



Membrane distillation and novel integrated membrane process for reverse osmosis drained wastewater treatment

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ABSTRACT

An integrated membrane process was constructed, which composed of immersing ultrafiltration(UF) cell as pretreatment step and vacuum membrane distillation (VMD) cell for both pure water reclamation from reverse osmosis (RO) drained wastewater and discharge reduction. The effect of feed temperature, velocity, and vacuum pressure at the pump side on the membrane performance in VMD process was studied. The performance of VMD process in the concentration of pretreated and untreated RO drained wastewater was compared. The surface morphology of the hydrophobic polyvinylidene fluoride hollow fiber membrane was observed by scanning electronic micrograph. Energy dispersed spectroscopy was also adopted to analyze the composition of the deposition on the membrane surface. Using un-pretreated RO drained water as the feed, the initial flux of VMD was 22.6 kg/m²h, and declined to 15.6 kg/m²h as the concentration multiple reached four. The composition of contamination on membrane surface contains 32% calcium, 1.92% magnesium, and 1.41% sodium. Whereas the RO drained water was pretreated by hardness removal and UF, the VMD initial flux reached 25.6 kg/m²h, and declined to 17.8 kg/m²h as the concentration multiple got 10. The flux decreased to 11.8 kg/m²h as the concentration multiple enhanced to 20. The contamination contains 26% sodium, 37% chlorine, and 2% calcium.

Keywords: Integrated membrane process; Vacuum membrane distillation; Reverse osmosis drained water; Hydrophobic membrane; Polyvinylidene fluoride hollow fiber membrane

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