The Carbon Negative Building Envelope

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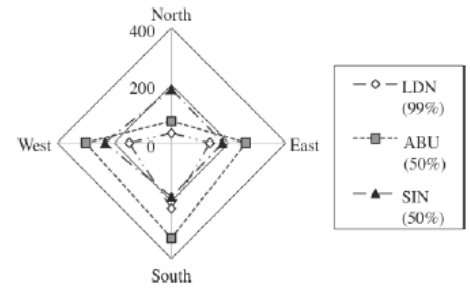

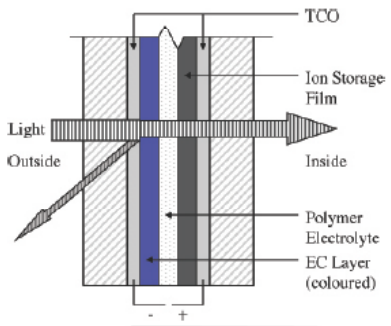

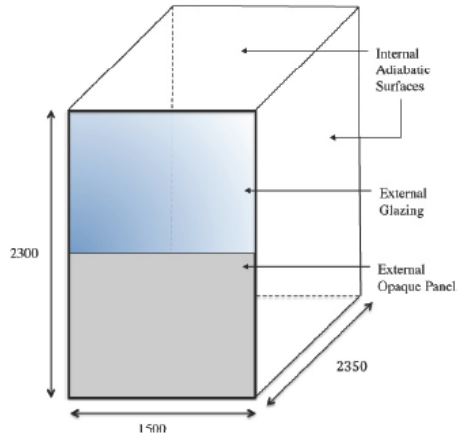

Overview | *This report evaluated a method that façade designers could use to determine the carbon emission implications of specifying smart glazing for a façade. This method used a comparative life cycle analysis to calculate the lifetime carbon emissions of electrochromic glazing. A control case of low-emissivity solar control glazing was used. Electrochromic glazing was defined to be carbon neutral if its lifetime carbon emission footprint was less than that of solar control glazing. The in-service performance of the glazing was evaluated using building energy simulation of a solar test room. The model was considered at the four compass directions in three locations: London, Abu Dhabi and Singapore. The Shard, London was subsequently used as a case study building. The monetary value of the CO_2 savings was calculated using the carbon emission price taken from the EU Emissions Trading Scheme in May 2011. This value was compared with the construction cost of the Shard.*

Main Outcomes | *It was found that electrochromic glazing was carbon negative for all four orientations in all three locations. The greatest percentage reduction in carbon emissions was 20%, achieved for a south-facing façade in London. This suggests electrochromic glazing offers greater performance enhancements in locations at high latitudes. The cash value of the carbon emission savings were negligible when compared to the construction costs.*

Future Work | *The model requires a more complex understanding of how electrochromic glazing can improve occupant comfort. A measure of occupant comfort can be linked to increased occupant productivity, allowing the actual economic benefit of electrochromic glazing to be determined.*