

PowerShade - 3D solar shading and transparent photovoltaic

- Results from the national PSO programme for R&D

General information:

- Technology developer: PhotoSolar ApS
- Location: Gregersensvej 1A, DK-2630 Taastrup (Denmark)
- Date of issue (year): 2008

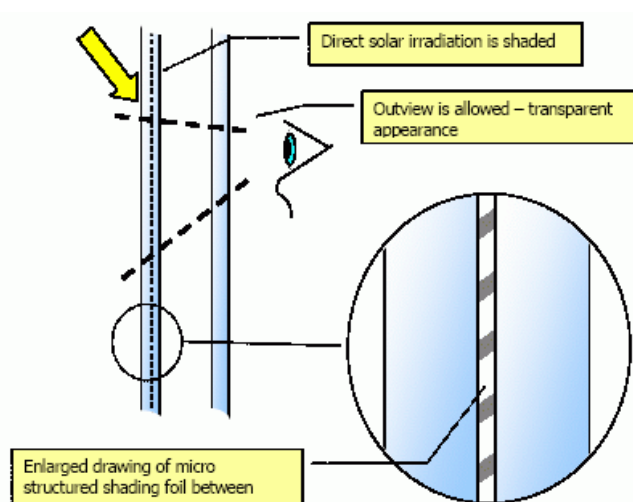
Aims and Objectives

The objective of the PowerShade technology is to create a highly transparent Photovoltaic module and efficient progressive solar shading module. The PowerShade has been developed to replace costly exterior shading devices with a fully glass integrated and highly transparent photovoltaic component.

The PowerShade modules serves two functions – reduction of the cooling need in the building, and green power production from the shaded off solar fraction.

A Short Description of the Technology

The shading principle employed in the PowerShade is simple and effective. It is based on geometric screening of the solar rays. This principle is also known from Venetian blinds, external shutters and solar shadings based on lamella systems.



With the PowerShade we have miniaturized the structures forming the shades – in fact we have made them so small that they become invisible to the human eye. The micro structured device enables a free view out of the window in typical viewing angle, while the solar rays from high angles are partly or completely screened off.

The shading performance of the micro structured module is similar to that of conventional exterior shadings – only it can be integrated into the glazing, reducing the cost of installation and cleaning and eliminating the need for maintenance of external devices mounted on the facade.

Results and Achievements

The electrical efficiency of the PowerShade is higher than that of other transparent photovoltaics with similar optical transparency. The higher efficiency is due to lack of area reduction due to 3D photovoltaic technology. The thermal efficiency of the PowerShade has been tested by Danish Technological Institute and found similar to exterior shading devices. Thus, the PowerShade module may replace exterior shading devices without compromising the indoor climate of the building.

The MicroShade and PowerShade are efficient shading devices designed to replace exterior shadings.

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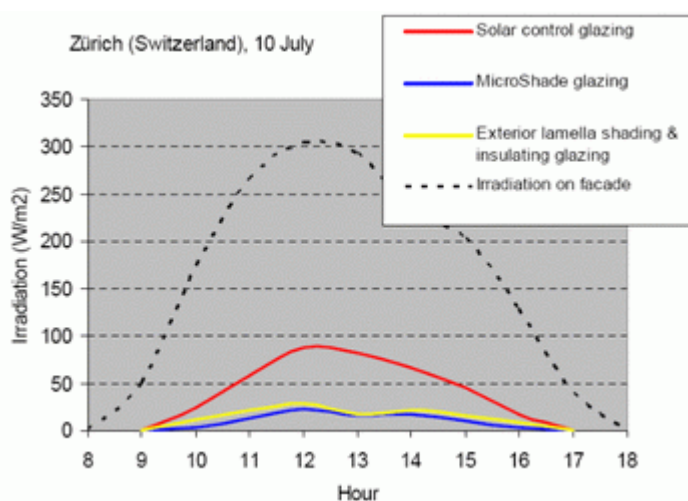
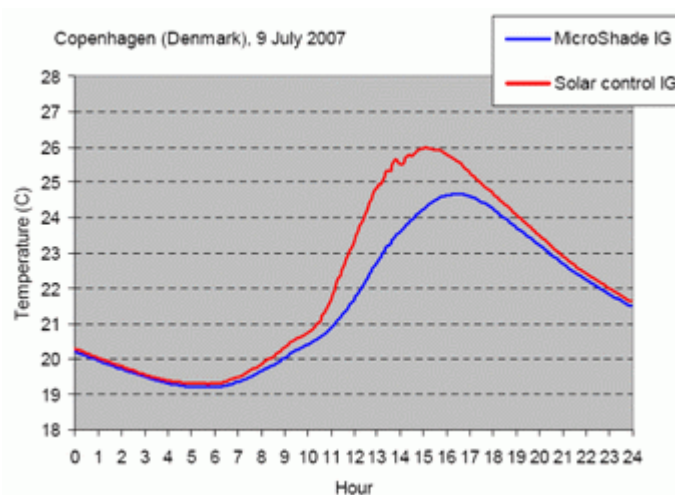


Figure 1 below shows the solar energy falling onto a facade of a building situated in Zürich on a clear summer day. The facade is facing south. The figure shows the amount of energy passing through the glass of the façade, for three different solar shading systems, i.e. a solar control glass insulating glazing solution, a solution based on insulating glazing and exterior Venetian blinds, and a MicroShade insulating glazing.

Figure 2 shows the room temperature in two identical rooms. Both rooms feature a glazed area facing south. Room A is fitted with MicroShade insulating glazing, while the other room is fitted with a solar control type of glazing.



Possible application area:

PowerShade has been developed with focus on application in large area glass façade building.

Reference:

The PowerShade development was developed within the PSO Energy R&D programme.

The PSO Energy R&D programme has resources made available through electricity customers' bill. Since its establishment in the late 1990s an increasing amount of money is channeled through this programme. With a budget of around 100 million DKK a year (130 million in 2005) it has become of the same size as the Energy Research Programme⁴. The PSO programme is defined as supporting research and development on environment-friendly energy production technologies. The PSO R&D programme was operated by the two electricity grid operators, but the Minister Economic and Business Affairs, - through the Energy Authority - has the overall political responsibility and must approve the areas prioritized in the programme.

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- energy efficient building materials, components and systems not yet introduced into the building market or in their first market phase;
- innovative applications of heating/cooling and power supply technologies, combined with the use of renewable energy sources, in building sector;
- best EU demonstration eco-building projects.