

Accepted Manuscript

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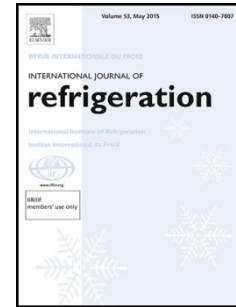
PII: S0140-7007(17)30061-0
DOI: <http://dx.doi.org/doi: 10.1016/j.ijrefrig.2017.02.009>
Reference: IJR 3553

To appear in: *International Journal of Refrigeration*

Received date: 19-10-2016
Revised date: 9-2-2017
Accepted date: 10-2-2017

Please cite this article as: Pavel Makhnatch, Adrián Mota-Babiloni, Jörgen Rogstam, Rahmatollah Khodabandeh, Retrofit of lower GWP alternative R449A into an existing R404A indirect supermarket refrigeration system, *International Journal of Refrigeration* (2017), <http://dx.doi.org/doi: 10.1016/j.ijrefrig.2017.02.009>.

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Retrofit of lower GWP alternative R449A into an existing R404A indirect supermarket refrigeration system

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Highlights

- R449A is retrofitted into a R404A real supermarket refrigeration system.
- Cooling capacity is lower for R449A.
- COP of both refrigerants is comparable.
- R449A discharge temperature is higher but still admissible.
- TEWI analysis indicates that CO₂-eq. emissions of R449A are lower than R404A

Abstract

R404A is going to be phased out from most of the commercial refrigeration systems due to its high GWP value of 3943. R449A (GWP of 1282) has been proposed to replace R404A with only minor system modifications in supermarkets. This paper presents the measurements of a light retrofit replacement of R404A using R449A in a medium temperature indirect refrigeration system (secondary fluid temperature at the evaporator outlet between -9 and -4 °C). It has been demonstrated that with a slight expansion device adjustment and 4% increase of refrigerant charge, R449A can be used in this refrigeration system designed for R404A because of its suitable thermodynamic properties and acceptable maximum discharge temperature. At a secondary fluid temperature at condenser inlet of 30 °C, the COP of R449A nearly matches that of R404A (both were between 1.9 and 2.2), despite having approximately 13% lower cooling capacity. As a conclusion, attending to the GWP reduction and similar energy performance, it was demonstrated using the TEWI methodology that the use of the recently developed refrigerant R449A in these applications can reduce the total CO₂ equivalent emissions of an indirect supermarket refrigeration system designed for R404A refrigerant.

Keywords: supermarket refrigeration, R404A, R449A, HFC HFO mixture, low GWP, alternative refrigerant

Nomenclature

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