



Effect of different filter aids used in cake filtration process on the removal of suspended solids in anaerobically digested palm oil mill effluent (POME)

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ABSTRACT

Palm oil mill effluent (POME) is a highly polluted wastewater that requires proper treatment before it can be safely discharged to the environment. Presently, the effluent is treated with a closed anaerobic digester tank which is used to entrap methane gas prior undergoing downstream treatment. The digestate discharged from the tank contains abundance of nutrients that can be potentially recovered and reused as organic fertilizer. However, the digestate contains a high amount of suspended solids that may disrupt the downstream nutrient recovery process. Therefore, this paper explores the feasibility of the cake filtration process to remove suspended solids in anaerobically digested POME. Different types of filter aids such as perlite, diatomaceous earth, bleaching earth, powdered activated carbon and boiler ash were used to investigate the filtration performance by evaluating the quality of filtered digestate (turbidity and total suspended solids), filtration flux and specific cake resistance. The amount of filter aid used as precoat and body feed was varied (with ratio 1:1) from 1.0 to 5.0 g in the process. Turbidity removal above 90% can be achieved regardless of the amount of filter aids used. It was found that perlite achieved the highest turbidity removal (99%) combined with the highest filtration flux at the end of the process ($\sim 2 \text{ m}^3/\text{m}^2 \text{ h}$) and lower specific cake resistance (2.69 m/kg). This was due to the presence of plenty fine pores (as shown by field emission scanning electron microscope image) on perlite and its narrow particle size distribution (10–15 μm) which resulted in the formation of a homogeneous cake layer that succeeded in retaining the suspended solids. The findings from this study showed that cake filtration is a feasible treatment process to remove suspended solids in POME and thus produce filtrate of an improved grade for downstream nutrient recovery processes.

Keywords: Palm oil mill effluent (POME); Anaerobic digestate; Cake filtration; Filter aids; Turbidity and suspended solids

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