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Experimental investigation of an ejector-enhanced auto-cascade refrigeration system

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Abstract:

This study presents the experimental investigation of an ejector-enhanced auto-cascade refrigeration cycle (EARC) with zeotropic refrigerant R134a/R23. Performance comparisons among the EARC and two conventional cycles were conducted at selected operating conditions. The effects of ambient temperature, charged mass fraction ratio of the mixture, throttle valve opening, and heat load on the performance characteristics of the EARC were investigated. The results indicated that the EARC had more advantages in terms of lower refrigeration temperature and higher energy utilization efficiency over the conventional cycles, and the coefficient of performance (COP) and exergy efficiency improvements of the EARC reached up to 9.6% and 25.1%, respectively. The throttle valve opening was optimal with respect to the maximum system exergy efficiency determination. The refrigerant R134a/R23 with the optimal mass fraction ratio of 0.70/0.30 was proposed.

Keywords: experimental investigation; ejector; zeotropic refrigerant; auto-cascade

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