



Integration of MED with captured CO₂ flue gas compression

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ABSTRACT

The improvement of specific energy consumption and the reduction of steam temperature to drive the system are two of the main challenges to improve the performance of distillation processes in desalination plants, especially for multi-effect distillation technique. The low temperature requirement is a suitable characteristic to integrate multi-effect distillation units as bottom system. Obviously, one of the best options is to use low-grade heat from power plants or gas turbines as a cogeneration system. Mitigation of CO₂ emissions from power plants will be a priority for most of power companies in a near future, one of the most promising techniques is carbon capture and storage. Nevertheless, energy requirements and efficiency penalties in the overall system are some of their disadvantages. They are largely caused by CO₂ compression above both its critical temperature and pressure prior storage. There are a huge low-grade heat coming from condensing water in the CO₂ stream and from compressors intercooling that is suitable to reduce energy penalties in CO₂ capture process and to produce desalted water. With the aim of analyzing these combined systems (desalination unit, power plant and CO₂ capture), five different integration configurations have been proposed and simulated. Three aspects have been analyzed: the energy penalty in the steam cycle, the water costs associated to thermal energy and their environmental impact. Results show that although CO₂ capture systems reduce power generation and therefore increases its costs, available heat from those systems could produce distilled water at affordable costs.

Keywords: Multi-effect distillation; Residual heat; Energy integration; CO₂ capture

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