

## **PHS Greenbeans: Insulating Solar Blinds**

Climate change is a salient issue with no dominant solution, and its effects have vast implications in the present and into the future. It is the change in global climate patterns, mostly due to anthropogenic means. One route to address climate change is through methods of mitigation, whose implementation serves to reduce greenhouse gas emissions. Gas molecules that absorb thermal infrared radiation can alter the climate of the globe drastically, which is the primary factor that contributes to climate change. However, these methods must be innovative yet practical to create real change. Nearly 50% of household energy consumption is spent on maintaining an ambient temperature, and over 40% of energy use in general is attributed to household use. To generate this energy, fossil fuels like coal, oil and gasoline are burned, which release vast amounts of greenhouse gases. By increasing household energy efficiency, total energy consumption will drop, and the emission of greenhouse gases will decrease as well.

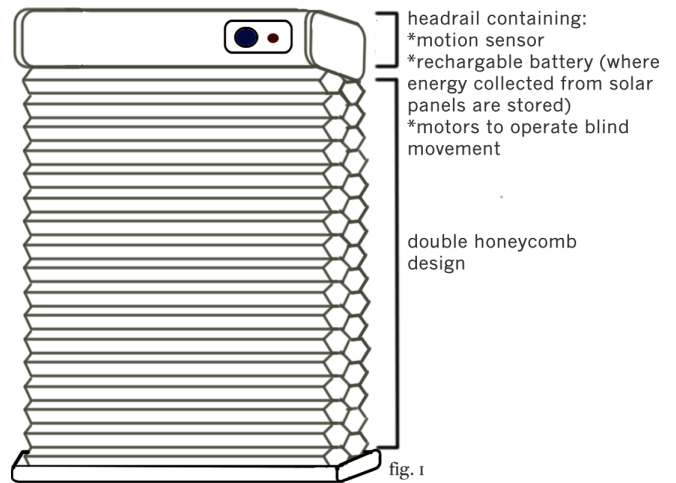
The current state of household insulation is imperfect, as windows contribute to 25% of energy wasted. To combat this waste, blinds and window coverings can insulate windows. One factor that mitigates heat loss is a fabric with a higher resistance to heat flow. Effective blinds should reduce the convection current between the internal and external environment, yet be visually appealing and consumer-friendly. An elegant double honeycomb design of colored semi-opaque polyester would be ideal, as air pockets both within the polyester and the larger honeycombs offer insulation, and sidetracks would seal the energy inside the household rather than leak into the outside environment, which can reduce energy consumption. During the winter, the cellular air pockets insulate the building from the cold air outside, and trap the heat inside of the house from escaping. During the summer, the cool air within the building is contained, blocking hot air from the outside. The solar cells can absorb or reflect the radiation from the sun, and the air pockets can retain the internal temperature of the building. Attaching flexible solar cells with this design to harvest energy from incoming solar rays will also help to mitigate household energy consumption. The use of solar panels within the household also extend the lifespan of the modules, since the polymers that make solar panels flexible can be bleached by UV radiation and render solar panels ineffective. The glass of the windows protects the solar panels attached to the blinds from this damaging UV radiation. Additionally, the blinds

will be automatic, opening when the room is occupied. Through this, the utmost energy will be collected from incoming light, while allowing natural sunlight to flood the room while in use. The energy collected could then be used to charge electronic devices from a plug installed within the sidetracks.

Blinds have been used for centuries to block sunlight from entering rooms. The concept of solar powered blinds has recently come into fruition. However, most of these recent designs from the last decade have incomplete aspects.

Some blinds are motorized and can be opened at the touch of a button, though those designs do not open automatically. Others have implemented a honeycomb shape to improve insulation, but almost none actually gather the solar energy for continuous energy use or seal off openings from the effects of ambient temperature change. The innovation in our design is that it addresses the design flaws of previous attempts to commercially manufacture energy efficient shades. The double honeycomb design as well as the inclusion of sidetracks should offer even more insulation and disruption of circulation between temperature variations between ambient temperature and that of the outside environment. The polycrystalline silicon solar cells incorporated into the material of the blinds is something that has never been attempted before and allows for optimal energy acquisition. Along with the motor and motion sensor that make sure this product only opens when there is a movement in the room, the overall design of the product marks a significant change from what has been made throughout history and will be able to shape the future of this technology.

This newer piece of household technology can be eye-catching to consumers, and the price of buying new blinds would be recompensed by the energy savings. The innovation of this design is rooted in its practicality in the household. With it, entire communities can significantly reduce their harmful environmental footprints. Although the price of these blinds is estimated to cost around 130 dollars, which is more than six times the price of inexpensive contemporary



shades, yet reasonable compared to those of the higher-end shades, energy savings will pay compensate for the cost over time. In an average house, an energy-efficient window treatment can save up to 150 dollars per year in heating and energy costs. Additionally, newer energy-saving blinds can be eligible for up to a \$500 dollar tax credit from the IRS. The upfront price of these blinds may be rather high, but these blinds will pay for themselves many times over by reducing heating costs, generating electricity to power its automatic room functions and recharge small electronics to reduce electricity costs as well, not including the possible tax credit from the IRS. Implementation in local, state, and national scale will bring us one step closer to improving the desperate state of climate change that exists today.

The combined effects of a widespread implementation of this product would be astronomical. The United States alone has over 117 million households, and millions upon millions of additional buildings capable of using these solar blinds. No longer will large amounts of energy used in the household be devoted to maintaining an ambient temperature, as the shutter aspect of the blinds will do the job by reducing external heat flow. The blinds integrated with effective solar technology will allow for an additional power source in the home. If retail stores were to switch to this product, homeowners in all communities would be able to see the distinctive advantages of this system in relation to purchasing conventional blinds. The price of the blinds may make consumers hesitate to make such an investment, but the long term benefits heavily outweigh the short term costs.

Climate change is a quandary that must be addressed before the effects become irreversible. The most significant driver of climate change, greenhouse gas emissions, is a primary concern, and the mitigation of this factor is paramount to the continued survival of all organisms. The creation of these solar blinds is a significant step towards achieving this goal, and has the potential for widespread implementation in communities across the nation and even extension into international markets. In order to deal with the complex problems humanity faces today, innovative and elegant solutions are needed, which is what this design offers. It is time for this idea to be spread and be applied in the real world, so together we can make real change.