HERCULITE®

Do Energy Efficient Awnings Really Work?

The Science Explained

Introduction

By now, you're probably familiar with the concept of energy efficiency. Whether it's replacing incandescent light bulbs with LED options, insulating your water heater, or even driving an electric car, there are thousands of ways individuals can reduce energy usage.

You don't have to be an environmentalist to strive for energy efficiency. ***The simple truth is that using less energy often means spending less money.***

It's important to remember that energy efficiency means using less energy to achieve similar results. Your frugal roommate is certainly reducing energy usage by keeping the thermostat at 50°F in the winter, but they aren't exactly fulfilling the spirit of energy efficiency. There are ways to save on energy costs without sacrificing comfort and convenience.

How Much Solar Energy Hits the Earth?

At noon on a clear day, every square meter of land receives about 1000 watts of solar energy.
In one hour, the total amount of solar energy the Earth receives is more than humans consume in one year.

Optimizing climate control is one of the best ways to improve energy efficiency.
We spend a lot of money, and therefore a lot of electricity and fuel, keeping our indoor spaces warm in the winter and cool in the summer. There are myriad ways to rein in these costs, from smart thermostats to improved insulation. This eBook, however, focuses on one place where heating and cooling could use some serious help — windows.

Table of Contents

The Trouble With Windows

If you've ever visited a cave, then you're familiar with the sensation of entering an environment that feels totally separate from the outside world. Because of their isolation, the temperature in underground caverns stays relatively constant compared to the temperature at the surface.

Solar heat gain (SHG) is a measurement of solar radiation that passes through a window into an interior space.

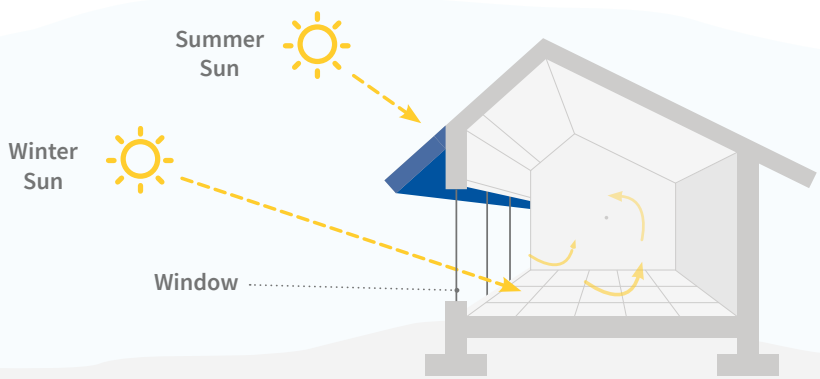
The ideal energy efficient home might resemble a cave. It would be heavily insulated, protected from wind, sun, rain, snow, and anything else that could change the equilibrium that we strive to create indoors. However, people are not cave dwellers, and most of us require sunlight and fresh air in order to be comfortable.

That's where windows come in. They connect us with nature by allowing views, sunlight, and fresh air into our buildings. But with sunlight comes heat, and for that reason, windows are one of the most serious threats to our efforts to create heating and cooling efficiency.

Solar heat gain (SHG) is a measurement of solar radiation that passes through a window into an interior space. In the winter, or in climates that are cold year-round, this effect can be advantageous. In the summer and in warm climates, however, SHG can heat up our homes and businesses significantly, forcing us to crank up the air conditioning in order to counteract it.

Passive Solar Heating

Solar Heat Gain isn't always a bad thing. Passive solar heating is a design approach that takes advantage of solar energy to heat a building in the winter, while using awnings or overhangs to deflect solar energy in the summer.



Reducing Solar Heat Gain

The solution to the solar heat gain problem is to cover up all or part of your windows in some way, either all the time, or only when the sun's energy is shining directly on the window.

There are many options for creating shade and limiting SHG. We've examined four of the most popular methods in order to determine which is most effective.

Blinds and draperies have one major disadvantage: Because they are installed on the interior of the window, they can only limit the effects of sunlight after it has already passed through the glass.

Blinds and Draperies

These window coverings are installed on the inside of a building. Their key advantage is that they can be adjusted in very small increments, allowing a person to take fine control over just how much sunlight is getting through the window into the interior. According to the Attachments Energy Rating Council, these interior window attachments can reduce a household's annual energy use up to 13%.

Blinds and draperies have one major disadvantage: Because they are installed on the interior of the window, they can only limit the effects of sunlight after it has already passed through the glass. If these attachments are used independent of exterior solutions, a certain amount of solar energy will penetrate into the space and warm the air between the blind or drapery and the window. That warm air then leaks into the space, warming the environment and necessitating the use of more cooling energy.

Shades and Solar Screens

Shades are similar to blinds, but instead of using slotted opaque materials, they are typically made of one sheet of semi-transparent material, which allows a certain amount of sunlight to pass through. They are installed inside the building, and can be rolled up or down depending on time of day and amount of light.

Solar screens are like shades, but are installed on the exteriors of windows, and made out of more weatherproof materials designed to be exposed the elements. In addition, solar screens are typically fixed in place once installed.

Solar screens and shades are inexpensive and can significantly reduce solar heat gain. Unfortunately, they tend to darken the interior space and obstruct views of the outside, which makes them undesirable from an aesthetic and comfort perspective. In addition, solar screens can cause windows to appear blacked out from the outside, making businesses appear closed and homes uninviting.

Awnings block sunlight before it passes through a window, making them much more effective at reducing solar heat gain.

Awnings

Because awnings are installed on the exterior of a structure, they have a significant advantage over interior attachments. Awnings block sunlight before it passes through a window, making them much more effective at reducing solar heat gain.

According to the University of Minnesota Center for Sustainable Building Research, awnings can reduce cooling energy usage for an average home by over 2000 kWh in warm climates like Miami, Florida **(that's over $200 in cost savings**).

In cooler climates, awnings save less in terms of absolute cooling energy, but much more in terms of a percentage of cooling energy. For example, an average-sized home with mostly west-facing windows in Seattle, Washington would use **79% less cooling energy** if it had standard fabric awnings on its exterior.

Because awnings are installed on the outside of a building, they are exposed to weather which, depending on the materials used, might cause them to fade, sag, or tear, reducing their longevity and increasing costs. However, they are more aesthetically pleasing than other exterior-installed options like solar screens and louvers, and don't obstruct views.

Color Makes a Difference

Black fabric absorbs heat from the sun, while white fabric reflects heat. Therefore, awnings made of light-colored fabrics will do more to reduce SHG than dark ones.
Benjamin Franklin proved this theory using swatches of fabrics and a pile of snow way back in 1761.

Louvers

Some modern buildings make use of louvers to limit the effects of solar heat gain on energy consumption. Louvers resemble large metal slats. They can be fixed or adjustable, and can be placed inside or outside a building.

awnings appear to be the best at reducing cooling energy usage when cost, aesthetics, and comfort are taken into consideration.

Louvers are essentially large-scale blinds, and are especially effective at blocking solar energy when placed on the outside of a building, and managed by a system which automatically opens or closes them based on the amount of sunlight hitting a side of the building.

These systems are expensive, and generally not scalable to a small residence, business, or other structure. In addition, they can be detrimental to the comfort level and aesthetic quality of a building.

Other solutions for reducing solar heat gain through windows exist, including shutters, window film, and tinted glass. However, among the four major solutions we examined, awnings appear to be the best at reducing cooling energy usage when cost, aesthetics, and comfort are taken into consideration.

Different Kinds Of Awnings

Awnings may be the best window attachment for increasing energy efficiency, but **not all awnings are created equal**. When designing awnings for a structure, there are many variables to consider, including the angle of installation, direction relative to the sun, and whether the awning will be fixed or retractable. However, the variables that require the most explanation are your different choices for awning materials.

We've examined three segments of awning materials to determine which is best at improving energy efficiency. We've also looked at other environmental factors which might affect your decision.

Natural Materials

In general, natural materials that are sustainably grown and sourced are more environmentally friendly than synthetic materials. Historically, awnings have been created from wood or natural canvas (which can be woven from linen, cotton, or hemp).

Unfortunately, natural canvas awnings are generally not suitable for modern needs. Because natural canvas fabrics are worse than synthetic materials at withstanding wear and tear from sun, wind, rain, snow, and other natural processes.

Both canvas and wood are susceptible to warping and are difficult to clean, which means they need to be replaced more often.

Most importantly, however, uncoated natural canvas and wood are not fire-resistant. In addition to posing a danger to building occupants, this makes them illegal to use in certain jurisdictions.

Metal

Metal awnings are 100% opaque, which means they are very effective at blocking sunlight from reaching a window. However, **metal conducts heat better than fabric or other materials, which means a significant portion of the solar energy that shines on the top of a metal awning will be transferred to the bottom of the awning, where it will radiate into the space below**. For this reason, metal awnings can actually contribute more to solar heat gain than fabric alternatives.

Metal awnings are naturally water, mold, and fire resistant, and are easy to clean, which increases their longevity. However, most metal awnings are made from aluminum. The process of extracting and refining aluminum has significant environmental impacts, like land degradation and carbon emissions, including C02 and perfluorocarbons. Some of these effects can be mitigated by using recycled aluminum.

Awnings and LEED certification

The U.S. Green Building Council's LEED rating system recognizes building projects for energy efficiency. LEED Certifications are awarded based on points, with the basic certification requiring 40 points to achieve.

According to the Professional Awning Manufacturers Association, **fabric awnings can directly help a building receive 11 leed points.**

Synthetic Fabrics

In the awning fabric space, the most popular choices are acrylic and vinyl. **These materials are much less expensive than aluminum, but can be created with similar sunlight-blocking qualities**. In addition, high-quality acrylic and vinyl fabrics are water, mold, and fire resistant. Vinyl in particular is dimensionally stable, meaning it won't stretch or sag, and is therefore **more durable and longer-lasting** than natural materials or weaker synthetic fabrics.

Vinyl fabric is considered the gold standard in awning materials.

Vinyl is a type of plastic, meaning its production does require oil or natural gas. However, it requires much less energy and oil than other materials — vinyl production uses 50% less energy than polyester, and 204% less oil than aluminum. In addition, vinyl is lightweight, which means it requires less energy to transport than heavier materials. That adds up to fewer

carbon emissions, and therefore **less environmental impact overall**.

Conclusion

Based on these facts, we can conclude that when it comes to improving the energy efficiency of windows, awnings are the clear choice. And when it comes to awnings, synthetic fabrics (and vinyl in particular) are the best materials to use.

Herculite and the Environment

Compared to other vinyl fabric manufacturers, Herculite puts a special emphasis on improving energy efficiency and reducing environmental impact. From pioneering innovative recycling methods to eliminating VOCs from the manufacturing process, Herculite has proven its commitment to sustaining the environment.

High-quality vinyl awnings are long lasting, aesthetically pleasing, and can even be used to extend livable space and increase the value of a structure. By installing these awnings to cover windows that see significant sun exposure, building owners can dramatically reduce cooling energy costs, as well as the environmental impact of air conditioning.

To learn more about how you can realize serious energy savings with the right awnings, contact Herculite today