

MEMBRANE ULTRAFILTRATION OF TREATED
PALM OIL MILL EFFLUENT (POME)

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**MEMBRANE ULTRAFILTRATION OF TREATED
PALM OIL MILL EFFLUENT (POME)**

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Abstrak

Kaedah rawatan efluen kilang kelapa sawit yang lazim diamalkan di Malaysia ialah sistem gabungan aerobik dan anarobik. Memandangkan kualiti tinggi penghasilan efluen mencapai $740\ 000\ \text{m}^3$ pada Mei 2001, penggunaan semula efluen terawat satu cara yang dapat mengurangkan penggunaan sumber air. Efluen terawat mempunyai kandungan organik yang rendah sebagaimana yang ditetapkan oleh Jabatan Alam Sekitar (contohnya BOD, kandungan nitrogen dan minyak). Rawatan lanjutan ke atas efluen ini akan meningkatkan kualiti efluen. Rawatan lanjutan ini bukan sahaja berupaya membenarkan penggunaan semula sumber air untuk pelbagai kegunaan di kilang, malah juga menyediakan industri ini untuk memenuhi piawaian baru yang dicadangkan untuk berkuatkuasa pada tahun 2005. Dalam projek penyelidikan ini, ultrapenurasan membran digunakan untuk menjalankan rawatan lanjutan ke atas efluen terawat. Sebelum proses rawatan membran, yang dijalankan dengan kelengkapan sel berkacau, sampel-sampel menjalani pra-rawatan secara berasingan dengan kaedah penurasan, pengemparan dan kongulasi untuk menyingkirkan bahan-bahan pencemar dalam sampel. Ini adalah untuk mengelakkan pengotoran membran oleh bahan tersebut. Kecekapan pra-rawatan, rawatan membran dan gabungan rawatan untuk ketiga-tiga sistem telah dikaji. Kajian menunjukkan gabungan penurasan-ultraturasan paling berkesan dalam penyingkiran kandungan pencemar dalam sampel. Kecekapan penyingkiran pepejal terampai, kekeruhan dan warna melebihi 97% manakala COD berkurangan sebanyak 86% daripada aras asal. Malah paras akhir COD dan pepejal terampai ($193\ \text{mg/L}$ dan $5\ \text{mg/L}$) berupaya memenuhi had yang dicadangkan oleh piawaian baru, iaitu $200\ \text{mg/L}$ dan $100\ \text{mg/L}$ masing-masing. Kandungan jumlah nitrogen pula hanya $0.4\ \text{mg/L}$ melebihi had baru yang dicadangkan iaitu $25\ \text{mg/L}$. Walaupun kajian ini hanya merupakan satu permulaan untuk rawatan membran ke atas efluen terawat kilang kelapa sawit, ia memaparkan potensi operasi membran dalam merawat efluen minyak kilang kelapa sawit untuk penggunaan kitar semula.

Abstract

The common practice for treatment of palm oil effluent (POME) in Malaysia employs a combination of aerobic and an anaerobic treatment. Bearing in mind that the quantity of POME produced is high, reaching 740 000 m³ in May 2001, reuse and recycling of treated POME can be an excellent practice in terms of saving of water resources. As the treated POME is already low in certain parameters required by the Department of Environment (i.e. BOD, total and ammoniacal nitrogen, oil and grease), further treatment will greatly enhance the water quality. The purpose of the advance treatment step is to allow the water to be reused in the mill operations for various applications including usage as feed water. Besides, it also prepares the industry to meet a more stringent discharge standard proposed to be implemented in year 2005. In this research project, membrane ultrafiltration is used to filter the treated POME as a tertiary treatment. Before the membrane operation, which is carried out with a bench scale stirred-cell apparatus, the samples are pretreated separately using filtration, centrifugation and coagulation to further eliminate pollutants in the sample. This is to avoid fouling of membrane by these constituents. The pre-treatment efficiency, membrane rejection and overall treatment efficiency of each treatment combination was investigated. It was found that the filtration-ultrafiltration treatment produced the best quality of treated sample. Elimination of suspended solids, turbidity and colour exceeded 97% while COD was retained as much as 86% from the original level of treated POME. The final level of COD and suspended solids (193 mg/L and 5 mg/L respectively) were able to comply with the proposed discharged limit that is 200 mg/L and 100 mg/L respectively. The total nitrogen measurement exceeded by 0.4 mg/L compared with the proposed limit of 25 mg/L. Although this is only a preliminary study of membrane treatment on POME, it shows a promising potential in the advanced treatment of treated POME for reuse and recycle.

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