



Water & Waste Management

BioRemove™ AM

Municipal

Case study: Cold weather nitrification

Rethink Tomorrow

novozymes® 

BioRemove™ AM helped a municipal wastewater treatment plant through a cold winter.

Benefits

- **17% improvement in ammonia removal**
- **Removed 43-46% of the residual effluent NH3-N**
- **Brought the monthly average effluent ammonia from 12 mg/L to 9.9 mg/L over 11 days to safely meet the monthly average limit**

Background

The municipality of a mid-size city in the Northwestern US (mountains) owns and operates a 15 MGD (design capacity) advanced secondary wastewater treatment facility. The system is currently at 50% hydraulic capacity receiving 7.5 MGD of municipal wastewater. The activated sludge plant is well run and typically removed 99 percent of BOD5 and 98% of TSS.

Although the average annual ammonia effluent is 5 mg/L, the municipality is challenged in the winter months to meet their monthly ammonia limit of 12 mg/L.

Application

Facing one of the coldest winters in quite some time, the operations supervisor of the municipal plant was trending his effluent ammonia concentrations on a daily basis. The plant's effluent ammonia concentration continually teetered in and

out of compliance as water temperatures hovered between 8°C and 10°C. Not willing to gamble with compliance, he contacted and a local engineer for guidance. With their guidance and with the recommendation of a neighboring but smaller treatment plant, the supervisor contacted Novozymes to discuss the utilization of BioRemove™ AM, a highly concentrated source of nitrifying microorganisms.

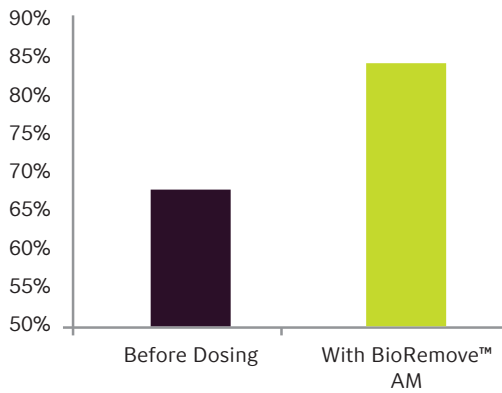
Novozymes' technical staff reviewed the aspects of the application and determined that the likelihood of success with bioaugmentation was high. They provided a recommended dosage and monitoring strategy. BioRemove™ AM was expedited to the site and applied over 4 days.

The results

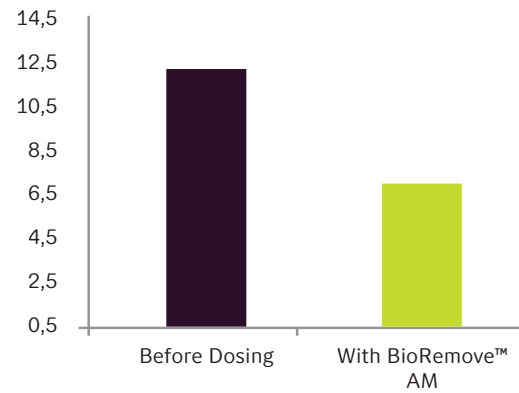
Within 3 days, the effluent ammonia concentrations began to decline. Within 1 week, the monthly average was safely 2 mg/L under the monthly limit and was continuing to trend downwards. The improvements did not stop there. During February, the new nitrifying biomass established so well (6 mg/L effluent ammonia) that compliance breaches was very unlikely (50% of the limit). Nitrification was also confirmed by seeing the equivalent increase in corresponding nitrate.

In comparing the 20 days prior to bioaugmentation and the 20 days after initiation, the differences are stark:

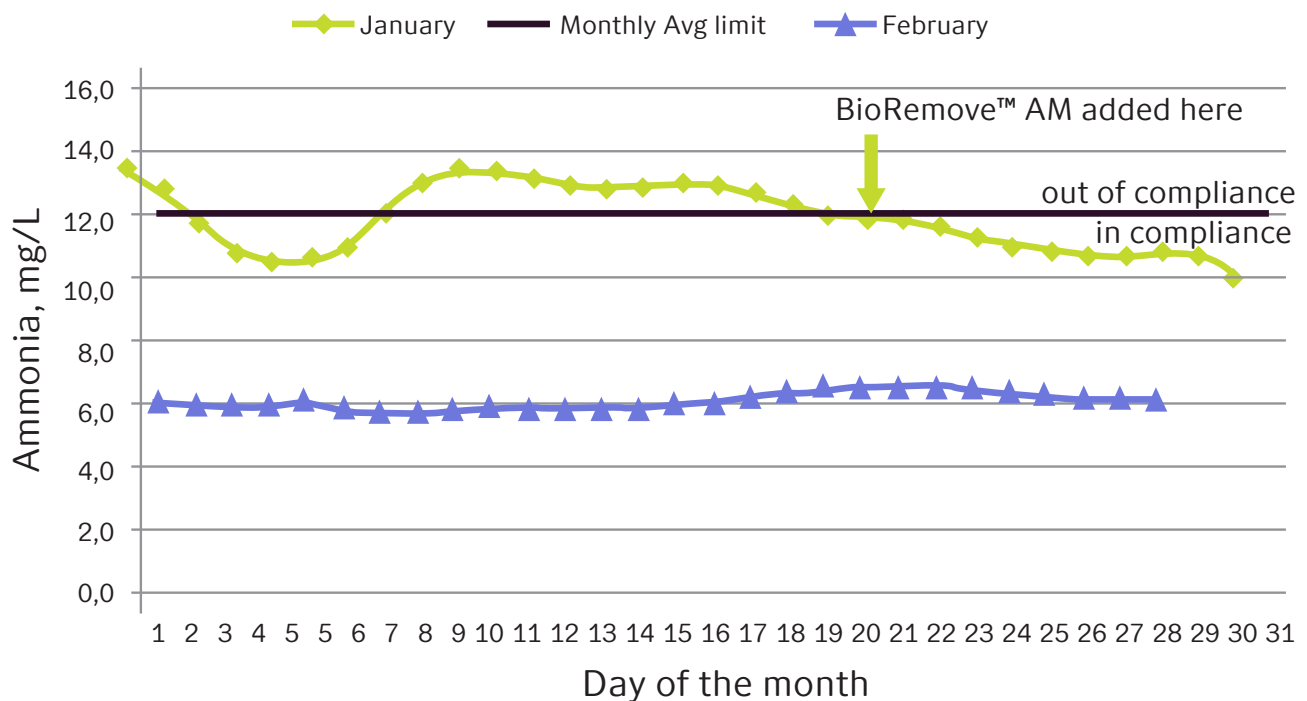
Ammonia Removal



Effluent Ammonia



Effluent Monthly Average



Conclusions

Novozymes' biological program was easy to implement and provided a rapid response to cold weather nitrification challenges. The municipality was able to prevent non-compliance with their effluent permit and avoided spending rate payers' money on environmental penalties and associated costs with the local environmental protection agency.

The utilization of BioRemove™ AM resulted in:

- **Improved plant efficiency**
- **Cost avoidance from non-compliance**



About Novozymes

Novozymes is the world leader in biological solutions. Together with customers, partners and the global community, we improve industrial performance while preserving the planet's resources and helping to build better lives. As the world's largest provider of enzyme and microbial technologies, our bioinnovation enables higher agricultural yields, low-temperature washing, energy-efficient production, renewable fuel and many other benefits that we rely on today and in the future. We call it Rethink Tomorrow.

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Novozymes A/S

Krogshøjvej 36
DK - 2880 Bagsvaerd
Denmark
Tel. +45 4446 0000

<http://biosolutions.novozymes.com/industry/wastewater>
water@novozymes.com

novozymes.com