World Academy of Science, Engineering and Technology
International Journal of Agricultural and Biosystems Engineering
Vol:14, No:03, 2020

The Effect of Wet Cooling Pad Thickness and Geometric Configuration to Enhance Evaporative Cooler Saturation Efficiency: A Review

Authors : Biruk Abate

Abstract : Evaporative cooling occurs when air with high temperature and reduced humidity passes over a wet porous surface and a higher degree of cooling process is achieved for storage of fruits and vegetables due to greater rate of evaporation. The main objective of this reviewed study is to understand the effect of evaporative surface pad thickness and geometric configuration on the saturation efficiency of evaporative cooler and to state some related factors affecting the performance of the system. From this overview, selection of pad thickness and geometrical shape with suitable characteristics of heat and mass transfer and water holding capacity of the pads was reviewed as these parameters are important for saturation efficiency of evaporative cooling. Increasing the cooling pad thickness through increasing the face velocity increases the effectiveness of wet-bulb saturation. Increasing ambient temperature, inlet air speed and ambient air humidity decreases the wet bulb effectiveness and it increases with increasing length of the pad. Increasing the ambient temperature and inlet air velocity decreases the humidity ratio, but increases with increasing ambient air humidity and lengths of the pad. Increasing the temperature-humidity index is possible with increasing ambient temperature, inlet air velocity, ambient air humidity and pad length. Generally, all materials having a higher wetted surface area per unit volume give higher efficiency. Materials with higher thickness increase the wetted surface area for better mix-up of air and water to give higher efficiency for the same shape and this in turn helps to store fruits and vegetables.

Keywords : Degree of cooling, heat and mass transfer, evaporative cooling, porous surface
Conference Title : ICAPT 2020 : International Conference on Agricultural Postharvest Technology
Conference Location : Miami, United States
Conference Dates : March 12-13, 2020