Improving the ene

CONCERNED ABOUT THE COST OF ENERGY FOR COOLING YOUR BUILDING? WORRIED ABOUT GLOBAL WARMING FROM EMISSIONS OF CARBON DIOXIDE INTO OUR EARTH'S ATMOSPHERE, A SO-CALLED 'GREENHOUSE GAS'? WANT TO KNOW AN EASY WAY TO REDUCE CARBON DIOXIDE EMISSIONS USING 'HIGH-TECH', COST-EFFECTIVE WINDOW FILMS AND SAVE MONEY?

Global Warming – the European Union Viewpoint

Global warming from carbon dioxide emissions and the cost of energy are major topics of discussion around the world. The European Union and European Governments are committed to reducing carbon emissions and improving energy usage with a particular focus on energy in buildings. In 2007, the European Commission organised a conference on the best implementation of the Energy Performance of Buildings Directive in the context of the EU sustainable Energy Week and identified energy efficiency in buildings as the most decisive contribution to improve energy efficiency. Energy efficiency in buildings is also at the heart of the Energy Efficiency Action Plan published by the Commission in October 2006 and part of the Strategic Energy Review presented in January 2007.

The Growth in Air Conditioning

In the ten years to 2000, Germany had a 250% increase in air conditioned floor area and the UK had an increase of about 60%. Unsurprisingly, the number of air conditioned buildings continues to rise across Europe. In this context, it is important to note that cooling buildings often consumes significantly more energy than heating. All this is in addition to energy demand caused by the revolution in computer and communications technology. The result? An escalation in demand for energy that seems never ending. This escalation adds to the attention given to energy efficiency. The most obvious source of high temperatures in buildings is the energy from the sun. In fact research by the Building Research Establishment (BRE) in the UK shows that on average, 40% of the load placed on air conditioning in offices comes from direct solar gain through windows. As events in recent times indicate, the cost of fuel is very unlikely to fall in any significant way and so such sources of energy consumption cannot be ignored.

The Business Perspective

Responsible employers want to

play a part in reducing global warming, and, naturally, they also want to keep staff happy while controlling capital expenditure and operating costs. In addition, European businesses and other organisations are required by EU Directive and legislation to maintain workplace comfort for employees, including ensuring temperatures in workplaces are neither too hot nor too cold – and energy is expended in cooling or heating buildings. This creates an apparent contradiction: save energy according to legislation or expend energy keeping workers comfortable according to legislation.

The Solution

Using modern high technology solar control window films, the cooling loads demanded by air conditioned buildings can be substantially decreased, giving business managers the possibility of significant savings in energy costs and maintain workplace comfort, as well as contributing to reducing carbon dioxide emissions.

Solar Control Window Films – Performance

The article "Thermal Comfort in Buildings" gives details of how these high technology films work. The fundamental requirement is to ensure the solar control window film reflects high levels of solar radiation back to the outside, before this solar energy can be absorbed by or enter into the building. Table 1 gives just a few examples of the performance of some solar control window films compared to selected glass types. With g values[1] of as little as 1/4 that of the glass itself and total solar energy rejection values as high as 81% the solar control performance of glass can be improved considerably. This shows that the range of solar control window films work well for various types of glazing. Typically, the metallised films, using aluminium, copper and silver, along with certain specific spectrally selective films have higher performances. Neutral films, using nickel or stainless steel, have more moderate performance and are more suited to clear glazing and older style buildings. External solar control films also provide high performance protection and can be used on virtually any glazing type.

Solar Control Window Films – Payback Time

So what is the typical performance of solar control window films in reducing energy costs? Understandably, the actual results depend not only upon the film selected but also upon the glazing specification and building construction. However, it is possible to save thousands of Euros a year in energy costs, even in moderate climates. Payback times of less than 3 years are achievable.

How do I select the best film?

It may appear that selecting the correct solar control window film for the type of glazing is not always straightforward. There are specialist window film installation companies across Europe to provide assistance in window film specification. These experts must understand glass and glazing as well as the window film itself. They will check your glass / glazing and ensure that the correct product is specified with respect to both your requirements and to the glazing system. They may even be able to provide a model for your cooling energy demand and an analysis of the predicted energy savings compared with current use, based upon the internationally recognised DOE-2 simulation software.

Glazing system	Direct solar transmittance	Direct solar reflectance	g value	Total Solar Energy Rejected
Clear 4 mm glass				
Glazing only	0,81	0,07	0,84	14%
+ 20% metallised 'silver' film	0,12	0,55	0,20	79%
+ 20% bronze sputtered film	0,14	0,43	0,25	73%
+ 35% neutral sputtered film	0,35	0,17	0,47	52%
+ 60% Spectrally Selective film	0,31	0,28	0,41	58%
+ 35% metallised external grade film	0,22	0,50	0,28	71%
Clear 4/16/4 Insulating glass unit (IGU)				
Glazing only	0,67	0,12	0,74	25%
+ 20% metallised 'silver' film	0,11	0,45	0,31	68%
+ 20% bronze sputtered film	0,12	0,37	0,36	63%
+ 35% neutral sputtered film	0,29	0,18	0,57	42%
+ 60% Spectrally Selective film	0,27	0,22	0,51	48%
+ 35% metallised external grade film	0,17	0,50	0,23	76%
Bronze tinted 4 mm glass				
Glass only	0,60	0,06	0,70	28%
+ 20% metallised 'silver' film	0,09	0,31	0,26	73%
+ 20% bronze sputtered film	0,10	0,26	0,28	71%
+ 35% neutral sputtered film	0,26	0,10	0,45	53%
+ 60% Spectrally Selective film	0,22	0,15	0,39	59%
+ 35% metallised external grade film	0,14	0,49	0,25	73%
Bronze tinted 4 mm outer glass / 16 mm space / 4 mm clear inner glass IGU				
Glazing only	0,49	0,09	0,59	40%
+ 20% metallised 'silver' film	0,08	0,26	0,27	72%
+ 20% bronze sputtered film	0,09	0,22	0,31	68%
+ 35% neutral sputtered film	0,22	0,12	0,46	52%
+ 60% Spectrally Selective film	0,19	0,15	0,41	58%
+ 35% metallised external grade film	0,12	0,49	0,19	81%

Table 1:
Performance of solar control window films – examples of upgrading and modifying glass

[1] The total amount of solar energy that goes to the inside of the building by reflection and by absorption / re-radiation.

Thermal comfort in buildings

ARE YOU TOO HOT IN YOUR OFFICE SITTING IN THE SUN? WISHING THE AIR CONDITIONING WOULD WORK BETTER? THE PROBLEM OF OFFICES OVERHEATING ON SUNNY DAYS IS FOUND ACROSS THE WORLD. EMPLOYEES WHO ARE HAPPY AND COMFORTABLE AT WORK ARE AN IMPORTANT FACTOR TO BUSINESS COMPETITIVENESS AND EFFICIENCY. ONE COST-EFFECTIVE METHOD TO REDUCE SOLAR OVERHEATING IS USING THE MICRO-THIN, HIGH PERFORMANCE TECHNOLOGY OFFERED BY SOLAR CONTROL WINDOW FILMS.

What is Solar Overheating?

Heat flows from hot to cold by radiation, conduction or convection, or by a combination of these processes, for example:

- The sun warms the earth by radiation – its temperature is about 5500° C compared to less than 40° C for the earth
- A metal bar heated at one end will become hot at the other end because heat transfers to the other end of the bar by conduction
- A wind will occur when one part of the earth is warmer than another – the heat is transferred by convection via the air.

Buildings gain heat from many sources including lighting, electrical equipment, building occupants, and the sun.

We all know the power of solar energy – it is so strong that buildings can reach high temperatures after a short period of time. Air conditioning systems can reduce the problem but then building managers can find themselves in the predicament that part of the building is at satisfactory temperatures but other areas are too hot or too cold. Added to this, direct solar energy causes surface temperatures – doors, walls and furniture – to become particularly hot. Worse still, people sitting in direct sunlight experience the full force of the sun, heating both them and their surroundings.

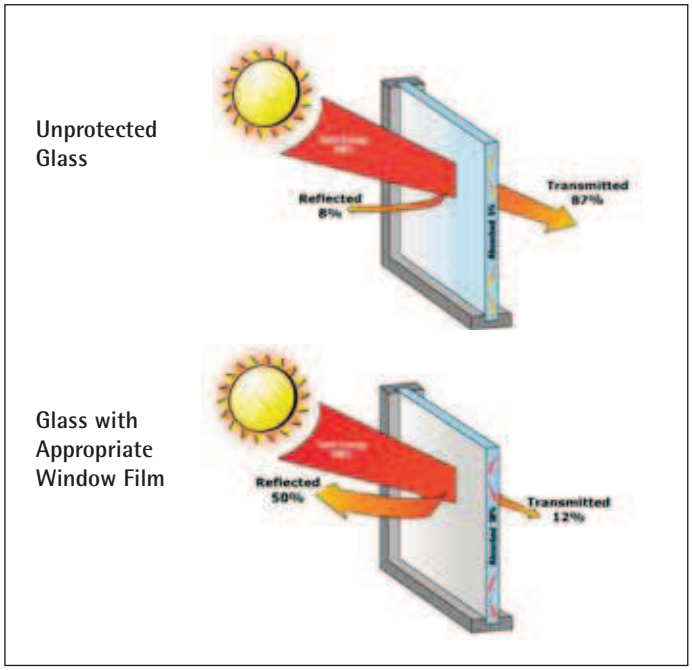
The Effects of Solar Overheating

There are three aspects to consider:

- Building occupants prefer stable workplace temperatures of typically 20-23° C. It has been shown that as workplace temperatures rise above 24° C workers concentration drops by 30-50%; in factories, above 25° C, staff can become more vulnerable to accidents and mental performance declines, causing productivity and quality to suffer. Trade Unions and staff organisations may draw the attention of managers to the high room temperatures, adding to the impetus for a solution to solar overheating
- However, not only is a reasonable room temperature needed, but it should be realised that comfortable workplace conditions are also influenced by changes in temperature and by the speed of such a change. In real life, environmental conditions will always be changing, so buildings will never be at constant temperatures. If the temperature is acceptable and then a change in environmental conditions is slow, or if the change is small, then workplace comfort will change slowly or not significantly and people will generally remain content. But a fast and large change in room temperature will also cause workplace comfort to change quickly.

The Solution

Reducing solar energy transmitted by glazing before it enters the building by installing solar control window films is often the best solution. This helps to reduce solar heat gain, workplace room temperatures, and the rate of temperature change.



See the difference in Solar Energy transmission when comparing clear glass and glass with appropriate window film.