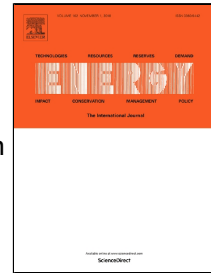


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Performance analysis of an advanced ejector-expansion autocascade refrigeration cycle

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Abstract

In this paper, an advanced ejector-expansion autocascade refrigeration cycle (AEARC) using hydrocarbon mixture R290/R170 for applications in low-temperature freezers is proposed. In the AEARC, a two-phase flow driven ejector is introduced with new cycle configuration to reduce the thermodynamic loss in throttling process and lift the suction pressure of compressor significantly. The performances of the AEARC and traditional autocascade refrigeration cycle (ARC) are compared using energy and exergy analysis methods, and several important parameters for AEARC are also discussed in detail. The results indicate that AEARC is feasible and there are obvious performances improvements in the COP, volumetric refrigeration capacity and exergetic efficiency. Especially, in AEARC, the COP and volumetric refrigeration capacity increase by 80.0% and 78.5% at most compared to that of ARC, respectively. In general, the AEARC can provide significant performance improvement and produce better actual operation benefit. The potential practical advantages may be worth further attention in future research.

Keywords Hydrocarbon mixture; Ejector; Autocascade refrigeration cycle; Performance improvement

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