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Full Length Article

Effects of temperature and dark fermentation effluent on biomethane production in a two-stage up-flow anaerobic sludge fixed-film (UASFF) bioreactor

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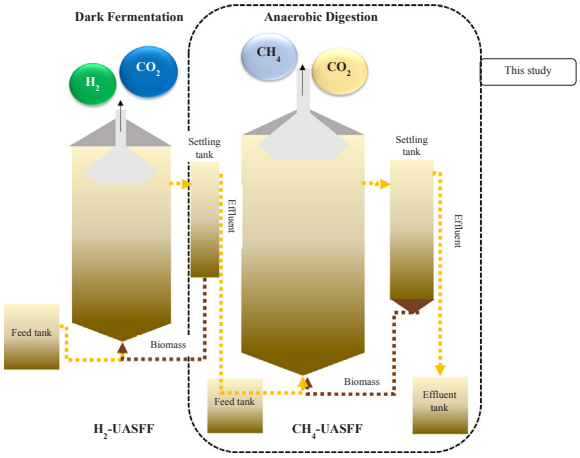
GRAPHICAL ABSTRACT



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ABSTRACT

In a two-stage of up-flow anaerobic sludge fixed-film (UASFF) bioreactor, palm oil mill effluent (POME) wastewater was used as inoculum and substrate to study the biodegradation in association with hydrogen and methane production. During the first stage (H_2-UASFF unit), different temperatures (37–70 °C) and hydraulic retention time (HRT) was designed and analyzed using response surface methodology (RSM) for biohydrogen production. In the second stage (CH_4-UASFF unit), at 24 h HRT, a continuous experiment was carried out using the same temperature and effluent from H_2-UASFF unit (also known as dark fermentation effluent) was used as substrate (12–20 g COD L^{-1}). This study is focusing on the second stage of UASFF bioreactor (i.e. CH_4-UASFF) for biomethane production. Studied parameters were designed using Historical Data in RSM. Its effects on methane production rate (MPR), methane yield, biogas percentage and COD removal were analyzed. The relation between initial effluent COD and temperature on biomethane production and overall reactor performance treating POME wastewater were also examined. Results showed that 76% of total COD removal efficiency (TCOD) was achieved using two-stage UASFF bioreactor. The MPR of 15.63 L CH_4 d^{-1}, methane yield of 0.803 L CH_4 g^{-1} CODrem.d^{-1}, COD removal efficiency of 66.28% and 93.31% of CH_4 at optimum temperature

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