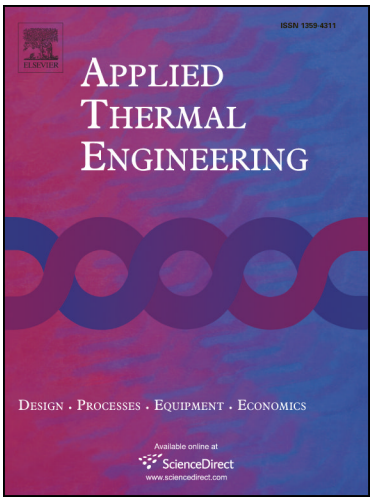

Energy and exergy investigation of a combined cooling, heating, power generation, and seawater desalination system

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Energy and exergy investigation of a combined cooling, heating, power generation, and seawater desalination system

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Abstract

In the present paper, a combined cooling, heating and power and a multi effect desalination with thermal vapor compression system was used to simultaneously produce electricity, fresh water, refrigeration, and hot water for domestic use. In order to link the Brayton cycle to the water desalination and ejector refrigeration systems, a dual-pressure heat recovery steam generator unit was utilized. In this research, the considered system was analyzed in terms of exergy and energy under various operational conditions and pollution generated by combustion process is determined. To consider the effects of design parameters on the efficiency of the system, a parametric analysis was further conducted to examine influences of such factors as compressor compression ratio, inlet temperature of turbine, vapor pressure entering into the desalination unit, and the number of desalination units on exergy and energy efficiencies of the cycle. The results indicated the capability of the proposed system for providing fresh water, power, cooling and heating loads of 85.57 kg/s, 30 MW, 2.03 MW and 1.11 MW, respectively. Finally, total exergy destruction and exergy and energy efficiencies of the cycle were obtained to be 55.82 MW, 36.03%, and 39.22%, respectively.

Keywords: CCHP, Gas turbine, Multi-effect desalination (MED), HRSG, Ejector refrigeration system, Exergy.

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