

A kinetic study of a membrane anaerobic reactor (MAR) for treatment of sewage sludge

ABSTRACT

The application of kinetic models (Monod, Contois and Chen & Hashimoto) and overall microbial kinetic on the membrane anaerobic reactor (MAR) for treatment of sewage sludge was investigated. The system consists of a cross-flow ultrafiltration membrane and six steady states were attained over a range of mixed liquor suspended solids of 12,760-21,800 mg/l. The results of all six steady states were successfully fitted above 98% for three known kinetics. The growth yield coefficient, Y , was found to be 0.74 gVSS/gCOD while the specific microorganism decay rate was 0.20 d⁻¹. The k values were in the range of 0.350-0.519 gCOD/gVSS.d and μ_{max} values were between 0.259 and 0.384 d⁻¹. The COD removal efficiency was 96.5-99% with HRT of 7.8 days. The methane gas yield was between 0.19 l/g COD/d to 0.54 l/g COD/d when the organic loading rate increased from 0.1 kg COD/m³/d to 10 kg COD/m³/d. The system efficiency was greatly influenced by SRT and OLRs. Membrane flux rate deterioration was observed from 62.1 l/m²/h to 6.9 l/m²/h due to membrane fouling. © 2005 Elsevier B.V. All rights reserved.

Keyword: Anaerobic; Kinetics; Membrane; Sewage sludge; Ultrafiltration