Making Superior Plates Every Time

By Malcolm G. Keif

Flexo plates are a critical component of the printing system. Printing is a system—viewing platemaking in isolation doesn't address the total print process. A system has multiple components that interact with each other and influence the performance of each. Great plates with the wrong anilox rolls offer nothing to improve quality. Likewise, great plates made from a poorly prepared file help little to produce an outstanding final product. So, looking upstream and downstream is necessary to ensure your plates are supporting the total printing system.

Superior printing plates…

- have sufficient resolution for the graphics to be reproduced on the substrate for the job (paper, film, foil, etc).
- are produced to optimize press and ink performance.
- are made in a controlled and repeatable manner.

Let's look at several important factors to making great plates.

PLATE ROOM

Quality in the plate room starts with the design of the plate room. If solvent processing is used, it is important to exchange the air in the plate room several times per hour. This ensures a safe working environment for the operators. Additionally, reducing dust is critical, which means having a filtration system and ideally a positive air system—air blows out of the plate room when the door is opened.

Many plate rooms have tacky mats that are stepped on when entering the room to remove dust from shoes. The goal is to minimize dust as much as possible. Basic housecleaning is essential to ensure pinhole-free plates.

PLATE MATERIAL

A number of companies manufacture plate materials. Plate material generally comes in three forms:

- **Liquid** for forming, then imaging, then mounting.
- **Sheet** for imaging, then mounting.
- **Sleeve** for imaging.

Obviously, the more processing you perform in-house, the cheaper you can acquire the base polymer. However, forming plates or sleeves in a "clean-room" factory provides better results than forming in a typical printing company.

If starting from scratch, one of the first decisions in buying sheet plates is which thickness to purchase. Plates come in various thicknesses and a balance is reached between buying extra polymer (thicker the plate, higher the cost) and having enough polymer for the various plate "reliefs" you may want to use. **Plate relief** is the difference between the plate surface and the floor that remains (film backing plus support polymer) after processing. Narrow-web printers usually use 0.067-in. plates in the U.S. However, European narrow-web printers often

use 0.045-in. to save on the cost of the polymer. Understand, though, that switching thickness usually requires new print cylinders or using tape to build up thickness.

Plate hardness is another important factor when selecting plate material. The unit of measure for hardness is *Shore A*, measured with a durometer. Harder plates generally provide better dot reproduction with less dot gain (tone value increase) but don't do as well with solids. Similarly, hard plates do well on very smooth substrates but struggle with rough surfaces. Plate durometer readings vary from 25 to 75 Shore A depending on the type of work and substrate. Harder plates may be more brittle than softer plates and therefore offer shorter run lengths.

IMAGING

Today, there are more imaging processes for flexo plates than ever before. Polymer plates are imaged in one of five ways: a) a film mask [analog]; b) a carbon mask; c) a transfer mask; d) an ink-jet mask; e) direct ablation of the material. Rubber plates are either molded or directly ablated.

If using one of the mask systems, you must expose the plate through the mask to form the graphics. This is what creates the hard part of the plate—the part that remains after processing.

When handling a carbon mask plate, you must use care to ensure you don't scratch or kink the pre-coated plate mask. This means storing the plate on good shelves (boxes flat and not stacked too high) and supporting the plate when moving it. Do not remove the protective coating until just prior to imaging the carbon coating on the laser imager.

The typical sequence for making carbon mask plates is:

1) **Back exposure** to create the floor thickness
2) **Carbon mask imaging** to ablate the carbon and form the mask
3) **Main exposure** to expose through the mask and polymerize the image area
4) **Plate processing** to remove the unexposed, unpolymerized material
5) **Quality check** of relief, dot area, durometer, etc.
6) **Post exposures** and **detack** to finish the plate.

Various systems have been used for exposure. Bank exposure systems (where 20 or more UV lamps are simultaneously illuminated) have been around a long time and remain the most common today. In the 1990s, point light sources gained popularity for their ability to produce a dot with sharper shoulders, and subsequently finer printed dots with less dot gain. These systems have a single lamp and produce more collimated light (hence the sharper shoulders). This provided a distinct advantage in analog, film workflows. However, one of their drawbacks is the potential for dot pointing, where each dot on the plate points to the light, much like a plant points to the sun. This isn't a problem when the lamp is directly above the dot, but for dots near the edge of the plate, this can be problematic as the dots angle toward the lamp. With film, the benefits outweighed the potential problems.

With carbon mask systems, bank sources are generally preferred over point light sources. Because of the intimate contact of the carbon (compared to film) and the elimination of the diffusion sheet (used to create vacuum with film), bank systems provide shoulders that are much sharper than those same exposure systems using film. Even though the operator doesn't have as much latitude compared to point light systems (which allow the operator to decide how much direct light and how much diffused light is used), the results are close to the benefits found in point light sources. Further, the bank lamps reduce the dot pointing problems with point lights, which is exaggerated by the intimate carbon mask.

Warming up bank lamps is crucial for repeatable results. Point lamps are on whenever the unit is powered and use a shutter system that opens during the exposure. However, bank lamps illuminate only when the exposure timer is started. This results in radically different UV output when cold lamps are initially started. Make sure your lamps are warmed for at least two minutes before an exposure if they have been cold for a while. Also, with 20 or more lamps, they will not age at the

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same rate so you need to periodically check for consistent output (no light integrator like a point light system). A radiometer can measure the output or you can use a simple grid and micrometer to determine the outcome of an exposure.

After the main exposure, the unpolymerized material is removed by one of three methods:

- Solvent washout
- Water washout
- Thermal processing

Historically, solvent washout produced the finest plates. However, in recent years, both water and thermal plates have improved in resolution. Screen values of 175 lpi or more are possible with both water and thermal processing, with less environmental impact.

MONITORING PLATE VARIABLES

There has been a fair amount of discussion about plate dot shapes (volcano, pillow top, round top, flat top, etc.). The shape and surface characteristics of a dot is largely determined by the response of the material to the imaging and processing system. The debate will go on whether a flat dot surface is better than a round dot surface. The key is to ensure that you produce the sharpest, most consistent shape and size dot possible with your system. And the only way to do that is to have consistent and measurable processes.

One of the most important variables to control and track is image relief. As noted earlier, this is the difference between the plate surface and the supporting floor—the measured physical difference between image and non-image area on a relief plate. This difference is measured in inches. A digital plate micrometer is a must have for anyone making flexo plates.

Some companies use only one relief spec while others may have two or more. The key is to know what relief is desired and to control your back exposure to hit that relief within the tolerance. Generally speaking, the lower the relief, the sharper the printed dot. However, low reliefs also are more difficult to print and require better press controls. Further, low reliefs are most appropriate for smooth substrates and tonal work. Rough substrates and large solids may dictate more impression on press and will "print the floor" if low relief plates are made. For fine graphics on a smooth substrate, a narrow-web printer might shoot for a relief of around 0.020-in.

Another important variable to ensure optimum plates is dot area, measured by a plate dot reader. These instruments help to ensure repeatable results by measuring a couple of patches on the plate, prior to printing. If I measure 10 plates and have consistency at 1 percent, 5 percent, 10 percent, 25 percent, 50 percent, 75 percent, 90 percent, 95 percent, and 99 percent, then I can be confident that I have a controlled process. Hopefully, I have an optimized process too, but that depends on how those patches reproduce on press. It is important to keep a log of key variables when making plates. Measure, record, and correct when these variables drift out of spec.

SUMMARY

Platemaking is a critical part of the printing system. It can be controllable and predictable with some standard best practices. Spend time analyzing, measuring, and improving your plate processes and you will be on your way to better printing. Your press room will love the results.

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