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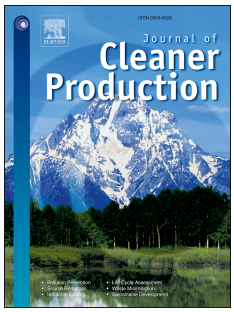

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Hamzat Tijani, Norhayati Abdullah, Ali Yuzir

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Enhancing methane production of palm oil mill effluent using two-stage domesticated shear-loop anaerobic contact stabilization system

Hamzat Tijani [1], Norhayati Abdullah [2], Ali Yuzir [2*]

[1] *Algal Biomass iKohza, Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia*

[2] *Department of Environmental Engineering & Green Technology, Malaysia-Japan International Institute of Technology (MJIIT), Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia*

[*]*Corresponding author/Current address:*

Assoc. Prof. Dr. Ali Yuzir

Department of Environmental Engineering and Green Technology, Malaysia-Japan International Institute of Technology (MJIIT), Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur.

(E-mail: *muhdaliyuzir@utm.my*)

Abstract

Palm Oil Mill (POM) effluent is the primary discharge from the industrial clarifiers during POM processing and a potential substrate for methane production. However, due to its rich content of sulfate components, the initial fermentation phase of anaerobic digestion is highly acidifying which leads to severe performance losses, digester's instability, and even culture crash. This study introduces a new reactor design, shear-loop anaerobic contact stabilization (SLACS) system to enhance the methane productivity of POM substrate. The treatment profiles, including the influence of feed COD/SO_4^{2-} ratio, pH and sulfide inhibition was examined for the shear-loop anaerobic bed (SLAB) and the anaerobic plug flow (APF) units of the SLACS system which functions as a dissimilatory sulfate reduction phase and a methanogenic phase, respectively. Experimental observations indicated that methane (CH_4) production, COD and sulfate removal were influenced by the feed COD/SO_4^{2-} ratios. In addition, the performance of the one-stage domesticated digestion of POM substrate was compare with the two-stage domesticated SLACS system. During two-stage domestication, methane productivity was 256 mL g^{-1} VS, a 32% methanogenic proficiency higher than that of the one-stage digestion. The SLAB unit had great advantage in averting the toxic inhibitory