



STUDIES OF VARIOUS WASTEWATER NITRIFICATION BIOREACTOR TYPES BASED ON MODELLING AND SIMULATION

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Abstract

In view of the importance of wastewater treatment, the purpose of this work is to study and simulate the behavior of various reactors used in wastewater biological treatment, under different working conditions, based on analytical models.

The paper approaches the performances of some constructive types of reactors, in order to assess their competitiveness for the nitrification process. The studies were performed in the following systems: a single-stage activated sludge nitrification, a continuous nitrification with immobilized biomass, a fed-batch nitrification with immobilized biomass, a fluidized bed reactor with attached nitrifying microorganisms.

The analytical models used for simulation are based on dynamic balance equations for ammonia and organic substrate, for organic stabilizing and nitrifying organisms. Also, nitrification kinetics involving a sequence of two steps of oxidation as well as oxygen transfer equations, as complementary relations are included. The computer simulations revealed that the analyzed bioreactors are different in terms of substrates and biomass dynamics. Also, simulation tools based on analytical models of the nitrification systems could be successfully applied in a preliminary phase of process synthesis for choosing the most appropriate nitrification system without experiments, thus saving time and money.

Keywords: nitrification, bioreactors, flow rate, activated-sludge, immobilized biomass

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