Executive Summary

LLumar® Window Film Application to the MG Tower, Padua, Italy
Energy Savings and Environmental Analysis by the University of Padua

The use of window films to modify the properties of glazing systems in buildings is well known, but there are very few independent studies that examine energy savings from window film installation; no studies exist for locations outside the continental USA, nor with analysis of the potential for environmental improvements. To correct this anomaly, Solutia Performance Films commissioned Professor Michele De Carli and his research team at the University of Padua to conduct an independent study of the effects of using LLumar® solar control window film on a building in Padua, Italy: the MG Tower.

The MG Tower is a recently constructed 9 storey building with over 1000 m^2 of modern solar control low E glazing, which rejects a large part of the solar energy back to the exterior environment. This creates a greater challenge for solar control window film to improve glazing performance, save energy, and improve environmental conditions.

The study was based on a comprehensive three year assessment of the building, including 450 days of consecutive monitoring of environmental conditions, investigation of the buildings energy consumption over the three years, and analysis of the energy savings obtained. A key method used to assess the impact of the installed solar control film was the development of sophisticated computer simulations for energy use and lighting conditions as well as economic benefits, CO_2 emissions reduction, thermal comfort, and visual comfort. These were calibrated based on data collected from the monitoring phase and from measured local weather conditions. Detailed calibration was vital to ensure simulations properly represented the behaviour of the building before and after film was applied. In addition to the quantitative analysis techniques used, occupant surveys were undertaken to identify the perceived impact of the film on the building occupants.

The study shows the significant benefits of LLumar® products for saving energy, reducing CO_2 emissions, improving thermal comfort, and controlling glare:

Energy:
- 3.9 year simple payback / return on investment
- 42 % annual savings on electrical energy used for air conditioning cooling
- Savings of €125 800 on energy costs over operational lifetime of the film
- Reduction of 46 tonnes annual CO_2 emissions (according to EN 15603)
- Film was shown to be a better investment option than increasing HVAC capacity

Thermal Comfort:
- Reduction in indoor temperatures of up to 5 °C when HVAC cooling switched off
- Increased occupant satisfaction with the thermal environment
- Productivity savings estimated at €40 per employee per cooling month

Lighting and Glare:

- Significant reduction in glare conditions after film installation – comparable with blinds, but retaining view through the glazing to the outside
- Significant increase in useful daylighting conditions and in occupant satisfaction when glare conditions occur, but no negative impact during lower lighting levels of the year
- No measurable change in energy consumption from lighting use by occupants

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