ABSTRACT

In this study recovery of heavy metals (Ni and Cr) and water from wastewater have been explored using the reverse osmosis process. The relationship between permeate flow rate and trans-membrane pressure drop (TMP) for different feed concentrations were derived. The effect of TMP on concentration of heavy metals in the permeate was also studied. Recovery of heavy metals and high quality process water were two main applications studied here using pilot plant membrane unit. A feasibility of reclaiming high quality process water from the effluent was carried out by a comparative study between RO membrane process and deionization process for small and medium scale electroplating industries. A modification of surface force pore-flow (SFPF) model was also included as a part of this study. Experimental data for the modelling work were gathered by using aqueous sodium chloride solutions. The verification of the SFPF model for the aqueous $NiSO_4$, $NiCl_2$ and $CrCl_3$ solutions was not included in the scope of this work.

ABSTRAK

Kajian ini meliputi pemerolehan semula logam-logam berat (Ni dan Cr) dan air dari air buangan dengan menggunakan proses reverse osmosis. Perhubugan di antara kadar aliran hasil penapisan dan perbezaan tekanan membran (TMP) bagi kepekatan larutan yang berlainan telah diperolehi. Kesan TMP ini terhadap kepekatan logam-logam berat di dalam hasil penapisan juga dikaji. Pemerolehan semula logam-logam berat dan air proses berkualiti tinggi adalah dua penggunaan utama unit membran (pilot plant) yang dikaji. Kajian perbandingan kos penghasilan air proses berkualiti tinggi dari effluen oleh proses membran dan proses penyahionan dilakukan bagi tujuan penggunaan di industri penyaduran kecil dan sederhana. Selain daripada itu, kajian ini meliputi pengubahsuaian model 'suface force pore-flow' (SFPF). Data eksperimen dikumpul dengan menggunakan larutan akuas natrium klorida. Kajian model SFPF ini tidak merangkumi penggunaan larutan akuas $NiSO_4$, $NiCl_2$ dan $CrCl_3$.