

Abstract

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The potential for office buildings with mixed-mode ventilation and low energy cooling systems in arid climates

The application of hybrid mixed-mode ventilation in severe arid climates and its integration with other passive cooling strategies is very challenging. This paper presents a systematic evaluation of the performance of various mixed-mode cooling strategies for office buildings with different levels of internal heat gain operated in four cities representative of arid climates. The results of simulations made with EnergyPlus are evaluated in terms of appropriate thermal comfort criteria and subsequently potential reductions in plant energy consumption so that the most effective strategies to mitigate the energy consumption associated with air-conditioning processes. The results show that hybrid approaches to maintaining indoor environmental conditions have the potential to save approximately half of the plant energy consumption compared to common active air-conditioning systems. Savings in plant energy due to the application of mixed-mode strategies that include low energy cooling technologies such as radiant, evaporative and ground-coupled cooling could exceed 90%. We conclude that mixed-mode cooling strategies should be able to provide satisfactory indoor environments and can result in highly efficient office building designs and so should be considered for application in arid climates.