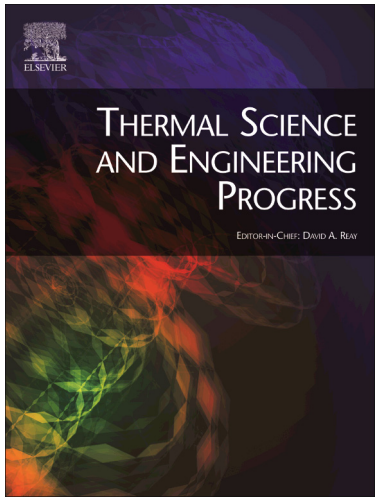

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An analysis on the comparison of low-GWP refrigerants to alternatively use in mobile air-conditioning systems

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Abstract

The results of an analysis are discussed in this paper considering R1234yf, R444A and R445A refrigerants having low Global Warming Potential (GWP) which can be used in the mobile air conditioning systems. The evaporation temperatures of −5°C and +5°C while condenser temperatures of 30°C and 60°C were taken for the evaluations of thermodynamic properties of the refrigerants. In the study, electrical power consumption of the system and COP values were calculated considering thermodynamic properties determined for the points in the cycle depending on the assumed system parameters. The system was considered to operate in a steady-state cycle. The pressure loss through evaporator and condenser, and heat transfer amounts through connecting tubes, expansion valve and compressor were neglected for the computations. The computations have pointed out that while cooling capacity of R444A and R445A were higher; their COP values were smaller compared to R1234yf because of their increased consumption of electricity. Although COP of R444A is smaller compared to R1234yf, it may be suggested that R444A can be utilized in air-conditioning systems of heavy vehicles such as busses, trucks, and trains due to its decreased flammability risk by mixture content.

Keywords: MAC systems, alternative refrigerant, flammability, COP, isentropic efficiency