The study of building physics is becoming an ever more popular and necessary direction for engineering research and development worldwide. This includes in particular the energy conditions and efficiency surrounding the usage and maintenance of everyday buildings. For the majority of commercial and domestic buildings worldwide it is a desirable requirement to maintain a comfortable interior environment, and due to the extremes of external environmental conditions this requires energy.

Energy consumption and wastage is a worldwide concern with global warming caused by excessive greenhouse gases in the atmosphere as well as rapidly diminishing non-renewable resources. There are two important directions associated with tackling these problems; to convert energy generation to renewable 'non-carbon' resources and to reduce the amount of energy consumed by society.

The Department of Engineering at the University of Cambridge recently released a paper outlining the results of a study into the energy saving potential of suspended particle devices for chromogenic switchable glazing (also known as "smart glass") in comparison to regular clear glazing on glass.

This study focuses on such new 'smart' technologies that aim to reduce the high energy wastage in buildings. These 'smart glasses' have the ability to modulate optical and thermal properties, and therefore are able to adapt to prevent undesired energy flow through a glass façade.

While briefly looking at the various smart glass devices this project focused on the performance evaluation of electrotropic switchable technology, and more specifically, suspended particle device (SPD) glass. SPD glass is able to control its optical properties by the application of an electrical current to the glass, and holds great potential in being able to reject solar heat gain into an internal environment. A reduction in solar heat gain during summer months and hotter climates could result in significant energy saving in terms of cooling and air conditioning.

Performance data was measured using SPD glass in an actual real-world environment and compared with measured data using clear float glazing. In addition to this, environmental modeling was carried out using computer software to analyze the energy performance of the SPD windows.

With such comparisons available, the performance conclusions between a real-world and virtual environment also allowed the research team to comment on the accuracy of such simulation modeling.

From the real-world performance data of the SPD windows it can be concluded that SPD glass is able to provide a much more uniform and comfortable internal room temperature than regular single float glazing. This was shown by data measurements detailing how the room temperature only fluctuated by 2°C with SPD windows, in comparison to 8°C in the reference office.

SPD windows were shown to be significantly more energy efficient than regular clear float glazing. The solar heat gain was reduced by 90% through SPD glass, which partially results in a 65% reduction in annual cooling loads.

This investigation into the performance of SPD glazing has shown that this switchable smart technology has important advantages over the use of regular clear float glazing. It was identified before experimental measurements that SPD glass had a lower visible light transmission, and similar solar heat transmission to other smart switchable glazing, such as thermotropic, gasotropic and electrochromic. All of which can be used to reduce energy consumption and wastage in buildings.

Cambridge, Engineering paper presentation