Abstract

Optimizing control strategies and sequences of operation are cost-effective methods for reducing building energy consumption. This thesis presents a near-optimal condenser water supply temperature setpoint strategy capable of minimizing the energy consumption of the chiller plant in The Cooper Union's 41 Cooper Square academic building. An analytical model was developed to calculate the power consumption of each chiller, pump, and cooling tower within the loop. A parametric study sweeps through various condenser water supply temperatures under various weather and cooling load conditions to determine the supply temperature that minimizes energy usage. These setpoints are fitted to a function that calculates the near-optimal temperature based on wet bulb temperature and cooling load. This function can be utilized by the building management system to control the condenser water supply temperature. An 8760 model is developed to compare this strategy with other condenser water supply temperature reset strategies. This thesis also uses historical chiller plant data to conduct analyses useful for fault diagnostics. These analyses help maintain plant performance and allow the near-optimal setpoint strategy to operate properly and reduce energy consumption.