

Immobilized Cement Kiln Dust Enhances Biomass and Neutralizing of Palm Oil Mill Effluent for Biogas Production

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Abstract

Immobilization techniques were adopted for the treatment of palm oil mill effluent (POME) and biogas production using immobilized anaerobic sludge as the seed. The performance of an upflow anaerobic sludge blanket reactor (UASBR) was monitored using cement kiln dust (CKD) at various hydraulic retention time (HRT). POME was used as the substrate carbon source. UASBR with POME concentration of 20 g-COD/L in the feed was able to produce methane at an optimal rate of 0.689 L CH₄/(L POME h) and HRT of 50 h. The reactor pH was improved and maintained above 7.5 steadily by increasing CKD dose from 1.5 to 10 gCKD/L. In UASBR containing immobilized-granule, the methane production rate was 0.600–0.699 L CH₄/(L POME h) at HRT of 75 h. The biogas production rate of 1.37 L/g-COD₄.h and COD removal of 93% were found at POME concentration of 20 g COD/L (r = 0.95) and HRT of 75 h. The suspended solids removal of 82% was found at 6.5 gCKD/L dose (r = 0.99).

Keywords: immobilized techniques, cement kiln dust, palm oil mill effluent, mass balance, methane

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