NoMonia

Q&A: Biological Ammonia Removal

Q: What are the concerns about ammonia in drinking water?

A: If nitrification occurs in the distribution network, it may lead to corrosion, biofilm generation, poor taste and odor, and elevated nitrate levels in drinking water. Additionally, it requires high levels of chlorine in order to reach safe concentrations of residual chlorination.

Q: What are the acceptable levels of ammonia in drinking water?

A: Based on the World Health Organization's report in 2003, the acceptable ammonia level in drinking water is 0.2 mg/L.

Q: What are the highest levels of ammonia that the NoMonia technology can handle?

A: Nitrification generates NO_2 and NO_3, and their respective U.S. EPA regulatory limits are 0.1 mg/L and 10 mg/L. Therefore, the target maximum ammonia concentration for NoMonia is up to 10 mg/L NH_4^+.

Q: Where are there any existing commercial installations of NoMonia?

A: There are two full-scale systems: The first is a 300 gpm system installed in Palo, Iowa, in 2013 (NH_4^+ = 3.3 mg/L, Fe = 0.63 mg/L, Mn = 0.01 mg/L), the second a 200 gpm system started up in 2015, also in Iowa (client confidential) (NH_4^+ = 3.5 mg/L, Fe = 4.7 mg/L, Mn = 0.15 mg/L). Both sites are custom-designed and pilot to full-scale U.S. EPA demonstration projects. A third pilot site has also started up in 2016.

Q: What is the source of the biological activity in NoMonia?

A: The source of this activity is naturally occurring bacteria in the raw water.

Q: What is the substrate in the biological filter?

A: The media used in the two stages of treatment are conventional, commercially available filters, such as AdEdge's AD26, ADGS+, gravel, anthracite, etc.

Q: What is the difference between the two stages?

A: Aeration and microbiological activity take place in the contactors, and the filters are still biologically active for polishing and the filtration of particulates such as oxidized metals.

Q: Can NoMonia integrate with existing filtration systems?

A: Yes, NoMonia can be added to an existing filtration system as a retrofit.

Q: Are there any nutrients added to the treatment process?

A: Orthophosphate and polyphosphate. Polyphosphate, or PO_4, is essential for the initiation, acclimation, and maintenance of healthy biofilm. A carbon source is not required because nitrifying bacteria are autotrophs, meaning they are capable of converting CO_2 and water to carbohydrates.

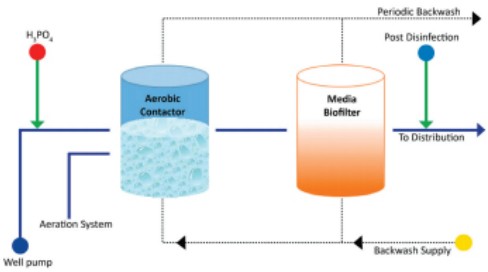

Figure 2: Process flow diagram of the NoMonia process.

Q: Is NoMonia based on gravity or pressure vessels?

A: Aerated contactors = atmospheric. Filters = typical design using pressure vessels.

Q: How is O2 supplied to the process?

A: Traditional aeration is not sufficient. Saturation levels of DO are below the requirements of the treatment system.

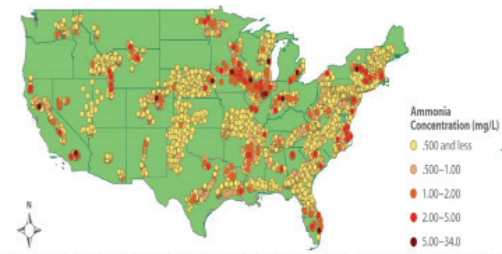

Figure 1: Map of the ammonia contamination in the contiguous United States.

The diffuser design (a patented process) is critical in generating continuous oxygen supply and preventing clogging.

Q: What is the backwash schedule? What is the quality of the backwash wastewater?

A: Maintenance of the contactor is minimal, but monthly backwashes could be beneficial. Filters are typically backwashed once a week based on water quality. The water source for backwash water could be treated water or chlorinated finished water for the biofilter. The final water source and backwash schedule are determined during the pilot period.

Q: Is there any monitoring equipment?

A: DO levels, nitrite (limit 1 mg/L), and nitrate levels. Nitrite in the contactor indicates nitrification. Nitrate appears later when nitrite levels drop. Alkalinity (which decreases in the process as a result of the interaction of H+ with $CaCO_3$) can serve as a process efficiency-monitoring tool. In all cases, nitrite and nitrate levels are maintained below regulatory concerns.

Q: What is the acclimation period of the system?

A: The system acclimates typically within 25 to 45 days. The goal is to achieve complete conversion of nitrite to nitrate.

Q: What are the estimated operational costs?

A: The estimated operational costs are $0.20 to $0.50 per 1,000 gallons. These costs are verified during piloting.