Fouling Resistant Membrane:

Comparative Analysis

Introduction

One of the major problems with reverse osmosis membranes is membrane fouling. This is especially true in cases involving treatment of surface and wastewater where the concentration of organic compounds is relatively high, which makes it difficult to restore the membrane to an operable state. However, the fouling resistant reverse osmosis membrane (FRM) developed by Woongjin Chemical is proven to be an effective solution for this problem.

The fouling resistant RO membrane's surface roughness, being comparably lower than other RO membranes currently available, decreases the amount of colloidal substances from depositing on the membrane surface. This ultimately reduces the accumulation of particles on the membrane surface. In addition, for wastewater use, where the content of organic matter is high, Woongjin Chemical's fouling resistant membranes display by far one of the best fouling resistant properties and performance results among current RO membrane models on the market.

Below you will find test results of Woongjin Chemical's CSM FRM (CSM FE and FE^n) RO membranes compared with a competitor model under different test conditions. The tests used flat sheet membranes and measured changes in flux and salt rejection under various conditions of pH, feed concentration, and operating pressure.

Note: CSM's new fouling resistant model - the FE^n *- shows improved salt rejection and fouling resistant properties compared to the FE model.*

pH

Results from testing the membranes under various pH levels are shown in Figure 1. Tests were carried out under the following conditions: 2,000ppm NaCl, 225psi; pH 2.5–12.

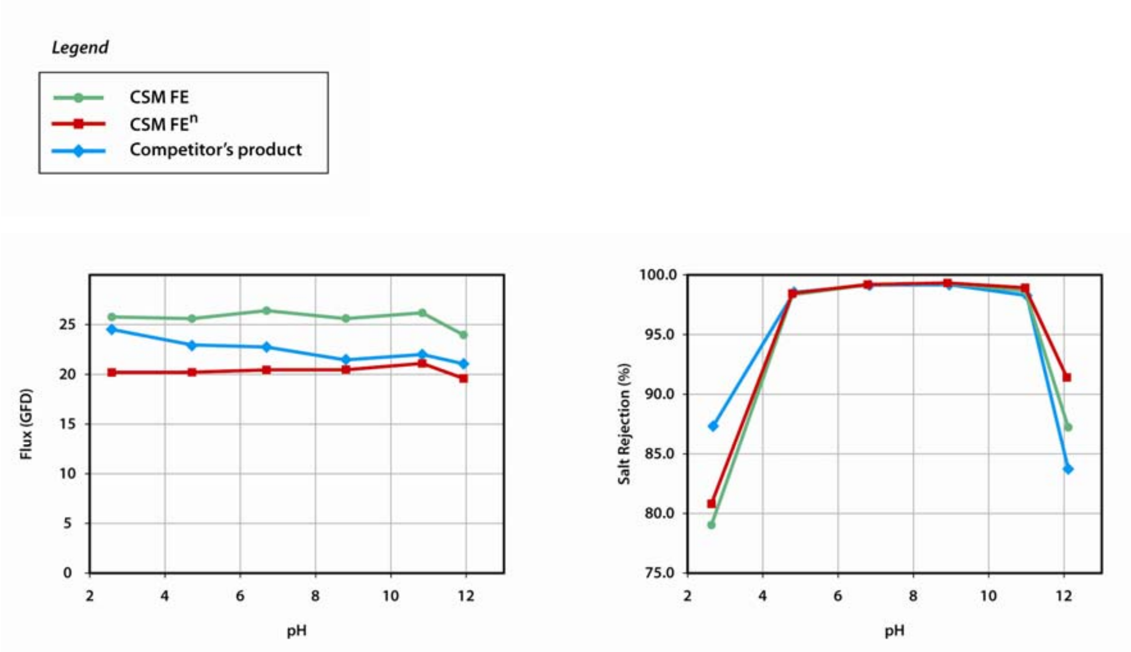

Figure 1: Flux and salt rejection of CSM FE, CSM FE^n and the competitor's product at various pH levels

When tested at different pH levels, the CSM FE and FE^n membranes did not indicate any changes in flux. However, when tested under the lowest pH level at 2.5, both the FE and FE^n models displayed a 5% decrease in salt rejection compared to the competitor's model. On the other hand, in the vicinity of pH at 12, the FE^n model displayed a salt rejection 8% higher than the competitor's model. As a result, the tests show that the FE^n model exhibits better performance at higher pH levels (membranes for maintaining optimal levels of salt rejection at low pH levels are currently in development by Woongjin Chemical).

Feed concentration

Figure 2 shows the results of testing under various feed concentrations. The feed concentration of raw water frequently experiences fluctuations in real field settings. This test again measured flux and salt rejection against varying feed concentrations with the following test conditions: 1,000–10,000ppm NaCl, 225psi, pH 6.5–7.

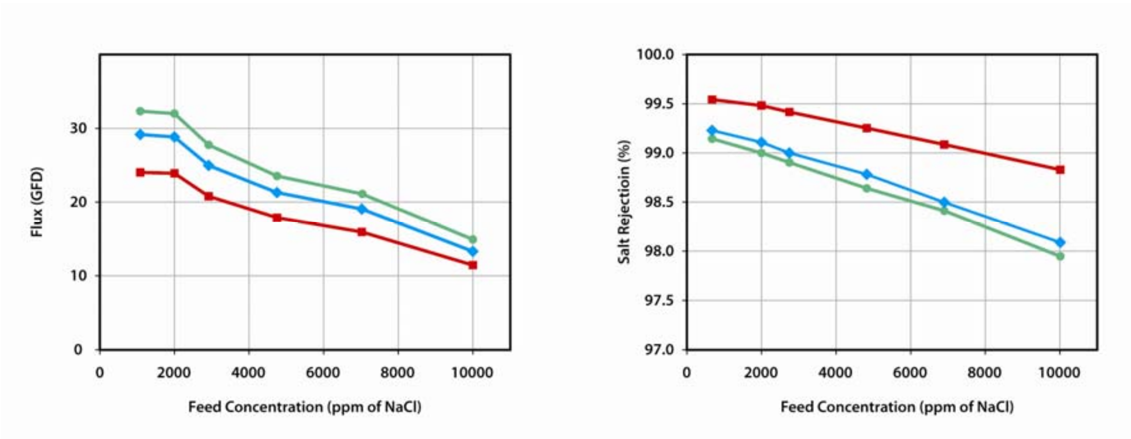

Figure 2: Flux and salt rejection of CSM FE, FE^n and the competitor's product at various feed concentrations

Upon investigating flux and salt rejection at various feed concentrations, findings showed a correlation between increase in feed concentration and decrease in flux in all of the models. For salt rejection, the FE^n demonstrated the least amount of change. In conclusion, the FE^n model best maintains salt rejection properties at high concentration levels compared to the other models.

Operating pressure

Operating pressure is adjusted depending on the quality of feed water and the desired permeate quality. Tests were run under the following conditions: 2,000ppm NaCl, 100–400psi, pH 6.5–7

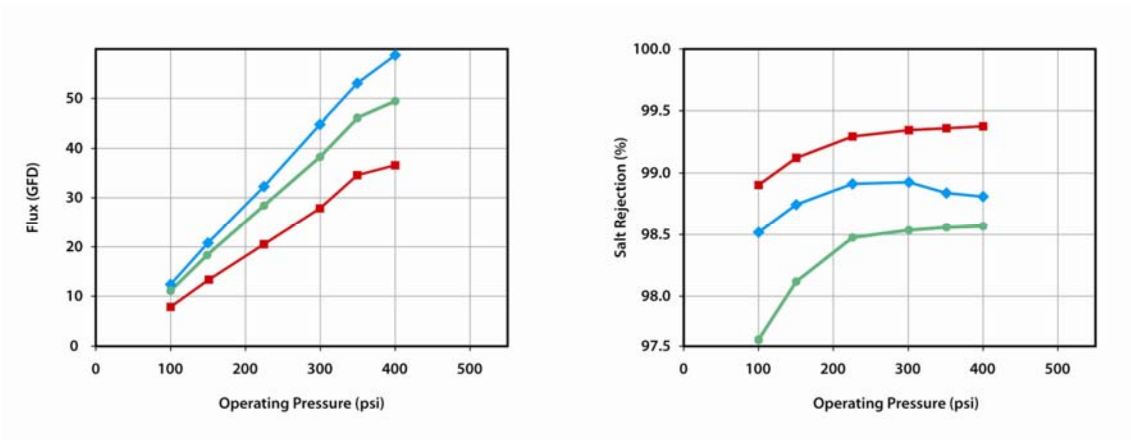

Figure 3: Flux and salt rejection of CSM FE, FE^n and the competitor's product at various operating pressures

At different operating pressures, the FE^n model displayed the least amount of change in salt rejection. When compared to the competitor's model, flux and salt rejection were well-maintained to yield high quality product water.

The above findings are a result of testing the RO membranes under various test conditions of pH, feed concentration and operating pressure. As shown, CSM's FE^n model exhibited superior performance readings over the competitor's model. Similar results are found in real field settings. Additional R&D is also currently being conducted on the FE^n model to increase the membrane's performance under other conditions.