

ABSTRACT

In the past years, there has been a growing interest among building designers and owners to include intelligence and dynamic systems, as a way for achieving energy-efficient buildings that comply with stringent energy codes and national goals of reducing dangerous emissions, together with improving corporate image. Dynamic façade features have not been sufficiently studied in the Arab Gulf Region. Therefore, this research aimed at exploring the influence of incorporating external dynamic louvers in office buildings under climatic conditions of Abu Dhabi city, through the perspective of energy consumption.

By means of computer energy modeling, a proposed office module was used to evaluate overall energy performance of external dynamic louvers for the south, east and west oriented façade. An economic analysis was carried out also to explore the viability of adapting such dynamic systems in the local market of Abu Dhabi.

The results of this research showed that the installation of dimming methodology for lighting was always advantageous. It was found that the potential energy saving for south, east and west oriented façade was 24.4%, 24.45% and 25.19%, respectively. The proposed dynamic fenestration system with dimming light achieved maximum energy reductions among other scenarios, although by small margin in many cases. The dynamic system achieved a reduction of energy consumption of approximately 34.02%, 28.57% and 30.31% for south, east and west orientations, respectively. The optimal angle fell between -20° and 0° for the south oriented façade and between 0° and 20° for east and west oriented façade. The results of the economic analysis showed that high construction costs and low prices of electricity in Abu Dhabi were direct reasons for the unfeasible investment of the proposed static or dynamic fenestration systems.

In conclusion, the dynamic ability of external louvers can improve the energy performance of fixed louvers especially when lighting control methodology is applied. However, a careful integration of any proposed dynamic system and glass properties is highly recommended to help acting as a true energy saver as well as environmental controller.

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