

## Energy and Cost Analysis of Hybrid RO/PRO Process

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In seawater reverse osmosis process, high hydraulic pressure is applied on the seawater, therefore, the fresh water permeates through the membrane and the concentrated seawater flows out with high pressure and high salt concentration. The pressure of the concentrated seawater is recovered by exchanging the pressures with feed seawater in the energy recovery device (ERD) such as pressure exchanger. However, the recovery of the energy which exists in the form of high concentration in SWRO process has not been considered so far from our knowledge. With pressure-retarded osmosis (PRO) process, the high concentration of the solution can be converted into usable energy from the osmotic pressure obtained by interfacing with a dilute solution. In this study, two kinds of work are presented: First, a novel design of the hybrid RO/PRO system is proposed in order to recover the energy contained in the highly concentrated seawater effluent. Second, the optimization of operating parameters in PRO system is conducted through the analysis of the required energy and cost for water production.