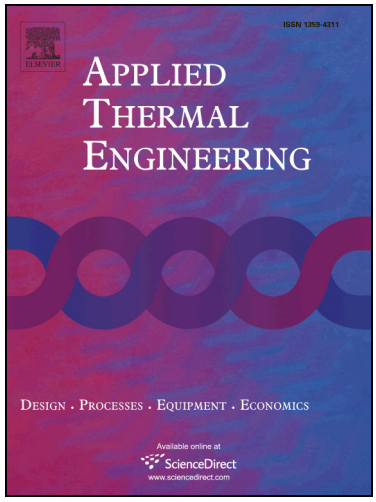

Research Paper

Performance Evaluation of Energy Efficient Evaporatively Air-Cooled Chiller

A.E. Kabeel, Y.A.F. EL-Samadony, M.H. Khiera

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Performance Evaluation of Energy Efficient Evaporatively Air-Cooled Chiller

[1]A.E.kabeel , [2]Y. A. F. EL-Samadony, and [3]M. H. Khiera

[1]Prof. Faculty of Eng., Tanta Univ., Egypt, E-mail: A.kabeel@hotmail.com

[2]Coressponding author, Assoc. Prof, Faculty of Eng., Tanta University, Egypt, TeL: +201229597403 , Fax: +20403453860, E-mail: Y. A. F. EL-Samadony@F-eng.tanta.edu.eg

[3]HVAC Engineer, Sharm El Sheikh Airport, Egypt, E-mail: engineer_mahmoud87@yahoo.com

ABSTRACT

In the present work, a novel evaporatively air cooled chiller using cold mist water has been investigated experimentally. The cold mist water is injected before the inlet air stream of the chiller's condenser. The mist water is cooled by a small amount of the chiller's chilled water through a heat exchanger. The effects of ambient temperature, ambient relative humidity, mist water temperature, modified air temperature and modified air relative humidity on the chiller's coefficient of performance (COP) are obtained. Unlike all conventional direct evaporative cooling system, experimental results reveal that the proposed system was able to cool ambient air to a temperature below its inlet wet bulb temperature. Also, experimental results showed that the proposed system is an energy efficient system. It has considerable effect on the enhancement of the performance of the cycle and hence reduces the electricity demand. The rate of this enhancement is increased as ambient air temperature increases and ambient relative humidity and mist water temperature decreases, therefore it is very promising for hot and dry regions. It was found that the proposed system, evaporative condenser with cold mist water, had a higher coefficient of performance by up to 91% than that for the conventional air cooled chiller. However, conventional evaporative air cooled chiller had a higher coefficient of performance by up to 82% than that for the conventional air cooled chiller. Finally, the relation between ambient conditions, mist water temperature and coefficient of performance enhancement percentage, COPEP, is correlated with an acceptable error

Keywords: evaporative cooling, mist water chiller, energy saving.