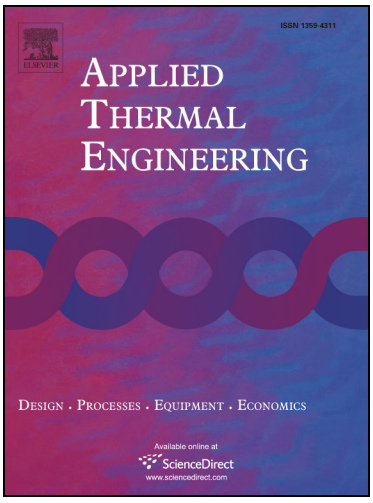

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Experimental investigation on a transcritical CO_2 ejector expansion refrigeration system with two-stage evaporation

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Abstract: Adding a two-stage evaporator in the transcritical CO_2 ejector expansion refrigeration system can not only regulate the quality equilibrium of system refrigerant but also improve the system performance. This paper presents an experimental study on the transcritical CO_2 ejector expansion refrigeration system with two-stage evaporation under variable operating conditions. Some key performance indicators such as gas cooler pressure, mass flow rate, entrainment ratio and pressure lift ratio of ejector, cooling capacity and COP of system were evaluated through varying the volumetric flow rate of the second evaporator chilled water $V_{te,wa}$, area ratio of ejector A_t/A_{mix}, compressor speed N and expansion valve opening EV. The present results indicated that the second evaporator played a significant role in improving the system performance, and such improvement was more evident for smaller entrainment ratio. Greater gas cooler pressure, pressure lift ratio of ejector and cooling capacity of system could be obtained by increasing the volumetric flow rate $V_{te,wa,}$ and compressor speed. The small area ratio of ejector was conducive to high gas cooler pressure, great entrainment ratio of ejector as well as large cooling capacity and COP of system. This study provides an approach for the improvement of ejector expansion refrigeration system.

Keywords: ejector expansion refrigeration system; two-stage evaporation; system performance; operation conditions; experiment

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