



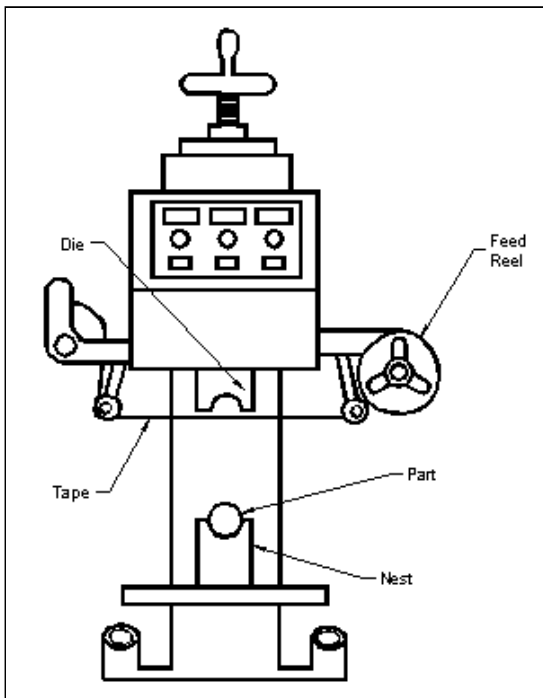
Printing and Decorating Parts Molded From Geon® Rigid Vinyls

Geon rigid vinyl compounds offer molders the advantages of a wide range of engineered properties, ease of processability and operational economy. Additionally, rigid vinyl parts molded from Geon compounds are amenable to a variety of common secondary manufacturing operations involving printing and/or decorating the surface of a part.

Where parts require the application of accent trim, labels, logotypes, end-user directions, warnings, etc., Geon rigid vinyl readily accepts printing and decorating by hot stamping, silk screening and pad printing techniques.

HOT STAMPING

In the hot stamping process, woodgrained, pigmented, or metallic designs are sandwiched between special coatings on a release carrier strip or tape. The designs are then transferred to the surface of the part via a heated stamping die, which is first pressed against the tape, then against the part.



When Geon rigid vinyl parts are to be imprinted by hot stamping, the following factors will help guarantee the success of the imprinting operation:

1. Mold designers must allow sufficient wall thickness of the printed part so that it will not deform under stamping pressure.
2. Imprinting is most successful when limited to flat, or simple curved (cylindrical) surfaces.
3. When imprinting large surface areas, such areas must also be designed as flat as possible.
4. Mold surface finish, especially in areas corresponding to part areas to be imprinted, should be specified for polishing.
5. Parts should be designed so that mold release agents are not necessary.
6. A "nest" must be designed to secure the part during the imprinting process.

The part is usually "hand located" in the nest which secures it in the proper position to receive the hot stamped image. Nests can be constructed of several materials including cast epoxy, cast or machined aluminum, wood, etc. Material selection is determined by the quantity of parts to be produced (a high volume of parts requires a nest able to handle the wear), overall operational economy, and nest rigidity required to maintain proper image registration during the hot stamping process.

One variation of the hot stamping process is to transfer the design from a tape to the surface of a part by use of a hand-held roller with a silicone rubber surface. This process offers the advantage of applying a design to a relatively large area; e.g., the placement of an accent stripe around the perimeter of a part.

General purpose transfer tapes used for most plastic substrates will work very well with Geon rigid vinyl. Manufacturers (considering vinyl part imprinting by hot stamping) should discuss their specific imprinting needs with Geon Technical Service Representatives to solicit their recommendations. In many cases, samples of imprinted vinyl parts can be prepared and tested in advance of production.

Hot stamping tapes can be purchased from suppliers such as: Webtech, Inc., Robbinsville, NJ; Dri-Print Foils, Inc., Rahway, NJ; Decorating Resources, Color-Dec Division, Pitman, NJ.

SILK SCREENING

In the silk screening process a selectively permeable screen is used to deposit the inked image onto the plastic part. A relatively inexpensive process, silk screening yields a high quality print image. Registration, in the transfer of intricate designs, however, can present a problem. For that reason, silk screened images are usually limited to two colors.

Silk screening offers the advantage of eliminating the need for backup tooling to support the part as very little imprint pressure is necessary.

A "wet process" by definition, silk screened designs must be dried (by any of several methods) after imprinting, which adds a production step. Where solvent-based inks are used, the silk screening area must be well ventilated for personnel protection.

For optimum image adhesion with any ink, mold surfaces should be vapor-honed to produce a matte finish on the molded part. After exiting the mold, the part should be wiped with anhydrous alcohol to remove dust, residual mold release, and fingerprints prior to imprinting. Printing on textured surfaces is not recommended.

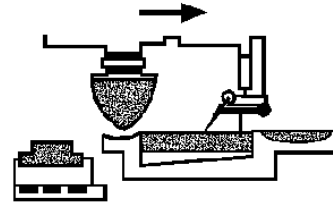
Ink suppliers are: Naz-Dar, Inc., Chicago, IL; Advance, Excello Color & Chemical Division, Chicago, IL.

PAD PRINTING

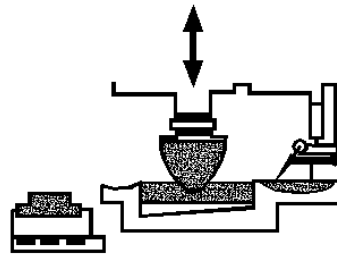
Transfer pad printing, more commonly known as pad printing, is an indirect gravure process wherein a silicone rubber pad is used to transfer an inked image from an engraved plate, known as a "cliche," to a part. Pad printing (one or more colors) can be applied to flat, cylindrical, or even odd-shaped plastic parts. Lightly textured plastic parts, as well as parts exhibiting some sink marks have been successfully printed.

A transfer pad made of a mixture of silicone rubber, silicone oils and other fillers is the heart of the pad printing process. Shape and hardness of the transfer pad are necessary to the successful transfer of images by this method. Generally, the largest possible pad is used to minimize distortion. A cone (V-shaped pad) can be used to achieve good roll-off as well as minimize the possibility of air entrapment.

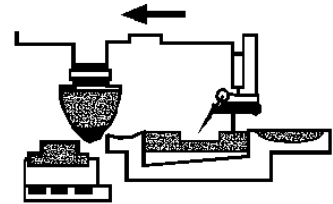
Printing plates (cliches) are available in several different materials. Hardened, lapped steel is most often used in applications requiring long production runs. Plates are etched to depths ranging from 0.0006 to 0.0012 inches. It is not uncommon for a plate of this type to produce 10 million impressions.



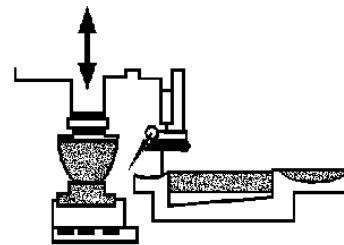
A. In the standard transfer pad printing process the assembly moves to the right as the "doctor" blade removes excess ink from the printing plate ("cliche").



B. The transfer pad is then lowered to press against the inked plate.



C. The transfer pad (now holding the image) lifts and moves left toward the part to receive the image. As the pad moves away from the plate, new ink is deposited on the plate.



D. With the image (now) slightly tacky, the pad descends to imprint the part. When step D is completed the transfer pad ascends and moves right to start a new cycle as a new part moves into the imprinting area.

PAD PRINTING PROCESS

FACTORS	HOT STAMPING	SILK SCREENING	PAD PRINTING
coverage	limited by press size	almost any size	image within 100 sq. in.
image density	opaque over large areas, possible air entrapment	opaque	less opaque tends to wash-out over large areas
multi-color registration	fair-good	fair-good	fair - good
detail	good	good	better
part shape limitations	flat to regular curve	flat or cylindrical	flat to somewhat irregular
substrate variation tolerance	slightly forgiving silicone die conforms	important, sink marks blemish	forgiving, minor sink marks Ok
ink drying time	none	slow	fast
EPA issues	none	possible VOCs	possible VOCs
operator competency	hours - days	days - weeks	days - weeks
operator skill level	unskilled	semi-skilled	semi-skilled
equipment cost	large areas and multi-color expensive	inexpensive except multi-color	large areas expensive
tooling cost	low - moderate, multi-color higher	low - moderate, multi-color higher	low - moderate, multi-color higher
consumables cost	expensive over large areas	inexpensive vs coverage	inexpensive vs coverage
overall advantage	metallics, wood grains	large areas coverage	fine detail print, wet-on-wet

VINYL PART PRINTING AND DECORATING TECHNIQUES COMPARISON CHART

While pad printing inks are similar in composition to inks used for silk screening, they should not be used interchangeably. A good ink for pad printing allows for wet-on-wet, multicolor printing that is dry to the touch within 30 seconds after transfer. Multi-purpose, single part epoxy inks give excellent results when used on Geon rigid vinyls. Two part epoxy ink systems can be used if additional hardness and abrasion resistance are required. Ink selection for pad printing should be discussed with ink suppliers in advance of their use. Ink selected should be tested to ensure that the imprinting meets specification.

Pad printing inks can be purchased from suppliers such as: United Silicone Inc., Lancaster, NY
Trans-Tech America Inc., Schaumburg, IL

For additional information on printing and decorating parts molded from Geon rigid vinyl compounds contact your Geon Vinyl Division, sales representative.

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