

PRODUCT REVIEW

Thin Glass to Change High-Performance Window Market

Alpen is rolling out triple-pane products that are thinner and lighter—and will eventually be cheaper.

by Peter Yost

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The good news about window performance is that the market has been transformed by the building industry moving to dual-pane, low-e, argon-filled glazing with performance around R-4, according to [Lawrence Berkeley National Laboratory](#) (LBNL). See Figure 1 in the slideshow.

The bad news is that since around 1990, the performance of the vast majority of our windows has not really changed much. See Figure 2 for a current breakdown of the market based on performance of windows rated by the National Fenestration Rating Council (NFRC).

Yes, we now have triple-pane glazing in the R-6 and beyond range, but these windows are quite heavy, expensive, and not really embraced by the U.S. market.

Enter thin glass triple glazing (TGT) technology. In Figure 3, you can see the key ways TGT is a breakthrough:

1. The “thin”—1 mm—glass is inserted in the middle of a standard dual-pane insulated glazing unit.
2. Krypton gas replaces argon in the now half-as-wide spacing of the three glass panes.



The Winsert thin-glass triple-pane inserts are not only thinner but also lighter than conventional triple-pane glazing options.

Photo: Alpen

Thank your iPhone

The patent for TGT was pulled way back in 1991 by research scientists at LBNL. The only problems—at the time—were:

1. No one knew how to manufacture large plates of 1 mm glass, at least not economically.
2. Krypton gas was way more expensive than argon gas.

But then two things happened in the last four years or so:

1. Smart phones and flat-screen TVs: smart phones need thin glass for their touch operation—creating real demand for thin glass, and then flat-screen TVs needed thin glass made in really big sheets. Large-panel thin glass went from \$5 per square foot to around \$0.60 a square foot.
2. LED lighting: LEDs nearly completely replaced halogen lamps, so the demand for krypton gas for lighting fixtures plummeted. Also, gas-fill technology advances reduced manufacturing fill losses from around 50% to 10%. This translated into krypton gas in window manufacturing dropping in cost by a factor of five.

Two manufacturers, one almost ready for market

Two of the U.S. window manufacturers that have been working with LBNL on TGT technology and its deployment are [Alpen](#) and [Andersen](#).

Let's start with Andersen and its work on TGT because this will be quick: after my lead contact with Andersen responded enthusiastically to working with me, I eventually received word that details are currently “confidential” along with a message implying that the product is not yet ready for prime time: “We are currently working on ensuring the solutions we are exploring meet our rigorous internal standards,” my contact wrote.

On the other hand, Brad Begin, Alpen CEO, was clearly anxious to convey his excitement for TGT ([see this Alpen website news story](#)).

According to Begin, Alpen has been working with LBNL on thin-glass triples since mid-2018. When I asked Begin about the marketing schedule for Alpen TGT, Begin said, “We haven't created a separate area on our website for TGT yet. We are beginning to roll out on a limited basis thin-glass triples and quads now into both the residential and commercial markets. Projects are in motion.”

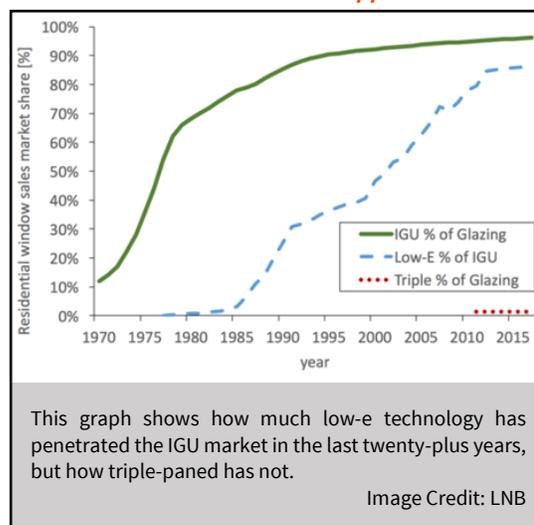
The cost conversation

“We have ready access to affordable krypton and now have worked successfully with 50-square-foot thin-glass lites,” Begin continued. Although he said the company can make TGT units “very efficiently” on existing manufacturing lines, it is looking into other options. “We have spent some significant time investigating more automated lines capable of making thin-glass units,” he said. “I am actively working through a capital plan and in further discussions with potential capital sources to fund the plan.”

When I asked Begin about cost, his quick reply was: compared to what?

For a high-performance window company like Alpen, featuring long-standing triple-pane windows, the added cost for TGT will be marginal. But compared to conventional double-paned windows, there will be a significant premium—but with far better performance. According to Begin, some larger U.S. window manufacturers remain unconvinced that the market demand is there for higher-performing windows. “I invite these larger companies to

See slideshow in the appendix

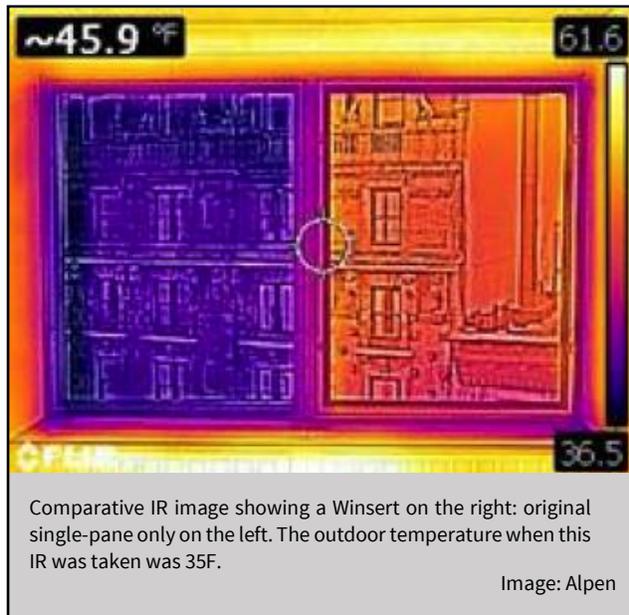


call us,” he said, adding that Alpen is watching market demand “being filled by products from outside the country.”

The bottom line? Thin glass will start at essentially the same price as tradition triple,” said Begin, “but likely will be less expensive as supply channels and manufacturing efficiency mature.”

Inserts for a commercial high rise retrofit

Begin was also anxious to talk about an innovative thin-glass product Alpen has been working on: **Winsert**.



Winsert is a lightweight fiberglass-framed interior secondary window using thin glass with a performance film (the film strengthens the thin glass). Alpen has pulled two patents on its developing Winsert series. Begin shared a recent Winsert installation in a high-rise commercial building in New York City.

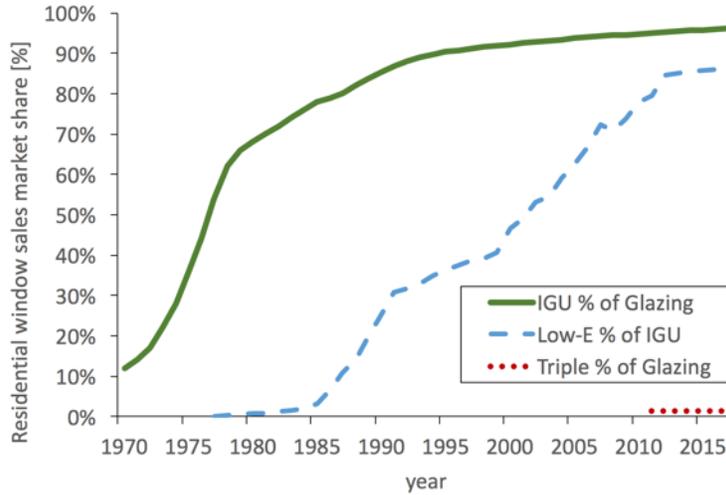
“The building has had single-pane center pivot windows for almost 50 years,” he explained, and the existing window assemblies can’t structurally handle the weight of dual-pane replacement glazing.

The Winsert high-performance secondary window insert is easy to install (and can be easily removed for window cleaning—a big deal in high-rise buildings) and significantly

beefs up energy performance of the single-pane pivot windows. (See the infrared image taken with the Winsert on the pivot window to the right, the original single-glass window on the left.) The Winsert not only improves thermal performance but also adds thermal comfort for occupants near the windows.

Alpen is working on getting all the information necessary to NFRC so that all of its new thin-glass products are rated for their performance.

Slideshow



Slide 1

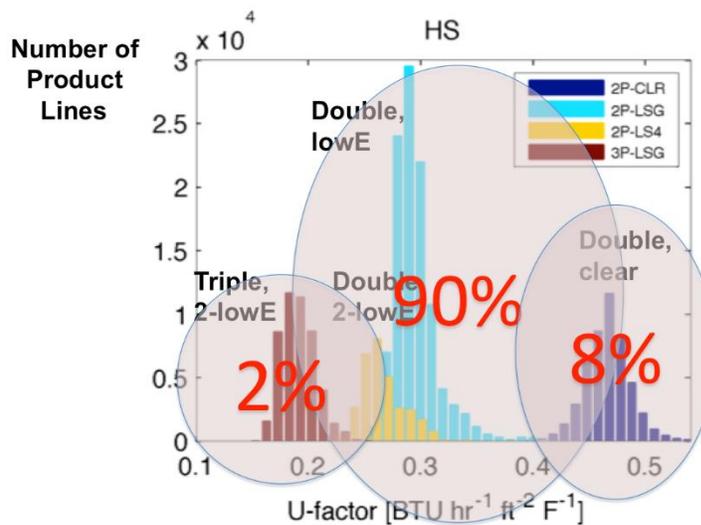
This graph shows how much low-e technology has penetrated the IGU market in the last twenty-plus years, but how triple-paned has not.

Image Credit: LNB

Market Snapshot

Performance distribution of NFRC-Rated Windows

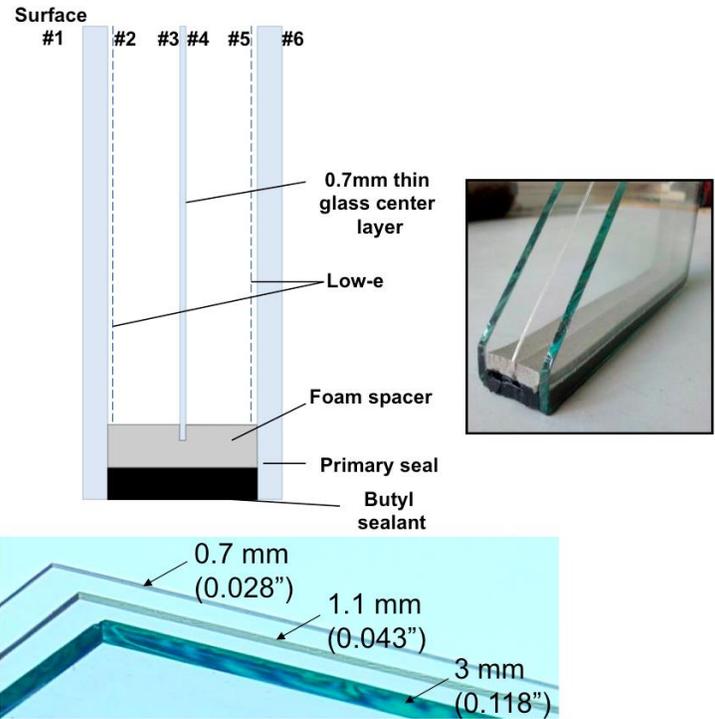
Source: EPA ENERGYSTAR analysis, Horiz. sliding windows



Slide 2

This graphic drives home how dominant the market is for windows that have energy performance right around R-3 or maybe R-4.

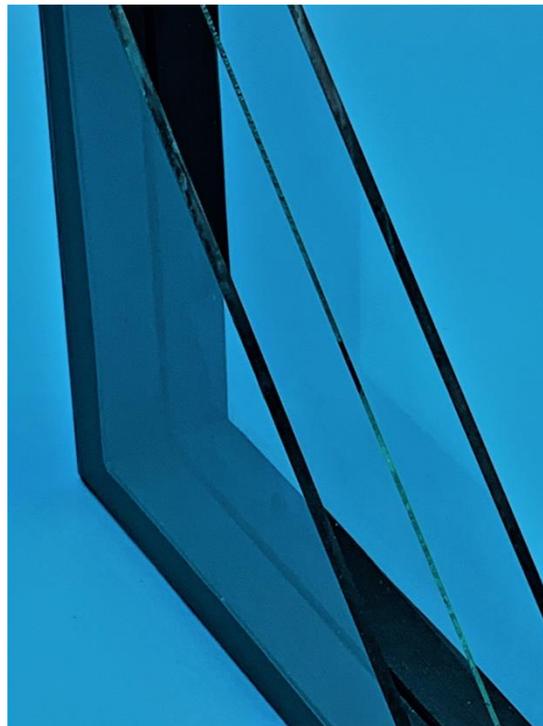
Image Credit: LBNL



Slide 3

Details of the thin-glass triple construction. Note that while the thin-glass splits the IGU in two, there is still just one gas fill between the two outer thicker glass panes.

Image Credit: LBNL



Slide 4

A corner cut of one Alpen TGT configuration showing Alpen's "Superspacer" in a TGT.

Image Credit: Alpen



Slide 5

In this corner cut you can see the way in which the aluminum spacers locate the thin glass but it's the IGU seal underneath that defines the dual pane seal.

Image Credit: Alpen



Slide 6

The sample in the lower left corner is a Winsert: Lightweight fiberglass frame, thin-glass, and a performance film to make the thin-glass much stronger.

Image Credit: Alpen



Slide 7

This hasp is what compresses the airseal gasket for thermal performance and condensation control with the interior Winsert.

Image Credit: Alpen



Slide 8

High-rise center-pivot single pane window wall ready for Winserts.

Image Credit: Alpen