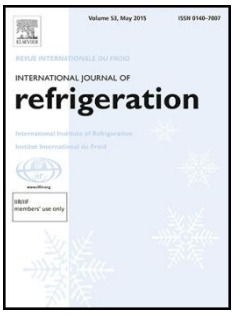
Accepted Manuscript



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PII: S0140-7007(17)30329-8
DOI: http://dx.doi.org/doi: 10.1016/j.ijrefrig.2017.08.010
Reference: JIJR 3728

To appear in: *International Journal of Refrigeration*

Received date: 13-1-2017
Revised date: 22-8-2017
Accepted date: 23-8-2017

Please cite this article as: Pavel Makhnatch, Adrián Mota-Babiloni, Rahmatollah Khodabandeh, Experimental study of R450A drop-in performance in an r134a small capacity refrigeration unit, *International Journal of Refrigeration* (2017), http://dx.doi.org/doi: 10.1016/j.ijrefrig.2017.08.010.

Experimental study of R450A drop-in performance in an R134a small capacity refrigeration unit

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HIGHLIGHTS

- R450A is tested in an R134a small capacity refrigeration unit.
- Evaporating temperature is varied between -15ºC and 12.5ºC.
- Average mass flow rate and cooling capacity are 9.1% and 9.9% lower for R450A.
- Average compressor power consumption and COP values are 7.2 and 2.9% lower for R450A.
- R450A can be considered as R134a drop-in replacement if decrease in cooling capacity is acceptable.

Abstract

The Kigali's amendment to the Montreal Protocol has highlighted the hydrofluorocarbons (HFCs) phase out as a priority to reduce the future global Earth's mean temperature increase. R134a is the most abundant HFC in the atmosphere and therefore it must be substituted using environmentally benign alternatives. In the short term, blends of HFCs and hydrofluoroolefins can replace R134a. This paper experimentally evaluates R450A (GWP of 547), a non-flammable mixture of R1234ze(E) and R134a, in an R134a small capacity refrigeration system. The controlled experimental conditions cover evaporating temperatures from -15 to 12.5 ºC and condensing temperature of 25, 30 and 35 ºC (36 tests in total for each refrigerant). The experimental results showed that with only a thermostatic expansion valve adjustment the average R450A cooling capacity and COP are 9.9 and 2.9% lower than those measured using R134a. Besides, the observed compressor discharge temperature values of R450A are not greater than that of R134a.

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