

The Feasibility of Anaerobic Digestion at 45°C

Authors : Nuruol S. Mohd, Safia Ahmed, Rumana Riffat, Baoqiang Li

Abstract : Anaerobic digestion at mesophilic and thermophilic temperatures have been widely studied and evaluated by numerous researchers. Limited extensive research has been conducted on anaerobic digestion in the intermediate zone of 45°C, mainly due to the notion that limited microbial activity occurs within this zone. The objectives of this research were to evaluate the performance and the capability of anaerobic digestion at 45°C in producing class A biosolids, in comparison to a mesophilic and thermophilic anaerobic digestion system operated at 35°C and 55°C, respectively. In addition to that, the investigation on the possible inhibition factors affecting the performance of the digestion system at this temperature will be conducted as well. The 45°C anaerobic digestion systems were not able to achieve comparable methane yield and high-quality effluent compared to the mesophilic system, even though the systems produced biogas with about 62-67% methane. The 45°C digesters suffered from high acetate accumulation, but sufficient buffering capacity was observed as the pH, alkalinity and volatile fatty acids (VFA)-to-alkalinity ratio were within recommended values. The accumulation of acetate observed in 45°C systems were presumably due to the high temperature which contributed to high hydrolysis rate. Consequently, it produced a large amount of toxic salts that combined with the substrate making them not readily available to be consumed by methanogens. Acetate accumulation, even though contributed to 52 to 71% reduction in acetate degradation process, could not be considered as completely inhibitory. Additionally, at 45°C, no ammonia inhibition was observed and the digesters were able to achieve volatile solids (VS) reduction of $47.94 \pm 4.17\%$. The pathogen counts were less than 1,000 MPN/g total solids, thus, producing Class A biosolids.

Keywords : 45°C anaerobic digestion, acetate accumulation, class A biosolids, salt toxicity

Conference Title : ICCEE 2015 : International Conference on Civil Engineering and Environment

Conference Location : Bali, Indonesia

Conference Dates : October 11-12, 2015