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# Exergy Analysis of Reverse Osmosis for Potable Water and Land Irrigation

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**Abstract :** A thermodynamic study is performed on the Reverse Osmosis (RO) desalination process for brackish water. The detailed RO model of thermodynamics properties with and without an energy recovery device was built in Simulink/MATLAB and validated against reported measurement data. The efficiency of desalination plants can be estimated by both the first and second laws of thermodynamics. While the first law focuses on the quantity of energy, the second law analysis (i.e. exergy analysis) introduces quality. This paper used the Main Outfall Drain in Iraq as a case study to conduct energy and exergy analysis of RO process. The result shows that it is feasible to use energy recovery method for reverse osmosis with salinity less than 15000 ppm as the exergy efficiency increases twice. Moreover, this analysis shows that the highest exergy destruction occurs in the rejected water and lowest occurs in the permeate flow rate accounting 37% for 4.3% respectively.

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