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Embossing and Foil Stamping

Techniques made easy

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INTRODUCTION

We hope you find this booklet useful. We hope also that it takes some of the mystique out of the process of embossing and foil stamping. We feel it is both informative and interesting to read. the center spread of this booklet contains examples of the processes that are discussed and described herein.

We are pleased to present this booklet on embossing and foil stamping. It was written to fill a void. The knowledge that is imparted herein encompasses many years of experience collected from craftsmen all across the United States. We realize that their techniques are not the only ones that are being used today. There simply is not enough space in this booklet to detail all methods. We published what we felt was a good sampling.

The research and the writing took almost three years to complete. the article ran as a five part series in Graphic Arts Monthly in January, February, March, April and May of 1983.

It is with gratitude that we acknowledge the following people for their help in putting out the booklet: Gordon Lindstrom of Gordon Graphics, Novato, California; Len Lender, Golden State Embossing, San Fransisco, California; Glen Hutchinson, U.S.E. Foils, Lenexa, Kansas; Roger Olson, Accent Embossing, Minneapolis, Minnesota; Paul McIntosh, McIntosh Embossing, Minneapolis, Minnesota; Murray Grant, Strathmore Paper Company, Westfield, Massachusetts.

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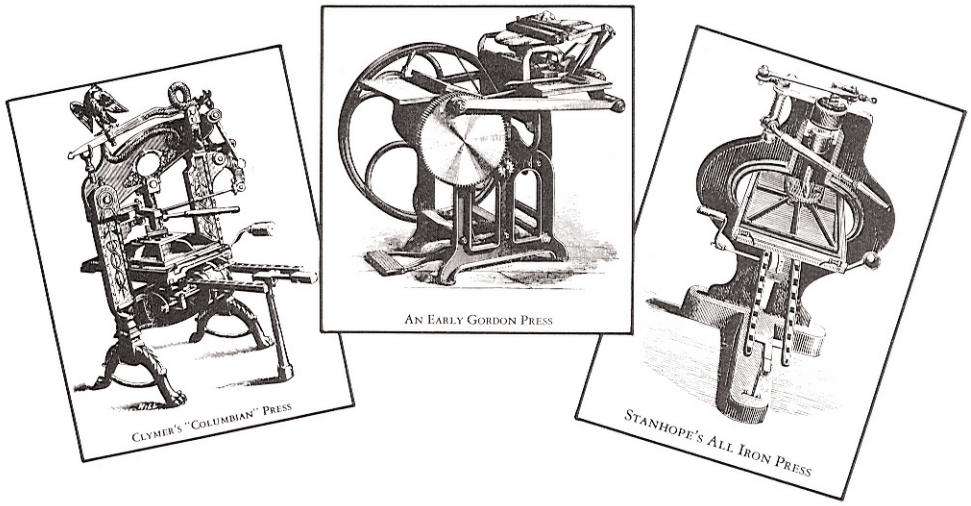


ALL ABOUT DIECUTTING, EMBOSSING, AND FOIL STAMPING

As explained in this booklet, these striking graphic effects are surprisingly easy to understand, master, and utilize

Part One

THE SPECIAL decorative techniques of diecutting, embossing, and foil stamping are very much a part of today's graphic arts industry. Referred to by some printers as three-dimensional printing, these graphic processes carry an aura of mystery.

While a lot of information about diecutting is available, there is very little published material about embossing and foil stamping. With this in mind, we begin a continuing series of five articles on diecutting, embossing and foil stamping. It is hoped that these articles will strip away some of the mystery and shed light on specialty techniques that more job printers might be able to utilize.

The five articles, to eventually be reproduced in booklet form, will be :

• Part 1 - the letterpress machine and its specialty market niche, giving a brief history and comments about its future;

• Part 2 - dies, a background of dies by type, material usage, and proper handling;

• Part 3 - foil stamping and makeready, including the history of foil, its uses, types available, and an explanation of the makeready process;

• Part 4 - paper and a description of qualities necessary for selection, specifically the types best suited for diecutting, embossing, and foil and pastel stamping jobs; and

• Part 5 - how to put embossing and foil stamping into a graphic package, as well as comments about the future and what it might hold in store for the specialty market.

The Letterpress

The basic flatbed design used in conventional diecutting, embossing, and foil stamping is said to be patterned after a wooden wine press; the principle of operation dates back to the era of Johann Gutenberg in about 1450 in Germany and remained unchanged for at least a century and a half.

The first press builder in America reportedly was Adam Ramage. In 1790, he substituted an iron platen and bed for the wood and stone that had previously been in use. For some years. Ramage reigned as the principal press builder in this country.

In 1798, Charles, Third Earl of Stanhope, built the first press with a one-piece, cast-iron frame, and in 1816 George Clymer of Philadelphia built the Columbian all-iron press. The latter would make an impression with one pull of the handle and bore a platen capacity as large as 23 x 32". Its only drawback was that in printing a single sheet, 11 different press operations were involved.

The Gordon press was introduced in 1851 by George Phineas Gordon, who in 1862 developed his improved Franklin Gordon press. This became the standard for the commercial printing industry in the U.S. for some 75 years.

There are three forms of letterpress machinery: platen, cylinder, and rotary. The platen press holds the printing form on a flat bed and obtains its impression by the impact of a flat platen, the entire surface of which meets the type form squarely in a single thrust.

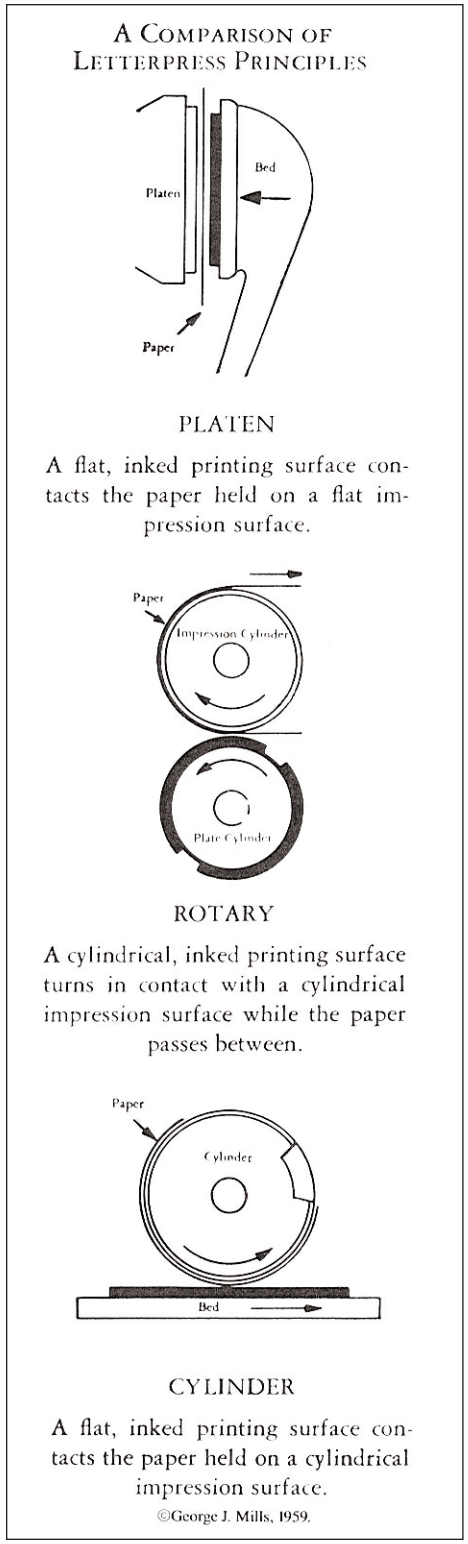
The cylinder press holds the type form on a large flat bed, which moves backward and forward on a track beneath the impression cylinder. Paper carried around the cylinder and receives the impression by a rolling contact with the type form.

The rotary press impression is taken between two cylinders that roll together, one which holds the curved printing plate, the other the packing or makeready. Paper passes between the cylinders and comes into contact with the inked cylinder.

Focus on the platen

The platen press is the one we'll track developments for up to the present simply because most of the specialized work we will discuss is produced on this type of press.

All platen press manufactured today use the basic mechanics that Gordon invented in 1862. The platen moves by cam action form a horizontal open position where the sheet is



fed to a closed vertical position where the impression is made. The Gordon type of platen presses are predominant today and are being manufactured in the U.S. by Brandtjen & Kluge, Inc., Chandler & Price and Thomson National Press, and in Germany by Heidelberg.

The early powered platen presses were all handled and as such were slow in production. Automatic feeders for the platen were introduced in the early 1900s by Climax and Miller. Both had mechanical feeders and thus were not very efficient. Brandtjen & Kluge manufactured the first vacuum-type automatic feeder, which was built until 1931 when Kluge made its first integral automatic press, a complete platen press with automatic feed.

The least complex of the letterpress presses, the platen unit is a piece of equipment that is simple to operate and maintain. The press is described by the size of its chase, which can range from 8 x 12" up to 17 x 25" in the automatic model. Larger platen presses are available in hand-fed models.

The simple principle of the platen press has evolved over the past three decades into a piece of equipment that can handle the specialty operations of embossing and hot stamping better than any other press.

It offers the printer various advantages over cylinder and rotary models: faster makeready, feeding design that can better handle heavier material for diecutting, use of less-expensive steel rule dies, greater adaptability to smaller sheet sizes as well as odd-shaped stock, and less cost to purchase and to operate.

Maximum strength

Its mechanism allows for a maximum of impressional strength on each cycle, strength needed to produce foil stamping and embossing. The addition of a full bed-size die heating plate enables the platen press to perform thermal diecutting, a process that is used today on vinyls.

The years from 1930s to the 1950s saw the Kluge automatic platen press emerge as the dominant automatic press. During World War II there was a Kluge on almost every armed forces base and aboard most U.S. seagoing vessels. In 1947 when the postwar economy was booming and letterpress printing was extremely popular. Kluge was producing 300 presses a month on an assembly-line basis. But by the late 1950s most printers began to turn to offset printing, mainly because of the many advantages of offset platemaking that letterpress could not overcome.

At this time, Chandler & Price discontinued manufacturing the 10 x 15" and 13 x 18" platen presses, but the company was starting to energetically expand into the offset equipment market.

Kluge, meanwhile, made the decision to diversity its press and by so doing take advantage of the potential of the platen press in serving specialty markets. With the aid of engineering design and solid state electronics, it came up with the D series press, a press with impressional performance virtually unmatched in its size in the marketplace.

At the same time, embossing and foil stamping became popular as a result of the promotion of the process by equipment manufacturers and foil suppliers. Not only had the platen press made progress in the sheet-fed market, but it also became popular in the continuous forms market. Embossing and foil stamping, magnetic ink character recognition encoding, jumbo numbering, and crash imprinting all lend themselves best to production on the platen press.

Clearly, the basic press design had inherent advantages in its versatility and simplicity of operation over other units, plus its impressional strength was perfect for diecutting, embossing, and foil stamping. Through it all, the platen press manufacturers gravitated gradually into a specialty market niche in the graphic arts marketplace.

Definitions

It's helpful to define some of the main terms used in describing these specialty processes:

Embossing is the process of making raised designs on paper or other flat substrates. To accomplish this, the press

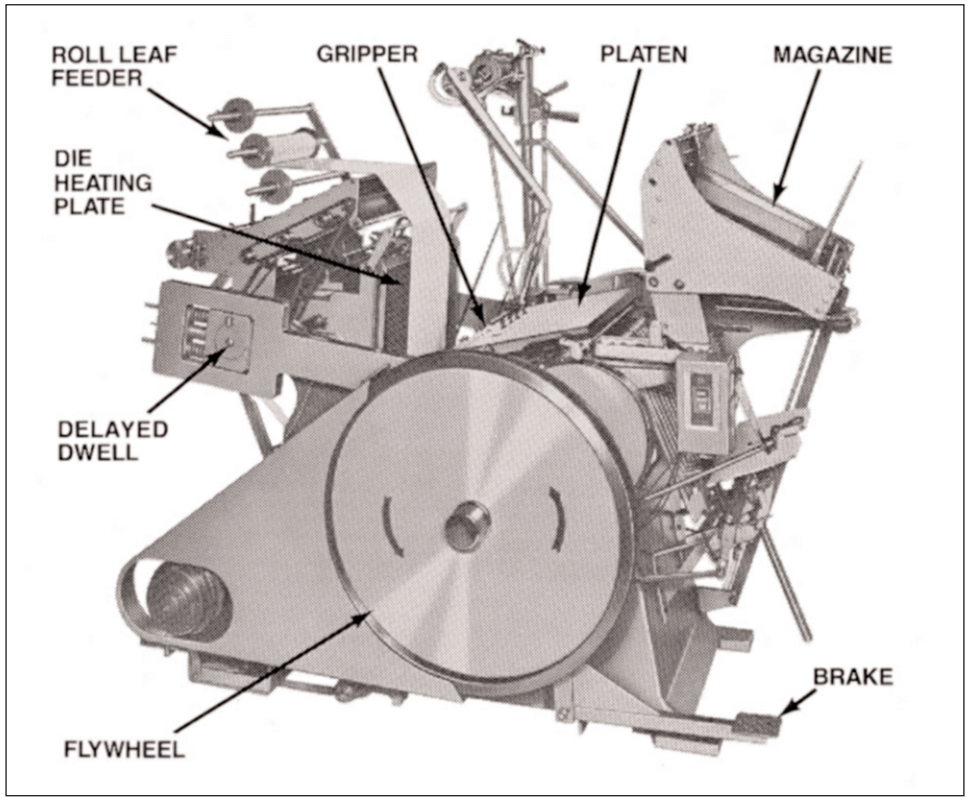
exerts enough pressure so that a counter die attached to the platen forces the stock into a relief die mounted on the toggle base, thus creating an image on the stock. Although it is possible to perform this with a cold die, the operation is usually carried out with a heated die using temperature-controlled heating plates.

It can be said that embossing predates printing almost seven centuries. The Chinese performed passable printing from engraved wooden blocks without the benefit of type or press; they simply inked the surfaces of the blocks and laid sheets of dampened paper or silk on them. Impression and transfer of ink was accomplished by brush. Skillfully manipulated, the brushes performed the function of today's male die although they did require soft inks and tremendously absorbent paper. However, today's embossing - whether hot or cold - requires papers that have completely different qualities.

Foil Stamping can be either flat stamped, yielding no surface emboss, or foil embossing, which combines the raising or embossing of an image with the addition of a foil. In some cases, this is also called hot stamping, that is, application of foil with the use of heat to a surface, whether it is paper, plastic, metal, or anything else. Foil stamping became a recognized process around the year 1700, and at first was used to decorate books with pounded gold leaf.

Debossing describes the technique of towering, rather than raising as in embossing, the surface of a substrate with the use of a male die. This could be a blind emboss - without further decoration - or, with an application of foil, a foil deboss.

Pastel leaf, also called tint leaf emboss, is a relatively new specialty process introduced in the early 1970s. Tinting or pasteling adds a soft antique look to certain stocks. The combination of color subtlety and an embossed effect makes for an attractive finished product.



The basic design of a platen press has remained unchanged for many years.

Thermal diecutting, as its name suggests, involves the application of high heat to the steel-rule dies or engraved dies. The cut is usually performed on vinyls, plastics, and pressure-sensitive materials where a kiss impression or face-cut result is desired.

Glazing is an effect that can be used when embossing a heavy textured paper stock. It is controlled by the amount of heat and the pressure applied when contact to the stock is made.

Scorching is an effect given to an emboss by increasing the die heating plate temperature beyond normal. A two-tone appearance can be achieved on lighter colored stock. It can be done only in combination with a blind emboss, not foil, and care must be taken not to burn the stock in the process.

It should be added here that the continuous forms market is gradually taking on the sophistication of embossing and hot stamping. To date, Kluge is the only manufacturer to address this market, which extends to the label industry as well. Pack to pack, roll to roll, roll to fold, or toll to sheet are all possible using what is called a Web-Flow system. The market range encompasses such products as continuous specialty pin-fed forms, commercial labels, and foil-stamped continuous checks, to name just a few. Pin-fed forms constitute a goof portion of this market.

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Conclusion

This part of the series is really only a brief description of the specialty markets served by diecutting, embossing and foil stamping.

Articles two, three, and four in the five-part sequence will provide you with a background in the mechanics of these processes. In the final installment, the focus will be on a variety of ideas on how the techniques can best be utilized by almost any type of printer. There are many graphic messages that can be enhanced by the use of diecutting, embossing, or foil stamping; the state of the art is such that s printer or trade shop is limited only by its imagination.

DIES

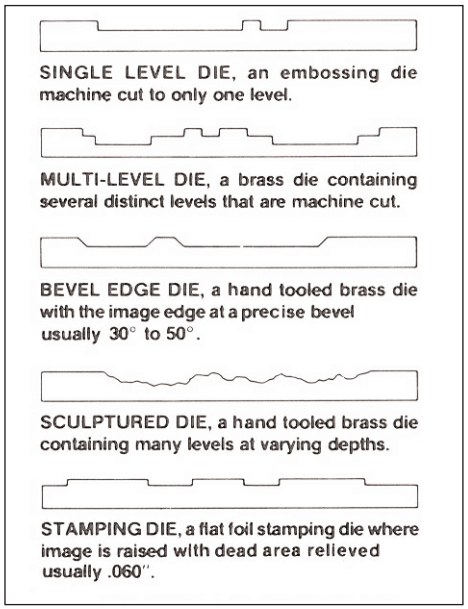
Part Two

A DIE is a piece of metal that has been machine cut or acid etched and is used with pressure to achieve varied effects on paper. Embossing or debossing dies create a special sculptural effect by changing the surface configuration of the paper. Foil stamping and combination foil dies lay down either a flat or raised layer of foil that can be highly reflective or subdued by using pigment or colored foil. The two materials most commonly used in the graphic arts industry to produce embossing and foil stamping dies are magnesium and brass. Magnesium is generally used when a quick turnaround is required on a job. It is used for most foil stamping jobs, is cheaper than brass, and is usually available from a local photo engraver. Magnesium dies usually give a satisfactory single-level embossing result but do not have the bevels, hand finishing, or sculpturing of a brass die. Brass dies are sometimes used for foil stamping on long runs because brass is tougher than magnesium and withstands the repeated impressions without damaging the die. It will also not be damaged if sheets jam up on press.

Brass takes time

The quality of a foil stamp is the same whether a brass or magnesium die is used. A brass die is necessary when special effects are required, such as sharp bevels, texturing, multilevels, or sculpturing. Extra time must be allowed to produce a brass die, normally one to four weeks or more. The price of a brass die will depend on the amount of handwork necessary to fulfill detail. All dies, whether magnesium or brass, are generally ¼" in height. Other thicknesses are available for special applications.

Flat stamping or foil stamping dies are made of magnesium or brass and are always used with heat to transfer a metallic or pigment color coating from a Mylar (polyester) carrier film to paper, resulting in a flat image. Combination dies are usually constructed of brass, although some photo



engravers are able to make a single-level magnesium combination die by double-etch process. A magnesium combination die results in a generally less effective end product than a handmade brass die. Combination dies remove the outside or dead area of the image with a cutting edge around the outside of the area to break the foil away cleanly. This type of die will stamp the foil and emboss in one press run.

Blind embossing, single-level, and sculptured dies are made of magnesium or brass depending on the results desired. Blind embossing refers to the embossing or raising of an image with no foil or ink. Blink embossing dies can also be used to apply a blind embossing foil called pastel foil or tint leaf foil. This gives a very light tint to the embossed image. Blind embossing dies are not designed to apply metallic or pigment foils. Magnesium blind embossing dies are usually single-level with slightly rounded edges on the image. Brass dies can be single-level with sharp defined bevels, sculptured, rounded, textured, or multilevel.

Bevels on brass blind embossing dies can be between 30° and 80° depending on the type of stock and the design of the image to be embossed. You would need a cover stock with optimum fiber quality to use a die with an 80° bevel because the depth of the die would tend to crack a hard-finish paper. The most often used bevel on single-brass blind embossing dies is 45°. This has proven to work well on most cover stocks. A Kromekote or cast coated sheet would require a broader bevel (about 55°) to avoid cracking the harder stock. Bold, heavy designs work best on hard stocks. With acid-etched magnesium dies you can specify a depth that will somewhat change the image edge. The deeper the die is etched, the more gradual the inside edge will be.

Pantographs

Pantograph brass dies are made from original artwork that is transferred to a template, which is either hand cut in plastic or photo engraved in magnesium. The template is usually two to eight times larger than the size of the finished die. The oversized template is necessary because it is easier to transfer from a larger image, especially when there is fine detail in the copy. The template is traced over and the image transferred through a series of arms that make the reduction and cut the die to the size of the artwork. Pantograph dies can be single multilevel and generally have a flat bottom. Various depths and bevels are available.

Acid-edged magnesium dies are made by putting a film negative (for a stamping die) or a film positive (for an embossing die) on top of a presensitized, light-sensitive coated magnesium plate. This is then exposed to an ARC lamp to fix the image. The metal is developed in a heated solution, touched up to fix any pin holes that might have occurred during the light exposure, and put into an etching machine, where an acid bath etches away the unexposed area, leaving the desired image. The amount of time the metal is in the etching machine determines the depth (in case of an embossing die) or the relief around the image (in case of a stamping die.)

Hand-tooled dies

Hand-tooled brass dies are just that. Most of the work is done with an engraver's hammer and various chisels, along with a small hand-held electric engraving tool. You start with same-size art work and scratch a tracing of the copy onto a sheet of celluloid. Graphite is rubbed into the scratches, the celluloid is flipped over, and the graphite image is transferred to the brass to give guidelines. (Sometimes the graphite-celluloid process is omitted and the image is drawn or scratched freehand directly on the brass.) These dies are started with a hammer and chisel and ground out with an electric hand-held grinder to give the die its rough cut. The die is then given finishing touches with engraver's hand finishing tools. Hand-tooled brass die makers are few and far between. These dies take time to produce, and the end user must allow for this in his production schedule - 10 to 30 days or more should be allowed to produce a hand-tooled brass die.

The artwork required for a magnesium die must be camera-ready copy. Magnesium dies are photographically reproduced and acid etched. Original artwork will be exactly reproduced. Film can be touched up to a certain extent before being exposed to the plate, but it is much better to start with good quality original copy. Very fine lines (less than 1/32") should be avoided whenever possible. Fine lines do not etch well and do not come up well when embossing on the paper.

Brass dies, on the other hand, can be made from rather crude copy because the die maker has the ability to correct or change the copy as he goes. A brass die can be made from camera-ready copy, a drawing, a photograph, or a preciously embossed sample.

Depth

The depth of the embossing die depends on the stock and the image that is being embossed. A soft long-fiber 90-lb cover stock, for example, will take a deeper emboss than a hard cast coated sheet. Brass dies can be specified in depth from 0.0006" to approximately 0.040" for a single-level beveled die. A sculptured brass die that gradually gets deeper toward the center could

be made to 0.100" in depth. This depth would require a good 80-lb or heavier cover stock that would stretch enough without cracking the fibers of the stock. The brass die maker must always know what kind of stock will be used so he can make the die with the correct bevels.

Bold design is best for deep embossing; finer detail lends itself to shallower embossing. It is not always necessary to go deep with the emboss die. A medium emboss of 0.016" can be just as effective as a deeper die if the press makeready is done properly, with the die being bottomed out to give all its depth and detail. Magnesium dies are generally made all the same depth, about 0.015", but can be specified shallower or deeper depending on the stock and the image. Brass dies are priced by the amount of detail involved in them.

With experience you can estimate fairly accurately what a brass die will cost. It is a good idea on a detailed brass die to let the die maker look at the copy in order to give you a firm price. Magnesium dies are easier to price because they are sold by square inch or by the standard scale for photo engravers.

Counter dies

The counter die is just as important as the embossing die because without a perfect counter to mate with the relief die, the end result will be a failure. The female relief die is mounted on the die heating against the bed and the male counter die is mounted in register on the platen. (In the case of a debossing die, the counter would be a female die and the deboss would be a male die.)

There are several methods and materials used to form the counter die, but whatever method and material is used, the instant the metal emboss die strikes it, the counter die starts to be formed. The press operator can use a counter-cast resin material, and cast a very hard durable counter that will last for long runs with minimum touch up during the run. He might prefer to pull an impression of the die on one of many embossing board materials that are available and hand cut away the dead area to form the counter. The other type of counter die is a pre-cast made by the die maker. A pre-cast counter is very popular because it is a very hard material that can be used over again on reruns, thus saving time for the press operator. The additional cost of the pre-cast counter is unimportant because of the time it generally saves.

Whichever counter method is used, it is absolutely necessary that the male counter die bottom out into the female embossing die to get all of the detail out of the die that the die maker has put into it. Sometimes this requires a layer of gum lavel or soft cover stock behind the counter.

There are problems the embosser encounters that can only be avoided by experience. For example: (1) The die was made too deep for the stock and the stock is cracking. A layer of Mylar stretched across the die sometimes will help out but you can lose some of the detail in the die by doing this. (2) A single-level combination brass foil embossing die with bevels that are too steep will make the makeready more difficult because the foil will resist transferring on these areas. This is the reason most combination single-level brass dies are slightly rounded instead of being beveled. (3) Another problem is trying to interpret to the brass die maker what the customer wants his finished embossing die to look like. On an involved die it is a good idea to tell the customer that you will have to leave some of the detail and decisions up to the die maker. Die makers are very artistic and usually can visualize what something will look like when it is completed, even with a simple explanation.

All stamp dies need to have a protective covering on them (chipboard or corrugated pad) at all times when they are not being used to protect them from being scratched or damaged. A small scratch on a stamping die makes it useless and it will have to be remade, causing lost time and money. Embossing dies are not as easily damaged but should be protected the same way.

KLIGE

Flat Foil Stamped

KLIGE

Foil Stamp and
Register Embossed

Sculptured
Embossed

Blind Embossed

Blind Embossed

Tint
Embossed

Debossed

Combination
Foil Embossed

FOIL

Part Three

PRODUCING high-quality foil embossing work requires the proper balance of heat, impressional strength, paper stock, and a foil that releases properly. Selecting that foil requires some thought. Foil, also known as foil leaf, roll leaf, marking tape, transfer paper, tipping foil, or printing ribbon, is capable of being metallic, glossy or dull, and in any color, but is most frequently gold. It is applied to various substrates through a process involving heat and pressure in a design dictated by a metal engraving.

All roll leaf foil products start in the lab with a chemist who works out a formulation intended to stamp certain substrates. In may cases, one particular formulation will adhere to many different substrates. Foil products are made by coating a carrier, usually polyester film, with a release agent, a color or laquer coat, a metallized aluminum, and an adhesive coat, in that order. Pigmented and dusted foils are usually coated on cellophane or polyester film carriers. Genuine gold is used sparingly, because it is very costly. All manufacturers of leaf attempt to make as consistent a product as possible, but various factors work against them such as supplier changes, equipment changes, personnel, and weather changes.

Morocco

The first known gold-leaf tooling was done on Bible covers produced in Morocco in the 12th century. The covers were decorated with gold leaf and gold paints using a very fine-line design. The leaf was made by putting a chunk of gold on a heavy iron block and beating it with a hammer, producing a very thin gold film. this film was then hand rolled on leather or paper for decoration.

The most common use of foil products, whether dusted, metallic, or pigmented, is in the graphic arts—on letterheads, envelopes, business cards, book covers, menu covers, annual report covers, etc. Other applications of foil can be found on credit cards, any-thing code-dated such as bread wrappers and potato chip bags, key tags, nursery tags, displays, cosmetic cartons, paint brush handles, children's toys, pens and pencils, picture frames, electronic parts, calendars, and printed forms. Anything that can withstand pressure and heat can safely be foil stamped. the highest usage of foil products today is by greeting card manufacturers and carton stampers.

Holograms

An innovative new addition to the specialty foil market is the hologram. Used first on credit cards, the first large commercial application was the eagle hologram applied to the March 1984 cover of the "National Geographic Society Magazine". The hologram is a development of today's laser technology which makes possible the three dimensional photograph that is recorded on film. This virtually flat film is able to reflect 3 dimensional shapes and designs. Hot stamping is used to transfer this special foil to many surfaces. Special registration systems have been designed to register the hologram foil to the stock surface to assure proper transfer of that foil to that surface. the Kluge 14"x22" EHD series press was used to apply the 11 million eagles and later 15 million skulls to the covers of the "National Geographic Society Magazine".

Estimating

Foil ranges in price from 5c a square foot way up to $1.50 a square foot for the heavier metal applique foils. Simply estimating square footage to be covered on a job and multiplying that number by the manufacturer's price plus a fair markup will give you a rough price good enough for estimating purposes.

When placing orders for foil products, it is best to give as much information about the job as possible. This information should include types of stock to be used, type of job (flat stamping, embossing, combination), and the image are to be stamped. You should always have a foil color chart available so that you and your foil supplier can specifically

identify the product you are looking for. If you find that the majority of the stamping you do is gold, order enough stock to carry you 30 to 60 days. this will enable you to cut costs. In purchasing foil products, order standard 24" width. You can purchase a foil slitting machine for approximately $600 and do the slitting into smaller rolls yourself. the foil manufacturer charges from 5% to 15% extra for slitting rolls to size.

Makeready in foil stamping is the production of an exact duplicate of the female die. the purpose of this duplicate, called the makeready, is to equalize pressure uniformally between the face of the stamping die and the substrate for the entire length of the job. The makeready must have good support on a base or foundation. Makereadies must be forgiving, resilient, durable, nonreceptive to leaf, lubricated, anti-destructive, quickly applied, and easily patched.

The most economical makeready system is the precast counter that can be ordered through your engraver. the following is a list of the most commonly used makeready dies:

• **A powder and liquid mixture** is used for molding male embossing counters or combination engravings perfect registration to stamping engraving die.

• **Counterboard** is affixed to press platen with double-sided tape. It is formulated to increase adhesion of powder and liquid mixture.

• **Release film** is used to cover the male embossing counter. it will stop powder and liquid mixture from adhering to the engraving while setting up.

• **Duplofol/double sided adhesive tape** is used for fastening all boards to the platen of the press.

• **Cover film** is used to cover the finished male counter during the press run. It protects the counter from wear and softens edges to prevent cutting of stock.

• **Countercast release film** prevents countercast from sticking in your engraving and keeps countercast from entering engraving cavity.

• **Antiquing liquid** product allows antiquing after stamping without attaching a breaking down with leaf foil.

• **Counteract greyboard** is a face board recommended for use with powder and liquid. porous finish allows good counter adherence.

• **Phenolic board** is a very hard board for mounted on the platen of the press for extra sharp detail and for flat stamping.

• **Engravers board** is a 14-ply layered board for blind embossing makeready base.

• **Capping board** is a dry form of powder and liquid mixture used for patching low spots on counter.

• **Polyurethane sheet** is used as flat stamping counter under phenolic board when large engraving is used. Will level the press.

• **Mole skin** covers embossing makeready to prevent wrinkling of stock during embossing.

• **Pyrometer with a sensor** provides accurate heat readings on engraving face, also calibrating thermometers.

• **An optivisor** is worn by operators like a cap. it has magnified lens for close work on counters and dies.

• **Air grinder** is used in hand-cutting counters. provides more accuracy than the use of a makeready knife.

Preplanning

Preplanning consists of limiting sheet size to the maximum production size afforded by your equipment. It also means laying out the work on the sheet so that foil embossing or engraving can be locked up as low on the press as possible. It means not stacking items over each other when they require different colors of foil so they may all be run in the same pass. It means planning guide positions in relation to engraving, sheet size, scores, cutting rules, etc. It involves planning the press setup procedure from the equipment setup standpoint. One such planned equipment setup procedure is setting the temperature at 215°F.

Platen height should be at 0.918", 0.918" + 0.030", or 0.918" + 0.030", depending, of course, on your prescribed makeready procedure. Platen level at 0.918" + 0.030" + 0.010" (meaning 0.918" from bed plus 0.030" for counter plus 0.010" under the platen plate). You are now ready to pack the 0.010" under the platen plate and run all of your flat foil stamp jobs on letterheads, envelopes, or business cards with 0.030" phenolic as a counter board. If the schedule requires embossed or combination foil and emboss, use the same setup using precast counters.

Maximum makeready production always calls for precast counter makeready procedures and since our primary interest is production with quality, we will address this procedure in detail:

(1) Obtain a brass die and precast counter.
(2) Place a sheet of #70 bond paper on platen large enough to accommodate the counter, taping only the right and left side of the paper.
(3) Cover back of counter with duplofol and mount die on chase.
(4) Using the wood dowel pins register counter on the die.
(5) Pull press on impression.
(6) Counter is then transferred to the bond paper
(7) Remove wooden dowel pins.
(8) Perform spot makeready (if necessary under bond paper).

Another form of makeready utilizes countercast material. the following is a step-by-step description of the use of countercast. the countercast items can also be ordered from your engraver.

(1) Mount embossing or hot stamping die onto press in desired position.
(2) Preheat die heating plate to approximately 190°F die face temperature.
(3) Cut special countercast board into desired size and position carefully on press, making sure it will match up with the hot stamping die.
(4) Make a kiss impression on countercast board,making sure the die is just barely hitting all the way around the design area cutting edge.
(5) Mix the countercast liquid and powder together until the desired consistency is reached. (If not familiar with consistency desired, try a one-to-one ratio for a starter). Mix thoroughly, but do not over mix, as this will hasten hardening of the mixture. A semi-liquid paste similar to tar or asphalt is the consistency desired.
(6) Before spreading the pasty countercast material on the gray cardboard, wipe over the board with countercast liquid alone. this assures good bond between the cardboard and the countercast material.
(7) Spread mixture over the kiss impression about 1/32" thick, but never in excess of the deepest area of the die.
(8) Cover the mixture with 1/2-mil polyester film, making sure no air bubbles are trapped inside.
(9) Close press manually and slowly, so as to squeeze the excess material out to the sides.
(10) Leave the press closed until leftover countercast material in mixing container is hard.
(11) Open press, remove polyester film and bulk excess countercast material immediately with an upward picking motion. A pocket knife is an excellent tool for this.
(12) Chip away all undesired material, cover with clean piece of polyester, and begin hot stamping and embossing.

Prepositioning

A secondary use of the precast counter is to position the die from the prepositioned sheet rather than the sheet from the die. With the advent of good metal-to-metal thermoset adhesives you are able to set the sheet in the guides, locate the counter on the floating sheet in registration to the negative stamped into position, register the engraving to the counter, cover the back of the engraving with adhesive, shut the press for a few minutes (depending on the adhesive used), and pick the engraving up on the chase plate (which in this case should be smooth solid steel). Selecting adhesives that cure at 200°F will enable you to proceed to work at the first hit. The press operator should look for misregistration between the engraving and the counter, improper platen level adjustment, foil coverage, and proper positioning.

Platen impression distribution is controlled by the installation of four bearer blocks on each chase; in our example they would be 0.918" + 0.030" to strike the platen face. The two lower blocks get the most usage in a clamshell construction press, since a high-placed engraving will tend to bear off in the weak extremities of the press. Addition of

0.005” to 0.010” packing on the platen face opposite the bearer block will serve to transfer the lower strength of the press to the top where it is desired. A left-to-right or right-to-left condition can be corrected in the same manner. One are to cover is poor foil coverage. This position should not be corrected by a temperature change at this point because of the slow reaction time. Instead, slow the press rate or increase pressure or both. When the problem is corrected in this manner then we work back and forth between increase of temperature to increase of speed to obtain maximum production. Remember, production is the name of the game.

Temperature selection

The selection of the proper temperature depends on the melting point of the substrate. Paper can be stamped at temperatures ranging from 210°F for fine-line to 230°F for panel. rigid PVC, cellulose acetate buterate, leather, ribbon, and suede require a temperature of 220°F. Materials to be stamped at 230°F include acrylic, flexible PVC, and low density polyethylene, and at 240°F, polystyrene, ABS, and polycarbonate. Stamp high-density polyethylene at 250°F, and noryl, polypropylene, polyurethane, and nylon at 260oF. temperatures for cloth range from 210°F to 260°F.

Problems

Nonporous substrates can cause air entrapment. the air is impossible to remove, so the idea is to displace it in controllable stampable segments. Nonreceptive surfaces such as oil, cross-linked surfaces also present a problem. Most are stampable with a low-temperature hot melt adhesive. Outgassing is caused by die temperatures high enough to boil the trapped solvents in the substrate. When this occurs, gas is formed on the surface between the foil adhesive coat and the substrate surface, preventing adhesion or binding of the two surfaces. A texturing of the die or finish or counter or the leaf carrier will usually achieve the described adhesion when lowering of temperature is not possible. this will not eliminate the problem but can control the gas release. the chemical finish on the foil will protect the mirror finish on the foil.

Foil is still the most economical means to imitate gold or silver on a produced product. There is nothing that offers as many options in appearance and allows so many effects on a variety of substrates as foil does. Equipment manufacturers are working on faster production machinery and technicians are working on advanced techniques in faster processing on present machinery.

PAPER

Part Four

PREHISTORIC MAN used the walls of caves to draw pictures expressing his thoughts. He progressed from there to the use of clay tablets, animal skins, bark, and cloth. All the while he was trying to find the perfect surface on which to draw messages.

The Chinese were the first to develop a true form of paper. In 105 A.D., Ts’ai Lun, an advisor to the emperor Ho Ti, became the first papermaker. He used fibers of hemp, rags, and mulberry bush mixed with water, mashed into pulp, formed into sheets, and sun dried. This process remained a secret known only to the Chinese until the year 751, when moslem raiders captured a Chinese paper mill and forced the paper-making secret from the imprisoned Chinese craftsmen. The secret traveled westward from china to the Near East to North Africa and finally to Europe. In 1151 the first European paper mill was built in Spain.

Inspired by insects

Paper remained scarce and expensive; it was made by hand until 1799. In that year the Fourdrinier paper machine was developed in France. Rags were still the only source of pulp for all paper and proved scarce. While observing wasps using wood slivers to build their paper-like nests, the French scientist Rene DeRaumur came up with the idea of using wood fibers for paper making. His paper-making theory was not used until 1850. this renewable resource, wood fiber, offered the breakthrough that made modern papermaking possible.

Today the paper industry furnishes about 550lb of paper annually for every man, woman, and child in the U.S. paper brings the written word to us in all forms—all the way to the coupons we clip. Everywhere we turn there is paper.

Paper comes in all grades from groundwood construction paper to fine embossed writing paper. This article will concern itself only with the finer grades of paper used in embossing, foil stamping, and other specialty printing.

Today’s paper mills offer a myriad of papers to choose from when designing a particular job. A rudimentary knowledge of the manufacture of paper will help in choosing the right paper for that special job.

The process for all paper making is essentially the same, although it becomes more elaborate in finer paper making. The two basic fibers that constitute the raw materials used in paper making are cotton and wood pulp, both consisting primarily of cellulose. The wood pulp has to have impurities refined out of it after which it is combined in cotton, usually trimmings obtained from textile manufacture.

The raw pulp—cotton and refined wood fibers—is fed into a hydrapulper, which is nothing more than a huge blender. the pulp is broken down and abraded into individual fibers suspended in a water bath, then mixed with a filler that improves the opacity, brightness, and ink-holding capacity of the paper.

Additives

If the paper is to be used for writing, painting, or printing, sizings are added to make it more water resistant. Sizings are of two types; one is resin and alum, the traditional papermaker’s sizings, and the second is the newer acid-neutral synthetic sizings. Color would be added at this stage if the paper was to be colored. It is also at the hydrapulper where recycling would take place for those paper mills that feature recycled paper in their line.

The product that comes out of the hydapulper is called a slurry. The slurry goes from the hydrapulper through a refine where the fibers are cut and shaved by abrasion to produce stronger, denser, and more uniform paper.

This refined slurry is then fed into the paper machine itself, at the head box. At this point it is 99.5% water and 0.5% fiber. Through the head box, the slurry flows onto a moving wire screen, which is agitated from

side to side as it works forward. The water is drained away from the fibers, and as this happens the fibers interlock to create paper.

The paper passes over a series of suction boxes, where more water drains out of the moving wet mat of interlocked fibers. The paper continues forward underneath the dandy roll, a screen-covered roll that squeezes out more moisture. The dandy roll presses a design in the wet mat of paper. It is here that texture and watermarks are imprinted.

Out of the wet end

Still 85% water, the paper now leaves the wet end of the paper machine to press rolls and the dryer section. The paper jumps from the paper machine to a blanket, called a felt. The felt supports the paper as it moves between heavy press rolls, rolls that reduce water content to about 60%. the remained of the water is evaporated in the dryer section.

Fine papers, the papers used for embossing and foil stamping purposes, now go through a sizing bath. The sizing fills the voids, levels the surface, and adds strength. The paper then passes to the calender stack, a pyramid of heavy steel rollers that ride one on top of the other. The roller pressure has exacting controls to produce a slick, smooth surface on the paper.

Papers are then removed from the paper machine to be stored in rolls or to be cut into sheets. Or, if the paper is to have a special finish, or deckled edge, it is transferred to a special machine. If the paper is to become a duplex stock, layers of cut sheets are pasted together.

From the pulp to the hydrapulper to the head box to the calender stock to the machines for special finish, the whole process is precisely controlled. Basis weight and moisture control are monitored to conform to pre-set tolerances.

Choosing the right paper

The following ideas will give some basic tips in helping to assure success in your next design job.

Diecutting. There is really no special care to be taken in choosing a paper for diecutting. A die maker can make a steel rule die to cut almost any paper chosen. However, when another special process is added to the diecutting, care should be taken in making choices. Cast coated stocks or enameled stocks, for example, have tendency to crack when scored.

Embossing. As stated in an earlier article, blind embossing is a combination of the application of heat, a multi-level die, a counter die, and the right grade of texture of paper. the greater the detail and the depth an engraver can accomplish when making his die. Paper should not only be considered for color but also for texture and thickness. Strength is also an important feature to consider; will the paper accept the die you plan to use? Interesting effects can be achieved with heavy textured papers or duplex stocks. A multi-level brass die can press out the texture and created a real contrast. This can be extremely effective on stocks of darker colors.

With embossing, it has been found that the more durable the sheet the better. You can stretch paper only so far before it will crack. The proper amount of heat and the right die will eliminate some of these problems, but the right paper choice before the die is made will enable the die maker to eliminate the problem completely. Also, if you are embossing a coated paper, remember that you can stretch coating. Both ink and coating will crack when stretched too far. (The use of foil instead of ink can eliminate the cracking problem).

The grain of the paper should be taken into consideration when embossing—go with the grain. A cross-grain emboss can cause problems. If there is to be a score involved on the piece, always score along the grain. If borders are to be embossed, the lines should emboss with the grain. With heavy border, it will not matter if the emboss goes across the grain.

A long-fiber sheet seems to be the most popular for most embosses. It handles a deep emboss better. the second most mentioned feature is the soft felt finish. This goes with the soft, durable, pliable sheet mentioned earlier. A third factor is texture in the finish, important when a blind emboss is considered.

Foil stamping. This image transfer takes place with pressure and the right amount of heat. It is an effective graphic technique and when used alone or with embossing it can create a stunning effect. It is estimated that there are approximately 300 different choices of foil that can be used. This is not even taking into consideration the special colors that can be matched. If you are going to use a brilliant foil or a multicolor coil, make sure the color and texture of the paper compliment that foil or contrast with it. Most paper will foil stamp easily, but if in doubt check with your embosser/foil stamper or your local paper merchant.

Foil stamping a large area with solid foil coverage can lead to complications, especially with a coated sheet. One problem, gas trapping, can result when large areas are to be foiled on coated stocks, but it is not insurmountable. It can be handled by sand blasting the die to relieve the gas pressure; refer to Part 3 of this series (GAM, March 1983) for an explanation of several solutions in greater detail.

Pastelling is a process used to lay down a foil with a combination die. This specialty process appeared for the first time in the early 1970'2. Pastelling, or tint leaf, as it can be called, adds a soft antique look to certain lighter-colored stocks of paper. Earth tones lend themselves particularly well to the pastelling process. The choice of the pastel or tint should complement the paper color or contrast only slightly to give the process the proper effect.

Glazing is a technique that can be used when embossing a heavy textured paper stock. Control of the amount of heat and the pressure applied when contact to stock is made gives the emboss a glazed or polished effect. This technique is particularly effective on darker colored stocks.

Scorching is just what it implies, a scorching of the stock. Increasing the die heating plate beyond the normal temperature range gives a scorched effect to an emboss, i.e., a two-tone effect can be achieved on lighter colored stock. This process works only on lighter colored stocks and should only be attempted by an experienced embosser/foil stamper as it is easy to burn the stock if care is not taken.

These are a few of the considerations to be taken when selecting paper for a specialty job. I am sure there are as many tips available as there are embossers around the country.

Each paper has its limits and these must be discussed with the embosser/foil stamper, engraver, and designer from when the job is started. Ask your local paper merchant for samples of jobs that have been embossed, foil stamped, pastelled, tinted, glazed, or scorched on the paper you have selected. if they don't have samples, ask them about the qualities of the paper you have selected. They can find answers from the mill that should help, or they can take a look at the design and possible recommend paper that will work.

PAPER, DIES AND FOIL

Part Five

IN THE LAST 20 YEARS, embossing and foil stamping technology and equipment have so developed that these techniques are now easy for designers to use. Their appearance on printed products is becoming commonplace. Many graphic products depend heavily on them to achieve impact. Point-of-purchase displays are an example of the creative use of diecutting. Blind embossing often appears on quality stationery. Menu covers and greeting cards have become traditional places for foil stamping and embossing. The purpose of this series has been to make these specialty techniques more accessible; the following are thoughts to heed when you ponder your next foil stamping or embossing job.

Samples of blind embossing and debossing techniques.

Blind embossing (raised image) or debossing (sunken image) changes the surface of the paper by the use of male and female dies. Great amounts of detail can be sculptured into the die, or it can be a simple one-level die. Paper is placed between a male and female die and impressed with several tons of pressure by the press. Heat is often applied to help the paper stretch; temperatures of 200°F or more are commonly used.

Dies

The finest quality dies are made from brass and are usually hand-tooled. Brass is soft enough for the engraver to work with, yet hard enough to withstand the pounding it receives on the press without losing its shape. It can be prepared with a hand-guided drawing machine called a pantograph or entirely by hand. Highly-sculptured multilevel dies made for blind embossing are almost always made by hand. A simple, more economical die can be made from magnesium. these dies are photomechanically etched. the process has its limitations and can in no way match the detail and the quality of a hand tolled brass die, but for a simple design embossed on good paper, a magnesium die can be as effective as a brass die.

No matter how well the die is made, the final effect can be greatly impaired if unsuitable paper is selected. textured stocks with long fibers work well when using embossing. With heat and pressure, the texture of the stock can be ironed out to allow contrast between the sheet and the embossed image. Stationery to be embossed should be 25% ray or better to hold together under the pressure of embossing.

Copy preparation

You should, when preparing designs that rae to be embossed to a single level, make a sharp, black-and-white copy for the die maker. Whenever possible, rules should be 2pt in thickness or more. The artwork should indicate whether a bevel or round edge is desired and the type of stock that is to be embossed. A rule of thumb for preparation of artwork for embossing is to make the original slightly larger and heavier than if it were going to be lithographed. Also, for greater depth, more letter space should be considered in the artwork. You should not use extremely small art with a lot of detail or small type sizes.

Artwork for multilevel dies should also be sharp black-and-white copy with a tissue overlay; color code the various levels with felt tip pens (for example: red—first level; blue—second level; etc.). Overlays similar to color breaks on litho work are also acceptable. A beveled edge on a die is normally hand tooled brass with the edge of the image in a precise bevel, usually 30° to 50° If there is need for a broader bevel, one can be specified up to 80°. beveled edges cannot be achieved with magnesium dies.

If the relief is a picture of an actual object, you should give the engraver both a line drawing of what you want on the die and, if possible, a photograph of the object. If this is not possible, then a detailed sketch and a detailed description of the sculptured effect are essential.

Build up on the surface of the die gradually. Sharp dips in the die will cause cutting or cracking in the paper you use. A sculptured multilevel die should reach its desired depth gradually, not abruptly. Depth is not as important as sharpness of the detail. An engraver and an embosser will know this and should be consulted when you are deciding on the image to emboss.

If a job is to be stamped with one die and then bumped or embossed with another die, consider a combination die. A combination die saves register headaches. Also, a combination die will take care of cracking problems when embossing on coated paper. If cracking occurs, a light layer of foil can be laid down on the paper to cover that cracking.

It is extremely wise to proof an embossing die run on paper specified before the full run is started. This procedure has prevented many surprises. Also require that an embosser get down to the bottom of the die, since that is where the details is. If you are using multilevel sculptured die then much of the detail will probably be in the bottom 10% of the die. Make sure you are satisfied with the way it appears on the paper before you proceed.

Foil Stamping

To properly utilize the technique of foil stamping you must understand it. Foil comes in a myriad of colors. Finishes can be shiny or metallic, matte or soft lustre; pearl and marble patterns and even wood grains can be achieved. Foil also comes in pigmented colors. It comes on a Mylar backing in 24" rolls and can be cut to a desired width. The roll is fed through a foil stamping press and is transferred to paper by applying pressure. the design is taken from a heated die. Several foils can be applied to the same sheet of paper as long as adequate space is retained between color bands.

Foil stamping provides a reflective, opaque surface that adds eye appeal to your designs. One very popular use of foil is white pigment foil stamped on dark-colored stock. A good, opaque white image is produced with a single pass through the press instead of the multiple passes necessary with offset printing to cover a dark background with white ink.

Artwork prepared for foil stamping should be sharp black-and-white, as is prepared for high-quality lithography. Caution should be used when the design has lines or elements close together as foil has a tendency to fill or "bridge" across narrow spaces. Bold, open designs are best suited for this process. there are variations available in the formulation of foils for fine line work up to large solid coverages.

Lead time must be allowed for foils other than gold or silver or on large coverage areas for long runs. Plastic-coated or heavily varnished sheets offer a nonporous surface, which makes stamping large solids very difficult. Coated or smooth finish cover stocks and most bond and card stocks are best suited for foil stamping. The smoother the sheet, the greater the reflective quality of foil stamping. Foils are generally opaque, so they may overstamp printing or another foil without requiring reverses in the lithography of first foil down. More than one color of foil may be stamping in one press run, provide the colors are spaced 0.5" apart horizontal to the gripper edge of the sheet.

Plan ahead

Take advantage of the foil stamper's expertise early on in the design stage. Not only can he suggest the proper foil to be used, but he can detail foil placement on a job to best utilize foil and minimize waste. He knows heat release properties and how they react with the particular paper chosen. The same advice goes for pastel or tint leaf application. If you plan to use two different foils on one job and they will have to overlap, make sure they are compatible. One foil application could pull or repel the first foil laid down.

Stamping on foil paper should be no problem. Foil stamping over a varnished surface is definitely not recommended. Gas trapping will result and hamper the proper release of the foil.

The process of glazing adds a contrast to a darker colored stock. This process is useful when you have a multilevel sculptured die and are producing a piece on dark stock. This process is good to use when it will appear by itself on a page, i.e., the cover of a book, menu, or report.

Scorching

Scorching adds a two-tone effect on lighter colored stocks. This is achieved only when blind embossing a piece. Again, multilevel sculptured dies work best. The added head will smooth out the texture of the stock and add highlights to an embossment. This is recommended when the image will stand alone or far enough away from any type as to appear alone.

Pastelling, or tint leaf embossing, appeared a decade ago and has become very popular. This process eliminates the old register problem of printing soft colors or pastels and then embossing over them; it gives a contrasting image or creates a soft, tow-tone antique look without scorching. It is effective with multilevel sculptured dies or any embossed image where a soft effect is desired. Tinted foil can highlight an embossed image. Clear gloss and pearlescent foils are also available.

Artwork for combination foil/embossing (stamping foil and embossing at the same time) can be prepared in the same way as for blind embossing. Avoid specifying bevel edges on foil/embossing combination dies as it is difficult to get foil to adhere to a beveled edge. very fine lines may sometimes have to be flat foil stamped and then embossed to maintain clarity.

When designing cover or fold-over cards, if 0.5" is allowed between the embossed or foil-stamped image and the fold, the sheet can be scored in the same press run.

It cannot be stressed enough that the designer, the embosser, and the engraver should get together at the start of a job. All three are needed to come up with a quality piece. The designer loses nothing of his or her creativity; it is still the designer's idea that will appear on paper. the embosser and the engraver can take that idea and make it a workable, cost effective piece to produce.

The popularity of foil stamping and embossing continues to grow. Although the capacity to produce such work has increased, demand still surpaces capacity. One industry spokesman feels there is no better segment of the graphic arts in which to become of a true specialist.