

A MATHEMATICAL MODEL FOR THE ESTIMATION OF ANAEROBIC SLUDGE ACTIVITY

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EXTENDED ABSTRACT

In this work a mathematical model for the microbial activity estimation of an anaerobic digestion, based on mass measurements of COD reduced in one day per mass of VSS present, has been developed. Also a laboratory method was created in order to determine the empirical parameters of the model mentioned above by proper fitting on experimental data. According to this method, in a sample that has been retrieved from an anaerobic reactor, 1 g/l of sodium acetate was added and the mixture was left for sufficient time, in a closed, agitated and temperature controlled vessel. During the time that bubbles of biogas are observed to arise, samples of 5 ml were taken every half an hour from the supernatant liquid, followed by COD analysis for each sample. At the end of the sampling, VSS (g/l) was determined from the entire content of the vessel. After fitting of the mathematical model on the collected data the activity of the sludge is calculated from the equation: activity = $(26.30972/VSS) \cdot a^{0.587} \text{ (d}^{-1}\text{)}$ where “a” is an empirical constant of the model determined by the above fitting. The adequacy of the model was determined from the prediction of an UASB reactor’s efficiency for wastewater treatment from a potato processing industry. The results proved that the use of proposed model for anaerobic sludge activity determination is more accurate and easy to run than the conventional.

Key words: anaerobic sludge activity, anaerobic treatment, kinetics of batch culture