

AN ABSTRACT OF A THESIS

THE TEMPERATURE EFFECTS OF THE ANAEROBIC DIGESTION OF CORN STALKS TO METHANE

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Master of Science in Chemical Engineering

Previous observers have shown that the cost of the reactor plays a very important role in the economic analysis of the process used for the production of methane gas by the anaerobic digestion of crop wastes on a commercial scale. Hence, the reliability and accuracy of the kinetic data are of significant importance because of their considerable influence in the economic analysis of the process.

In this research work, a kinetic study was made on the anaerobic digestion of corn stalks in a mixed culture using a single-stage semicontinuous operation. The digestion was carried out in 5.5 liter plexiglass reactors equipped with pitched blade paddle-type agitators. Feed concentrations were varied from 2.0% to 10.0% by weight solids in water over a temperature range of 35 C to 60 C.

The maximum rates of gas production were observed at 40 C in the mesophilic temperature range. The control of the reaction pH at 40 C was also found easier than at 55 C. Experimental results also showed that the fermentation kinetics of the anaerobic digestion of corn stalks in a mixed culture can be represented by an equation of the form

$$-r_c = \frac{k_1^i \cdot C_c}{k_2 + C_c}$$

where k_1^i and k_2 are reaction constants and are functions of temperature only.

From the results obtained in this study, it was concluded that a feed concentration of 7.0% to 8.0% by weight and a digestion temperature of 40 C is preferable for the commercial scale production of methane gas by the anaerobic digestion of corn stalks in a mixed-cultured, single-stage, semicontinuous operation at a constant reaction pH of 7.0.

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