

ROLL LEAF STAMPING By Kensol-Olsenmark, Inc.

Hot Leaf Stamping (also known as roll leaf stamping) is one of the oldest methods of marking and decorating. For many years, this process was used only for lettering and tooling in pure gold on book covers, leather goods, etc. The development of imitation gold, silver, pigment color foils and improved stamping equipment made the hot leaf process a high speed, industrial method of marking and decorating plastics, paper, wood, cloth, leather, hard rubber and some coated metals.

The hot Leaf stamping technique was first used on plastics for trade-marking consumer items, such as combs and toothbrushes. As plastic s found more uses and larger items were molded, the molders, equipment manufacturers and roll leaf manufacturers cooperated to improve their products and develop new techniques for decorating and finishing plastics, using the hot leaf process.

Hot leaf stamping is a branding technique which involves the use of a stamping press, an engraved metal die, or a flat silicone rubber pad, roll leaf material or foil, and a nest, jig or fixture which both supports and positions the item to be marked.

The stamping die is mounted in the heated head of the press, with the item to be marked, positioned directly below on the press work table. A roll of stamping leaf is mounted so that the material passes between the die and the item. When the heated die is brought into pressure contact with the plastic, the heat softens the plastic surface and transfers the roll leaf coating into the depressions made in the plastic by the die. When raised areas are to be marked, the flat silicone rubber pad is used instead of a die. With each impression, the strip of roll leaf is advanced to an unused portion by an automatic roll leaf attachment. Since roll leaf stamping is a "dry" method, the stamped item can be handled immediately without fear of smearing the mark. This complete marking cycle normally will vary from one-half to five seconds, depending upon the degree of hardness of the plastic, the plastic is resistance to heat, boldness of the mark, stamping die temperature, and pressure applied by the die.

A plastic item that has been hot stamped will have the metallic or pigment coating "inlaid" into depressions made by the heated metal die, or raised areas molded in relief will be coated using a silicone rubber pad.

Although the majority of hot stamping applications are on thermoplastics, thermosetting materials can be hot stamped by using sharply engraved hardened steel dies under relatively high heat and pressure.

One of the advantages of hot stamping is that both flat and contoured surfaces can be marked by this method. In order to mark a contoured surface, the die is accurately shaped to match the part. The "up" and "down" action of a standard

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hot stamping press can mark up to 90 degrees or one-quarter of the circumference of a cylindrical (round) shape.

A hot leaf stamping operation requires the following:

- 1) Stamping equipment of the proper size and pressure range.
- 2) Roll leaf formulated for the particular plastic to be decorated.
- 3) An accurate die, set of loose type, or silicone rubber pad.
- 4) A supporting surface that will both support properly the areas to be marked, and position the mark in the desired area.

Stamping equipment must have a stamping or impression area large enough for the size mark to be made, and a frame large enough to take the over-all dimension of the item. It must be capable of developing enough pressure that will be required for the work (pressure required depends upon the size of the mark, and hardness and resistance to heat the plastic).

A stamping press should have an adequate heating system controlled by an adjustable thermostat. The head should be capable of heating quickly and maintaining heat up to 450 degrees F. In stamping operations, heat settings vary from 175 degrees for cold operating leaf to 450 degrees F. for silicone rubber pad stamping and phenolic marking. Once the thermostat is set, it should accurately control the temperature. This is extremely important, as too low a temperature for a given roll leaf causes it to release incompletely, resulting in a partial print. Too much heat causes the leaf to overflow, fill in the impression and sharpness of the detail is lost.

An accurate, adjustable dwell control on the press is also necessary. The softer plastics, such as vinyl and polyethylene require a short dwell or "kiss" impression; the harder plastics (polystyrene and the phenolics) require a longer dwell time. On any plastic, fine line detail requires a shorter dwell period than bold lettering.

Finally, a stamping press should have an adjustable pressure control. In general, the same rules apply to pressure as to dwell.

Basically, there are three types of stamping machines; hand-fed - hand-operated; hand-fed - power-operated; and automatically-fed equipment. Hand-operated equipment will prove satisfactory for limited production runs and intermittent use. However, the operator must be skilled, since the uniform dwell time and pressure required for good results are under his control. Power equipment is either motor driven or air operated. Motor driven equipment is available with accurate heat

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and adjustable pressure controls; but dwell time and head speed is difficult to adjust and the motor driven press will not satisfactorily compensate for thickness variations commonly found in plastic items. Air operated machines are therefore the most popular because all three variables, (heat, dwell-time and pressure) can be accurately controlled, and compensation for thickness variations is automatic.

The production rate that can be expected from a hand-fed power press is determined by the required dwell time, size and shape of the part, and dexterity of the operator. Normally, it will vary from a few hundred per hr. on bulky parts (such as radio cabinets) up to 1200 per hr. on small flat parts (such as sheet vinyl novelties). On large molded parts, usually the molding machine operator has plenty of time to de-gate the part, hot stamp it and pack it. Production on most small parts can be increased up to 2500 per hr. through the use of turntable fed power equipment. In some instances, the size and shape of an item is such that it can be channel or hopper fed. Rates of up to 5000 per hr. are thus obtained on combs, toothbrushes, credit cards, and similar high volume items.

Obtaining the proper formulation of roll leaf is of utmost importance. Roll Leaf consists of a thin carrier strip of acetate, cellophane, or Mylar polyester film coated on one side. We have a wide variety of coating formulations that are designed to give maximum adhesion with the various plastics. Naturally, if the formulation is not compatible with the particular plastic being marked, the coating will not release properly from the carrier strip.

In general, there are three different types of pigment foils and three types of metallic. Pigments are available that will stamp with a matte (non-glossy) finish, gloss finish, and transparent colors. Gloss colors are the most popular because of appearance and excellent abrasion resistance. Transparent foils are actually dye coatings rather than pigment colors. These foils are used for decorating automotive deck medallions, horn buttons, etc. The part is usually hot stamped from the back (second surface) and then vacuum metalized for an interesting metallic effect. Transparent foils are also used on household appliance dials and escutcheons that are to be back lighted.

Metallic foils are coated with suspensions of bronze or aluminum powder, with vacuum plated aluminum, and with pure gold. Within the past three years, the vacuum metalizing process has been adapted to roll leaf manufacturing. The use of roll leaf stamping as a method of decorating molded plastic items has increased tremendously with this development. The finisher can now "selectively metalize" well defined areas of a part in a simple stamping operation.

The manufacture of metalized imitation gold, silver and colors is a complex operation requiring several steps. When making a metalized foil, Mylar polyester film must be used as the carrier. Acetate and cellophane will give off gas and

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become brittle during the metalizing process. The Mylar is first coated with a 'release agent which releases the coating off the carrier strip and on to the plastic during the stamping operation. If the foil is to be chrome finish, the release coating is clear. If the finish is to be gold colored, the release coating is dyed to the desired shade of yellow. Naturally, other color metallic can be made, using the appropriate dye. It is important that the dyes used are as color fast as possible to prevent fading. The carrier strip is then vacuum metalized in a chamber. A final sizing coat is applied to facilitate adhesion to the plastic.

One of the big advantages of roll leaf stamping as a method of marking and decorating is that "difficult-to-mark" plastics such as polyethylene, polypropylene, etc, can be marked without any surface treatment.

Roll leaf usually is supplied in 200 foot lengths wound on a 1 inch diameter core. It can also be purchased in rolls up to 1 000 feet for high speed applications. Roll leaf is usually manufactured in 24 inch widths. The leaf supplier cuts it to whatever width the job calls for.

When ordering roll leaf it is important to specify the plastic being marked, whether a metal or silicone rubber die will be used, and whether the part will be painted or vacuum metalized either before or after the stamping operation.

Dies are usually made on a pantograph machine, or by chemically etching the metal. Depth of the engraving is obtained by routing, and the die is hand finished to eliminate burrs that will tear the roll leaf and give ragged looking results. Curved dies are engraved from a blank that is first shaped to match the contour of the item.

Hardened tool steel dies are recommended for long production runs on hard plastic s, (phenolic, polystyrene, acrylics , etc. , }, It is important not to have steel dies hardened until the die is actually tested to see if it matches the part.

As mentioned previously, silicone rubber is used for stamping or "selective metalized" raised letters, figures, trademarks, panels, etc. The desired markings are engraved into the mold. We recommend the mold maker engrave to a depth of at least 35/thousandths. When the article is molded, the areas are raised from the surface of the piece. These raised areas can be on either the viewing side of the item (first surface) or on the back side of a clear item (second surface).

The rubber has enough "give" to compensate for slight variations in the article. The silicone rubber is supplied in sheet form, vulcanized to a thin sheet of aluminum, which simplifies mounting the die to the heated head of the press. Silicone rubber dies should be mounted as close to the heat source as possible and, since silicone rubber is a comparatively poor conductor of heat, the

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stamping head must be held at approximately 4500 in order to maintain the 3000 die face temperature that most roll leaf requires.

The final component in roll leaf stamping is the supporting surface, jig, or fixture, which positions the item accurately under the stamping dies and supports the piece properly when pressure is applied. If the part is not supported rigidly, the work will shift out of level, causing stamping of uneven depth. Poor support is also likely to cause the stamped plastic to crack or craze.

If the desired mark is to be applied over a hollow section in a product, a nest must be made, shaped accurately to conform to the hollow section.

“Making a job ready” is a printer’s expression for leveling the mark with the die so that a perfect impression is made. A job is made ready as follows: After a properly matched supporting surface is provided, a piece of hard, smooth paper or cardboard is bonded to the surface under the stamping area.

An impression is then made on the plastic item which is placed in position on the supporting surface. The impression is examined. Weak or light spots are made heavier by building up the surface under the item with various thicknesses of paper in the necessary areas. Kensol Stamping Presses will compensate for over-all thickness variations found in multi cavity molding. However, through improper molding cycles, molding heat variations, poor mold design, and so forth, shrink marks and other imperfections will be found in the item. In many cases, this problem can be overcome by bonding a thin sheet of firm rubber to the face of the supporting surface. This rubber gives enough to help level an inaccurate piece.

Many shops have minimized make-ready problems by hot stamping directly at the molding machine while the item is still hot. This reduces spoilage due to cracking and crazing, and produces finer quality stamping with less pressure and better adhesion. Many molders cut costs and spoilage on large single-cavity molded items by having the molding machine operator stamp and pack the part with very little additional effort.