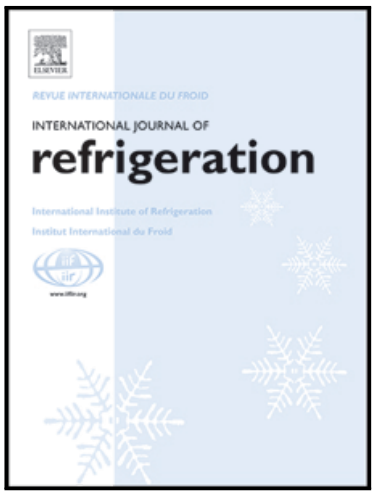

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Performance of a Hydrocarbon Driven Domestic Refrigerator based on Varying Concentration of SiO_2 Nano-lubricant

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Highlights

- There are lower compressor power input for all chosen charges of LPG refrigerants than R134a.
- The nano-lubricants based LPG resulted in reduced power consumption at low concentration.
- Least value of compressor power consumption was 64W with 50g charge of LPG using 0.4g/L nanofluid.

Abstract

This experimental work studies the performance of varying concentrations of SiO_2 nanoparticle in mineral oil lubricant using LPG refrigerant, as a retrofit to R134a in a domestic refrigeration system. The test rig is fitted with thermocouple K, pressure gauges and a watt-meter to monitor the suction, discharge, the condensing temperatures, pressures and power consumption in accordance with ISO 8187 recommendations. Performance parameters investigated included: pull down time, compressor power consumption and input, coefficient of performance and thermal conductivity and viscosity. Findings showed that all the selected charges of LPG refrigerant infused with varying concentrations of nano-lubricants, achieved equal values of -3^{o}C (ISO 8187), or lower values of evaporator air temperatures at lower refrigerant charges, than the baseline R134a refrigerant. All the selected nano-lubricants based refrigerants resulted in improved Coefficient of Performance (COP) than R134a refrigerant, with COP values ranging from 2.05 with 50g charge of LPG using 0.4g/L nano-lubricant to 2.65 with 60g of LPG using 0.2g/L SiO_2 based lubricant. Lower power input was recorded by the compressor for all the selected charges of SiO_2-lubricant based LPG than R134a refrigerants, having