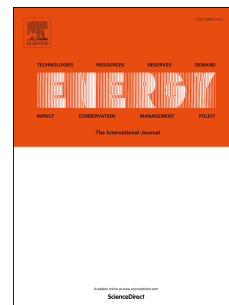


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Investigation on a Solar Thermal Power and Ejector-Absorption Refrigeration System based on First and Second Law Analyses

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Abstract

The energetic and exergetic performance of a solar thermal power and ejector-absorption refrigeration system is investigated. R141b, R600a, R290, R717 and R143a were employed as the working fluids for ORC and $\text{NH}_3\text{-LiNO}_3$ was utilized in the ejector-absorption cycle for cooling production. The energetic and exergetic output of PTC driven combined power and refrigeration cycle were evaluated along with the calculation of thermodynamic irreversibility. The distribution of solar exergy input to the cycle in term of exergy produced, destroyed due to irreversibility, and loss due to thermal exhaust to the ambient was computed and compared with the traditional energy distribution. The maximum exergy was destroyed in the PTC where it amounts to 79.61% of the overall exergy destruction. The conversion of solar exergy input to the cycle exergy output was best (14.6%) for R141b fluid and worst (3.9%) for R143a fluid. Parametric analysis of the results reveals that Solar beam radiation (SBR), turbine inlet pressure (TIP), ORC pump inlet temperature, heat transfer fluid (HTF) temperature at the inlet of PTC, and the selection of ORC working fluid have the significant effect on the energetic and exergetic outputs of solar thermal power and ejector-absorption cooling system.

Keywords: Ejector; Vapor absorption cycle; $\text{NH}_3\text{-LiNO}_3$; Parabolic trough collector; Organic Rankine Cycle

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