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EFFECT OF WATER FLOW RATE ON COOLING EFFECTIVENESS AND AIR TEMPERATURE CHANGE IN EVAPORATIVE COOLING PAD SYSTEMS

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Abstract

In this study, it was aimed to determine the relationship between the temperature decrease of the air passing through the pad and flow rate of pad wetting water for pad evaporative cooling. In the experiments, a commercially available cellulose based evaporative cooling pad (CELdek®7060-15 pad) was used. Experiments were conducted at three different water flow rates (2 L min^{-1} m^{-2}; 4 L min^{-1} m^{-2} and 6 L min^{-1} m^{-2}) and two different air velocities (1.0 m sec^{-1} and 1.5 m sec^{-1}). The temperature decrease of the air passing through the pad and cooling effectiveness values were lowest at water flow rate of 6 L min^{-1} m^{-2} while they were close to each other at 4 L min^{-1} m^{-2} and 2 L min^{-1} m^{-2} water flow rates. The relationship between water flow rate and the temperature decrease of the air passing through the pad was found to be statistically insignificant, while the relationship between water flow rate and cooling effectiveness was statistically significant ($P<0.01$). It was concluded that it is impossible to build a mathematical model between water flow rates and temperature decrease of the air passing through the pad. However, the most appropriate water flow rate for the experimental conditions was considered 4 L min^{-1} m^{-2}.

Key words: cooling effectiveness, evaporative cooling pad, water flow rate

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