Go Decorative

Options, opportunities and challenges in decorative glass fabrication

By Douglas Canfield

For many successful glass businesses, decorative glass can provide new opportunities and growth potential. Architects, interior designers, homeowners and commercial clients increasingly look to decorative glass to enhance their designs. While more traditional glass products such as shower doors, mirrors and fabricated glass are now almost commodity products, glass companies can find opportunity to create added-value products through decoration.

Prior to investing in new equipment to produce more value-added decorative glasses, company leaders need to consider their customers, competitors, market demands and factory capabilities. Additionally, companies need to identify the scale of glass products they will be providing.

Fabricators can pursue two general directions with decorative glass: architectural applications working with large sheets of glass and high volumes for commercial and residential projects; or, more specialty added value products that may be specified by an architect or interior designer for unusual or high-end projects. To determine which path to take, one should evaluate the competitors in their area and potential customers. Business owners should also ask themselves how far out of the current service area they are willing to go to service these new customers.

Additionally, company leaders should become familiar with the various decorative glass options, and should investigate the market demand and trends for each glass type. Companies should become aware of the manufacturing considerations for the various fabrication processes. The incorporation of some decorative fabrication machines will be easier for some facilities and companies than others based on current operations and staff.

This article offers an introduction to a number of value-added decorative glass products and their fabrication processes.

Coated and spandrel glass

For fabricators looking to produce decorative glass at a higher volume, coated and spandrel glasses may present a good opportunity.

Spandrel glass is used to obscure the viewer from seeing what is behind the colored glass, and is commonly used between floors on the outside of large buildings or for decorative colored panels. Typical spandrel glass is coated with either a ceramic or silicone based paint/ink.

Ceramic inks are generally roll coated onto the glass, while silicone inks can be either roll coated or sprayed. Ceramic inks offer increased durability, but they come with a more limited color selection. Ceramic inks are applied to annealed glass, dried with an infrared oven and then the ink is fired into the glass as part of a tempering operation.

Silicone inks, on the other hand, are available in almost any color. They can be applied to both annealed glass and tempered glass. The silicone inks can be dried in a low temperature infrared oven or even air dried. Sufficient coating thickness will also provide some glass fallout protection and the coatings can be patched in the field. Silicone inks do not have the strength of the ceramics.

A roll coater and dryer can be designed to process both ceramic and silicone based products. It is generally recommended that the width of the spandrel equipment match your tempering furnace. Most common widths are 84 inches, followed by 72 inches and 96 inches. Line speeds for these machines run from 5 to 30 feet per minute with output varying on the glass sizes that fill the conveyor. Spandrel equipment can easily be incorporated into a plant that has tempering equipment.

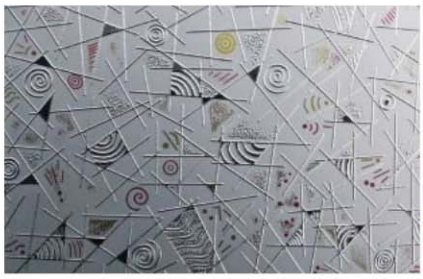
Printed glass

Fabricators looking to produce printed glass products can incorporate either a screen printer or a digital printer. The choice between the two technologies is dictated by the customer base for either one-of-a kind or low volume per print production (digital printer) versus high production of the same image (screen printer). Both technologies involve significant investment.

In architectural applications, printed patterned glass offers aesthetic benefits and provides important bird-safe benefits, a growing concern in today's architectural market. Decorations such as lines and dots on large commercial glass minimize bird impacts on the windows. This glass is generally created with large area screen printers where single color ceramic inks are applied, dried with an infrared oven and then fired into the glass during the tempering operation.

Some repetitive patterns can be applied with a roll coater that has an embossed print roll. Large screen printers are generally offered as "half automatic," where the operator rolls the glass onto the print table and positions it against registration stops, or "three-quarter automatic," where the glass is conveyed on and off the table but still with manual registration. The three-quarter automatic allows large sheets of glass to be fed from a washer and then to proceed automatically to the dryer.

For fabricators looking to produce custom decorative glass in various sizes, one-of-a-kind or low quantities



Top Row (left to right)
Casso-Solar Technologies standard spandrel oven for both ceramic and silicone inks. The oven can also be used for screen printed products. Glass widths up to 96 inches and line speeds of up to 15 feet per minute are possible.

Custom glass furniture from Galaxy Glass & Stone, galaxycustom.com. The glass is laminated with a decorative colored film to give this unique effect.

Casso-Solar Technologies Vacuum Batch Laminating System utilizes both infrared and convection technologies; twin chambers each with two trays allow for flexible operation to laminate glass with PVB, EVA or Kuraray SentryGlas. Dual heating technologies shorten cycle times over standard convection oven systems. Trays accept glass at widths of 72 inches, 84 inches and 96 inches and lengths of 72 inches, 144 inches and 216 inches.

Bottom Row (left to right)
Glass with screen printed circle pattern, from Glass Unlimited, glass-unlimited.com.

Acid-etched glass with spot color of ceramic ink, fired into the glass and available in jumbo sheet sizes for fabrication into wall art, doors, partitions. Produced by Vidriera del Cardoner, vidrieradelcardoner.com.

Casso-Solar Technologies shuttle system for cast and pattern glass. Glass sizes of 96 inches by 144 inches are possible.

Fabricators should carefully consider their end market goals before investing in a screen or digital printer.

of large graphic images can be created with digital printers. Digital printers can fabricate glass from small to jumbo sizes. The printers, much like your inkjet printer at home, deposit special colored ceramic ink onto the glass that is dried with an infrared dryer and then fired into the glass as part of the tempering process. Printed glass products are used for interior and exterior panels, and for artwork and specialty projects.

Fabricators should carefully consider their end market goals before investing in a screen or digital printer. Comparing digital printing to screen printing, if a large run of a single color image is to be printed, the screen printer can output one part every two minutes or so. The digital printing time would be considerably longer. However, when multiple colors are required, screen printers require separate screens for each color and also drying of the ink between prints making this cumbersome for the specialty projects.

Specialty laminated glass

Specialty, decorative laminated glass offers another opportunity for glass companies. However, fabricators should note that standard laminating lines used for architectural and hur-

ricane glass do not work well with art laminated glass. Specialty laminated glass requires process positioning and often uses vacuum systems instead of the roller press systems.

Extremely unusual effects can be created by laminating objects such as a fabric, woven wood, metal mesh and almost any object that can be compressed flat between two pieces of interlayer material and then glass. Such laminations are generally suited for interior applications and use of ethylene-vinyl acetate (EVA) as the interlayer material. Polyvinyl butyral (PVB) or Kuraray SentryGlas can also be used as an interlayer material for exterior applications. One can also print bright images on a transparent film which is then similarly laminated producing very dramatic effects.

These high value products are generally laminated in an infrared/convection batch vacuum oven which assures that the assembled product keeps all of its components in proper alignment. Alternately vacuum bags can be used for the products and process can be completed in an autoclave with vacuum assist.

Graphic design capabilities are very important when creating truly high value-added laminated products. Care must be taken in the placement of the decorative interlayer materials to achieve the final effect.

It is generally recommended that a vacuum oven be sized for either the largest size glass that you will process or to accept multiples of the most common sizes offered to your customers. Ovens with a combination on convection and infrared provide the best uniformity, faster process times and best quality.

Multiple oven chambers help with small batches or batches of different products so that you can run one chamber alone or run different products in each chamber. Ovens are available up to 96 inches wide by 216 inches long, although the most requested bed size is for glass 84 inches by 144 inches. Process times vary from 2 to 4 hours per batch depending on the interlayer used and the decorative materials. Pushing the process may result in poor laminations and field failures.

Back-painted glass

Equipment for the production of back-painted glass is one of the lower cost options and is a good entry point for a company not decorating glass at this time. Applications such as decorative colored partitions, kitchen back splashes and colored counters, generally used for interior applications, are created with back painting using organic or epoxy paints. The glass is generally cut to the final size, edged, tempered if required, and the paint is then applied with a conveyorized automatic spray application system to ensure a uniform coating that will have good visual qualities. These paints are typically dried in infrared or combination infrared/convection dryers with dry times of two to 10 minutes depending on the ink type and thickness.

Automated spray systems and dryers vary in size with the largest product that is to be made. Typical widths are 72 inches to 96 inches, with glass lengths of up to 12 feet.

Acid-etch and sandblasted glass

Complex decorations can be made through the combination of screen printing or digitally printing an image and then flood coating the back with a solid color. Acid-etched or sandblasted products can be enhanced with the addition of color from a screen printer or digital printer. Acid etch effects can be simulated with ceramic inks that have low solids content. These products may be commissioned projects from architects and designers, or can be a specialty product offered by a glass company.

Acid-etch machines are complicated and expensive, as the ceramic ink is fired into the glass, and the glass is cooled slowly to prevent stress buildup (annealed like original float line glass). Often the final product is offered in the annealed or un-tempered state so that the end user can cut the size they need and then temper or laminate it as needed. Acid-etched products require special equipment operation knowledge, thus there are few companies doing this on a large scale.

Sandblasting equipment, on the other hand, can be simple hand held systems relying on the operator to create the image. Faux sandblast/etch products can be created using semi-transparent ceramic inks screen printed onto the glass.

Cast glass

Cast glass is a specialty area that generally is not the first jump into decorative capabilities. Cast or pattern glass can be offered as a standard product collection or by spec from an architect, interior designer or customer.

Specialty pattern glass or cast glass can be creased in a high temperature kiln where repetitive imprints can be made with a ceramic mold or special one-of-a-kind patterns can be created in a bed of sand which the glass will soften and mold into. Kiln sizes vary from small art type kilns to very large systems than can handle glass sizes such as 96 inches by 144 inches. Time to process varies with glass thickness, but can be between 8 and 30 hours.

Glass fabricators have many choices and opportunities today when it comes to decorative glass. Become educated about the market and the options before investing. Machinery suppliers, and ink and/or paint suppliers can provide additional assistance to make sure a company chooses the right product for the market they wish to serve.

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