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EVALUATION OF BIO-METHANE YIELDS FOR HIGH-ENERGY ORGANIC WASTE AND SEWAGE SLUDGE: A PILOT-SCALE STUDY FOR A WASTEWATER TREATMENT PLANT

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Abstract

This paper describes a pilot-scale study for a wastewater treatment plant, operating a biogas plant (2.793 MW). In the experiment, the authors used organic waste material, including: chicken fat with feathers (FF), molasses (M), glycerol (GL), raw sewage sludge (SS) and a digested sewage sludge as inoculum. The parameters of the raw sludge and the digested sludge were compared, for instance, in respect of changes in their concentrations of ammonium nitrogen ($N-NH_4^+$), alkalinities, chemical oxygen demand (COD) and light metal ions. Potential biodegradation pathways for the used organic, used in the experiments, were also proposed. The proposed sequences of chemical reactions are a useful tool for performing further appropriate biochemical analyses and for the mathematical modeling of anaerobic digestion.

The results show that fat with feathers is the most valuable high-energy substrate, providing a cumulative methane yield of 822 m^3/Mg VS (VS – volatile solids). Comparable values of cumulative methane were obtained for molasses (350 m^3/Mg VS) and glycerol (342 m^3/Mg VS), while that of sewage sludge was the lowest (246 m^3/Mg VS).

Key words: anaerobic digestion, biodegradation pathways, biomethane efficiency, high-energy waste, sewage sludge

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