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Performance of high area spiral wound elements in wastewater reuse RO system

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ABSTRACT

Increasing global water demand and reduction of fresh water resources puts more and more pressure on municipalities all over the world to use membrane technology for reclamation of their wastewaters. Earlier pilot studies followed by full scale installations have proven that membrane pretreatment (MF, UF or MBR) in combination with RO technology can be the right answer to wastewater reclamation challenge. As energy consumption is one of the major contributors to the running cost of RO plants, use of high area and low pressure membranes can have significant impact on reclamation plant running cost. Latest developments in membrane technology towards the energy saving, high area, high rejection and high flow membranes gives further opportunities to membrane plant designers to lower the capital cost of membrane plant as well as cost of water production. As the new features in membrane development have various influences on final membrane performance, it is very important to understand their consequences in order to select right membrane for particular application. Ideally, one would like to have combination of highest area, highest flow, highest rejection and lowest pressure in one element and almost certainly the future development in RO technology will lead to product combining all these features. On brackish water applications, the high area 40.9 m^2 (440 ft^2) elements have been successfully used in many applications, including surface and well water treatment, treated secondary effluent (TSE) polishing wastewater applications and for the second pass in seawater systems. Generally, these applications have a higher quality feed water being supplied to the RO membranes, particularly when membrane pretreatment is used upstream. This allows the RO plant to be designed and run at higher fluxes, saving thus on total number of elements required to produce design permeate flow. One example of such application is the 147,000 m^3/d wastewater treatment plant in East Asia. Newly developed elements will also have significant advantage when used as replacement on existing installations. Their new features will allow to produce more permeate without additional changes to the system components like feed pumps head, pretreatment size, etc. This paper will present the data of the 40.9 m^2 (440 ft^2) ESPA2+ elements under operation at the wastewater reclamation plant in East Asia and compare it with other treatment plant performance where standard 37.2 m^2 (400 ft^2) elements are used. RO performance data, including flux, differential pressure, and salt passage will be presented as well as analysis of RO elements from site after extended operating periods. It will also briefly inform about high area membranes developed for seawater application and describe advantages and flexibility they can offer to design engineers.

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