Fabrication of 2-inch Nanofiltration Hollow Fibre Membrane Module for Low Pressure Water Softening

Overview

Commercial Nanofiltration (NF) membranes are generally in flat sheet configuration. The selective layer of polyamide thin film made by conventional interfacial polymerization is either neutral or negatively charged. The retention towards hardness ions mainly depends on its relatively small pore structure. In addition, due to undesired high salinity retention to monovalent ions, high osmotic pressure generated in the feed requires an elevated operation pressure when using conventional NF membranes for water softening. NEWRI's novel NF hollow fiber membrane overcomes these limitations, and can be operated at low-operating pressure (<2 bar) for water softening application.

Applications

- ➲ Softening of industrial and potable water
- ➲ Removal of small organics and heavy metal in municipal and industrial wastewater
- ➲ Pre-treatment for RO

Key features

- ➲ A porous hollow fiber ultrafiltration membrane designed and fabricated to be used as the NF membrane substrate
- ➲ Polyelectrolyte deposition and crosslinking to form the selective layer of the hollow fiber NF membrane.
- ➲ The NF membrane module can be operated at low operating pressure (<2 bar)

Market opportunities

NF membrane market has a total revenue of $0.7 billion and has a total market share of 1.3 % with a high growth outlook (Frost & Sullivan, 2016). Due to the low operating pressure, the operating cost would be lower compared with existing NF in the market.

Advantages and benefits

- ➲ Available in hollow fiber configuration (more surface area)
- ➲ High water permeation and low energy consumption
- ➲ Excellent water softening capability with the presence of high concentration SO_4^{2-} ions in the feed which tend to deteriorate positively charged NF membrane retention to divalent ions
- ➲ The membrane show >7 LMH/bar and >90% rejection to 1,000 ppm $MgCl_2$, $MgSO_4$, Na_2SO_4 at 2 bar.