

Investigation of the Effects of the Whey Addition on the Biogas Production of a Reactor Using Cattle Manure for Biogas Production

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Abstract : In a lab-scale research, the effects of feeding whey into the biogas system and how to solve the probable problems arising were analysed. In the study a semi-continuous glass reactor, having a total capacity of 13 liters and having a working capacity of 10 liters, was placed in an incubator, and the temperature was tried to be held at 38 °C. At first, the reactor was operated by adding 5 liters of animal manure and water with a ratio of 1/1. By passing time, the production rate of the gas reduced intensively that on the fourth day there was no production of gas and the system stopped working. In this condition, the pH was adjusted and by adding NaOH, it was increased from 5.4 to 7. On 48th day, the first gas measurement was done and an amount of 12.07 % of CH₄ was detected. After making buffer in the ambient, the number of bacteria existing in the cattle's manure and contributing to the gas production was thought to be not adequate, and up to 20 % of its volume 2 liters of mud was added to the reactor. 7 days after adding the anaerobic mud, second gas measurement was carried out, and biogas including 43 % CH₄ was obtained. From the 61st day of the study, the cheese whey with the animal manure was started to be added with an amount of 40 mL per day. However, by passing time, the raising of the microorganisms existed in the whey (especially Ni and Co), the percent of methane in the biogas decreased. In fact, 2 weeks after adding PAS, the gas measurement was done and 36,97 % CH₄ was detected. 0,06 mL Ni-Co (to gain a concentration of 0.05 mg/L in the reactor's mixture) solution was added to the system for 15 days. To find out the effect of the solution on archaea, 7 days after stopping addition of the solution, methane gas was found to have a 9,03 % increase and reach 46 %. Lastly, the effects of adding molasses to the reactor were investigated. The effects of its activity on the bacteria was analysed by adding 4 grams of it to the system. After adding molasses in 10 days, according to the last measurement, the amount of methane gas reached up to 49%.

Keywords : biogas, cheese whey, cattle manure, energy

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