Aerated Lagoon System
0.3 MGD

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Nitrification Treatment in an Aerated Lagoon System

Municipal lagoon systems often face challenges in facilitating nitrification. Nitrifying bacteria are responsible for removing ammonia from wastewater. These organisms are generally present in low abundance in lagoon processes for two main reasons: (1) nitrification is an energetically taxing process, and (2) nitrification is easily disrupted by inconsistencies in physical wastewater conditions. For example, moderate changes in alkalinity and temperature can impair ammonia oxidation. Lagoon systems offer limited control over these physical conditions. Because of these limitations, nitrification is often the rate-limiting reaction in the treatment process.[1]

Lagoon systems can be augmented with concentrated cultures of nitrifying bacteria to promote nitrification. The following case study describes the bioaugmentation of BioLynceus® ProBiotic Scrubber® II (PBII) in a wastewater lagoon network struggling to reduce ammonia concentrations.

A 0.2 MGD covered lagoon system in Colorado was having difficulty maintaining a nitrifying biomass. At times, the process basins experienced inconsistent temperature and alkalinity. During the winter months, the wastewater became very cold, halting nitrification. Alkalinity was also not consistently maintained. These factors, among others not identified, limited nitrification in the lagoons.

The city's wastewater management team wanted to improve nitrification in the treatment process. The facility had effluent ammonia limits to meet and needed to promote ammonia removal. To support bioaugmentation, the city contacted BioLynceus®.

PBII, a highly diversified consortium of living bacteria abundant in nitrifiers, was added to the lagoon to stimulate the nitrification process. The product was applied over three months: April, May, and June. Wastewater temperatures remained above 3 degrees Celsius.

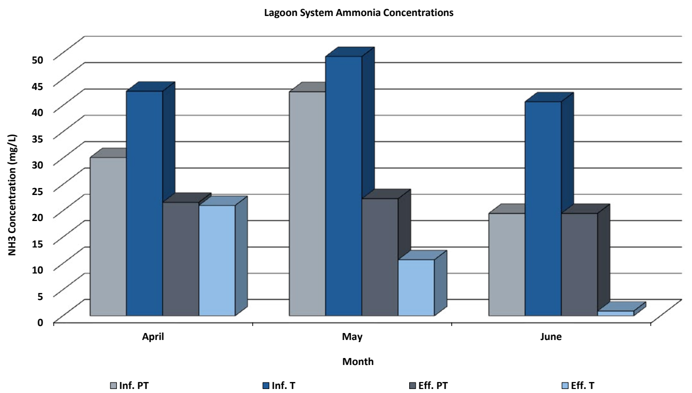

Figure 1. Pre-treatment (gray) and treatment (blue) influent (Inf. PT and Inf. T) and effluent (Eff. PT and Eff. T) ammonia concentrations measured in the lagoon system over two consecutive years during April, May, and June.

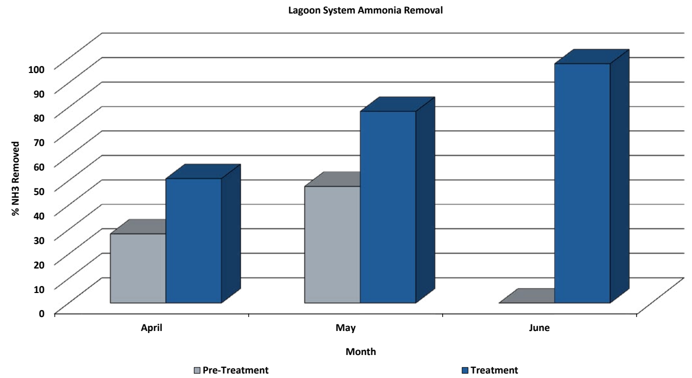

Figure 2. Monthly percent ammonia removal in the lagoon system was determined for April, May, and June in the year prior to treatment (gray) and during treatment (blue). Percent ammonia removal was calculated by comparing influent and effluent ammonia concentrations.

Compared with the same period in the previous year, influent ammonia concentrations increased each month while effluent concentrations decreased (Figure 1). Effluent ammonia concentrations were approximately 96% lower during the treatment year from April through June. Furthermore, the percentage of ammonia removed in the process increased by 23% in April, 31% in May, and 98% in June (Figure 2). Augmenting the lagoon system with PBII supported efficient nitrification and improved effluent quality.

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

BioLynceus® ProBiotic Scrubber® II helps promote nitrification in wastewater lagoon systems.

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