BioLynceus

Activated Sludge Plant
0.2 MGD

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Nitrification Bioaugmentation in an Activated Sludge Process

Augmenting wastewater processes with cultures of nitrifying bacteria can increase nitrifier abundance and, correspondingly, nitrification efficiency. Additionally, introducing organic-matter-degrading microorganisms into a system can increase the time available for nitrifying bacteria to oxidize ammonia.[1] The following case study describes the effectiveness of BioLynceus® bioaugmentation for improving nitrification in an activated sludge system with fixed-media trickling filters.

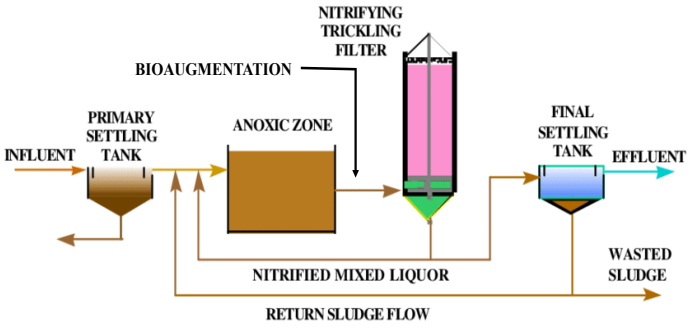

Figure 1. Combined activated sludge and trickling filter system with direct feeding of activated sludge mixed liquor to improve ammonia removal. The case-study bioaugmentation inoculation point is indicated (Modified from Soriano et al. 2014).[1]

1 Soriano, A. G., Audic, J. M., McCarley, S., Ekama, G., & Wentzel, M. (2014). Options for the Upgrading of WWTP's by Means of Trickling Filters. Retrieved at https://www.researchgate.net/publication/228598263_OPTIONS_FOR_THE_UPGRADING_OF_WWTP%27s_BY_MEANS_

A 0.2 MGD municipal activated sludge plant in Oregon was experiencing high ammonia concentrations in its treated wastewater. Nitrifying bacteria in the trickling filters were inhibited by undesirable wastewater conditions during the summer months. Influent flows were low and varied in temperature and pH. Inconsistencies in physical wastewater conditions impaired nitrification, causing high effluent ammonia concentrations. Facility management was concerned about violating its ammonia permit.

In need of a solution to promote ammonia removal, the plant supervisor contacted BioLynceus® . A specialized bioaugmentation plan was designed for the facility. ProBiotic Scrubber® N (PBN), a live-culture product abundant in nitrifying bacteria and organic-substrate-degrading microbes, was applied immediately upstream of the plant's trickling filters.

After a few days of treatment, the system's biology was nitrifying effectively, and effluent ammonia concentrations decreased. Additionally, BioLynceus® bioaugmentation helped the plant remain in compliance with its ammonia permit. The activated sludge facility continued to use PBN from May to October to promote efficient nitrification in its trickling filters.

Establishing an effective community of nitrifying bacteria in wastewater treatment systems can be challenging. Nitrification is most efficient under appropriate environmental conditions, without extreme temperatures or pH levels. Beyond the physical factors affecting nitrification in wastewater processes, maintaining a high abundance of nitrifying and organic-matter-degrading organisms is essential for optimal ammonia conversion. Nitrification is often the rate-limiting reaction in wastewater treatment.[2] This process provides a low energy yield for nitrifying bacteria, which affects their growth rates and abundance. As a result, these bacteria require a high residence time in the aerobic process to oxidize ammonia properly. Bioaugmentation, such as the treatment used in the case study above, can help improve nitrification in activated sludge processes.

1 Kirchman, D. L. (2012). Processes in Microbial Ecology. New York: Oxford University Press Inc. Pp. 228, 229.

2 Gerardi, M. (2016). Wastewater Bioaugmentation and Biostimulation. Lancaster, Pennsylvania: DEStech Publications, Inc. Pp. 20, 64.

BioLynceus® ProBiotic Scrubber® N promotes nitrification in activated sludge processes.

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