

Experimental Study of a Mixture of R290/R600 to Replace R134a in a Domestic Refrigerator

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Abstract : Interest in natural refrigerants, such as hydrocarbons has been renewed in recent years because of the environmental problems associated with synthetic chlorofluorocarbon (CFC) and hydro-chlorofluorocarbon (HCFC) refrigerants. Due to the depletion of ozone-layer and global warming effects, synthetic refrigerants are being gradually phased out in accordance with the international protocols that aim to protect the environment. In this work, a refrigerator designed to work with R134a was used for this experiment, Liquefied Petroleum Gas (LPG) which consists of commercial propane and butane in a single evaporator domestic refrigerator with a total volume of 62 litres. In this experiment, type K thermocouples with their probes were used to measure the temperatures of four major components (evaporator, compressor, condenser and expansion device) of the refrigeration system. Also the system was instrumented with two pressure gauges at the inlet and outlet of the compressor for measuring the suction and discharged pressures. Four sets of experiments were carried out using different charges and the charges were measured with a digital charging scale. Thermodynamic properties of the LPG refrigerant were determined. The results obtained showed that the design temperature and pull-down time set by International Standard Organisation (ISO) for refrigerator was achieved using LPG charge of 60g. The system COP increases with 14.6% and the power consumption reduced with 9.8% when compared with R134a. Therefore, LPG can replace R134a in domestic refrigerator.

Keywords : domestic refrigerator, experimental, R290/R600, R134a

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