



High frequency back-pulsing for fouling development control in ceramic microfiltration for treatment of produced water

Sumihar H.D. Silalahi^{a,*}, TorOve Leiknes^b

^aGE Healthcare AS, Ramlandsvegen, 4521 Spangereid, Norway
Tel. +4738258107; email: sumihar.silalahi@ge.com

^bDepartment of Hydraulic and Environmental Engineering, NTNU - Norwegian University of Science and Technology, S.P. Andersensvei 5, N-7491 Trondheim, Norway

Received 14 November 2010; Accepted 20 February 2011

ABSTRACT

Produced water is a mixture of dispersed oil in water, dissolved organic, and inorganic particles. Membrane technology is a potential process to meet future discharge standards and regulations on the Norwegian Continental Shelf (NCS). Fouling minimization with back-pulsing technique was assessed in this study. The influence of produced water properties i.e., oil concentration, oil types, particles and membrane flux during the back-pulsing was investigated. α -Al₂O₃ MF membranes (nominal pore sizes; 0.1, 0.2 and 0.5 μ m) were tested. Results show that control of fouling rates is better at low oil concentrations, low flux, larger oil droplet size and no fine oil/particles. Selection of membrane pore sizes depends on the feed properties. At low oil concentration (i.e., 50 ppm) and low flux (i.e., 250 l.m⁻².hr⁻¹ (LMH), a pore size of 0.5 μ m resulted in the lowest fouling rates, whereas for higher oil concentrations and low flux and presences of fine particles the 0.2 μ m pore size performed better. At high flux (i.e., 500 LMH), high oil concentrations and presences of particles the 0.1 μ m membrane had the lowest fouling rates. A permeate quality of <5 ppm could be achieved even though the oil in the feed was increased from 50 to 350 ppm of oil in water.

Keywords: Produced water; Oil emulsion; Ceramic microfiltration; Fouling rate; Back-pulsing

*Corresponding author.