WHITE PAPER

Contribution of dynamic solar shading to

High Performance Façades

somfy®

EXECUTIVE SUMMARY

Today, designing and renovating a building is increasingly complex. Climate change and the necessity to reduce CO_2 emissions have created new challenges which have had a major impact on the conventional rules and codes of conduct in the building industry.
Nonetheless, beyond their sustainability in terms of energy, buildings are for people and they must enhance our quality of life, both at work and at home. Buildings play a major role in keeping us happy, healthy and productive.

To meet these challenges, building professionals, designers and suppliers have to work more closely together in an early integrated approach, focusing on two major issues:
- How to achieve the best possible energy performance?
- How to provide occupants with maximum comfort and liveability?

The **façade**, being the interface where most thermal exchanges take place, is key in this process. That is why a proper understanding of what dynamic solar shading can bring is essential today.

Our ambition with this White Paper is to highlight some of the major benefits that dynamic solar shading, driven and controlled by Somfy solutions, can provide for sustainable and liveable buildings. All statements are supported by reliable scientific studies, demonstration projects or live buildings.

For more information, please contact your local Somfy office.
We would be happy to provide you with the documentation referred to in this White Paper or arrange a training course or seminar at your office.
We can also provide you with the ESBO Simulation software.

WHY DYNAMIC SOLAR SHADING?

The best combination is clear glass (non-coated) or even Low Iron (clearer than standard) and automated shading.

The gtot (gsystem or SHGC) required in most buildings today is as low as

0.10 – 0.15

This is far below what glass alone can provide...

Dynamic solar shading gives buildings not only a dynamic gtot, but also U value and LT.

By using non-coated clear, or even Low-Iron, glass combined with dynamic solar shading you will have the flexibility to change the gtot according to current needs and always be able to maintain the highest possible LT value.

This dynamic function will also influence the U value in a positive way.

Think in terms of summer or winter scenarios. What will be the requirements during a hot summer or cold winter? You will soon realize the value of flexibility compared with the static situation using glass alone.

By using clear glass combined with dynamic solar shading you will be able to «open or close» the energy flow through the window in line with what is required at any given time during the day, week, month or season. Manage heat gain during summer and heat loss during winter. You will also have a solution that can manage glare.

g: the % of energy entering the room through the glass alone

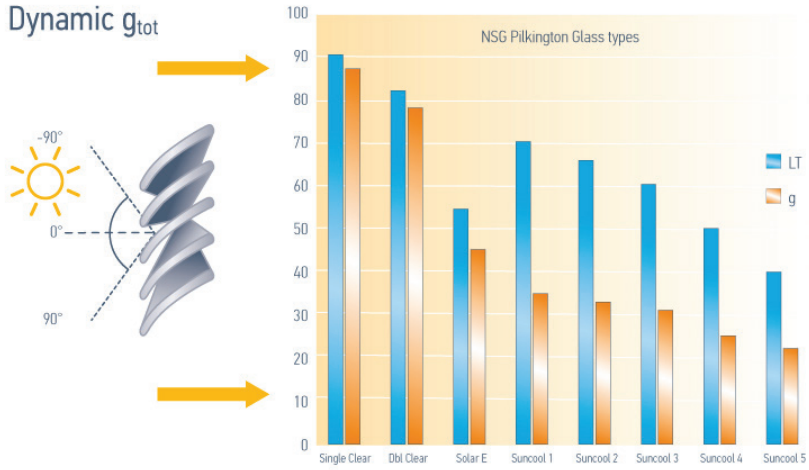
gtot (also called g system or SHGC): the % of energy entering the room through the glass and shading

LT: the Light Transmission coefficient

U: the measurement of the insulation ability of the shade and glass

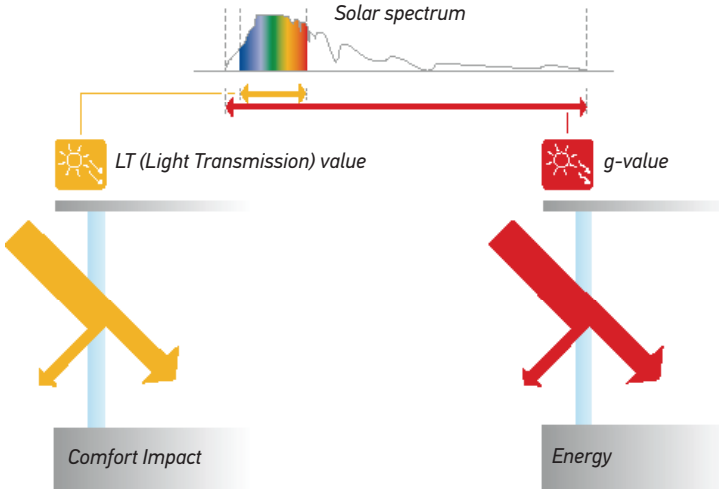
Source or reference:
The Shard building in London, 2011 (gtot at 0.12)
The 200 George Street building, Sydney. 2015 (U value 1.1)

Dynamic gtot according to different kind of glass



This table shows a selection of glass specifications - from Single Clear, Double Clear and further adding various levels of selective coatings showing the g and LT values (note that buildings today often require a gtot around 0,15).
Clear glass combined with dynamic solar shading can provide dynamic values.

Energy flow through the window



LT (or sometimes referred to Tvis) has a direct impact on the comfort as it measures the ammount of natural daylight entering the room potentially creating glare or enabling good working conditions. The g value (same as Solar Heat Gain Coefficient, SHGC) impact both comfort and energy. The measurement on how much of the radiation from the sun that enters the room potentially transferring to heat.

FOR A SUSTAINABLE FUTURE

Dynamic solar shading needs to be seen as a vital building function in a sustainable future.

> “ Efficient and effective dynamic control of solar shading is of the highest importance and needed to be seen within the context of the entire building design.
>
> Synergies and integration of solar shading with other building technologies, e.g. dimmable lighting, HVAC and night cooling are necessary to realize cost-optimal packages of energy saving measures. ”

Source or reference:
ES-SO Study “High performance dynamic shading solutions for energy efficiency and comfort in buildings” by Sonnergy Ltd, UK, 2015

IN EXISTING BUILDINGS

Today, we are undertaking every conceivable effort to make new buildings energy efficient. But this only accounts for a fraction of the global building stock (in EU 1 - 1.5 % per year).In order to succeed with the global challenge we must start addressing existing buildings as well.

In the EU 86 % of the windows in those buildings are either single or double clear glass. We are convinced that, in such cases, installing automated solar shading would prove a very cost-efficient initial alternative to many other potential measures.

This has recently been recognized by the International Energy Agency, the IEA:

> “ Office buildings should be fitted with integrated façade systems to:
> - optimize daylight
> - minimizing energy requirements
>
> Solar shading should become standard features globally in new buildings and can also be applied to existing buildings. ”

SAVINGS ON ARTIFICIAL LIGHTING

35 % savings in Switzerland
2 €/m² per year in France
Up to **25 %** in Brazil

Dynamic solar shadings compared to manual shading, provides much **higher levels or savings on energy for artificial lighting.**

Manual solar shading is rarely managed by people in practice (less than twice per week according to the ESTIA Study below).

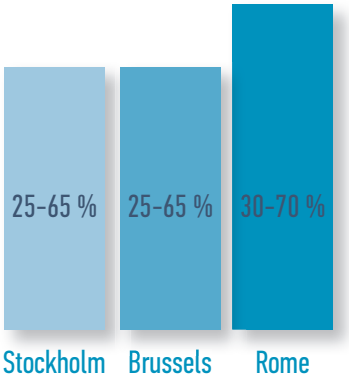
This means you will lose a large part of the potential savings in both energy efficiency and liveability.

By automating the shading solution you can gain significant savings on artificial light.

Source or reference:
ESTIA Study, Switzerland, 2014
"Smart lightning by Somfy & Philips", IES, France, 2016
"Simulation of integrated systems", Sustentech , Brazil, 2015

COOLING AND HEATING

The ES-SO 2015 Study gives some examples of savings from Europe as follows:



Dynamic solar shading provides significant annual savings on energy used for cooling & heating.

A good starting point to estimate the potential savings on energy use is to look at recurring consumption for cooling. The results will of course heavily depend on the glass and shading specification, the orientation of the façade and the climatic location.

If you switch to climatic locations not comparable with Europe, you need to simulate the energy needed to remove excessive heat from a room. We recommend ESBO Simulation software (Early Stage Building Optimization) as it has been endorsed by ES-SO (the European solar shading organization) in 2016 and is considered a reliable tool to guide your active choices early in the planning process.

All calculations are made in accordance with ISO15099.

Source or reference:
ES-SO Study "High performance dynamic shading solutions for energy efficiency and comfort in buildings" by Sonnergy Ltd, UK, 2015
ESBO Simulation software, EQUA

SIGNIFICANT SAVINGS ON BOTH CAPEX AND OPEX

If you properly include the potential CAPEX in a ROI calculation, the pay-back time for an investment in automated solar shading rarely extends beyond **1 year.**

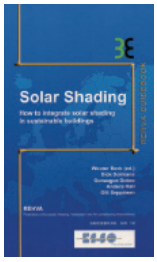
High-performance façade enables you to right-size HVAC equipment and make significant savings on both CAPEX and OPEX.

Automated solar shading is an active part of the building's HVAC system and has a very positive potential impact on both sizing of equipment and running expenses.

Investigate this early during planning. Also note that using automated shading allows you to consider clear glass: another significant cost-saving factor.

CAPEX: Capital expenditure or capital expense («CAPEX») is an amount spent to acquire or upgrade productive assets (such as buildings, machinery and equipment, vehicles) in order to increase the capacity or efficiency of a company for more than one accounting period.

OPEX: OpEx (Operational expenditure) refers to expenses incurred in the course of ordinary business, such as sales, general and administrative expenses (and excluding cost of goods sold - or COGS, taxes, depreciation and interest).



Source or reference:
REHVA Guidebook No 12 – "How to integrate solar shading in sustainable buildings"

WELL-BEING & PERFORMANCE

Increased productivity in the US of up to **15 %** (AGS 2006)

> Productivity **+ 4.5 %** to **15 %**

> Absence **– 1 %**

> Mistakes **– 1 %**

Dynamic solar shading with local controls contribute to human comfort, well-being & performance.

Access to outside views and natural daylight are important factors with positive effects on satisfaction, productivity, ability to focus, short-term sick leave, learning development in schools, recovery time in hospitals etc.

We know that automated solar shading, combined with REHVA, has the ability to manage the balance between personal needs and building requirements. By putting the individual at the core of the design you create a more liveable indoor environment.

Source or reference:
World Green Building Council report, Health Wellbeing & Productivity in Offices, 2014
REHVA Guidebook No 6, Indoor Climate & Productivity in Offices, 2006
"Smart lighting by Somfy, Philips & Serge Ferrari", IES, 2016

NOTES

By SOMFY

The scientific studies related to this white paper are available in the download section from our website:

www.somfy.com/projects/

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