

# Energy-efficiency solution is easier to manufacture after design consultation



## Company Profile

Based in Rochester, New York, WexEnergy LLC was founded in 2014 by Dr. Ronald Wexler. Their flagship product is WindowSkin®, an effective, non-intrusive window-insulation solution that helps to improve the energy efficiency of residential and commercial buildings. The design features an insulating panel to trap air against a window to create a thermal barrier. Each corner of the panel is attached by tabs that form a seal and connect the panel to fastener strips that are adhesively mounted on a window. WindowSkin® is designed to be easily installed and long-lasting without interrupting the everyday use of windows it is applied to.

## Situation

Early versions of WindowSkin® showed good performance as a thermal barrier with customers noting its simple installation, attractive appearance, and affordable cost. Despite this early market interest, the design presented several manufacturing challenges.

In the original product design, mounting tabs were cut and formed from the same sheet used to construct the main panel of the product. The company found that this production process was costly and limited throughput. Each corner of the panel had to be cut and formed in sequence, which restricted material and thickness options for the main panel to those parameters also favorable for producing the mounting tabs.

WexEnergy decided to replace the “in-process” formed corner tabs with a different mounting solution that would not compromise the functional and aesthetic features of the original design. To do this, Dr. Wexler turned to the Center of Excellence in Advanced and Sustainable Manufacturing (COE-ASM) at Rochester Institute of Technology (RIT).

## Objectives

The primary goal of the project was to narrow down potential alternative designs, materials, and manufacturing methods for a more robust and cost-effective mounting tab. The redesigned mounting tabs had to meet ease of use requirements while providing mechanical rigidity and robustness for the largest WindowSkin® design, as well as material and dimensional compatibility with a cost effective manufacturing process.

## Outcomes

COE-ASM and WexEnergy created eight different potential mounting tab design concepts for two different WindowSkin® air-gap thicknesses. These were then down-selected to four, based on WexEnergy's priorities. Each of the remaining four were modeled using computer-aided design (CAD) and structural performance (strength and stiffness) was analyzed using Finite Element Analysis (FEA).



The simulation results showed that some of WexEnergy's initial requirements unnecessarily limited design options for the mounting tab. Structural analysis identified that certain initial design assumptions were not valid, and that the mounting tab could be made much stiffer than expected while still meeting functional requirements. This allowed WexEnergy and COE-ASM to proceed with a high-strength, high-stiffness mounting-tab design that would be suitable for even very large WindowSkin® dimensions.

Once the final design was selected, WexEnergy and COE-ASM jointly consulted with a local injection-molding company to review the design. COE-ASM implemented specific dimensional changes recommended by the manufacturer, such as ideal wall thickness, draft angles, and corner radii. This modified design was then tested in a final round of full-model simulations that measured the expected deflections and stresses under hanging, peeling, and thermal loads. With these results, WexEnergy was able to move forward with confidence on tooling for the new design.

The new mounting-tab design has many benefits over the original "in-process" design. It controls the air-gap thickness better. It is capable of supporting WindowSkin® panels in excess of five feet square. It also allows for better sealing and is more cost-effective to produce and assemble.



Since the project with COE-ASM was completed, WexEnergy implemented the enhancements into its next-generation product design and began production in Upstate New York. The small business was able to confidently launch their novel product in order to gain traction against larger competitors in the market.

Today, WexEnergy is making headway with the updated WindowSkin® in the United States. The company recently won a grand prize award through the CleanTech Impact Challenge organized by TechUnited and the utility provider PSE&G. In fact, PSE&G is considering offering incentives for the purchase of WindowSkin® for customers in New York and New Jersey. This would be similar to the Energy Star LED lighting program

launched in 2011. Going forward, WexEnergy looks to engage in future projects with RIT because, according to Dr. Wexler, "the COE-ASM project moved the dial on product development."

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