

MODELING OF ENVIRONMENTAL-ENERGY EFFICIENCY OF THE BIOGAS INSTALLATION WITH HEAT SUPPLYING OF THE BIOMASS FERMENTATION PROCESS

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Abstract

The determinants of profitability and environmental friendliness of bioconversion are noted in the paper. As one of the major factors the reduction of thermal energy costs for the fermentation of organic wastes in their utilization is proposed to take into consideration. The expediency of using renewable energy sources for thermal stabilization of the fermentation process, especially in the thermophilic mode of organic fermentation, is emphasized. The energy efficiency biogas installation with structural and technological scheme is given as an example. It receives thermal energy to increase its efficiency from a solar collector and a heat pump. It is proposed to evaluate the energy efficiency of a biogas plant taking into account the cost of bioconversion products and the costs of providing this process. A mathematical model was proposed to substantiate the environmental-economic efficiency of a biogas installation with the minimum energy costs for the thermal stabilization of the biomass fermentation process. The model is based on fuzzy set theory which uses linguistic variables. Linguistic variables take into account the influence of quantitative and qualitative factors on the objective function.

Keywords: Biogas installation; Biomass; Eco-energy efficiency; Fermentation; Fuzzy logic; Renewable energy sources; Thermal stabilization.