Interior Storm Window Insert for Improving Performance of Existing Windows

Startup
Indow
Portland, OR

Host
Tennessee Valley Authority

Technology Solution

Windows are a significant source of heating and cooling losses and comfort issues in homes. Exterior storm windows are commonly employed to mitigate these issues but can be expensive and difficult to install and operate. Applying plastic sheeting to interior window framing is an inexpensive but cumbersome and temporary solution that often reduces visibility.

This pilot project was launched to test interior storm window insert kits designed and manufactured by Indow for improving comfort while reducing heating and cooling bills and carbon emissions. By creating a tight seal within window openings, the inserts reduce air in-leakage and the associated drafts and thermal energy losses. Indow Kits arrive with all parts needed—about 15—for quick and easy assembly and installation by contractors and homeowners alike. Additional items needed to ensure a proper fit of the transparent film in the aluminum frame include a butter knife and hairdryer. The frame includes a mechanical attachment system suited for providing a secure seal in a variety of window configurations.

Indow's interior storm window insert kits are designed to facilitate assembly, installation, and seasonal removal as appropriate.

Project Overview

The goal of this project was to equip all windows in up to 20 homes with Indow Kit inserts in order to evaluate qualification, measurement, assembly, and installation processes and energy-saving performance. Project team members included TVA as the utility host, EPRI as subject-matter expert, Indow as technology developer and supplier, and CLEAResult as TVA's contractor for window qualification and measurement and window kit assembly and installation.

TVA identified 94 potential customer participants based on homes in a localized area that had already been provided with various weatherization improvements through the utility's Home Uplift Program. Indow provided remote trainings to CLEAResult addressing frame capability and window qualification and

measurement, and homes were assessed as potential sites for installing Indow inserts. CLEAResult reached out to customers with suitable windows, conducted in-home visits, and collected measurements, providing the data needed to initiate the first-large scale production run of Indow Kits.

After kit manufacturing, packaging, and delivery, CLEAResult assembled and installed the storm window inserts and conducted a blower door test, allowing comparison of post-treatment air exchange to pre-treatment test results. Indow, first and foremost, focused on developing experience with manufacturing, assembly, and installation of its new energy-saving product and on evaluating the improvement in quality of life for homeowners participating in the project through before-and-after qualitative surveys. Changes in energy usage, bills, thermal comfort, and air quality also were important metrics for project participants.

Results & Learnings

During the pilot project, CLEAResult identified and measured six homes, and Indow Kit inserts for 62 windows were manufactured to order. An additional eight inserts for TVA's Tiny Home demonstration were delivered. This provided the first test of large-scale kit manufacturing, allowing Indow to better understand the resources needed to continue to scale production of its new product. Despite supply chain issues for certain parts, Indow amassed enough materials to build up to 500 inserts.

Assembly and installation by CLEAResult after training conducted by Indow went smoothly and offered unique insight into the workflow within a utility program environment. Factors not considered by homeowners as typical Indow customers or by Indow staff closely involved in development of the product were identified.

In summary, Indow provided remote frame compatibility and window measurement training lasting less than 2 hours in total, and CLEAResult was able to measure qualified windows in a straightforward process. Indow manufactured the inserts kits in timely fashion, and the initial manufacturing ramp yielded a number of process efficiency improvements. Shipping a large number of kits via a single crate provided cost efficiencies.

Assembly and installation training supported by printed materials enabled ease of installation. Blower door test measurements showed a reduction in air infiltration relative to pre-install conditions, but impacts on energy use and comfort are still to be determined.

While customer recruitment proved challenging, the project team succeeded in installing Indow inserts for various window configurations.

One key learning is that Indow Kit uptake in utility programs is influenced by regional architectural styles within target demographics. Among the homes identified as potential participants in this project, the window incompatibility rate was dramatically higher than anticipated based on previous Indow experience. Very shallow frame depths, protruding hardware, and curved frames, all of which can preclude insert usage, were commonly encountered—sometimes all in the same window!

Additionally, over 90% of the homes in the initial candidate pool had already being outfitted with exterior storm windows. To reach the target of 20 participating homes, the project team expanded the pool of potential participants through the Home Uplift Program, including customers previously served in neighboring communities plus new program participants.

Implications & Next Steps

While deployment progress during the pilot demonstration period was slowed and the performance of Indow inserts remains under assessment, the project team succeeded on several collaborative fronts. In short, product qualification, measurement, assembly, and installation training guided the deployment of the initial large-scale production run of Indow Kits, and several opportunities along the value chain were identified for achieving significant efficiencies at scale.

Going forward, as Indow plans product rollouts in conjunction with utility programs, architectural characteristics and common window types across the

potential pool of participating homes will be investigated. This will help in identifying and mitigating compatibility challenges and determining realistic metrics of success in engaging customers and deploying storm window inserts.

Indow also is interested in exploring alternative approaches to customer engagement, such as hub-and-spoke recruitment strategies organized around retrofits of schools and other community buildings. Students and volunteers working on interior storm window measurement, assembly, installation, and reporting tasks—as well as beneficiaries, in terms of improved comfort, reduced energy bills, and lower emissions—could then serve as Indow customers or advocates.

Resources

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TESTIMONIAL: Indow

Working with TVA, EPRI, and CLEAResult helped identify lever points in our value chain that once addressed will enable Indow to rapidly scale sales and production through utility programs—and make improved comfort and lower bills accessible to more people.

TESTIMONIAL: Tennessee Valley Authority

The onsite assembly and installation of the Indow Kits went smoothly, and customers were pleased with the look and feel of the product. Early measurements indicate a 5 to 10% reduction in air infiltration in the home.

TESTIMONIAL: EPRI

Indow Kit technology provides a unique approach to the challenge of improving the performance of existing windows. The fact that efficiency contractors and homeowners can easily measure for, order, assemble, and install the product could help reduce deployment barriers and costs.

Resources

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