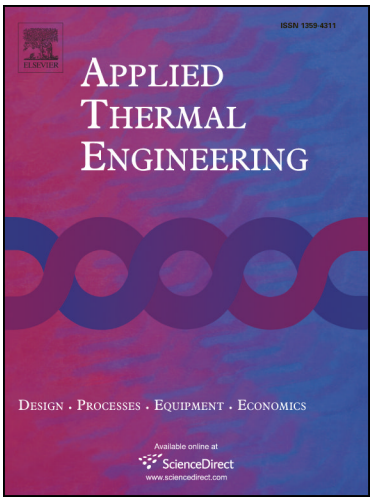

Improvement of energy parameters using R442A and R453A in a refrigeration system operating with R404A

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Improvement of energy parameters using R442A and R453A in a refrigeration system operating with R404A

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Abstract

In this study, R404A having high GWP (global warming potential) was experimentally compared with R442A and R453A refrigerants which have low GWP. The alternatives refrigerants of R442A and R453A were directly tested without performing a constructional modification in the refrigeration system. Three different evaporation temperature (−6, −3 and 0°C) and three condenser temperature (35, 40, 45°C) cases were investigated in the experimental work. Power consumption of compressor was highest for R404A while it was the lowest for R453A at three condenser temperatures. The measurements presented that cooling capacity amounts of R442A and R453A were greater by 1% to 8% than that of R404A. In comparison with R404A, COP (coefficient of performance) value was better by 5% to 12% using R442A and it was substantially improved by about 10% to 14% for the case of R453A refrigerant. The volumetric efficiency values were obtained as the highest for R453A at the covered experimental cases. The mass flow rate and quality of refrigerant at evaporator inlet were also reduced as a result of using considered alternatives refrigerants.

Keywords: Drop-in; R404A; R442A; R453A; GWP

Nomenclature

COP	coefficient of performance
GWP	global warming potential
h	enthalpy, kJ/kg
$\dot{m}$	mass flow rate of refrigerant, kg/s
$\dot{n}$	rotational speed for the compressor, rpm
ODP	ozone depletion potential
P	pressure, kPa