

## UV Inks Enhance Glass' Position in Packaging Market



It's no secret that glass packaging has been losing ground to metal cans, plastic and other options offering lighter weight and varied color/decorative appeal. In spite of this, billions of products are sold in glass containers in the United States every year due to the advantages of glass: its transparency, high quality image, and ease of recycling.<sup>i</sup> Most, if not all, glass containers are labeled in some fashion.

Glass and ceramic decorators, those making beverage bottles, drinkware, mirrors and flat glass, packaging for cosmetics, perfume and personal care products, desire the advantages that plastic decorators enjoy – namely the ability to directly print multiple colors at high speed, in any color, free of heavy metals, and with quick, simple, and low-cost curing. Regulations restricting the use of inorganic inks containing heavy metals and rising energy costs increased the need to find better solutions for glass decorating.<sup>ii</sup> UV curable inks provide glass packaging the advantage it needs to win market share.

### The Existing Decorating Options

Typically, decorative indicia are applied to glass using paper labels, decals, or a process known as applied ceramic labeling (ACL). ACL involves first printing the glass with an ink composition that may contain various heavy metals such as lead, cadmium, and chromium, then bonding the ink to the glass by baking in an oven known as alehr at temperatures of 1,000°F or more for several hours.

The table below shows comparisons of different glass decorating options.

Glass Decorating Comparisons				
	Paper Labels	Decals	ACL	UV Inks
<b>Cost</b>	Low	High	Medium	Medium
<b>High End Look</b>	Poor	Poor	Good	Excellent
<b>Water Resistance</b>	Poor	Poor	Excellent	Good
<b>Abrasion Resistance</b>	Poor	Poor	Excellent	Good
<b>Chemical Resistance</b>	Poor	Poor	Excellent	Excellent
<b>Energy Costs</b>	Low	Low	High	Low
<b>Environmental Concerns</b>	None	Recycling Problems	VOCs, Heavy Metals, Clear Must be Recycled into Colored Glass	None, Easy Recycling

## UV Ink Solutions Available

UV curable glass decorating screen inks in high gloss, satin, and specialty effects are available from a variety of formulators including Ruco Inks, Coates Screen, Ferro Corporation, Marabu Inks, Nazdar Ink Technologies, and Norcote International. Glass and ceramic decoration requires inks with high adhesion, scratch resistance and water resistance. For example, cosmetic containers need resistance to alcohol and essential oils, while beer and soft drink containers need abrasion resistance and resistance to water, and drinking ware needs resistance to dishwashing.

UV inks meet these requirements and contain no solvents or heavy metals. Also, because they do not contain solvents, there is no evaporation, so the thickness of ink applied is the final cured thickness. Another benefit is that the lower cure temperatures allow the use of organic pigments. This results in the ability to achieve virtually any color, even bright colors that were previously a challenge with traditional inks.<sup>iii</sup> Color matching is much easier with UV inks as compared to the ACL process which changes colors during the lehr heating.

Most glass UV screen inks do not require any secondary heat curing, but usually some type of flame pretreatment or primer application is recommended to ensure good adhesion to the glass. This is especially true for glass containers which are typically sprayed with a cold-end coating after the annealing process.

Some UV screen printing inks for glass and ceramic do not require a primer or pretreatment, but need a thermal post-cure to ensure excellent adhesion. Even with this post-cure, significant energy savings is achieved because the temperatures are much lower than those required to cure traditional inks. Multiple color prints with short UV intermediate curing on screen printing systems can easily reach speeds of 80 bottles/minute on existing machines, with higher speeds of 150 bottles/min. possible on new machines.

Actual curing speeds with UV-curable inks will vary depending on the color and opacity of the ink, screen mesh, UV curing equipment and other printing parameters that affect ink deposit.



## Glass Decorating Machines Available



Most glass decorating machine builders offer a UV curing version. These machines can decorate bottles at high speed (150 bottles/min) with excellent color-to-color registration of the printed images. The UV curing capable decorating machines save space because of the elimination of the Lehr. In addition, production can commence any time of the day without having to preheat for an hour or unload the oven, as is the case with a Lehr, saving

both time and money.

It is also possible to retrofit an existing decorating machine with UV cure stations instead of installing new machines. While this is less costly, this reduces the number of screen print stations available and the line speeds possible. In a typical retrofit, a screen print station must be replaced with a UV curing station because there simply is no room to fit the UV curing stations between the existing print stations. So the result is that a two color decorating line becomes a single color line, and a four color line becomes a two color line. The limiting factor for line speeds in a retrofit scenario becomes how fast the ink can be applied. So although a new machine requires additional initial cost, the machine can print and cure any desired number of colors and can run at higher speeds. So glass decorators need to factor this into their return on investment analysis when considering adding UV curing capabilities.

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<sup>i</sup> Maitland, F.J., "Glass Coloration Made Easy: Adding Value to Glass", Ferro Corporation presentation to Society of Glass Technology, May, 1999.

<sup>ii</sup> Koch, George, Chadwick, Robert, "A New "Cure" for Screen Printing", Ceramic Industry, Sept. 2001, p.39.

<sup>iii</sup> Koch, George, "UV Curable Inks for the Decoration of Glass and Ceramics", Ruco Inks prepared presentation for Society of Glass & Ceramic Decorators, Glass and Ceramic Decorating Seminar, Arlington, VA, October, 2001.

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