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Replacing the wet cooling tower with a ground source heat exchanger as a clean technology

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Abstract

In this paper, an investigation is performed on the possibility of the wet cooling tower replacement with the well-known horizontal ground source heat exchangers (GSHE) as a clean technology. Considerations are restricted to water-cooled chillers having the actual cooling capacities less than 50 tons of refrigeration (TR). A three-dimensional model is carried out to model the GSHE constructed under the building foundation and the effects of the various important parameters such as soil type, water flow rate, incoming water temperature, and chiller operation mode in the water cooling process are studied in details. It is found that the applied GSHE could provide safely the required cooling water for water-cooled chillers. Moreover, it is revealed that all under consideration parameters such as local soil type, incoming water temperature, cooling water flow rate and chiller operation mode have considerable effects on the thermal performance of the GSHE. In addition, the required pipe numbers to handle the cooling water for a specific chiller capacity varies as a function of soil type, water flow rate, incoming water temperature, and chiller operation mode. It was hoped that the obtained results arouse interest among the air-conditioning designers.

Graphical abstract