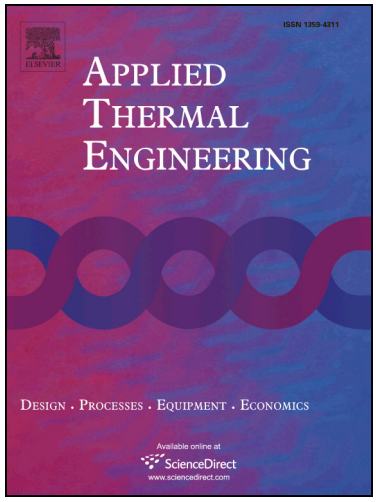

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Performance analysis of a modified zeotropic mixture (R290/R600) refrigeration cycle with internal subcooler for freezer applications

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Abstract

This study presents a modified vapor compression refrigeration cycle (MVRC) using zeotropic mixture R290/R600 for freezers. In the MVRC, an internal subcooler with additional bypass tube is introduced to enhance the overall system performance. Energetic and exergetic analysis methods are introduced to theoretically evaluate the system operating performance, and compared with the performance of the traditional vapor compression refrigeration cycle (TVRC). The results show that the MVRC yields higher refrigeration coefficient of performance (COP), volumetric cooling capacity and exergy efficiency than the TVRC. Under the given condition, the COP, volumetric cooling capacity and exergy efficiency of MVRC could be improved by up to an average of 8.9%, 12.4% and 10.4%. Moreover, COP and exergy efficiency of MVRC increases with the rising bypass coefficient of the refrigerant. The performance characteristics of the proposed novel cycle demonstrate the potential advantages for application in freezer systems.

Keywords: Freezers; Internal subcooler; Performance improvement; Zeotropic mixture;

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