

Reduction of cost and environmental impact in the treatment of textil wastewater using a combined MBBR-MBR system

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Abstract

A hybrid Moving Bed Biofilm Reactor - Membrane Bioreactor (MBBR-MBR) was studied for the treatment of textile wastewater, and the economic and environmental feasibility of applying this hybrid system on industrial scale was conducted. The results showed that, technically, the removal efficiency of COD, color and TSS reached 93%, 85% and 99%, respectively. The quality of new dyed fabrics performed with the treated wastewater was within the acceptable limits of the textile industry. Economically, MBBR-MBR had lower Capital Expenditures (CAPEX) and (OPEX) than conventional activated sludge (CAS) process due to lower effluent discharge tax and the decolorizing agent saved. The result of Net Present Value (NPV) and the Internal Rate of Return (IRR) of 18% suggested that MBBR-MBR is financially applicable for the implantation into industrial scale. The MBBR-MBR system also had lower environmental impacts compared with CAS process in the life cycle assessment (LCA) study, especially in categories, such as the

Climate change, Human Health, Marine eutrophication, and ecotoxicity categories, thanks to the high quality of the effluent treated by MBBR-MBR and the avoiding of using extra decolorizing agent, a compound based on a quaternary amine.

Keywords: Textile wastewater, moving bed biofilm reactor-membrane bioreactor, economic feasibility, life cycle assessment (LCA), water reuse.