

Application of integrated chemical precipitation and ultrafiltration as pre-treatment in seawater desalination

Jorge T. Aguinaldo

Doosan Hydro Technology, Inc., Tampa, Florida, USA

Tel. +1 (813) 805-8794; Fax +1 (813) 623-6666; email: jtaguinaldo@doosanhydro.com

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ABSTRACT

Chemical precipitation including lime softening, chlorination, clarification and filtration have been long recognized treatment for process water used in various industries because it provides consistent water quality, however these processes were rarely used in pre-treating feed to reverse osmosis desalination systems. The newly developed submerged spiral wound ultrafiltration membranes in conjunction with chemical precipitation or lime softening can be used to treat reverse osmosis feed. Previous studies have proven the feasibility of integrating immersed ultrafiltration (UF) membrane with chemical precipitation and lime softening. This paper describes the relationships of the operating parameters such as pH, membrane flux, trans-membrane pressure (TMP), membrane permeability; optimum dosage of coagulant; to be used as the basis for the design and construction of the full scale plant. A pilot unit consisting of chemical reactor and UF system was operated at various pH conditions, at membrane flux rates of 15, 30 and 45 gfd. The filtrate from the pilot unit when operated as lime softener achieved alkalinity reduction to 20–30 mg/L with lime dosage close to the calculated value. The filtrate turbidity during the test using ferric sulfate and lime was consistently within 0.04–0.05 NTU. The TMP values obtained during the test ranges from 0.1 to 2.5 psi, while the permeability values ranges from 18.19 to 29.6 gfd/psi. The results the pilot test can be used as the basis of designing and operating a full scale integrated chemical precipitation or investigation of other applications of the integrated lime softening and UF treatment process.

Keywords: Chemical precipitation; Ultrafiltration; Seawater desalination; Pre-treatment
