



## Treatment of poultry slaughterhouse wastewater using a membrane process, water reuse, and economic analysis

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### ABSTRACT

Poultry slaughterhouse wastewater, which represents one of the most important pollutants in Turkey, is generally treated with conventional biological processes in Turkey and around the world. In this study, poultry slaughterhouse wastewater was treated using laboratory-scale membrane processes, which were substituted for conventional processes. The performances of the membrane processes were investigated in terms of chemical oxygen demand (COD), conductivity, and membrane fluxes. Economic analyses were conducted for several membrane system alternatives. In addition, the alternatives were compared with each other and with conventional economic analysis of the data obtained in this study and data from several previous studies. The membranes used for the membrane processes were AG for reverse osmosis (RO), DK for nanofiltration (NF), and ER for ultrafiltration (UF). The highest COD removal efficiencies were 90% for NF and 97.4% for RO, and the conductivities decreased by 51.7% for NF and 96.6% for RO. When the (UF) was not used, the long-term membrane fluxes of the RO and (NF) sharply decreased, which increased the operation costs of these processes. Therefore, RO and NF without pre-treatment and with UF were not effective for this wastewater. According to the economic analysis results, the operational costs of the RO and NF after UF, the UF alone, and the conventional treatment process were 0.66, 0.70, 0.79, and 1.66 \$/m<sup>3</sup>, respectively. Because the operational cost of the conventional treatment process was 2.5 times greater than RO after pre-treatment with UF, it was deduced that this membrane process combination was a suitable treatment alternative for treating poultry slaughterhouse wastewater.

*Keywords:* Poultry slaughterhouse wastewater; Ultrafiltration; Nanofiltration; Reverse osmosis; Economic analysis

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