

### Optimal design of integrated RO -FO network synthesis in a seawater desalination system

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This work presents a mathematical optimization approach for the synthesis of integrated forward osmosis (FO) and reverse osmosis (RO) networks for energy minimization. The RO -FO design aims at synthesizing an integrated network of forward osmosis units, reverse osmosis units, pumps and turbines. An optimization approach is used to design an optimal RO -FO system has been developed. First, a simplified superstructure is devised to embed process units. Then, the problem is formulated as a single -step mixed integer nonlinear programming (MINLP) whose objective function is to minimize the total annual cost (TAC). Based on the optimization result, detailed optimal arrangement of reverse osmosis units, forward osmosis units, turbines, pumps can be determined. Illustrative case studies are then used to demonstrate the applicability of developed optimization model to determine the optimum design of integrated FO -RO network in a seawater desalinations system

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