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Use of Bio-Amp, a commercial bio-additive for the treatment of grease trap wastewater containing fat, oil, and grease

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HIGHLIGHTS

- Grease trap wastewater was studied with and without Bio-Amp treatment.
- Bio-Amp can reduce FOG deposit formation and thus alleviate sewer line blockage.
- Bio-Amp can reduce COD and nutrients loadings to the treatment plant.
- Bio-Amp can increase rbCOD fractions and potentially enhance Bio-P removal.

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ABSTRACT

This research investigated the application of Bio-Amp, a commercial bio-additive for the treatment of fat, oil, and grease (FOG) in a grease trap, and evaluated potential impacts of treated effluent on downstream collection system and treatment processes. Results show that after Bio-Amp treatment, FOG deposit formation was reduced by 40%, implicating a potential reduction of sewer line blockages. Chemical oxygen demand (COD), total nitrogen (TN), total phosphorus (TP) and total fatty acids were reduced by 39%, 33%, 56%, and 59%, respectively, which represents an overall loading reduction of 9% COD, 5% TN and 40% TP received by the treatment plant from all the dining halls. On the other hand, readily biodegradable COD fractions significantly increased, which implies a potential improvement on Bio-P removal. Overall, the results showed that application of Bio-Amp in grease trap provides potential reduction of sewer line blockages, and can also alleviate downstream treatment burden.

1. Introduction

Fat, oil, and grease (FOG) have negative impacts on wastewater collection and treatment systems. Most blockages in wastewater collection systems can be traced back to FOG (Kizilaslan, 2007). The blockages can increase frequency of cleaning or replacement of piping systems, and cause unpleasant odors, sewage spills, manhole overflows, or sewage backups in homes and businesses (Canler et al., 2001). In addition, raw wastewater from restaurants and FOG-producing establishments with no pretreatment has high biological oxygen demand (BOD), oil and grease, and total suspended solids (TSS), which result in extra burdens to wastewater treatment plants. It is known that FOG has deleterious effects on biological wastewater treatment processes, as the formation of lipid films around the flocs reduces the oxygen transfer rate to the biomass (Becker et al., 1999) and FOG is also involved with filamentous bulking and foam production (Dueholm et al., 2000). Therefore, removal of FOG from raw wastewater is important.

Grease traps are commonly used by FOG-producing establishments to reduce FOG entering the collection systems and treatment utilities. Grease trap is normally a vault that is located at the exterior of a building. It allows wastewater to cool, and FOG to congeal and rise to the surface where FOG accumulates until the grease trap is cleaned. Because the efficiency of grease traps is relatively low (Chu and Ng, 2000; Chan, 2010), more effective approaches are needed to reduce FOG entering the collection system. Bio-Amp, a bio-additive from Eco Bionics (Irving, TX, USA), is a system that provides high amounts of 5 bacteria (*Pseudomonas fluorescens, Pseudomonas putida, Bacillus subtilis, Bacillus licheniformis*, and *Bacillus thuringiensis*) (Table 1) that are known to degrade FOG. These bacterial species produced an array of metabolic enzymes allowing the breakdown of FOG in wastewater (Wakelin and Forster, 1997). *Bacillus* are gram-positive bacteria that produce enzymes to breakdown fat into glycerol and fatty acids (Kunst et al., 1997; Roheim, 2003). *P. putida* and *P. fluorescens* are gram-negative bacteria that

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