

UNIVERSITI TEKNOLOGI MARA

**KINETICS AND PERFORMANCE
STUDY OF ULTRASONIC-ASSISTED
MEMBRANE ANAEROBIC SYSTEM
(UMAS) USING MONOD MODEL
FOR PALM OIL MILL EFFLUENT
(POME) TREATMENT**

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MSc

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ABSTRACT

The discharge of Palm Oil Mill Effluent (POME) to river or sewage causes serious environmental problem. Serious treatment must be considered to treat the POME before it is discharged into any water ways. The use of ultrasonic-assisted membrane anaerobic system (UMAS) is a promising technology which applies ultrasonic device to the system so as to maintain the thickness of biofilm attached to the membrane. However, further use of UMAS in treating POME tends to give blockage on the membrane surface. Kinetic parameters for the samples of POME which contribute to membrane fouling were investigated which are the biomass growth rate and the substrate utilization rate. In this study, POME samples was taken from final discharge pond and decanter processing unit from palm oil mills in Felda Sungai Tinggi, Selangor and Felda Jengka, Pahang, respectively. The treatment was operated in 5 hours at which three-hour treatment was with ultrasonic application in order to observe their performances in terms of percentage removal efficiencies and CH₄ production for HRT of 7 days. The experiment is considered completed when the UMAS achieves steady state condition. The steady state is achieved on the day with no gas is generated. The performance results in terms of COD removal efficiency for both samples were 82.75% and 94.43% for final discharge and decanter samples, respectively. All these results were obtained using the experimental data and curve fittings were constructed using Monod model. Based on the calculations, the values of μ_{\max} were 0.237 day⁻¹ and 0.327 day⁻¹ for samples of Final Pond Discharge and Decanter, respectively. While, the K_s values were 0.1674 g VSS/g COD.d for Final Pond Discharge and 0.361 g VSS/g COD.d for Decanter samples. The results show that the sample has the lowest μ_{\max} which indicates the higher amount of biomass in UMAS reactor. In other words, the lowest value of K_s represents the high amount of percentage substrate removal. The amount of biomass achieved in UMAS is increased by using ultrasonic application which prevents the membrane fouling to occur. Therefore it was recommended to employ UMAS in POME treatments.

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