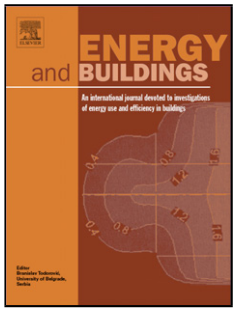


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# An advanced control of hybrid cooling technology for telecommunication base stations

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**Abstract:**

Inefficient cooling systems and rudimentary control methods are accountable for the significant cooling energy consumption in telecommunication base stations (TBSs). To address this issue, our study explores the performance of model predictive control (MPC) technology over a hybrid cooling system with ventilation and air-conditioning cooling. Specifically, a discrete particle swarm optimization (DPSO) algorithm is adopted in the MPC to handle the discontinuity and nonlinearity involved in the model built upon a state-space structure. Simulations are performed for a typical week during a cooling season. Moreover, we observe that a model mismatch could hinder the actual performance of MPC; thus, this study initiatively quantifies the impact of model mismatch by setting different coefficients of performance (COP) on the air-conditioner. The results show that the structured MPC has a better performance over conventional control methods, with an average reduction of 34% daily cooling energy consumption, while increasing the control accuracy in terms of maximum deviation from the desired temperature range. It is also found that a higher degree of model mismatch can lead to a higher performance degradation, either on the total energy consumption or on the room temperature deviation.