

### Feasibility Study of Hybrid RO–Crystallization–FO Process

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In the field of seawater desalination, the membrane processes, especially reverse osmosis (RO) process, has become most popular for the last decades. The main reason for that is the RO process can produce the fresh water with the lowest energy consumption and cost. However the energy consumption in RO process is still higher than the theoretical minimum. In this study, a novel hybrid RO–Crystallization–FO process is proposed and optimized. The proposed process utilizes solubility changes as varying temperature resulting in osmotic pressure change. A specific draw solution in FO process can draw water from seawater and then the draw solution flows to crystallization process and is cooled down. The solute in cooled draw solution is precipitated and filtered out, consequently, concentration of draw solution become lower. Then, it goes to the RO process and fresh water is finally produced as much lower energy due to much lower concentration (osmotic pressure). Through the hybridization of the 3 process processes, the energy consumption for fresh water production can be achieved to 1.78 kWh/m<sup>3</sup>.