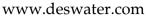
Desalination and Water Treatment



doi: 10.1080/19443994.2014.969320

56 (2015) 3427–3437 December



Ultrafiltration of municipal wastewater: study on fouling models and fouling mechanisms

J.L. Soler-Cabezas*, M. Torà-Grau, M.C. Vincent-Vela, J.A. Mendoza-Roca, F.J. Martínez-Francisco

Instituto de Seguridad Industrial, Radiofísica y Medio Ambiental, Universitat Politècnica de València, Camino de Vera s/n, 46022 Valencia, Spain, Tel. +34 96 387 70 00, ext. 76380; Fax: +34 96 387 76 39; emails: jsoca@isirym.upv.es (J.L. Soler-Cabezas), mitogr@etsii.upv.es (M. Torà-Grau), mavinve@iqn.upv.es (M.C. Vincent-Vela), jamendoz@iqn.upv.es (J.A. Mendoza-Roca), framarfr@iqn.upv.es (F.J. Martínez-Francisco)

Received 15 July 2014; Accepted 22 September 2014

ABSTRACT

Ultrafiltration (UF) with hollow fiber membranes is a proven membrane technique that can achieve high water quality standards as a tertiary treatment in municipal wastewater treatment plants. However, UF has a major drawback, membrane fouling, which causes losses of productivity and increases operation costs. Thus, the aim of this work is to model membrane fouling in the UF of a secondary treatment effluent. The tests were carried out with a model wastewater solution that consisted of bovine serum albumin and dextran. Three different transmembrane pressures and three different crossflow velocities were tested. Several fouling models available in the literature, and new models proposed, were fitted to permeate flux decline experimental data. The models studied by other authors and considered in this study were: Hermia's models (complete, intermediate, standard pore blocking and gel layer) and Belfort's model. The new models proposed in this work were: modified Belfort's model, quadratic exponential model, logarithmic inversed model, double exponential model and tangent inversed model. The fitting accuracy of the models was determined in terms of the R-squared and standard deviation. The results showed that the model that had the higher fitting accuracy was the logarithmic inversed model. Among the Hermia's models, the model that had the higher fitting accuracy was the intermediate pore blocking model. Therefore, the predominant fouling mechanism was determined and it was the intermediate pore blocking model.

Keywords: Ultrafiltration; Fouling; Modeling; Hollow fiber; Simulated wastewater

*Corresponding author.

Presented at the IX Ibero-American Congress on Membrane Science and Technology (CITEM 2014), 25–28 May 2014, Santander, Spain

1944-3994/1944-3986 © 2014 Balaban Desalination Publications. All rights reserved.