ENERGY EFFICENT SUN BLINDS

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1 .1. Aim/purpose of paper

The aim of this report is to investigate the possibility of reducing indoor climate costs by using sun shade products. The report will attempt to answer whether sun shade products do reduce heating and cooling costs in an office building or not. This report is written as part of the Diplomerad Solskyddsteknikerprogram run by Mälardalens Högskola. A programme designed for the Solskddysförbundet of Sweden for the benefit and advancement of its members.[1] [2]

1.2. Definition/demarcation

Due to the sheer number of factors to be considered when performing a proper energy assessment the report will focus on searching for a percentage value which can be applied to sun shade products instead of a finance approach.

This report will not deal with the economical incentives of installing sun shade products, rather it will point to methods of optimising energy efficiency of office buildings by the installation of sun shade products.

1.3. Method

The model is an office block with eight windows on either side, with the building laying in an east/west orientation. The building has approximately 18m^2 of glazed window facing south and equal amounts facing north. This theoretical building is situated 56°N 12°E, also known as Helsingborg. The base model is a double glazed window in the middle of summer.

In order to try to answer the question above the report will contain a number of calculations. The software programme *ParaSol* will be used.[3] ParaSol is a programme designed to model different types of products such as glass, internal and external sun shade products and room orientation and see their effect on energy loss/gain. It also lets you see the effect they have when used together. One limitation of this programme is its inability (at the time of using it) to be able to do a model of more than one office space with one window. Due to this my calculations are an approximation as I have taken the values and multiplied them by the number of windows I have in my model space. So this does not allow for transference of environment between rooms or open office planning.

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[1] Mälardalens Högskola - www.mdh.se
[2] Solskyddsförbundet- www.solskyddsforbundet.se
[3] ParaSol version 6.6- www.parasol.se

2.

The driving force behind nearly all research in the energy sector is that of sustainable and renewable resources.[4] A major part of this is energy management, which could be seen as especially interesting for the profit-driven business sector. Many studies have been done into the influence of temperature, oxygen levels and lighting of office buildings and work places to help maximise worker comfort, thus maximising worker output whilst optimising costs.[5]

Calculating on a normal two glass window on a sunny day in the month of July with a G-value of 0.67[6] we can see the following.

$(3627^{5}+2176^{5})*18=104454$w/day*0.001= 105kwh/d approx

$(3627^{7}+2176^{5})*18*0.67=69984.18$ w/day*0.001= 70kwh/d approx

This is already a reduction of 23% because of the effect of the glazing on the glass.

This is a simulation produced in Parasol (fig 1) of a similar glass with a g-value of 0.602.

With the introduction of a window screen you get G-value of 0.85

$(3627^{5}+2176^{6})*18*0.85=88785,9$w/day*0.001= 88kwh/d approx.

Fig 1

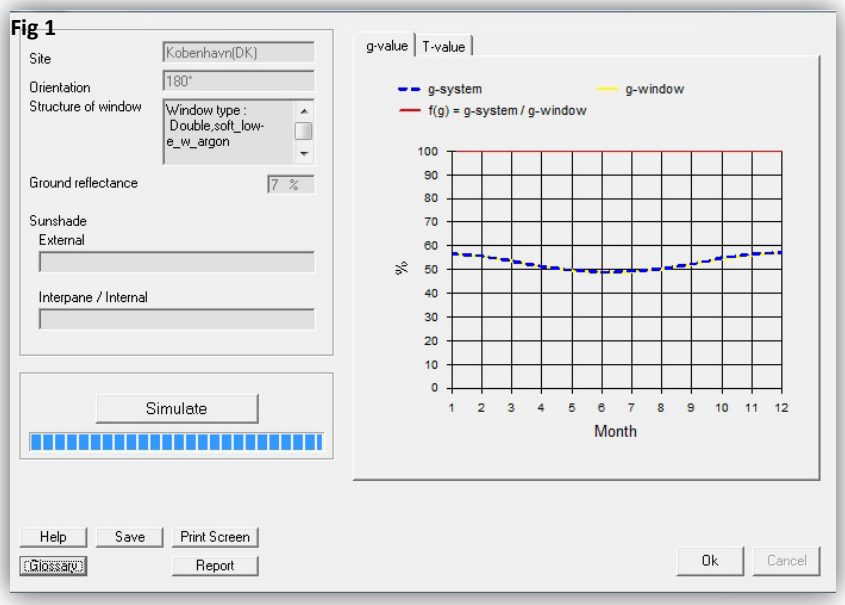
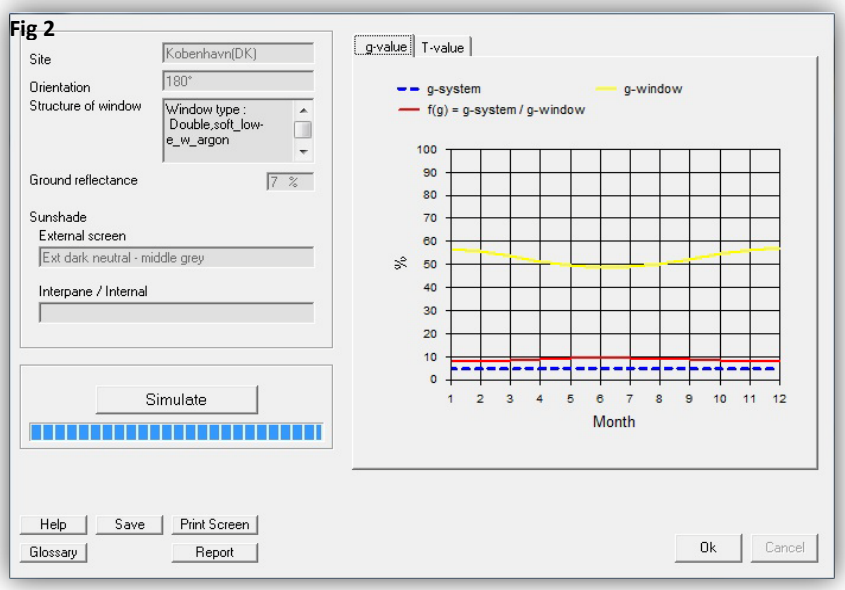


Fig 2



[4] E.g. the European Commission - http://ec.europa.eu/research/energy/eu/index_en.cfm
[5] E.g. Lawrence Berkeley National Laboratory - http://eetd.lbl.gov/ied/sfrb/performance-temp-office.html, McKennan and Parry: An investigation of task lighting for offices
[6] Pilkington Glasfakta 2004
[7] Solinstrålningtabeller for 56^{0} N, Solskyddstekniker kurspärm.

This is a reduction of 15% before it reaches the glass.

You can see this effect in the simulation (fig 2) with a 0.95 screen.

The second part of the report looks into the effect of internal sun shade in helping in the heat cost of a building. This is an area that still

needs much more research but the report does show that a heavy curtain can increase (lower) the U-value by approximately 1[8].

The difference can be seen from fig 1 to fig 2 with an internal blind. Even an external screen helps as seen in fig 3.

Fig 1

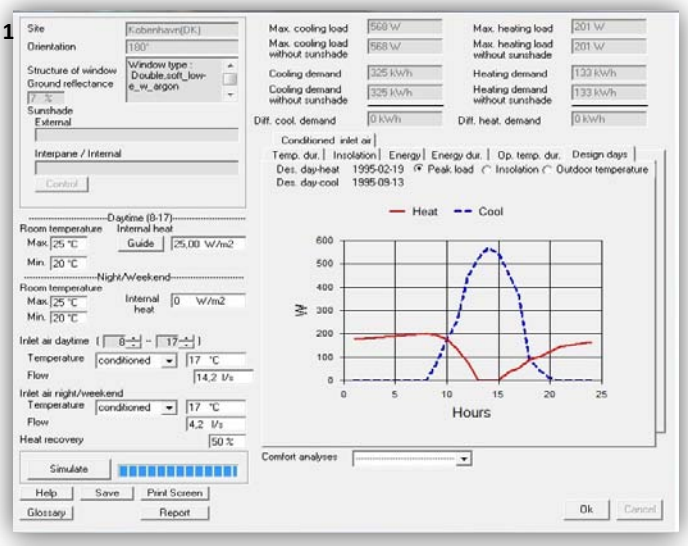


Fig 2

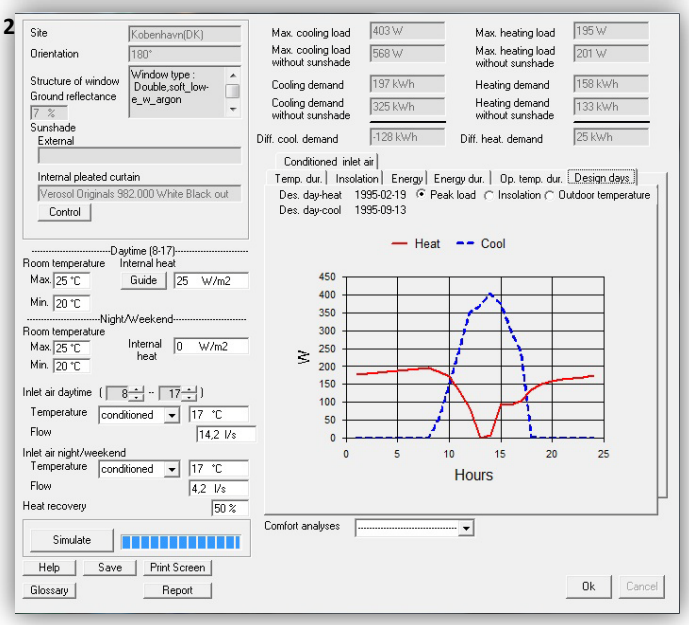
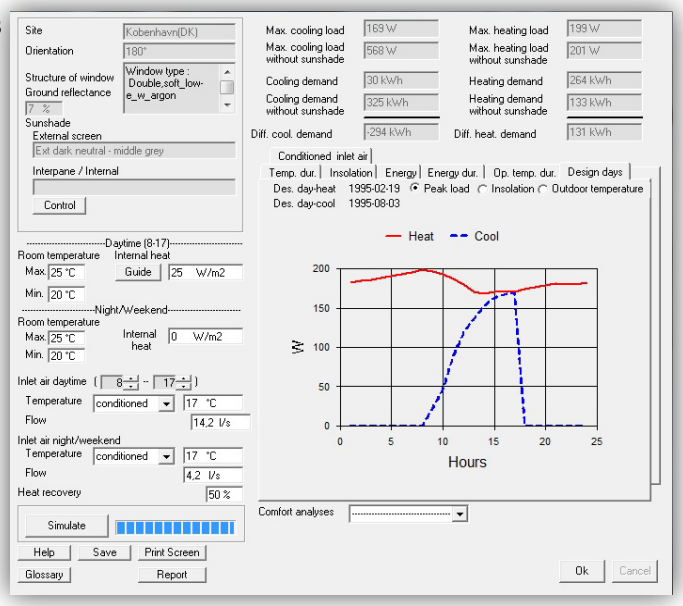


Fig 3



[8] www.Action21.co.uk

Conclusion

Calculations show that with the introduction of external and internal sun blinds there is the possibility for economical savings in heating/cooling costs both in winter and summer. Not to mention the increased productivity due to the improvement of the thermal comfort level and strong light reduction (e.g. reflection on computer screens and blinding effect from papers) Due to this and a vast number of other contributing factors it is impossible to ascertain the actual monetary gain without a full in depth look into the whole office environment. But what can be shown is that it **is** possible to reduce energy usage by the introduction of sun blinds.

3. References:

G.T. McKenna & C.M. Parry – An investigation of task lighting for offices, Sage Journals, 1984, vol. 16 no. 4, pp 171 -186, http://lrt.sagepub.com/content/16/4/171.short

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ParaSol version 6.6 – The division of Energy and Building Design, Department of Construction and Architecture, Lund Institute of Technology, University of Lund

http://www.action21.co.uk/existing_buildings.html

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Solinstrålningtabeller for 56^0 N, Solskyddstekniker kurspärm

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