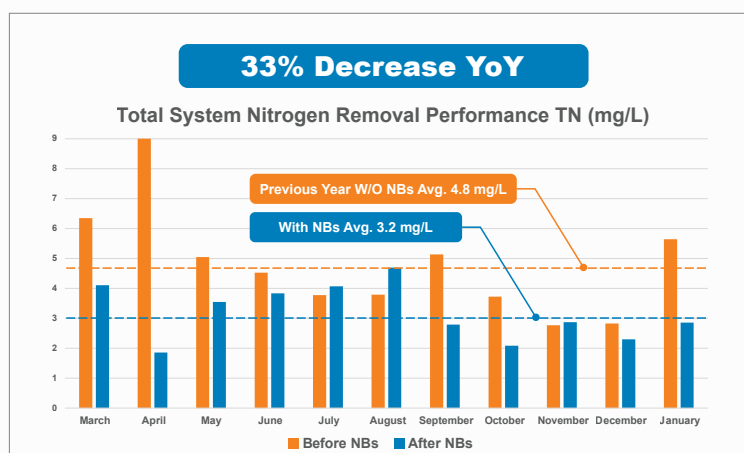
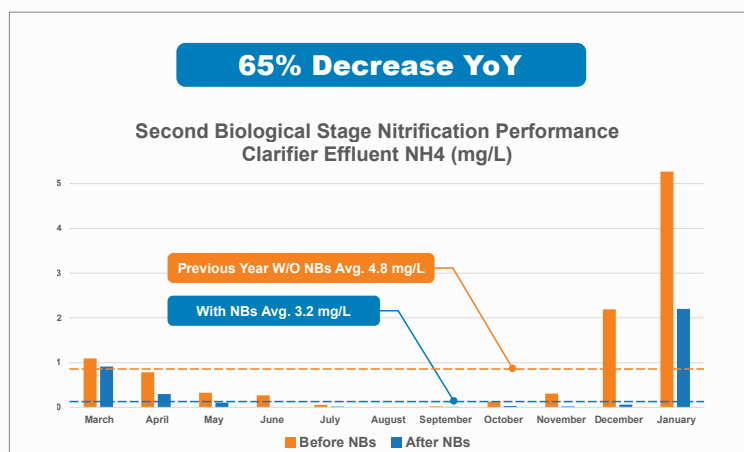
The nanobubble implementation delivered exceptional performance improvements that exceeded expectations:

✓ Nitrification Recovery

- Achieved complete, stable nitrification for the first time in years
- Restored biological treatment capacity despite high QAC influent loads

✓ Dramatic Pollutant Reduction

- **65% decrease in effluent ammonia** year over year
- **33% decrease in effluent nitrogen** year over year



✓ Operational Improvements

- Eliminated the need for quat-blocking chemicals
- Achieved consistent permit compliance since installation
- Resilient operation: recovered process stability during toxicity events

Long-Term Success

Based on the trial's outstanding results, Derby St. Shops proceeded with permanent installation of the Moleaer nanobubble generator.

Key Advantages of Nanobubble Technology

The Derby St. Shops experience highlighted several critical benefits:

✓ Environmental Sustainability

- Chemical-free approach removes concerns about additive impacts
- Reduces environmental footprint compared to traditional chemical treatment

✓ Economic Efficiency

- Minimal capital investment requirements
- Low installation and integration costs
- Reduced ongoing operational expenses through elimination of chemical purchases

✓ Operational Flexibility

- Scalable deployment options accommodate various facility sizes
- Low-footprint design minimizes space requirements
- Reduced maintenance demands compared to chemical feed systems

Setting a New Standard in Wastewater Treatment Efficiency

The success at Derby St. Shops demonstrates how nanobubble technology provides a superior alternative to traditional chemical treatment methods for facilities facing nitrification inhibition from modern contaminants. This chemical-free approach delivers exceptional performance while reducing operational costs and environmental impact.

For wastewater treatment facilities struggling with similar challenges from QACs and other inhibitory compounds, the Derby St. Shops case study illustrates the transformative potential of innovative biological enhancement technologies. The facility's achievement of consistent permit compliance through sustainable, cost-effective treatment represents a new benchmark for addressing complex industrial wastewater challenges.



Discover how nanobubble pretreatment solves common wastewater challenges:

www.moleaer.com/en-us/industries/wastewater