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Split partial second pass design for SWRO plants

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ABSTRACT

All over the world, the reverse osmosis (RO) desalination plants are providing populations and industries with high quality freshwater. There are various requirements on water quality produced by RO desalination plants depending on final purpose of water usage. In recent years, the requirement for low boron concentrations in RO permeate was the main parameter to be considered in designing many seawater RO systems. Beside the development of new RO membranes with improved boron rejection, there are also other design options which can help to achieve required product quality. One of such options is also split partial second pass (SPSP) RO design. The principle of a SPSP design is based on the fact, that front elements in RO pressure vessel are always producing better permeate quality than elements at the back of the pressure vessel. In order to take advantage of better permeate quality at the front of the vessel in SPSP design, permeate is collected from both sides of the pressure vessel. Low TDS front permeate is than sent directly to final product line, while higher TDS back permeate is treated by partial second pass RO plant. At the end of the process, both permeate streams are blended together to create the final product of required quality. The SPSP design allows to select the right ratio between front and back permeate in order to obtain final product of required quality in terms of boron, TDS and other quality parameters. The SPSP design provides cost effective option by minimizing the size of the second pass RO,which allows substantial savings on capital investments as well as in operating cost of the plant. This paper will present in more details the SPSP design option and requirements, the important parameters influencing SPSP design and different ways of the control, and finally it will discuss benefits and savings resulting from this RO design option. It will also present actual operating data from seawater RO plant using this design option.

Keywords: Reverse osmosis; Split partial second pass; Boron

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