

Performance evaluation and economic assessment of a gas power plant with solar and desalination integrated systems

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ABSTRACT

In this study, a new configuration of a cogeneration system of electricity and freshwater in integration with solar collector has been thoroughly investigated. A gas power plant is modeled thermodynamically. The results of this modeling are compared with the actual data of a power plant to verify the simulation. Subsequently, by placing multi-effect desalination with thermal vapor compression and solar collectors, the functions including energy and exergy efficiencies and carbon dioxide emissions of the power plant have been studied. By applying the desalinating cycle and solar collectors, the energy efficiency of this power plant is increased from 35% to 46% and the exergy efficiency from 37% to 48%. This configuration of the cogeneration system with linear solar collectors produces 16.479 m³ of fresh water per day while reducing the CO₂ emissions by 37,216 tons/d.

Keywords: Thermal desalination; Exergy; Energy; Gas turbine; Cogeneration system; Linear solar collector

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