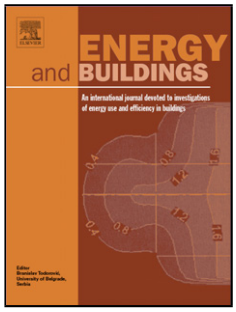

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OFFICE BUILDINGS WITH ELECTROCHROMIC WINDOWS: A SENSITIVITY ANALYSIS OF DESIGN PARAMETERS ON ENERGY PERFORMANCE, AND THERMAL AND VISUAL COMFORT

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Highlights

- A sensitivity analysis of smart windows performance based on the Main effect was proposed
- The influence of the main building parameters on energy and comfort indicators was assessed
- The presence of smart windows has as much influence on energy consumption as the main design parameters such as location, façade orientation and window to wall ratio
- Design guidelines are presented to assure improved performances while considering the integration of smart windows

Abstract

In this paper, a representative office building zone with an electrochromic (EC) glazed façade was simulated in TRNSYS and Radiance/Daysim for a large number of different combinations of design parameters (i.e. location, façade orientation, window control, window-to-wall ratio, internal gains, thermal mass and envelope air tightness). Results of energy consumption, peak energy demand, useful daylight index (UDI) and predicted percentage of persons dissatisfied (PPD) for a total of 7680 scenarios were obtained and used in a sensitivity analysis considering the Main effect of the building parameters. The relative influence of the parameters is presented and the different designs improving the outputs are determined. Results have shown that the greatest total energy savings considering EC windows are for warmer climates with higher solar radiation exposures. The presence of an EC window mostly influences the cooling peak load and acts as an alternative solution to thermal mass from the perspective of peak reductions. While the choice of the specific window control strategy is having a limited impact on the energy savings and peak load reductions, the analysis revealed that this

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