

Summary of doctoral dissertation

Selected methods of pretreatment to accelerate the gain of biogas from lignocellulose materials

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The aim of this study is to analyze the possibility of using the pretreatment of substrates to increase the efficiency of biogas in the process of anaerobic fermentation of residues from agricultural and food production. The study included laboratory, comparative and survey research. Laboratory tests concerned the measurement of biogas efficiency for the selected plant substrate and from food production residues. In comparative studies, an analysis of various pretreatment methods was performed, taking into account the costs of applying the treatment technology and the duration of the process of the most popular substrates used for biogas production, including maize. The third part of the work concerned the analysis of survey data obtained from biogas producers on agricultural biogas plants. The laboratory tests carried out have shown that the pomace and the use of algae as a supplementary medium give good results. From a comparative analysis of the various pretreatment methods, it has been found that one ideal treatment cannot be selected for each type of substrate. However, the most effective of the discussed methods turned out to be the combined pre-treatment, which in all analyzes allowed for obtaining higher biogas and biomethane production results than the use of only one type of treatment. Hydrodynamic cavitation also turned out to be very effective and justified from an economic point of view. Pre-treatment may allow for the management of problematic waste and obtaining sterile post-fermentation mass with high fertilizing values, but not every treatment is appropriate for a given substrate. An incorrectly selected method may reduce the production of biogas. However, based on the surveys and interviews with employees, it can be concluded that pre-treatment is not a popular solution in Polish biogas plants. No relationship was found between the technical parameters of the biogas plant and the use of pre-treatment.

Keywords: lignocellulosic biomass, pretreatment, biogas, biomethane