

Experimental investigation of evaporative cooling systems for agricultural storage and livestock air-conditioning in Pakistan

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Abstract

Evaporative cooling (EC) is an ancient technique that is usually suitable for hot and dry climatic conditions due to the potential of water vapor evaporation. In this study, three kinds of evaporative cooling systems such as direct EC (DEC), indirect EC (IEC), and Maisotsenko cycle EC (MEC) were locally developed at lab-scale. The performance of the systems was evaluated and compared for agricultural storage and livestock air-conditioning application in Pakistan. The experiments were performed for climatic conditions of Multan city (Pakistan) and the data were collected for hourly and daily basis. According to the results, it was observed that the DEC system has the ability to reduce the temperature of ambient air to an average of 8.5 °C. Whilst IEC and MEC systems were able to drop the temperature of ambient air to an average of 6.8 °C and 8.9 °C, respectively. As per the results, the DEC system remained behind to provide desired conditions for livestock and agricultural product storage applications due to excessive humidity. On the other hand, the IEC and MEC systems can achieve the desired conditions for livestock application, but could not provide feasible conditions for various fruits and vegetable storage. The study concludes that hybrid EC systems can be developed to provide desired conditions for a wide range of applications under varying climatic conditions.