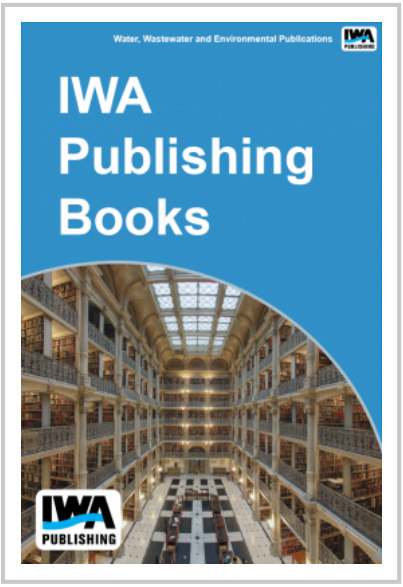
Pathogen Destruction Efficiency In High Temperature Digestion



The purpose of this research was to evaluate and compare various thermophilic anaerobic digestion processes for meeting U.S. EPA biosolids Class A pathogen standards.

The project was split into three phases. Phase 1 screened three bench-scale thermophilic anaerobic process configurations at three different thermophilic temperatures based on their fecal coliform destruction efficiency.

All three of the thermophilic process configurations tested were capable of achieving the Class A fecal coliform standard and were included in Phase 2. In Phase 2, bench-scale anaerobic digesters were fed primary sludge seeded with E.coli, helminth ova, poliovirus, and Salmonella to evaluate pathogen destruction.

Two process configurations, the thermophilic single-stage and the two-stage mesophilic acid-phase/thermophilic methane-phase system, met Class A requirements at 50oC. In Phase 3, the single-stage thermophilic anaerobic digestion process was compared to the single-stage mesophilic process at full scale (1.5-MG digesters) based on fecal coliform and pathogen destruction, process performance, digested sludge dewaterability, and odor generation.

Pathogen destruction and process performance comparisons of the various process configurations are presented for each phase of the study. Based on the fecal coliform data presented here, an empirical model was developed for quantitatively comparing multiple stage and single-stage thermophilic anaerobic digester performance. The model demonstrates that various combinations of thermophilic temperatures, staging, and residence times can achieve the Class A fecal coliform requirement.

This study also suggests that anaerobic digesters operating in the lower thermophilic temperature range (approximately 50?C) are not only capable of achieving Class A requirements but may also produce digested sludges with less odor and lower volatile solids than digesters operating at higher thermophilic temperatures.

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