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The Effect of Chilled Water Supply Temperature on the Energy Efficiency of the Chiller System

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A steady-state model for a centralized cooling system is developed and utilized to evaluate its energy efficiency. The numerical model resolves the energy equations for a cooling tower and a centralized water-cooled chiller simultaneously. It requires inputs that are readily available. The user-inputs are the ambient conditions, the cooling tower air flow rate, the condenser water flow rate, the evaporator water flow rate, the superheat and sub-cooling associated with the refrigeration cycle, and the full load design conditions. The model utilizes an empirical relationship for the compressor power as a function of load and temperature, and gives the user an option to select between a constant speed chiller and a variable speed chiller. The outputs include the chiller coefficient of performance, compressor input power and compressor isentropic efficiency. This talk will discuss the results of the assessment conducted of the effect of chilled water supply temperature on the performance and energy efficiency of the chiller system. The findings and recommendations on how to optimize chiller systems for best energy performance will also be presented.

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