

Design of an Ammonia–Carbon Dioxide Forward Osmosis Desalination Process

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A commercial scale continuous desalination process for water production from seawater using forward osmosis (FO) was developed by using ASPEN Plus. The FO desalination process is composed of a membrane unit that uses ammonia and carbon dioxide as draw solutes to produce the fresh water and a series of stripping columns to recover the draw solute. The operating conditions of the membrane unit and the stripping columns were determined by simulation studies based on ElecNRTL and OLI models, which represent the property models for electrolyte systems. The membrane unit was designed to use a plate-and-frame module with a water flux model that includes the concentration polarization phenomenon occurring at the membrane surface. The draw solution recovery process is composed of energy integrated parallel stripping columns for the optimal use of the condensing heat from the top side product of the first column to the reboiler of the second column. A standard design of an FO desalination process was proposed in this research. This proposed design will contribute to designing a commercial FO desalination plant.