

Decals 101

► Decals enable the decoration of irregular ceramic and glass surfaces that would otherwise be impossible through direct printing.



by François Caron, Production Manager, and Sylvie Strevey, Sales Manager, Fylograf inc., Trois-Rivières, Québec, Canada

Also known as transfer or indirect printing, decals are primarily applied in an industrial setting process that enables uniform decoration on ceramic and glass pieces for mass distribution. The use of decals to decorate pottery in an industrial setting dates from the mid-18th century. English earthenware decorated with decal images first appeared at Wedgwood in Stoke-on-Trent, UK. The first successful pattern was called “Cream Ware.”

Decals are used to decorate, mark or identify ceramic ware in several markets, such as tableware, tile, lighting, sanitary-ware, promotional products and insulators. Typical examples that best illustrate the use of decals for ceramics include

commemorative plates, collection plates and dish services. Custom decals enable the reproduction of images such as pictures, drawings, illustrations, paintings, posters, logos and signatures.

Basic Operation

Decals are sometimes confused with stickers; stickers are color prints that are attached via an adhesive. Ceramic decals, however, allow the transfer of images to the ware and are made from enamels that are fused on the piece once transferred and fired.

Decals offer the advantage of flexible application; they enable the decoration of irregular surfaces that would otherwise be impossible to decorate in direct printing, such as concave or convex

pieces. In addition, unlike direct printing, decals do not have any difficulty in color reproduction or the use of many colors in an image.

After firing, the color print will be vitrified and fused onto the piece, making the color print permanent.

Decals are of two types: water-slide and heat-release. Water-slide decals are best suited for small and medium runs, since the transfer is done manually. Heat-release decals enable the transfer of a large number of pieces in a short time, but they require sophisticated equipment.

The inks used to make ceramic decals are called enamels and are made of colored mineral pigments or precious metals such as gold and platinum. Once the enamel colors are selected, the patterns are printed on decal paper specially designed for this purpose.

The final step is to print the varnish of transfer (or cover coat). This coating completely covers the pattern and enables it to transfer to the ceramic or glass surface to decorate. It disappears during the firing process and leaves no trace. The fusion temperature of the enamels is between 1050-2550°F (570-1400°C), depending on whether the piece to be decorated is glass or ceramic. An inadequate firing temperature makes decals delicate; firing according to the recommended temperature makes the decal permanent.

Three types of enamels are specific to ceramic:

- Onglaze—for surface decoration; vitrified at 1350-1450°F (700-800°C)
- Inglaze—for decoration in the glaze; vitrified at 1850-2200°F (1000-1200°C)



The color print is dragged from the decal paper to the ceramic or glass surface to decorate.



A squeegee is used to remove any water and air bubbles.



Excess water is removed, and the piece is allowed to dry at room temperature for one day.

- Underglaze—for decoration under the glaze (directly on the ceramic bisque); vitrified at 2200-2550°F (1200-1400°C)

Reproducible Colors and Half-Tones

The enamels used for manufacturing decals are pigments of mineral origin and, as such, cannot reproduce all colors. For example, vibrant colors such as fuchsia and lime green are shades for which there are no enamels.

The printing of half-tones can be achieved by ceramic decals. Unlike conventional printing, however, the blending of process colors (known as CMYK, or cyan, magenta, yellow and black) cannot always sufficiently reproduce all the shades contained in pictures and photographs. Therefore, additional colors must be added, especially for reds, oranges and some greens.

In response to recent regulations, pigments are now free of heavy metals, such as lead and cadmium, which makes the decoration safer but unable to reproduce certain colors. To mitigate increasingly strict environmental and health standards, some manufacturers have developed organic inks for printing decals. These inks contain no heavy metals and are not derived from minerals.

Since they are not enamels, organic inks do not require firing or fusion—only a little heat. However, the absence of fusion with the piece affects the adhesion of the color print and results in a product whose decoration is not as durable as what can be achieved with a traditional decal.

Organic decals offer a nearly limitless range of reproducible colors—comparable to available conventional printing colors—including bright colors. They can also be used to decorate glass, metal and certain plastics.

Application Process

The recommended steps to transfer decals and optimize quality are simple and require minimal equipment: a water pan, a small flexible squeegee, and a cloth. First, place the decal in a pan of warm water. Let it soak for a few seconds, then place it on a clean surface. The color print should be able to slide from the paper surface after 30-60 seconds.

Drag the color print from the paper to the ceramic or glass surface to decorate. Apply and adjust the color print, and remove any water and air bubbles by rubbing the squeegee from the center of the print to the outer corner. Remove any excess water and allow the piece to dry at room temperature for one day.



Custom decals enable the reproduction of images such as pictures, drawings, illustrations, paintings, posters, logos and signatures.

After drying, the decorated piece will be ready to be fired to the required temperature. After firing, the color print is vitrified and fused onto the piece, making the color print permanent.

Myriad Possibilities

Decals have a long history and will continue to evolve and adapt to ever-changing markets. Ceramic manufacturers are increasingly integrating decals in the realization of their work. In combination with other techniques, decals can provide an additional source of expression. 🌐

For more information, contact Fylograf inc. at 2105 Sidbec-Sud, Trois-Rivières, Québec G8Z 4M6, Canada; call (819) 693-9700; fax (819) 693-3464; email information@fylograf.com; or visit www.fylograf.com.