Montri Pirunkaset 2009: The Simulation of Heat and Mass Transfer in Corrugated Packing for Counter-Flow Cooling Towers. Doctor of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Associate Professor Santi Laksitanonta, D.Eng. 179 pages.

This study presents the simulated results of the simulation of heat and mass transfer in the corrugated packing of counter-flow cooling towers. This numerical analysis has been partially validated by comparing it with the experimental data. Due to the complicated configuration of the packing surface, it was not able to measure temperatures of air at the intermediate sections, but was able to measure only the water temperatures and the outlet air temperatures. Under the same conditions at inlet dry bulb temperature of 35.5 ^{o}C, inlet wet bulb temperature of 27.4 ^{o}C, inlet water temperature of 40 ^{o}C, and three values of L/G ratios, the water temperatures were predicted at the vertical positions of 0, 0.09, 0.18, 0.27, 0.36 and 0.45m from the bottom of packing by using the simulation method and the Merkel's method. A comparison of the water temperatures at the vertical positions in the packing, it was found that all temperature differences of the water by using the simulation method and the measured data were approximately less than 3.19%, 3.06% and 2.77% and all temperature differences of the water by using the Merkel's method and the measured data were approximately less than 3.84%, 3.4% and 2.84% for the given L/G ratios of 0.553, 0.719 and 0.933, respectively. For the 95% confidence interval, it was found that the simulation model could predict the water temperatures at the vertical positions within the deviation of $0.5450 \pm 0.1443^{o}C$ and the Merkel's method could predict the water temperatures at the vertical positions within the deviation of $0.5639 \pm 0.1790^{o}C$ by using the K-type of thermocouples within the deviation of calibrated temperatures of $0.5333 \pm 0.2054^{o}C$. In the experiments, the orifice flow meter could measure the flow rates of water with the uncertainty of $\pm$ 6.5% by using 95% confidence interval.

Finally, this simulation model has been used as a tool for studying the phenomenon of heat and mass transfer in the corrugated packing and for predicting the water temperatures at the vertical positions and the outlet temperatures of air and water of the packing.

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