

Accepted Manuscript

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PII: S1383-5866(17)33694-8

DOI: <https://doi.org/10.1016/j.seppur.2018.01.022>

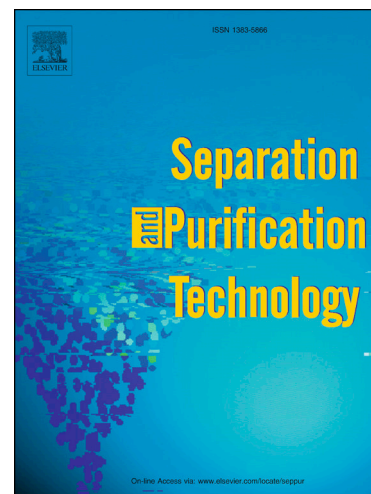
Reference: SEPPUR 14316

To appear in: *Separation and Purification Technology*

Received Date: 10 November 2017

Revised Date: 10 January 2018

Accepted Date: 10 January 2018



Please cite this article as: A.H. Haidari, S.G.J. Heijman, W.G.J. van der Meer, Effect of spacer configuration on hydraulic conditions using PIV, *Separation and Purification Technology* (2018), doi: <https://doi.org/10.1016/j.seppur.2018.01.022>

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Effect of spacer configuration on hydraulic conditions using PIV

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Making improvements to feed spacers of spiral-wound membrane (SWM) modules of reverse osmosis (RO) is a necessary step towards a wider application of these modules. This study sets out to evaluate the performance of six commercial feed spacers by comparing their actual velocity profiles and their pressure drop. Velocity profiles are obtained from Particle Image Velocimetry (PIV). Comparing images from PIV with corresponding friction losses revealed that the transition from steady to unsteady flow occurs at the moment when the incline of the friction factor changes from steep to slight. From the two types of spacers used, zigzag spacers showed a better distribution of flow than the cavity spacers did, but at the cost of higher pressure drop. The flow was in a straight line from inlet to outlet with zigzag spacers only at low Reynolds numbers and with cavity spacers for the entire studied range of Reynolds numbers. Additionally, results showed that hydraulic conditions in channels with cavity spacers are mainly affected by geometric characteristics of transverse filaments. The results from this study can be used to understand the effects of spacer geometry on the hydraulic conditions inside the feed channel and as a validation tool for computational modeling.

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