

Importance of anaerobic digestion (traditionally used as a method for waste water treatment) is determined of two main aspects of these processes: ecological effect, including depollution of higher organic loading, and energetical effect, because final product of methane fermentation consist of biogas, which main content is methane. The process carried out in three stages: hydrolic, acid producing and methanogenic, in which participate three main groups of bacteria: hydrolitic and fermentative, acid forming (mainly acetogenic) and methanocenic bacteria respectively.

Microbial population dynamics in this three stage anaerobic food chain is commonly described by a five order Hill and Barth non-linear model. Noncompetitive substrate inhibition for specific growth rate of methanogenic bacteria is also included.

The estimation of the parameters and initial conditions of variables is important for practice, because this problem is connected with successful start-up behavior of anaerobic continuous process. The solving of this problem is a difficult task, since except of high number of estimated parameters (thirteen) and initial conditions (five), there is rather restricted information for variables (measurable variables usually are only input organics and biogas production rate).

Sensitivity theory suggest a tool for investigating the influence of the parameters and initial conditions and that is why it can be used for solving the parameter identification problem.

The objective of recent work is to use sensitivity theory to find a method for selecting the most significant parameters. In particular, we develop a sensitivity model for anaerobic digestion using relative sensitivity functions. Based on this knowledge we suggest a procedure for parameter identification. This procedure gives results, which allow for off-line determination of parameter values if the experimental data for biogas production rate are known.

We are tested our procedure with three experimental data sets for batch processes. We are investigated three different experimental situations: normal, with strong substrate inhibition and case of higher organic loading. The results from parameter estimation show that the model is able to describe different experimental phenomena. One can conclude that after appropriate estimation the model can be used for optimization and control of continuous processes, which is subject for further work.