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TWO-PHASE CONDENSATION HEAT TRANSFER COEFFICIENTS AND PRESSURE DROPS OF HFC-134a FOR DIFFERENT CONDENSING TEMPERATURES IN A SMOOTH AND MICRO-FIN TUBE

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Abstract

Micro fin tubes are effectively used in refrigerant equipments for improving thermal efficiency. Efforts are made to investigate two phase heat transfer coefficients and pressure drops of pure HFC-134a experimentally in a smooth and micro-fin tube. Different from previous studies, the present experiments are performed for different condensing temperatures, with superheating and sub cooling and using hermetically sealed compressor. The test section is 4.5 m long shell and U-tube type with refrigerant flowing through tube and cooling water through annulus. The baffles are provided in the annulus side for better heat transfer. The inner tube is made from smooth and micro-fin copper tubing of 9.42 and 9.52 mm outer diameter respectively. The test runs are done at average saturated condensing temperatures ranging from 35^{o}C to 60^{o}C. The mass fluxes are between 90 and 700 kg/ms^{2}. The experimental results for both smooth and micro-fin tubes show that the average heat transfer coefficient and pressure drop increase with mass flux but decrease with increasing condensing temperature. The average heat transfer coefficient is 50-250% higher for micro-fin tube than that of smooth tube, with moderate increase in pressure drop ranging from 10-240%. New correlations based on the data gathered during the experimentation for predicting condensation heat transfer coefficients are proposed for wide range of practical applications.

Keywords: Condensation; Enhancement; Micro-fin tube; R-134a