Ammonia Reduction
Nitrification
Onsite Treatment
BOD Reduction

Augmenting On-Site Treatment System to Reduce Ammonia

The USPS operates a large Postal Distribution Center (DC) in North Reading, MA that has an on-site, in-ground BioClere Trickling Filter System to treat all the sanitary wastewater generated onsite. Due to higher than anticipated Ammonia levels in the influent the trickling filter system was not adequately reducing the Nitrogen-Ammonia to acceptable permit levels due to higher than anticipated organic loadings on the system.

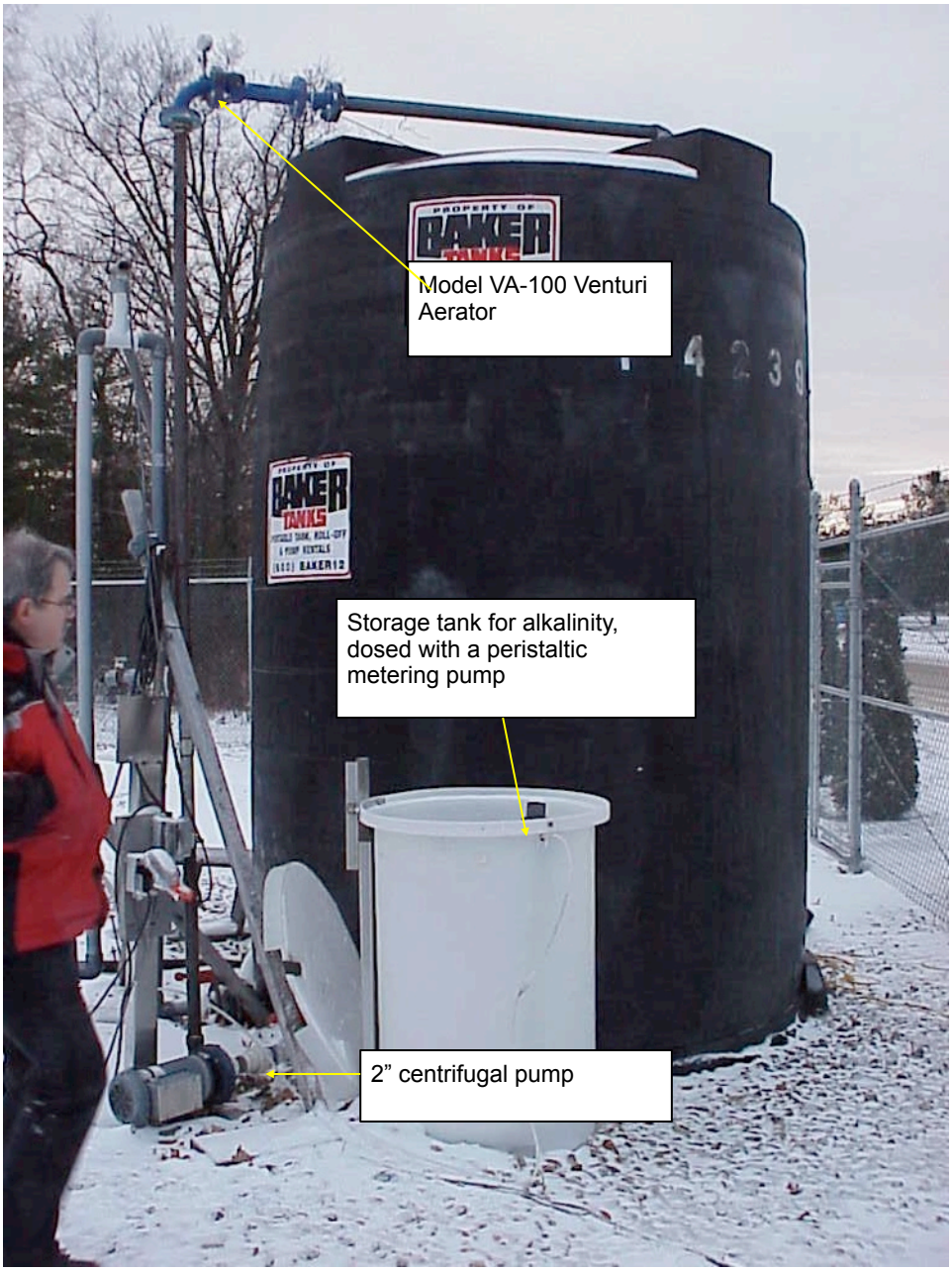
To bring the system into permit compliance the owner contracted with Dr. Benjamin Su [Corporate Environmental Advisors, Inc. W Boylston, MA] to determine a solution and to conduct a two-month pilot testing of the proposed solution. Dr. Su uncovered several major issues after an in-depth study of data and operational equipment. Some of these were with the equipment and others had to do with the process.

Ammonia from the DC influent to the primary septic tank ranged between 55 mg/L and 85 mg/L depending on the time of year, with the Christmas holiday mailing season being the highest. This was the time of year when additional seasonal staff was hired. Dr. Su discovered that the water going into the trickling filter trains was also void of DO, low in pH, and had Ammonia two to three times higher than the design loadings of 25-30 mg/L. Flows ranged from 20,000 to 35,000 gpd. Further, there was insufficient alkalinity to support the metabolic reductions of Ammonia by the resident bacteria in the wastewater.

Working with Venturi Aeration, Inc. a plan was developed to provide an ex-situ (above ground) supplemental aeration tank. For the pilot testing a 4,000 gallon poly rental tank was placed on-site as an aeration tank along with a two-inch venturi aerator unit with a small centrifugal pump. This venturi unit is designed to add dissolved oxygen (DO) from an ambient air source. During the cold winter months the venturi added DO up to 8.0 to 9.5 mg/L and in the very hot summer months DO ranged from 3.5 to 5.0 mg/L. This difference is due to water temperature and the reduced solubility of oxygen in warm and hot water. The fact that the tank was black allowed the hot sun to readily heat the water in the summer. The venturi aerator was placed in a submerged discharge so the kinetic energy of the discharge would spin and mix the contents of the tank. Liquids were pumped into the top of the tank at 15 gpm by a submersible pump placed in the primary septic tank (EQ tank) displacing an equal volume of treated effluent out of the bottom of the tank. The pH was also being raised by some stripping of CO2 by the venturi aerator from 6.7-6.9 up to 7.2-7.5. This allowed nitrification to occur in the aeration tank, which has a 4 hour hydraulic retention time before being transferred into BioClere treatment trains.

Venturi Aeration, Inc., 41 Tallant Road, Pelham, NH 03076-2236 603-635-8239

A siphon break was added to the discharge piping from the aeration tank. The siphon break was used to add the required additional alkalinity. A total of 15 pounds of bicarbonate was added daily and dosing was controlled by a small peristaltic metering pump.



The entire treatment process time was two days from when the wastewater was pumped into the aeration tank until it reached a very large leaching field after the two trains of BioClere trickling filters and a Dynasand denitrification column. Residual

Nitrogen-Ammonia in the polished effluent to leachfield is: Nitrate 0.18 mg/L; TKN 2.1 mg/L; NH3 0.01 mg/L; and BOD 27.