

## Membrane distillation and reverse osmosis based desalination driven by geothermal energy sources

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### ABSTRACT

Geothermal energy has been widely used in power generation and heating. However, its utilization in water desalination is not common due to several barriers and limitations including the saline water quality to be treated and the high cost of such a combined process. Some brackish desalination plants using reverse osmosis (RO) membranes are constructed and under operation. In some of these plants, the raw water is first cooled by damping its heat into the atmosphere using cooling towers. The cooled brackish water is then pumped to the RO membranes. This work discusses several configurations of using geothermal energy to drive desalination of brackish waters. It focuses on the modeling and simulation of a direct contact membrane distillation (DCMD) unit powered by geothermal energy sources. The performance of the whole system composed of the geothermal energy source and the desalination unit is modeled using balance equations of mass, energy and species. Hybrid desalination linking membrane distillation (MD) and RO units is also investigated. The results illustrate the benefits of combining the MD-RO and geothermal energy source in terms of enhancement of the plant recovery ratio. They show in particular that the overall recovery ratio for low salinity feed solutions (lower than 2,000 ppm) is high. The simulations show that it can be around 79% and 67% when the feed salinity equals 800 and 2,000 ppm, respectively.

*Keywords:* Geothermal energy; Direct contact membrane distillation; Integrated RO and DCMD; Recovery ratio; Brackish water

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