

Abstract

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Modeling and Simulation of Hybrid Anaerobic/Aerobic Wastewater Treatment System

Modeling and simulation using GPS-X software for a packed bed up-flow anaerobic sludge blanket (P-UASB) followed by a biological aerated filter (BAF) was studied. Both treatment units were packed with a non-woven polyester fabric (NWPF) as a bio-bed. The system was operated at a hydraulic and organic loading rate of 9.65 m³/m²/d and 2.64 Kg BOD₅/m³/day. Verification of the experimental results and calibration of the model were carried out prior simulation and modeling. Variables under consideration were HLR, OLR and surface area of the packing material. HLR and OLR are increased incrementally until the break through point has been achieved. The results obtained from modeling indicated that the treatment system has great potential to be used as an ideal and efficient option for high hydraulic and organic loading rates up to 19.29 m³/m²/d and 4.48 Kg BOD₅/m³/day. The model indicated that increasing the input HLR and OLR loads to the treatment system up to 50% of the original values achieved removal efficiencies 98% for TSS, 88% for BOD₅ and 85% for COD. Moreover, increasing the HLR to 4 times the original value (38.59 m³/m²/d) reduced the efficiency of the treatment system to 50% for COD and BOD₅. However, the removal rates of TSS, TKN and TP were not affected. Also, the modeling results indicated that increasing the surface area of the packing material increased the overall efficiency of the treatment system.