Cairo University

IDENTIFICATION AND COMPARISON OF SOME NANOFILTRATION BASED SYSTEMS FOR BRACKISH WATER DESALINATION

By

Aya Naguib Mohamed Abd El-Ghany

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science
in
Chemical Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

Identification and comparison of some nanofiltration based systems for brackish water desalination

Key Words:
Brackish Water; Nanofiltration; Desalination; Egypt; Cost

Summary:
This study aims to evaluate nanofiltration based systems for treatment of brackish water according to performance and cost under Egyptian conditions. Commercial nanofiltration (NF) membranes vary in materials and pore radii resulting in wide variation in performance. Three commercial NF membranes commonly used namely: NF90, NF270 and ESNA were selected in this study. Evaluation was carried out using single stage and two stage systems. Nanofiltration process performance for selected water resources (TDS 1000-4000 ppm) in Egypt was predicted using both Donnan Steric Pore Model (DSPM) and membrane commercial software (Wave and IMS Design). NF membranes performance results indicate that membranes have the following order NF90>ESNA>NF270 regarding rejection efficiency. Increasing number of stages increases membrane system recovery which increases productivity and reduces reject stream capacity; however, increasing recovery decreases membrane rejection. A simple linear correlation was developed for quick selection of membrane type for a certain feed for 2-stage system with recovery 80% using data predicted from WAVE and IMSDesign software. Two pretreatment technologies including loose NF and zeolite adsorption were selected and investigated experimentally for hardness reduction to prevent scaling and enhance system recovery.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

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