

Physical Properties of HFO-1234yf

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Refrigerants have evolved as environmental awareness and scientific modeling of the environment have improved. The transition from CFCs → HCFCs → HFCs has decreased the environmental footprint of common refrigeration. Due to rising concern over global warming a new class of refrigerants is once again required. A new low global warming potential (GWP) refrigerant hydrofluoro-olefin 2,3,3,3-tetrafluoropropene (HFO-1234yf) has been developed. HFO-1234yf has a very short atmospheric lifetime of 0.03 yrs and a GWP of 4. In the modeling and optimizing of new refrigeration systems accurate thermophysical properties of the working fluid are needed. Also a model is needed that can accurately describe the thermophysical properties of the working fluid. The critical temperature, freezing point and normal boiling point have been experimentally determined. The temperature dependant vapor pressure, density, surface tension and viscosity of HFO-1234yf have also been measured. An equation of state has been regressed using the experimental data. This data allows for the design of new refrigeration systems and performance analysis of HFO-1234yf in existing air conditioning applications. The development of this new class of refrigerants has continued the trend of more environmentally benign refrigerants. When comparing the environmental impact of refrigerants it is also important to look at the performance both capacity and efficiency of a new refrigerant. HFO-1234yf has been shown to maintain both the capacity and efficiency previously seen in applications such as mobile air conditioning.