Evaluation of different nanofiltration membranes for reuse of biologically treated denim textile mill wastewater

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ABSTRACT

The aim of this study was to investigate the reuse possibility with nanofiltration (NF) membranes of biologically treated textile wastewater (COD: 350 mg/L, color: 108.9 m^{-1} and conductivity: 2,843 μS/cm) of a local textile factory (denim washing and dyeing) in Tekirdag, Turkey. For this aim, the flux and permeate quality was evaluated within the context of COD, color and conductivity with different NF membranes (NP010 and NP030) under various pressures (4, 6, 8 and 10 bar). On the other hand mass transfer coefficients were calculated with Nernst–Planck equation based on experimental results. When compared with literature, NF permeate water was found to be alternative to freshwater in textile wet processing. According to the Nernst–Planck equation, the B_s (mass transfer coefficient) and R_s (removal coefficient) values are obtained. R_s and B_s values were determined as follows: 0.982 and 0.994 for COD, 0.995 and 0.959 for color, 0.295 and 0.3403 for conductivity and 6.79 and 3.38 for COD, 4.90 and 0.54 for color, 27.39 and 15.87 for conductivity, respectively. According to B_s and R_s, NP030 membrane was determined as the most convenient membrane for aerobically pre-treated wastewater.

Keywords: Reuse; Nanofiltration; Textile wastewater; Mass transfer coefficient