



EFFECTS OF ORGANIC LOADING RATE ON PALM OIL MILL EFFLUENT TREATMENT IN AN UP-FLOW ANAEROBIC SLUDGE FIXED FILM BIOREACTOR

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Abstract

The effect of OLR provided by hydraulic retention time (HRT) and influent chemical oxygen demand (COD_{in}) on the performance of an up-flow anaerobic sludge fixed film (UASFF) bioreactor treating palm oil mill effluent (POME) was studied. Anaerobic digestion of POME was modeled and analyzed with two variables i.e. HRT and COD_{in}. Experiments were conducted based on a general factorial design and analyzed using response surface methodology (RSM). The region of exploration for digestion of POME was taken as the area enclosed by HRT (1 to 6 days) and COD_{in} (5260 to 34725 mg/L) boundaries. Eight dependent parameters were either directly measured or calculated as response. These parameters were total COD (TCOD) removal, TCOD removal rate, volatile fatty acids to alkalinity ratio (VFA/Alk.), CO₂ fraction in biogas, solid retention time (SRT), sludge retention factor (SRF), methane production rate per volume of the reactor and feed. A simultaneous increase of the variables determined a decrease of COD removal efficiency, SRT and SRF and an increase of COD removal rate, VFA/Alk., CO₂ fraction in biogas, methane production rate. The present study provides valuable information about interrelations of quality and process parameters at different values of the operating variables.

Keywords: anaerobic digestion, UASFF reactor, POME, HRT, COD_{in}, response surface methodology (RSM)

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