PREDICTION OF THE OVERALL HEAT TRANSFER COEFFICIENT IN THE THREE ZONES OF WIRE AND TUBE CONDENSER

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Abstract

An experimental and numerical analysis is presented in this study to estimate the overall heat transfer coefficient in the de-superheated, two-phase and sub-cooled zones along wire and tube condenser length. Experimental analysis is conducted using test rig for vapor compression refrigeration system with R-134a refrigerant developed in the current work. Numerical model is based on mathematical formulation of the refrigerant side and air side heat transfer coefficients in finite sections along condenser tube which is solved using EES software. Investigating the temperature distribution, heat transfer coefficient and other thermal parameters along the length of condenser under different operating conditions has showed that, the de-superheated, two-phase and sub-cooled zones are approximately occupy 15 %, 80% and 5% of the condenser length respectively. Overall heat transfer coefficient was significantly affected by the variations of the ambient temperature. Comparison between experimental and numerical results has displayed average deviation of 6.5% which is reasonably acceptable. Comparison of the present work results with that of other research works has showed an acceptable agreement.