



Oily wastewater treatment using a hybrid UF/RO system

Abdolhamid Salahi^a, Ramin Badrnezhad^b, Mohsen Abbasi^a,
Toraj Mohammadi^{a,*}, Fatemeh Rekabdar^c

^aResearch Centre for Membrane Separation Processes (RCMSP), Faculty of Chemical Engineering, Iran University of Science and Technology (IUST), Narmak, Tehran 16846, Iran

Tel. +98 21 77240496; email: torajmohammadi@iust.ac.ir

^bFaculty of Chemical Engineering, Amirkabir University of Technology, Hafez Ave., Tehran, Iran

^cPolymer Science and Technology Division, Research Institute of Petroleum Industry (RIPI), West Blvd., Near Azadi Sports Complex, Tehran, Iran

Received 1 February 2009; Accepted 1 July 2010

ABSTRACT

Oily wastewaters and oil–water emulsions are two of the major pollutants of the environment. Treatment of the oily wastewater using hybrid ultrafiltration/reverse osmosis (UF/RO) system was experimentally studied and the results were presented. Polyacrylonitrile and polyamide membranes were used as the UF and RO membranes, respectively. In this research, Taguchi method was used initially to plan a minimum number of experiments. An L_9 orthogonal array was employed to evaluate effects of temperature (25, 37.5 and 5 °C), TMP (1.5, 3 and 4.5 bar), CFV (0.25, 0.75 and 1.25 m/s) and pH (4, 7 and 10) on permeation flux, rejection and fouling resistance. According to the results, the optimum operating conditions of the UF process were found as following: TMP (3 bar), CFV (1 m/s), operating temperature (40 °C) and pH (9). The results indicated that the treated wastewater has sufficient quality to be introduced to the RO process as a pretreatment feed. Afterwards, the treated outlet water of the hybrid UF/RO system was studied. Analysis of the second step showed 100%, 98%, 98%, 95% and 100% reductions in oil and grease content, TOC, COD, TDS and turbidity, respectively. Comparison of results of this method showed that quality of the finally treated outlet water is high and even better than standard water that are currently introduced to cooling towers.

Keywords: Oily wastewater; Hybrid membrane; Makeup; Cooling water

*Corresponding author.