

Case Study - Malatech Bioaugmentation

200 m³/d Category 1 & 2 Animal Protein Manufacturer's industrial WWTP

Goals of bioaugmentation:

The industry releases its treated effluent to a municipal wastewater canalization system of a city. Due to fluctuating factory production, raw material quality the cumulative load varies in a high range which the activated sludge can hardly handle. The WWTP can keep effluent COD below 1 000 mg/l, but NH₄-N below 100 mg/l, and Total Nitrogen below 150 mg/l are challenging, and the plant is fined for violating the limits by the local municipal sewage system operator. The client aimed to eliminate payment of fines without interacting in the manufacturing processes, or lowering the load



Author: Malatech Water Ltd.

Title: Animal protein manufacturing effluent industrial wastewater
treatment plant optimization

The client factory processes poultry and mammal carcasses to prepare category 1 & 2 protein products. The company is based in EU, and supplies to EU market.

The activated sludge part after DAF is a continuous flow plant equipped with a pre-anoxic basin, aerobic basins, and Dortmund-type secondary clarifier. Internal recirculation flows from the end of the final aerobic reactor into the anoxic basin. Sludge recirculation flows from secondary clarifier to the anoxic basin. Reactors are long and narrow mimicking tubular flow pattern quite well.

The plant has an aged infrastructure, designed to treat the wastewater for the canalization limits only (COD lower than 1 000 mg/l, NH₄-N lower than 100 mg/l, TN lower than 150 mg/l). Such designs barely work well in real life conditions because of microbial reasons. In this case the pre-treated inlet COD concentration is between 12 000 - 26 000 mg/l respectively, while NH₄-N varies between 400-4000 mg/l. The plant's biology is forced to operate at conditions of continuous overload. It means that the activated sludge floc structure is loose, causing periodic sludge washouts from secondary clarifier. Due to the high variation of C,N cumulative load, the biology is unable to adapt, and effluent violations are continuous.

Operator's aim was to reduce the duration, and extent of sludge washouts, and stabilize nitrification since the factory has been fined mainly for NH₄-N (discharge limit = 100 mg/l) , and TN (discharge limit = 150 mg/l).

We have used **Bioclean TM, BioGuarde I, and Ammonia Guarde** for bioaugmenting the activated sludge. Bioclean TM generally improves the operational window of the activated sludge bacteria for various parameters, and increases its treatment capacity, and its resistance towards shock loads. Dosage was 6 kg/d on week 1, 4 kg/d on week 2, 3 kg/d on week 3, 2 kg/d on week 4, while we kept maintenance dosage at 1 kg/d onwards.

BioGuarde I for further biological treatment capacity increase was added from Day 1 together with Bioclean TM (1.5 l/d) for 4 weeks. After 5 weeks of bioaugmentation with the 2 materials, we introduced Ammonia Guarde to restore nitrification (1 l/d) for 2 weeks, and kept dosing afterwards with 0.5 l/d.

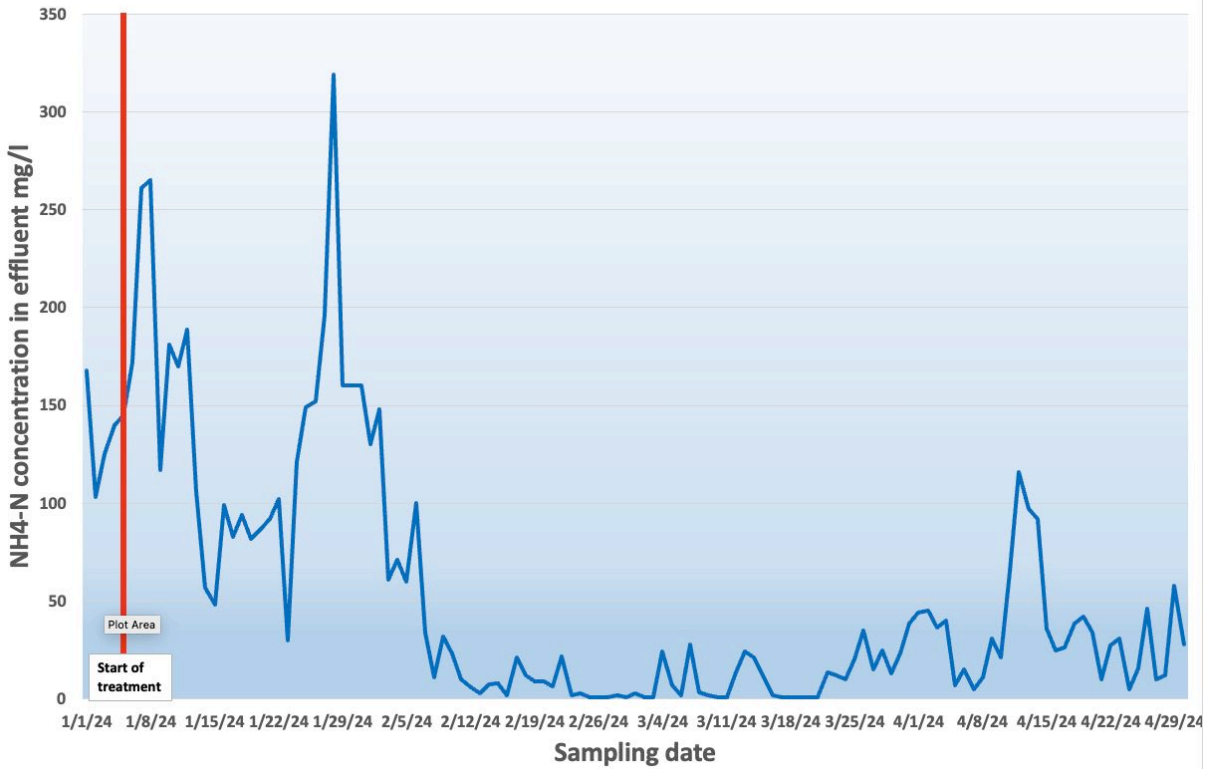
Results:

Diagrams show NH₄-N, and TN concentrations right from the start of bioaugmentation treatment. **Effluent NH₄-N fluctuated between 110 - 400 mg/l before treatment, and stabilized between 3-50 mg/l in less than a month after starting Ammonia Guarde dosage.**

Total Nitrogen fluctuated between 150-450 mg/l in the effluent before treatment. After restoring nitrification, representative TN values are below 100 mg/l.

Shifts in raw material and production within the factory still result shock loads, when the effluent NH₄-N and TN can fluctuate, but by continuous bioaugmentation treatment the peak values are way lower than before, and the parameters can be brought down in a few days.

Effluent NH4-N concentration



Effluent TN concentration

