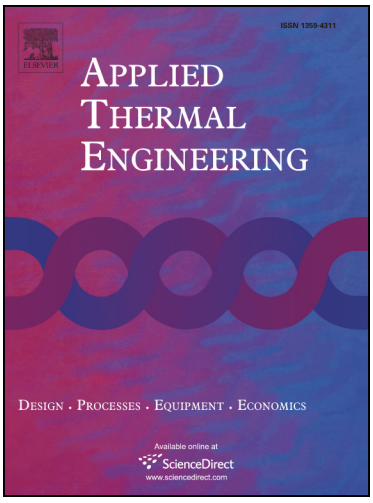

THERMODYNAMIC PERFORMANCE EVALUATION OF A NOVEL SOLAR ENERGY BASED MULTIGENERATION SYSTEM

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THERMODYNAMIC PERFORMANCE EVALUATION OF A NOVEL SOLAR ENERGY BASED MULTIGENERATION SYSTEM

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ABSTRACT

The main objective of the study is to assess the thermodynamic performance of a novel multigeneration system powered by solar energy. The proposed system is designed to produce clean hydrogen, power, heating – cooling, and freshwater as a multigeneration purpose. The system under investigation consists of a solar heliostat, a Brayton cycle that is driven by solar energy, a Rankine cycle, an organic Rankine cycle, an absorption cooling and heating system, a flash desalination unit, and a PEM electrolyzer. The fresh water is produced from the seawater by a flash desalination unit. Parametric studies are also carried out to investigate the effects of different parameters such as turbine inlet pressure, solar radiation, an isentropic efficiency of the compressor and reference temperature on system efficiency. The effect of these parameters on the energy and exergy efficiencies of the whole system and the sub-systems are examined. Results show that the overall energy and exergy efficiencies of the system are obtained as 78.93% and 47.56%, respectively. In addition, the hydrogen and fresh water productions of the proposed system are computed as 0.04663 kg/s and 0.8862 kg/s.

Keywords: desalination, energy, exergy, hydrogen, solar energy

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