

Co-Fermentation of Sewage Sludge and Waste from Oil Production – Katarzyna Bernat, Andrzej Białowiec, Irena Wojnowska-Baryła

Summary

The paper presents the results of anaerobic digestion and co-digestion under mesophilic conditions in the OxiTop system and in lab-scale fermentors. The goal of the study was to determine the effect of reaction-based oil waste on biogas production in co-fermentation with sewage sludge (mixture of thickened primary and excess sludge). The average water content in sewage sludge was 97%, with 70% of total volatile solids concentration (TVS) in total solids. Weight content of oil waste in the mixture of sewage sludge ranged from 15 to 45% (w/w) and the increase in TVS to 83.7% was observed. The primary investigations of gas productivity by manometric method (OxiTop) showed that biogas production increased with increasing content of oil waste in the mixture with sewage sludge. The rate constant of the first-order kinetics for biogas production was determined. To determine the yield parameters of co-fermentation, the experiment was performed in four continuously stirred anaerobic reactors with a working volume of 10 dm³. Organic loading rate (OLR) changed from 0.9 to 3.1 kg TVS/m³·d. High correlation between biogas flow rate and OLR was observed. Volumetric biogas production rate and the average methane content in the biogas increased from 0.79 to 1.98 m³/m³·d and from 52.3 to 62.3%, respectively, as OLR increased. The results obtained in lab-scale fermentors are promising and open the possibilities of the implementation of co-fermentation of sewage sludge and oil waste.