BioLynceus

System of Wastewater Treatment Utilities
0.1 MGD

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F:M Stability in a National Park Wastewater Network

The F:M ratio in the wastewater network at a National Park in Wyoming was optimal from July to October. There was consistent organic carbon loading during this time from tourist activities. However, when the park closed for the winter, the biomass declined due to reduced influent flows. This caused treatment issues at the beginning of the next tourist season in May and June because biomass declined during the slower recreation months from November to April. Thousands of visitors arrived in spring; the park lacked the biomass needed to process the increased loads. The Utilities Supervisor contacted BioLynceus® for a solution to support biomass in their system year-round.

Figure 1. A small mechanical plant with primary and secondary clarifiers similar to the National Park mechanical system.

The operator began adding ProBiotic Scrubber® II (PBII) to the collection lines, 0.05 MGD mechanical treatment plant (Figure 1), lagoon systems, septic tanks, RV dump stations, and pit toilets.
This increased biomass throughout the system, enabling more efficient wastewater processing.

In addition to PBII, the operators dosed the mechanical treatment plant with BioLynceus® Candy Carbon® (CC) from November to May. This treatment provided an organic carbon food source for the biomass when wastewater inputs were minimal. CC kept the plant biology active through the off-season, so there was no lag time in the treatment process when visitors arrived the following spring.

The bioaugmentation and organic carbon treatment helped promote TSS, BOD, and nutrient removal throughout the system. Additionally, NPDES permit violations were avoided at the treatment plant while the park was using BioLynceus® products. The combined PBII and CC treatment sustained biomass in the system year-round and improved the quality of treated wastewater. The F:M ratio was stabilized, allowing more efficient wastewater processing.

Wastewater treatment systems serving seasonal populations often encounter issues with biomass stability. A consistent supply of organic carbon is required to sustain the biological growth and metabolism essential for treating wastewater. Variable influent carbon availability can impact biomass formation and function. The organotrophic bacteria that facilitate biological oxygen demand (BOD) and total suspended solids (TSS) removal are impaired by insufficient organic substrate availability. The food-to-microbe ratio (F:M) of a system describes the relationship between organic carbon and biomass. Optimal F:M ratios can vary among plants depending on operational and design factors. However, when the F:M ratio in a system decreases below optimal, this indicates an insufficient organic substrate supply, diminished biomass, or both. Applying bioaugmentation and supplementing external organic carbon in wastewater treatment can help maintain a balanced biomass.

1 Gerardi, M. (2006). Wastewater Bacteria. Hoboken, New Jersey: John Wiley & Sons, Inc. Pp.73, 181.

2 Mishoe, G.H. (1999). F/M ratio and the operation of an activated sludge process. Florida Water Resources Journal 3, 20–21.

BioLynceus® ProBiotic Scrubber® II and Candy Carbon® balance F:M in wastewater systems.

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