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AMA-AGRICULTURAL MECHANIZATION IN ASIA AFRICA AND LATIN AMERICA, Vol. 44, No 4, 2013

IMPACT FACTOR=0.062

INFLUENCE OF PAD CONFIGURATION ON EVAPORATIVE COOLING SYSTEM EFFECTIVENESS INSIDE A WIND TUNNEL

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ABSTRACT

The investigation has been conducted to study the influence of pad configuration on the evaporative cooling effectiveness inside a wind tunnel. Three different configurations of pad were designed and these were expressed in terms of vertical, horizontal and multi horizontal. As well as, the influence of both pad thickness and pad-face air velocity was investigated. A developed wind tunnel was employed as pad fan evaporative cooling system to fulfill the objectives of study. The experimental results revealed that the multi horizontal pad configuration has achieved the highest values of cooling potential if it is compared with the other two pad configurations during the whole period of operation. The highest average cooled air temperature inside the wind tunnel was found at pad thickness of 15cm and pad-face air velocity of 1m/s for the multi-horizontal pad configuration. For multi-horizontal pad configuration and 1m/s pad face air velocity, the mean cooling potential was raised from 7.46 to 11.78ºC (+57.91%) by increasing pad thickness from 3 to 15cm. The highest mean values of cooling potential were found at pad thickness of 15cm and pad-face air velocity of 1m/s for the multi-horizontal pad configuration. Saturation efficiency was dramatically raised by increasing the thickness of pad especially for multi-horizontal pad configuration. The required airflow rate was raised by increasing both of pad thickness and pad-face air velocity for all configurations of pad. It has been reached its maximum values when applying the multi-horizontal pad configuration because of the rapid fluctuations taken place in airflow resistance. By increasing pad thickness from 3 to 15cm, for multi-horizontal pad configuration and pad-face air velocity of 1m/s, the static pressure drop across the pad was raised from 31.39 to 70.63Pa (+125%).