

Unique Silicone Speeds Production, Lowers Cost, Improves Quality

By Kelly Charbonneau and Ross Noel

Dow Corning Corporation

A breakthrough in silicone sealant technology is causing a fundamental change in the window and door industry. A new, reactive hot-melt material, *Dow Corning® InstantGlaze Window Assembly Sealant*, allows fabricators to manufacture high-quality silicone glazed units at two to four times current speeds using fewer workers. This combination of higher quality, faster output and lower costs delivers a significant competitive advantage to manufacturers of PVC, wood and aluminum windows.

Traditional sealants and adhesives

Silicone sealants have long been the “gold standard” in glazing performance. They are the sealants of choice in high-end windows and doors because they deliver the best durability, flexibility and longevity. They resist UV degradation and remain flexible across a wide range of temperatures. Silicone remains elastic enough to handle the different thermal expansion rates of various window components, even vinyl, which can expand nine times more than glass. For in-field repairs, it is much easier to deglaze a unit sealed with silicone than one sealed with an organic sealant such as polyurethane, which hardens over time.

For the fabricator, though, silicone performance has come at a price. Silicone takes time to cure, so lines must move more slowly while the sealant achieves green strength. Uncured sealant can be squeezed out when the glass is placed and pressure applied. This excess sealant must be cleaned from the glass and sash components, wasting material and adding labor costs. If too much sealant squeezes out, the remaining bead may be too thin, reducing the gap between the sash and glass, possibly compromising the seal. Even after the unit is successfully fabricated, it must often be held until sufficient green strength is achieved.

Many shops sidestep these challenges by using pressure sensitive foam tape to adhere glass to sash. Tape has the advantage of instant green strength, but it, too, has disadvantages. Tape must be cut precisely to size and applied without gaps, overlaps or folds to avoid leaky corners. Tape also makes rework difficult, as it must be pulled out and all residue scraped away before it can be reapplied. Anthony Ferrera, director of manufacturing for Graham Architectural Products, explains, “Tape is very labor intensive and the failure rate is high. Tape typically fails at the corners, causing leaky units and requires extra backsealing.”

Reactive hot-melt silicone

A breakthrough in silicone sealant technology has created a third alternative that significantly speeds production, reduces labor costs and delivers the quality performance of silicone. This unique, patented formulation, *Dow Corning InstantGlaze Window Assembly Sealant*, is a reactive hot-melt silicone material designed specifically to take full advantage of automated backbedding technology. It has instant green strength so windows can be handled immediately without risking the integrity of the seal or distorting the sash, offering major productivity improvements.

It works like this. The solid silicone is loaded into a pump. A heated plate presses it down and melts it, forcing it into a metering device. A perfectly formed, seamless sealant bead is applied to the frame on an X-Y glazing table. All these operations are controlled by a micro-processor, reducing the need for scarce skilled labor.

Here the advantages of the pressure-sensitive hot-melt silicone become clear. The material has a pot life of 24 hours and an open time of up to 15 minutes. This compensates for variability in line speed and reduces downtime. According to John Hannan, senior manufacturing engineer

for Eagle Window & Door, Inc., “The material’s long open time allows for glass positioning adjustments to be made before the material fully cures.”

The sealant delivers immediate aggressive adhesion to vinyl, wood, glass, aluminum, and painted or treated wood, high performance paint and fiberglass. Within 30 seconds of application, the shear strength of the material exceeds that of tape. The unit can be turned over immediately for work on the second side. Units can be shipped as quickly as they are fabricated, dramatically improving delivery times and reducing warehousing space and associated costs.

The quality of the finished unit is enhanced for two reasons. First is the well-known performance and longevity of silicone sealants. Second is the viscosity and uniform bead size of the reactive hot melt. The bead holds its shape well, even while glass is being pressed onto it. There is no squeeze-out, little material waste and no contamination of the sash. The consistent bead ensures proper spacing between glass and frame. Ferrera also likes the fact that the sealant is clear, so it never distracts from the aesthetics of the window.

This unique, neutral moisture cure material forms a 100% silicone sealant. Moreover, the volatile organic compound content is low enough to be exempt from California VOC regulations, the strictest in the nation. The sealant is non-hazardous, odorless and worker friendly.

Automated glazing

The development of a reactive hot-melt silicone sealant puts the advantages of automated glazing within reach of any window and door fabricator performing manual tape operations. Dow Corning and their preferred equipment suppliers work with customers to supply pre-engineered pump, dispensing and X-Y glazing table combinations. With this equipment,

fabricators can increase output two to four times while reducing labor hours. The charts below show an example of the labor savings and increased production that can be realized by a manufacturer switching from five tape glazing lines to automated glazing with InstantGlaze, working one 8-hour shift per day, five days per week.

As this example shows, the equipment investment pays for itself in less than nine months, so increased profits begin to accrue during the first year of operation.

Dow Corning InstantGlaze is specifically designed to enhance the efficiency and cost benefits of both sealant and equipment. “This sealant advances window assembly and quality to a new level. The ability to increase production speed while producing better products is a technology sought by all manufacturing processes,” says Don McLane, president of the adhesive systems group at Nordson Corporation, a pump manufacturer. “Utilizing *Dow Corning* InstantGlaze sealant in conjunction with Nordson dispensing technology delivers a reliable production process with a consistent, high-quality window.”

Automatic dispensing equipment also improves quality by applying a sealant of uniform diameter, no matter what the line speed. According to Jerry Wells, outside sales for equipment manufacturer Erdman Automation, this optimizes the efficient application of InstantGlaze. Wells says, “*Dow Corning* InstantGlaze offers both instant stick and long range performance benefits. I think they really have a good material here.”

While fabricators switching from glazing tape to *Dow Corning* InstantGlaze will realize the greatest gains, those already using automated technology also can increase productivity because of the fast cure and reduced assembly time the sealant allows. Anthony Ferrera says, “It is clear we have reduced the post-glazing labor that used to be spent on clean-up and adjusting prior to shipping. The sealant also eliminates the 24-hour cure period. Since we have been testing this material, I’ve embraced it. It’s a wonderful product, not only in production, but for its performance as well. We have three lines using it now and I am planning to convert the entire building by the end of the year.”

Tod Oliva, vice president for equipment manufacturer Besten, Inc., confirms that the sealant optimizes the performance of automated X-Y glazing tables. “It speeds process time by reducing the time required for assembly. This increases throughput. We’re pretty impressed with it.”

Reactive hot-melt silicone technology puts the advantages of silicone performance and automated glazing operations within reach of fabricators of all sizes. Oliva says, “*Dow Corning* InstantGlaze is still new, but it appears to solve an issue many of our customers have – getting the long-term benefits of silicone with the immediate benefits of double-sided tape. It satisfies both. As a table manufacturer, we see that as meeting a need in the industry.” Whether fabricators are making new or replacement windows using wood, vinyl or aluminum, the increase in productivity and profitability makes this new system very attractive.

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Productivity	Manual Tape Glazing	Automated Glazing with Reactive Hot-Melt Silicone
Labor hours	48,000 hours	29,000 hours
Number of operators	25	15
Units produced per hour	750	1,000
Annual capacity	1,224M window units	1,632M window units

Cost Savings	Manual Tape Glazing	Automated Glazing
Tape/sealant cost per year	\$600M	\$649M
Labor cost per year	\$720M	\$432M
Cost of waste per year	\$30M (5%)	\$16.2M (2.5%)
Cost of window rejects/scrap per year	\$450M (0.5%)	Negligible
Total annual glazing operations costs	\$1,800M	\$1,097M
Annual savings	N/A	\$702.8M
New equipment investment	N/A	\$500M
Estimated payback	N/A	0.71 year



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