

The Effect of Shading on Cooling Tower Performance

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Abstract : Cooling towers (CTs) in arid zone countries, used for heat rejection in water-cooled (WC) systems, consume a large quantity of water. Universally, water conservation is an issue because of the scarcity of fresh water and natural resources. Therefore, many studies have aimed to conserve fresh water and limit the water wasted. Nonetheless, all these methods are not related to improving the weather conditions around the entering air to CT. In Kuwait and other arid-zone countries, the dry bulb temperature (DBT) during the summer season is significantly greater than the incoming hot water temperature, and the air undergoes sensible cooling. This high DBT leads to extra heat transfer from air to water, demanding high water vaporization to achieve the required cooling of water. Thus, any reduction in ambient air temperature around the CT will minimize water consumption. This paper aims to discuss theoretically the effect of reducing the DBT around the cooling tower when considering the sun-shading barrier. The theoretical simulation model results show that if the DBT reduces by 2.8 °C approximately, the percentage of water evaporation savings in gallon per minute (GPM) starts from 6.48% when DBT reaches 51.67 °C till 9.80% for 37.78 °C. Moreover, the performance of the cooling tower will be improved when considering the appropriate shading barriers, which will not affect the existing wet-bulb temperature.

Keywords : dry-bulb temperature, entering air, water consumption, water vaporization

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