

The effect of mixed liquor suspended solids (MLSS) on biofouling in a hybrid membrane bioreactor for the treatment of high concentration organic wastewater

Abstract:

Biofouling is a crucial factor in membrane bioreactor (MBR) applications, particularly for high organic loading operations. This paper reports a study on biofouling in an MBR to establish a relationship between critical flux, $J(c)$, mixed liquor suspended solids (MLSS) (ranging from 5 to 20 g L⁻¹) and volumetric loading rate (6.3 kg COD m⁻³ h⁻¹) of palm oil mill effluent (POME). A lab-scale 100 L hybrid MBR consisting of anaerobic, anoxic, and aerobic reactors was used with flat sheet microfiltration (MF) submerged in the aerobic compartment. The food-to-microorganism (F/M) ratio was maintained at 0.18 kg COD kg⁻¹ MLSSd⁻¹. The biofouling tendency of the membrane was obtained based on the flux against the transmembrane pressure (TMP) behaviour. The critical flux is sensitive to the MLSS. At the MLSS 20 g L⁻¹ the critical flux is about four times lower than that for the MLSS concentration of 5 g L⁻¹. The results showed high removal efficiency of denitrification and nitrification up to 97% at the MLSS concentration 20 g L⁻¹. The results show that the operation has to compromise between a high and a low MLSS concentration. The former will favour a higher removal rate, while the latter will favour a higher critical flux.