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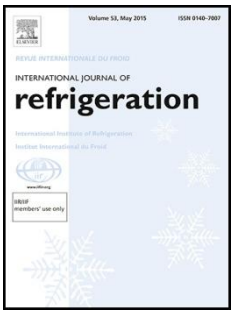

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Improvement of condenser performance by phase separation confirmed experimentally and by modeling

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Highlights

- This paper presents the experimental confirmation of performance improvement by the separation of liquid in condenser headers.
- The results confirm prediction by the model analysis presented in previous paper.
- At matched cooling capacity separation condenser increased system COP for 2-6%.
- About half of improvements come from additive effects to condenser performance increase (compressor efficiency).

Abstract

This paper presents results of an experimental study to determine the effect of vapor-liquid separation in a header of microchannel condenser for a MAC system. R134a is used as the working fluid. A condenser with separation and a baseline condenser identical on the air side have been tested to evaluate the difference in the performance due to separation. Two categories of experiments have been conducted: the heat exchanger-level test and the system-level test. In the heat exchanger-level test, it is found that at the same inlet and outlet temperature the separation condenser generates 1.6% to 7.4% more condensate flow rate than the baseline. The separation condenser also lowers the refrigerant exit temperature compared with the baseline at the same condensate flow rate. The improvement in the separation condenser confirms the results by a model. In the system-level test, COP is compared under the same superheat, subcooling and refrigerating capacity. System with separation condenser shows up to 6.6% a higher COP than the system with baseline condenser.

Key words: Two-phase separation; microchannel condenser; MAC system; experiment; modeling