

Efficient Denitrification and Process Control of Continuous Flow Anammox Treatment of Aged Landfill Leachate

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Abstract

The aged Landfill Leachate has a high concentration of ammonia nitrogen and an imbalanced C:N ratio, making it suitable for anammox denitrification treatment. However, recalcitrant substances such as humic acids can easily inhibit the microbial metabolic activity of microbes, thus have increased the difficulty of treatment through biological methods. In this article, aiming at alleviating the inhibitory of water quality fluctuation, qualitative impurity removal pre-treatment and partial nitrification were applied for gradient regulation of aged Landfill Leachate influent. The system can be activated within 2 months, which is approximately 60% faster than existing processes. Adopting continuous flow anammox process and N₂ external circulation treatment, the system can achieve efficient denitrification and accelerate sludge enrichment and proliferation. The denitrification load of the system reaches 1.3 kgN/(m³ d), with a denitrification efficiency of 92.4%, and the hydraulic retention time (HRT) of only 2-3 d, which is about 40% shorter than the industry average. After further use of Biological Aerated Filter (BAF) treatment in the backend, the effluent COD of the system is 60-90 mg/L, and the total nitrogen is less than 40 mg/L. The application of a combination process of qualitative pretreatment, partial nitrification-anammox, and BAF has stable performance and high efficiency. The application of this processes greatly alleviate the demand for carbon source in traditional biological denitrification treatment of aged landfill leachate, without producing terminal concentrate.

Keywords

Anammox, Aged Landfill Leachate, Denitrification, Gradient Regulation, Biological Aerated Filter, Continuous Flow