

Snap-On WindowSkin® for Improving Performance of Existing Windows



Startup
 WexEnergy
 Rochester, NY

Host
 Tennessee Valley
 Authority



Technology Solution

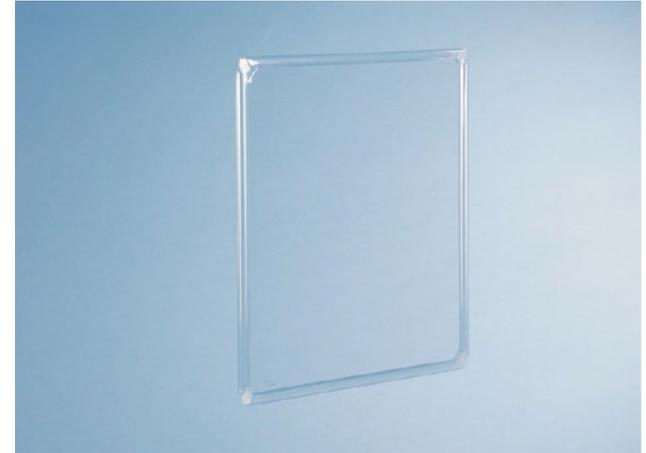
Windows are the most thermally porous component of the building envelope, single-pane models are the worst offenders, and aging windows of all kinds can suffer from performance problems. Windows also are very expensive to upgrade or replace, especially relative to other building envelope improvements. Consequently, poorly performing windows are often left unaddressed, especially in low-income or disadvantaged households.

This pilot project was initiated to demonstrate WexEnergy’s WindowSkin® products as an interior-mounted retrofit solution for reducing thermal energy loss through aging and underperforming windows. At a small fraction of the cost of window replacements, PolarSkin™ adds a layer of insulation to existing window panes, while SolarSkin™ also offers heat gain reduction, which can be important for reducing space cooling costs. The products are designed for improving thermal performance in buildings with single-pane windows or with aging double-pane windows no longer as energy efficient as when installed.

Project Overview

For this demonstration, WexEnergy, Tennessee Valley Authority (TVA), and EPRI teamed up to demonstrate the impacts of installing a mix of PolarSkin and SolarSkin products in 12 single-family homes in Tennessee. The goals were to improve the thermal performance of each house, as well as gain first-hand learning about pre-installation requirements, installation best practices, and customer satisfaction for this type of window retrofit product.

The project was organized into four task areas: site selection, WindowSkin production, installation, and reporting. To support the first task, WexEnergy provided remote training to TVA and its con-



WindowSkin inserts are designed and sized to improve the thermal performance of individual window panes by reducing heat loss and solar gain.

tractor, CLEARResult, to assist them in screening homes for window compatibility and in applying measurement tools for correctly determining window dimensions and verifying minimum acceptable clearances.

Homes were selected from a list of past participants in TVA’s Home Uplift Program, which provides free energy upgrades to low-income and disadvantaged consumers in order to reduce energy bills and improve quality of life. Previously, windows had not been an addressable measure under this program due to the high cost of treatment. For the selected homes, TVA and CLEARResult were tasked with performing customer outreach and collecting window measurements.

WexEnergy reviewed measurement data for each window to confirm compatibility with WindowSkin

qualification criteria and, once approved, to place a manufacturing order. Due to production constraints, WindowSkin products were delivered in two phases to CLEAResult. After WexEnergy provided a virtual installation training session, the contractor visited homes to complete the installations, product features were explained to customers, questions were addressed, and initial feedback was collected.

As part of this project's reporting task, both installers and customers were surveyed to gather their opinions about the process and the technology. TVA plans to continue to monitor the performance of the homes over the course of at least 1 year to better understand energy savings and other impacts.

Results & Learnings

The project team accomplished key tasks and applied learnings during the brief project timeline. Remote training proved successful in walking TVA's contractor through the necessary steps in assessing every window in a house and in properly determining the needed dimensions for every pane in suitable windows, including adequate clearances for operability.

One key learning is that the standard home energy audit would likely take twice as long if every window were to be measured for WindowSkins. In response, WexEnergy developed a streamlined process for small panes and is creating a new tool that is expected to reduce overall measurement time by at least 50%.

WindowSkin products ultimately proved to be highly compatible with the windows of the homes that were identified for inclusion. An initial constraint of the manufacturing process precluded pane dimensions less than 9 inches long, which would have prevented a number of windows from being retrofit during the project. WexEnergy modified the manufacturing pro-



WindowSkins have minimal impact on visibility through windows, and treated windows remain operational.

cess to include panes as small as 7 inches long, enabling 95% of the measured windows to be treated.

For future deployments, WexEnergy plans clearer upfront messaging to mitigate the potential for disappointment. Homeowners need to clearly understand that window measurements are part of the qualification process—and that not every building or window is suitable for the product.

Recruiting, scheduling, and measuring homes during COVID proved challenging. TVA and its contractor worked very efficiently to complete upfront work early

in the project timeline, enabling fulfillment and delivery of an initial manufacturing order and installation of WindowSkins in a few homes by October 2021, with the remainder of installations occurring before the end of the year.

According to CLEAResult, the installation process itself was easy, and customers were not concerned about visibility through the treated windows.

Implications & Next Steps

While changes in customer energy use attributable to the deployed WindowSkins will not be known until the end of 2022, this project achieved notable successes in advancing quickly from planning and assessment to manufacturing and then installation as part of TVA's Home Uplift Program.

The primary research question—how building energy usage has changed after 1 year—will be answered based on analysis of billing data from before and after the installations. TVA also plans to survey customers during both the heating and cooling seasons, addressing questions such as the following:

- Is your room/home more comfortable since WindowSkins were installed?
- Has visibility through windows changed?
- Do you ever open your windows?

For WexEnergy, a key next step toward WindowSkin integration in utility program offerings is to demonstrate its new measurement platform for speeding up residential site assessments and product sizing by energy auditors working alone. In addition, a small-pane product that also can be installed quickly and easily is under development.

TESTIMONIAL: WexEnergy

This opportunity to build relationships with important industry contacts helped WexEnergy accelerate market introduction of our SolarSkin product, with the first units reserved for TVA's customers, as well as advance our window measurement process.

TESTIMONIAL: Tennessee Valley Authority

We had no problem finding homes that qualified for Wex Energy's technology, the WindowSkin products were easy to install, and visibility through the window was not impacted.

TESTIMONIAL: EPRI

WindowSkin technology showed high compatibility with various types and sizes of older windows in this pilot project, creating potential to improve thermal performance and reduce heating and cooling loads in diverse residential buildings without having to replace windows.

Resources

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