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EXPERIMENTAL RESEARCH ON SPRAY COOLING FEATURES OF PRESSURE NOZZLE IN HUMIDIFICATION CHAMBER

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Abstract

The normal operation of spray humidification air cooler hinges on the good contact between droplets and air in the humidification chamber. The spiral pressure nozzle was chosen for the experiment on inlet air spray cooling. During the experiment, the spray cooling performance and atomization features were examined, and the cooling effects of different nozzle layouts were compared. Through the analysis of heat and mass transfer, the critical pressure of the spiral pressure nozzle was determined, and the relevant phenomenon was explained based on the energy balance relationship in droplet atomization. Meanwhile, the cooling effect fitting correlation was acquired with evaporative cooling being the major cooling mechanism. The comparison between different nozzle layouts revealed that the cooling effect of row spacing: 500mm is superior to that of row spacing: 1,000mm under the condition of the same $\Delta T \cdot L$. In this way, the critical pressure and optimal layout of the spiral pressure nozzle in the humidification chamber were discovered.

Keywords: atomization features, fitting correlation of cooling effect, spray humidification air cooler, spiral pressure nozzle

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