

Decentralized Membrane Bioreactor (MBR) Wastewater Treatment System for use by Fish Processing Industries in Urban and Peri-Urban Settlements in Kenya

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Abstract

The study aimed to investigate a potential application of membrane bioreactors (MBR) technology for treatment of fish processing wastewater in fish industries in urban and peri-urban settlements in Kenya. Pilot trials were conducted at lab scale using a membrane bioreactor (MBR) unit and fish processing wastewater from Makindi fish farm. The aim was to test the performance of commercial Polyethersulfone (PES) membranes when used for treatment of fish processing wastewater with high amounts of fouling agents. Further, low fouling membranes were developed by modifying the surface characteristics of PES commercial membranes via the polymerizable bicontinuous microemulsion (PBM) technique. The performance of the commercial PES and, the modified PBM-coated membranes was tested to compare their performance in terms of fouling propensity and effluent quality. Pre-filtered wastewater sample was fed to the reactor tank and sequential test for PES and PBM-coated modules studied through recirculation of the wastewater between the denitrification tank and the aeration tank at a rate of 10L/h. A hydraulic retention time (HRT) of 27.4 h -31.7h and 38.4 – 46.0 h was used for PES, and PBM respectively. The two studied PES and PBM-coated modules showed good performance with removal rate for chemical oxygen demand (COD), nitrogenous compounds ($\text{NH}_4^+\text{-N}$, $\text{NO}_3^-\text{-N}$) and phosphates ($\text{PO}_4^{3-}\text{-P}$) ranging between 93±2%, 85±2% and 69±3% and 96±1%, 88±1%, 84±1% respectively. Both modules had COD, $\text{NO}_3^-\text{-N}$ and $\text{PO}_4^{3-}\text{-P}$ in permeate within an acceptable range of < 100 mg/L, 5 to 30 mg/L and ≤ 5 mg/L as per the WHO guidelines for wastewater reuse for irrigation. The MBR technology was found to be effective for treatment of fish processing wastewater with ability to produce highly clarified treated water suitable for reuse for washing, irrigation and for other purposes such as cleaning.

Biography

Miss. Jane Njoki Mburu is a PhD student at the Institute of Energy and Environmental Technology, Jomo Kenyatta University of Agriculture and Technology. She has published several articles in management of solid waste (plastic) and wastewater treatment with more than 11 papers in peer referred Journals and conference proceedings.