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Combined electrocoagulation and membrane distillation for treating high salinity produced waters

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Abstract

Membrane distillation has been investigated for treating high salinity hydraulic fracturing produced water (HFPW). When treating real HFPW feed streams which contain not only high total dissolved solids (TDS), but also dissolved organics, surfactants and low surface tension contaminants pretreatment of the feed is essential to suppress the onset of membrane fouling. The objective of this study was to investigate the feasibility of electrocoagulation (EC) followed by direct contact membrane distillation (DCMD). EC was shown to be effective in reducing suspended solids and the organic content of raw HFPW samples.

Raw and EC pretreated HFPW samples were treated with DCMD system under variety of operational conditions. Higher contaminate removal during EC resulted in lower membrane fouling and consequently, lower flux decline during DCMD. The membrane permeability was modeled by summing the membrane and feed side fouling layer resistances. Long-term EC-DCMD experiments were conducted, concentrating the feed water, containing 135 g L^{-1} TDS, up to 265 g L^{-1}. Stable water flux with minimal fouling are reported over 434 h experimental run.

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