Oxidative cleaning of reverse osmosis membranes during reclamation of steel wastewater

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ABSTRACT

Oxidants in alkaline solutions were developed to regenerate reverse osmosis membranes that had been severely fouled during the reclamation of wastewater from steel production. The cleaning efficiency and kinetics of the processes were evaluated in parallel with the fouling formation. Analysis of primary foulant constituents using scanning electron microscope (SEM)-electron-dispersive X-ray microanalysis spectrometry and Fourier transform infrared spectroscopy (FTIR) suggested that organic fouling might be dominant. Analysis of wastewater constituents using gas chromatography–mass spectrometry indicated that aliphatic acids and long chain alkanes were likely to be the predominant foulants. The cleaning efficiency increased initially, and then decreased with increasing concentrations of the oxidant. Micro-analyzed by FTIR, SEM, and atomic force microscope, the membrane integrity was not destroyed by the oxidant under the proper cleaning conditions. Surface reaction kinetic expression based on fouling resistance decline was developed to delineate the process.

Keywords: Oxidant; Wastewater; Cleaning; Surface reaction; Fouling

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