UNIVERSITI TEKNOLOGI MARA

THE PERFORMANCE STUDY OF ULTRASONIC-ASSISTED MEMBRANE ANAEROBIC SYSTEM (UMAS) FOR PROCESS EFFICIENCY AND METHANE PRODUCTION IN PALM OIL MILL EFFLUENT (POME) TREATMENT

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ABSTRACT

The positive growth of palm oil industry in Malaysia accompanies adverse effect to the environment in which it has also been identified as the major contributor to the largest pollution load in the form of Palm Oil Mill effluent, POME. The governments are forced to look for alternative technology for the POME treatment because of the increased palm oil demand and awareness on environmental issue. Therefore, a new technology needs to be sought to reduce the impact on environment and at the same time renewable form of energy can be generated as an alternative source for the palm oil mill. Throughout the decades, membrane bioreactors experiments have been widely employed in POME treatment. However, its major drawback is central to membrane fouling problem. Thus, membrane cleaning is an essential part during the operation of membrane reactors since the membrane fouling is an unavoidable issue. Ultrasonic-assisted Membrane Anaerobic System (UMAS) is a promising technology through which an ultrasonic device is applied to the system so as to maintain the minimum thickness of biofilm and at the same time to ensure minimum population of bacteria inside the reactor. POME sample was taken from a palm oil mill in Felda Sungai Tengi, Selangor and was evaluated in respective 1, 2 and 3 times of sonication period in order to observe their performances in terms of percentage removal efficiencies and CH_4 production. From the study, the measured parameters (COD, BOD, VSS and TSS) that affect the performance of UMAS in treating POME are determined. The overall results demonstrated that 3 times sonication in UMAS was better in operation compared to 1 and 2 times of sonication operations (5 days operating times) as it produced highest COD (98.70 %), BOD (66.28 %), TSS (98.79 %), VSS (92.58 %) removal efficiencies, 980 mL of treated sample and 19676.40 mL CH_4 gas production for optimal operating time of 7 days. Hence, the feasibility of treating POME using UMAS within a short period of time at reduced space utility may offer a solution to the treatment problems.

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