Experimental And Theoretical Analysis Of The Goswami Cycle Operating At Low Temperature Heat Sources

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Abstract

The Goswami cycle is a cycle that combines an ammonia-water vapor absorption cycle and a Rankine cycle for cooling and mechanical power purposes by using thermal heat sources such as solar energy or geothermal steam. In this paper, a theoretical investigation was conducted to determine the performance outputs of the cycle, namely, net mechanical power, cooling, effective first law efficiency and exergy efficiency, for a boiler and an absorber temperature of 85 °C and 35 °C, respectively, and different boiler pressures and ammonia-water concentrations. In addition, an experimental investigation was carried out to verify the predicted trends of theoretical analysis and evaluate the performance of a modified scroll expander. The theoretical analysis showed that maximum effective first law and exergy efficiencies were 7.2% and 45%, respectively. The experimental tests showed that the scroll expander reached a 30-40% of efficiency when boiler temperature was 85 °C and rectifier temperature was 55 °C. Finally, it was obtained that superheated inlet conditions improved the efficiency of the modified expander.

Keywords

Ammonia-Water Mixture; Low-Temperature Cycle; Power And Cooling