Quantification of Biomethane Potential from Anaerobic Digestion of Food Waste at Vaal University of Technology

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Abstract : The global urbanisation and worldwide economic growth have caused a high rate of food waste generation, resulting in environmental pollution. Food waste disposed on landfills decomposes to produce methane (CH_4), a greenhouse gas. Inadequate waste management practices contribute to food waste polluting the environment. Thus effective organic fraction of municipal solid waste (OFMSW) management and treatment are attracting widespread attention in many countries. This problem can be minimised by the employment of anaerobic digestion process, since food waste is rich in organic matter and highly biodegradable, resulting in energy generation and waste volume reduction. The current study investigated the Biomethane Potential (BMP) of the Vaal University of Technology canteen food waste using anaerobic digestion. Tests were performed on canteen food waste, as a substrate, with total solids (TS) of 22%, volatile solids (VS) of 21% and moisture content of 78%. The tests were performed in batch reactors, at a mesophilic temperature of 37 °C, with two different types of inoculum, primary and digested sludge. The resulting CH_4 yields for both food waste with digested sludge and primary sludge were equal, being 357 Nml/g VS. This indicated that food waste form this canteen is rich in organic and highly biodegradable. Hence it can be used as a substrate for the anaerobic digestion process. The food waste with digested sludge and primary sludge both fitted the first order kinetic model with k for primary sludge inoculated food waste being 0.278 day^{-1} with R^2 of 0.98, whereas k for digested sludge inoculated food waste being 0.034 day^{-1}, with R^2 of 0.847.

Keywords : anaerobic digestion, biogas, bio-methane potential, food waste
Conference Title : ICGCSE 2018 : International Conference on Green Chemistry and Sustainable Engineering
Conference Location : Cape Town, South Africa
Conference Dates : November 15-16, 2018