Bioscience, Inc.
Environmental Products and Services

ISO 9001:2008 Certified

Nitrification Reactivation

Ammonia Removal Enhancement in landfill leachate treatment plant using MICROCAT® - XNL Nitrifiers BSE 097

Problem

To reestablish biological nitrification in a landfill leachate treatment plant after loss of activity during the colder winter period.

Recently in early December the nitrification performance decreased significantly, the cause for the decrease could not be determined. About a week after the initial indications of nitrification deterioration, ammonia removal came to a complete standstill. Simultaneously, the COD removal decreased from 50% to 35%. To increase the COD degradation and to reactivate nitrification various measures were undertaken including increased aeration, flow reduction, better pH reduction, and increased activated carbon addition, none of which yielded any success.

Landfill Description and Remedial Measures

A landfill site used for household waste in the EU experienced problems with maintaining nitrification during the winter. The site has been in use as a landfill for decades and the leachate has been collected and treated for 20 years in a trickling filter wastewater treatment plant. The system is in 3 steps. The first is a biological step to reduce chemical oxygen demand (COD) and ammonia-nitrogen (NH4-N) levels. This is followed by a physico-chemical step to further reduce COD through precipitation, and the 3rd and final step is granular activated carbon filtration for further COD reduction. Sludges generated by the process are dewatered and fed back into the landfill. Overall, the treatment plant is very heavily loaded. Both the waste strength and the hydraulic flow are significantly higher than the original design

parameters for the plant. Also, the conductivity (chloride content) is very high. Despite the currently overloaded conditions the treatment performance of the biological stage has been very good. The COD reduction is about 45 to 50% and NH4-N removal over 99%. Except for the addition of a carbon source for denitrification and small amounts of sodium hydroxide for pH adjustment in biological section, no chemicals are added.

Treatment Program

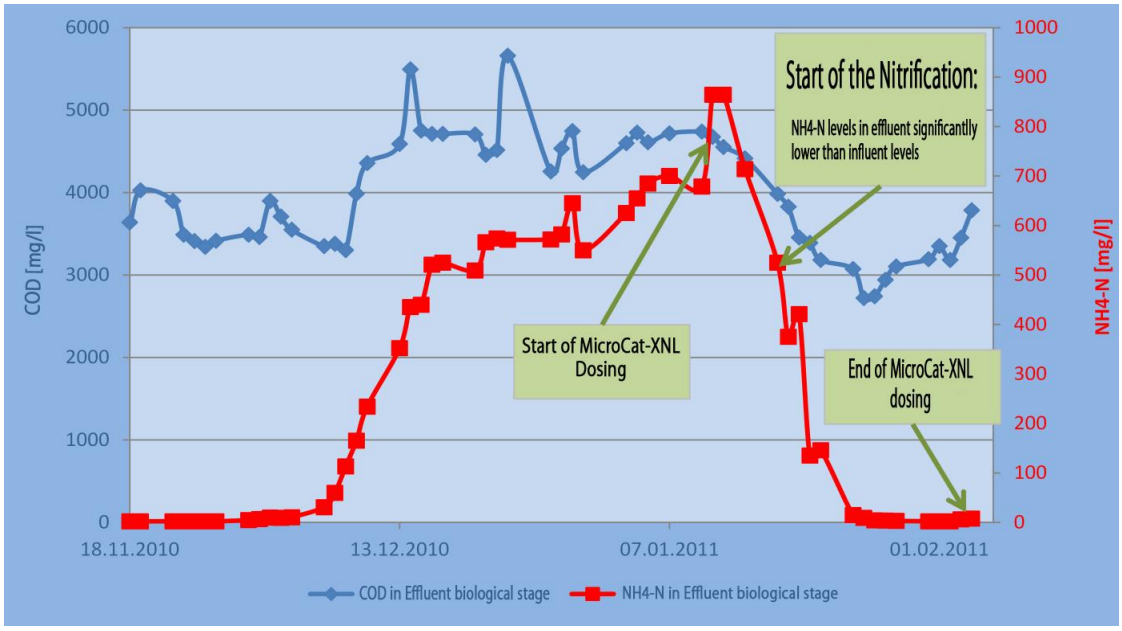
Due to the poor treatment performance of the biological stage, the subsequent stages needed significant additional amounts of coagulants and activated carbon. It was therefore decided to use our Microcat - XNL Ammonia Oxidizing Bioformula from Bioscience, Inc. to accelerate the reestablishment of nitrification populations in the biological stage. The Microcat product addition started in early January. The following application program was implemented.

Days 1 & 2: 7.5 Liters/day
Days 3 through 10: 1.5 Liters/day
Days 11 through 20: 0.75 Liters/day

The treatment program included a recommendation to reduce the pH to a range of 7 – 7.5 in order to reduce free ammonia toxicity. Even though the hydrochloric acid necessary to implement this pH reduction recommendation was not available at the time, Microcat XNL application proceeded as planned.

Results

After 7 days of applying MICROCAT – XNL Nitrifiers the first indications of NH4-N removal were observed. After 15 days of treatment the NH4-N removal was again above 99%.



Conclusions

After its collapse, nitrification in this leachate treatment plant didn't recover for several weeks, despite a number of conventional process operationalchanges designed to stimulate ammonia removal. Despite continuing cold weather within 2 weeks of starting the application of Microcat-XNL, nitrification was back at its original level of 99%. Microcat-XNL Nitrifiers achieved this recovery despite the continuing unfavorable conditions for nitrification, including high chloride levels, high ammonia-N concentration and high pH. These conditions favored the dissociation of ammonium - ammonia in the direction of free ammonia and therefore the inhibition of Nitrobacter and Nitrosomonas strains in the biomass.

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