Thesis Title	Numerical Prediction of Steady Flows of Pure Refrigerants and Refrigerant Mixtures Through Capillary Tubes
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Abstract

The capillary tube serves almost all small refrigeration and air conditioning systems. ASHRAE and DANFOSS charts are also widely used in the industries today but these charts can only be used for R12 and R22. In the present study, the capillary tube model is developed. The model is based on the fundamental of fluid mechanics and thermodynamics. In general, the refrigerant flow through the capillary tube can be divided into a liquid single-phase flow region and a two-phase flow region. Calculation of a two-phase flow region is more complicated than a single-phase flow region. The model is based on the conservation of mass, energy and momentum. The refrigerant's properties and two-phase flow viscosity equation used in the model are obtained from the published literature.

The results from the developed model were verified pressure distribution along the capillary tube with the experimental data of Mikol and Li for R12 and the experimental data of Melo for R134a. The results from the developed model are agreed well with those from the experiment. In addition, comparisons of some pairs of alternative refrigerant were done. It was found that the conventional refrigerants

consistently gave longer capillary length than the alternative refrigerants. For all pairs the conventional refrigerant consistently gave lower pressure drops for both single-phase and two-phase flow with resulted in longer tube lengths. As a results of the simulation, the capillary tube selection charts for R12, R22, R134a, R404A, R407B, R407C, R410A, R410B, R502 and R507A are developed for selecting appropriate capillary tube for a specific condition. These charts is valid only for adiabatic capillary tubes. The developed chart for R12 and R22 are found to agree well with those of ASHRAE chart.

Keywords : Air Conditioning System / Capillary Tubes / Refrigerant / Refrigeration System / Single-Phase Flow Region / Two-Phase Flow Region