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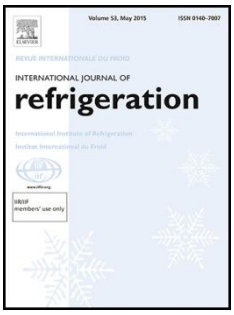

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Thermodynamic analysis of a novel ejector-cascade refrigeration cycles for freezing process applications and air-conditioning

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Highlights

- We present a theoretical comparison between new and conventional cascade cycle
- The improvements of the maximum COP could reach 37%
- The improvements of the maximum second law efficiency could reach 12%

ABSTRACT:

Waste heat from the gas cooler is a form of free energy, which can be utilized to drive an ejector cooling cycle. This paper presents a new CO_2 ejector-cascade refrigeration cycle. The effects of important parameters on the thermodynamic performance of the new cycle are theoretically investigated based on energetic and exergetic analyses. Furthermore, the performance comparison of the proposed cycle and conventional cycle is carried out. The theoretical study shows that the new cycle exhibits a reasonable value of COP (Coefficient of Performance) and system second law efficiency. For the same cooling capacity, the improvements of the maximum COP and second law efficiency could reach 37% and 12%, respectively over those of the conventional cascade cycle under the given operating conditions and at the optimum gas cooler pressure.

Keywords: Cascade refrigeration cycle, Ejector cycle, Performance, Energy, Exergy, Carbon dioxide