Produced water treatment by nanofiltration

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Abstract

The problem about produced water (PW) is worst if we consider that, for a single gallon of petroleum, there are three gallons of produced water as byproduct. PW is composed of a wide range of salts, suspended solids, chemical products such as antifloculating and anticorrosive substances and some organic products, being a treatment necessary either to disposal to the environment as to reuse. For this, the membrane processes such as ultra, micro and nanofiltration is becoming an option. In this study, nanofiltration (NF) membrane was characterized in terms of hydraulic permeability ($L_p$) and rejection coefficient ($f$), to be used as membrane process for onshore PW treatment. A synthetic effluent, simulating PW from onshore platform, was treated by NF in different operational conditions, combining three values of feed flow rate (96, 192 and 240 L.h⁻¹) and pressures varying from 2 – 6 bars. Temperature and pH were practically constant, with few modifications during the assays. The optimal regime, ie. feed flow rate and applied pressure, was the combination of 192 L.h⁻¹ of feed flow rate and 6 bars of pressure, which was capable to remove more than 81% of ions present in the synthetic PW. Between all the assays, the NF membrane was washed until $L_p$ reached at least 90% the initial value. This fact proves that NF is a very effective method in salts removing from PW, promoting water reuse, recycling and correct disposal.

Keywords: membrane processes, nanofiltration, reuse and disposal, produced water treatment