

19th International Conference on

NANOTECHNOLOGY AND EXPO

November 13-14, 2017 | Atlanta, USA

Exergoeconomic effect of TiO₂ nanoparticle on the performance of low gram charge of selected hydrocarbon in a domestic refrigerator

Luke O Ajuka, K M Odunfa and M O Oyewola
University of Ibadan, Nigeria

An experimental evaluation of low charge performance LPG, R600a and R134a was carried out with a domestic refrigerator designed to work with R-134a. TiO₂ nanoparticle of 15 nm particle size mixed with capella oil at varying TiO₂-lubricant concentrations of 0.1, 0.3 and 0.5 wt % was examined. The effects of the evaporator temperature on energy consumption, coefficient of performance, exergetic efficiency and defects in the components of the refrigeration system were examined. The results from the experiment show that the low charged 20 gram of LPG+TiO₂ (0.5 wt %), LPG+TiO₂ (0.3 wt %), LPG+TiO₂ (0.1 wt %) and LPG (Pure) respectively, have COP of 4.7, 6.3, 5.1 and 3.36% higher than HFC-134a, the compressor consumed 15.9, 20.6, 11.6 and 7.3% less energy respectively than that of HFC-134a and the exergetic efficiencies were respectively 7.8, 8.6, 6.5 and 6.0% higher than that of HFC-134a at 29°C ambient temperature. Similarly, 20 gram charge of R600a+TiO₂ (0.5 wt %), LPG+TiO₂ (0.3 wt %), LPG+TiO₂ (0.1 wt %) and LPG (Pure) respectively, have COP of 4.1, 5.3, 4.3 and 2.36% higher than HFC-134a, the compressor consumed 17.4, 21.4, 11.6 and 8.3% less energy respectively than that of HFC-134a and the exergetic efficiencies were respectively 7.5, 8.7, 6.2 and 5.8% higher than that of HFC-134a. The results shows that the low 20 gram charge of LPG with TiO₂ nanolubricant concentration of 0.3 wt % is the best result and can be adopted in the domestic refrigerator.

ajukamario@gmail.com