

CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME IV

Editors:

Ma'an Alkhatib
Abdullah Al Mamun
Faridah Yusof



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(VOLUME IV)

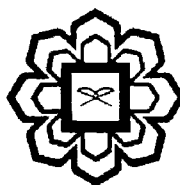
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CHAPTER 19

ANALYSIS OF CROSS FLOW ULTRAFILTRATION MEMBRANE

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ABSTRACT

In this study the effect of molecular weight cut-off (MWCO) and transmembrane pressure (TMP) on the quality of water was investigated. Cross flow ultrafiltration system with hydrophobic ultrafiltration (UF) membranes, namely polyethersulphone (PESU) were used. In order to treat the tap water, cross flow UF was applied with different types of MWCO (1kD, 10kD, 50kD and 100kD) and various types of TMP which are 0.35 bar (5.08 psi), 0.55 bar (7.98 psi), 0.75 bar (10.88 psi) and 0.95 bar (13.78 psi). Besides, this study indicated that MWCO and TMP imposed a direct effect on permeate flux. The study observed that membrane with the 1kD of MWCO and operated at the 0.55 bar (7.98 psi) TMP gave the best performance of tap water treatment and ultrapure water production, in that case the highest reduction of total suspended solids (TSS), turbidity and total dissolved solids (TDS) could be obtained up to 100%, 87.38% and 98.46% respectively.

Keywords: ultrapure water, molecular weight cut-off, transmembrane pressure, ultrafiltration, polyethersulphone

INTRODUCTION

Ultrapure water production is a series of chemical engineering unit operations designed to remove the contaminants from water to achieve an ultrapure level. Theoretically, ultrapure water has a total organic carbon (TOC) limit of 0.05 mg/L as C but a resistivity of 18 Megaohm.cm (Bennet, 2009). Production of ultrapure water is a key task for many advanced technology industries, most notably the dairy industry, electronic industry and pharmaceutical industry. Membrane technology is one of the alternatives including microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and reverse osmosis (RO). However, Water has beneficial uses which claimed to promote the economic and general welfare of society. However, the scarcity of water and the lack of safe water quality are most serious challenges in this globalization of twenty-first century (Elimelech, 2006).

Membrane technology has become a distinguished separation technology over the past decade. The main force of membrane technology is the fact that it works without the addition of chemicals, with a relatively low energy use and easy and well-arranged process conduction.