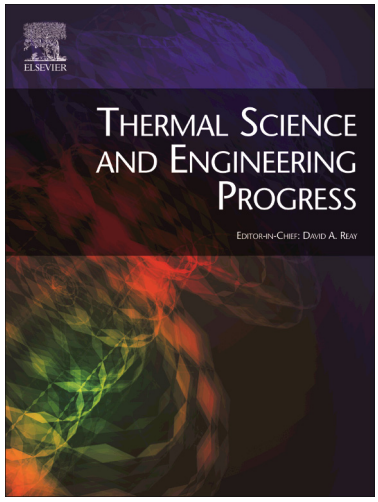

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Detailed parametric analysis of solar driven supercritical CO_2 based combined cycle for power generation, cooling and heating effect by vapor absorption refrigeration as a bottoming cycle

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Abstract

The present study investigates the exergy and energy centered parametric performance of parabolic trough collectors (PTC) driven combined Supercritical CO_2 (SCO_2) cycle/vapor absorption refrigeration (VAR) system in order to produce power, cooling and heating effect. Selected independent parameters such as direct normal irradiance (DNI), maximum cycle temperature, and the compressor pressor ratio has an incremental effect on the system efficiency in contrast to the compressor inlet temperature, generator temperature, and absorber and condenser temperature due to the inverse effect of these variables on the efficiency. Additionally, the effect of the local apparent time (LAT) has also been assessed on the performance of combined cycle (SCO_2-VAR cycle) and reveal that for the location of Mumbai, the maximum value of exergy and thermal efficiency was about 75.71% and 42.18% at LAT (h) = 1230, respectively on the April 15 and 70.1% and 39.05% at LAT (h) = 1130 & 1230, respectively for the December 15. Apart from this, study concludes that the maximum value of exergy and thermal efficiency of PTC was about 33.9% and 65.32% at DNI of 0.96 kW/m^2, respectively. Whereas, the exergy destruction rate follows the reverse behaviour from