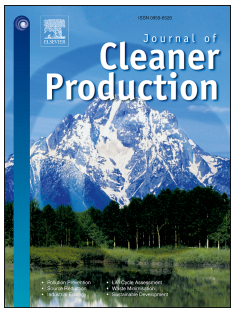
Accepted Manuscript



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PII: S0959-6526(18)31363-5

DOI: 10.1016/j.jclepro.2018.05.036

Reference: JCLP 12893

To appear in: *Journal of Cleaner Production*

Received Date: 8 December 2017

Revised Date: 30 April 2018

Accepted Date: 3 May 2018

Please cite this article as: Al-Obaidi MA, Kara-Zaïtri C, Mujtaba IM, Simulation and sensitivity analysis of spiral wound reverse osmosis process for the removal of dimethylphenol from wastewater using 2-D dynamic model, *Journal of Cleaner Production* (2018), doi: 10.1016/j.jclepro.2018.05.036.

Simulation and Sensitivity Analysis of Spiral Wound Reverse Osmosis Process for the Removal of Dimethylphenol from Wastewater Using 2-D Dynamic Model

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Abstract

Reverse Osmosis (RO) processes are readily used for removing pollutants, such as dimethylphenol from wastewater. A number of operating parameters must be controlled within the process constraints to achieve an efficient removal of such pollutants. Understanding the process dynamics is absolutely essential and is a pre-step for designing any effective controllers for any process. In this work, a detailed distributed two-dimensional dynamic (x and y dimensions and time) model for a spiral-wound RO process is developed extending the 2-D steady state model of the authors published earlier. The model is used to capture the dynamics of the RO process for the removal of dimethylphenol from wastewater. The performance of the 2-D model is compared with that obtained using 1-D dynamic model before the model is being used to investigate the performance of the RO process for a range of operating conditions.

***Keywords*:** Reverse Osmosis; Spiral-wound Module; Simulation; Sensitivity Analysis; Dimethylphenol Removal; Wastewater Treatment.

1. Introduction

Pressure-driven membrane technology has been widely used in a variety of applications ranging from seawater desalination to wastewater treatment because of its versatility including: no further chemical treatment requirements, low- energy demand and low capital and operating costs, compared to other thermal techniques such as MSF. It is not surprising therefore that such technologies as RO have been used ubiquitously in both seawater and wastewater treatment, and have yielded effective solutions for improved water quality (Fritzmann *et al.*, 2007; Singh *et al.*, 2013; Goh *et al.*, 2016).

The spiral-wound module is the most commonly used model in reverse osmosis as, it can readily be applied in a variety of different applications. Having said this, there remains the