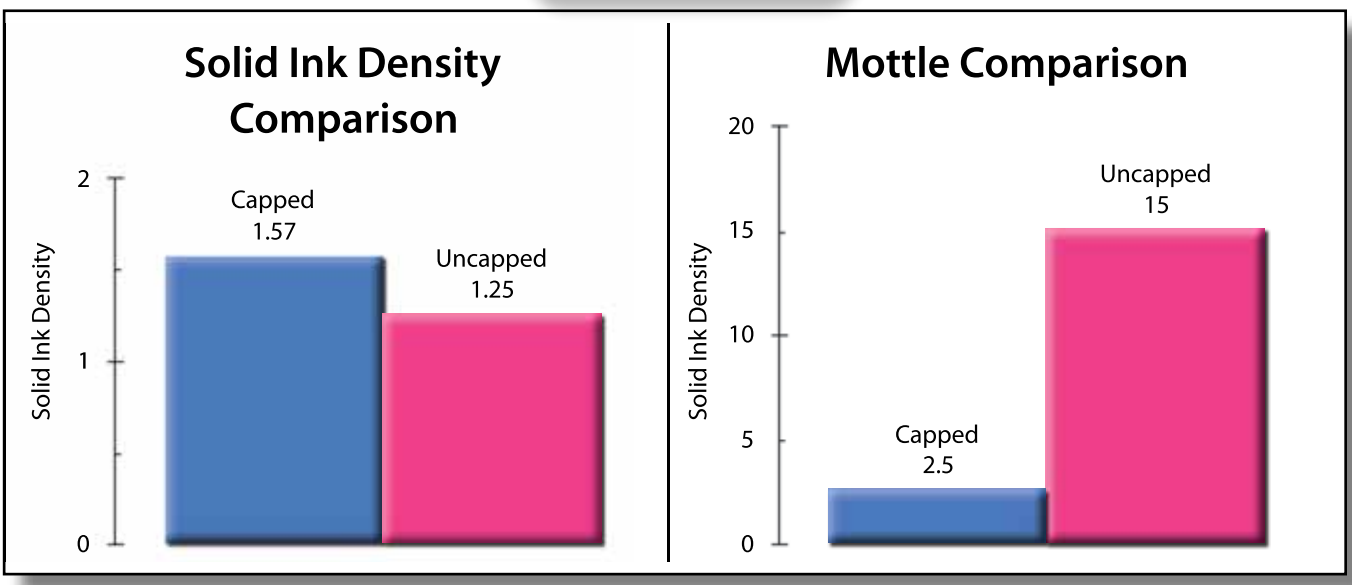

Figures 1 & 2: SID & Mottle Comparisons: Capped/Uncapped Plates.

Improving Solid Ink Coverage on Polymeric Films

Printers Embrace Plate Technologies to Deliver Crisp Color

By Timothy Gotsick and Brian Cook

Color is one of the most compelling aspects of all visual media, and its importance in the world of packaging is paramount. As a result, the pursuit of a wider range of colors, and of ever more vibrant color representation, has been a continual goal for printing technology. Ink technology has played the major role in color reproduction for package printing, but ink is only as good as its application, so flexo plate technologies have also evolved to better apply ink to packaging substrates.

The following article is a brief review of several plate-based technologies that can help printers increase the quality and range of colors applied to packaging substrates.

The amount of ink applied to a flexo plate on press is determined by the volume of the anilox roll, so changes in anilox volume will have a profound influence on color density. However, for a variety of economic and operational reasons, it is preferable to use the minimum amount of ink required to achieve the needed print quality. Doing so obviously reduces ink costs, but perhaps even more importantly, it allows crisp reproduction of halftones and more consistent (i.e. "cleaner") printruns.

The amount of ink applied to the plate is only half the story though, as the way that the ink is distributed on the surface of the substrate plays a major role in its appearance as well. It is during the ink transfer step that the plate can play a major role in improving both the solid ink density (SID, the intensity of the color) and the uniformity (most commonly measured as mottle) of the ink on the package.

CAPPED PLATES

For many years, "capped" plates were the only plate option available that had a meaningful impact on SID. Capped

COMPARING OPTIONS & REQUIREMENTS

Method	Benefits	Notes
Capped Digital Plates	Simplest option Very good SID Very low mottle	More expensive plate
LUX Membrane 200	Very good SID Reduced mottle LUX flat top dot properties	LUX lamination required
MicroCell with LUX	Highest SID possible Lowest mottle possible LUX flat top dot properties	Requires new imaging hardware and software LUX lamination required Substrate and pattern specificity are sometimes seen

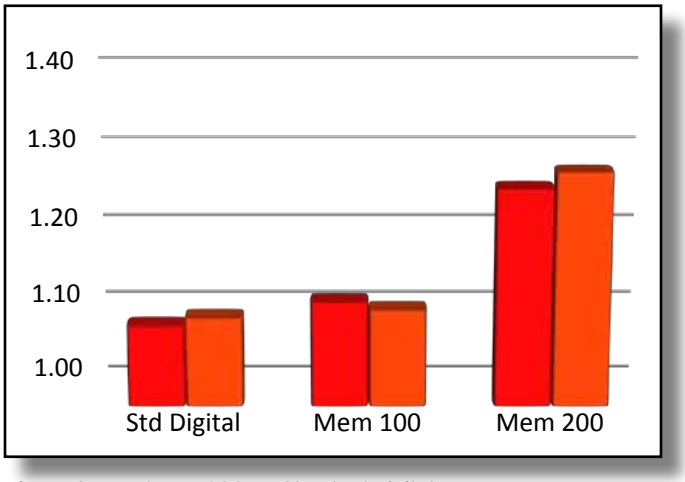

Figure 3: Membrane 200 vs. Standard Digital.

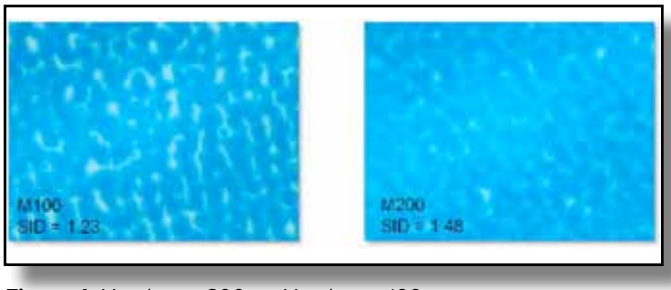

Figure 4: Membrane 200 vs. Membrane 100.

plates work by using a second, thin photopolymer layer on the surface of the plate, molecularly bonded to the main photopolymer layer. This second layer typically has different properties than the main photopolymer layer, which can confer special capabilities to the printing plate.

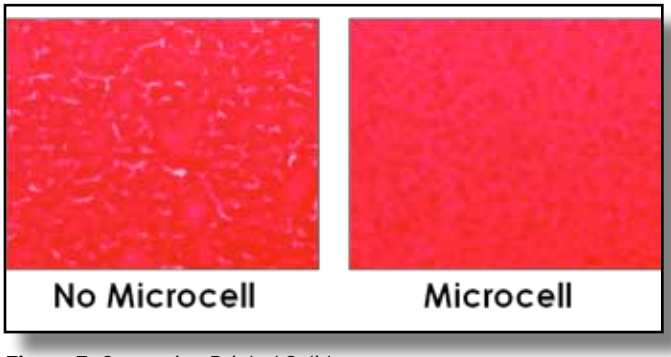

Figure 5: Comparing Printed Solid.

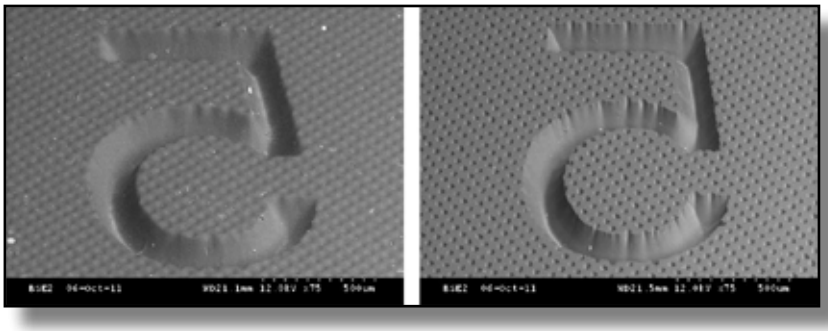

Figure 6: Printed Solid Comparison: Non-LUX at Left; LUX at Right.

For instance, the use of a harder photopolymer in the cap layer (compared to the base photopolymer) can reduce dot gain by minimizing dot deformation at the print interface. Additionally, the inclusion of particles in the cap layer can be used to impart a defined surface roughness to the print surface.

This engineered surface roughness in the cap significantly improves SID in many cases. It is hypothesized that the high-frequency roughness aids in the separation of the ink film from the plate after contact with the substrate, resulting in a more uniform distribution of ink compared to an uncapped plate. Typical improvements in SID and mottle for Digital Epic, the world's first digital capped plate, made by MacDermid Printing Solutions, are shown in *Figures 1* and *2*.

The undeniable performance benefits of capped plates have led to their widespread use in some applications, where they offer an easy and dependable increase in print performance. However, the addition of the second photopolymer layer in the plate adds to the cost of manufacture of these plates. For many, the additional value the plates deliver in print has more than justified their higher price.

MEMBRANE 200

Another option for those looking to increase SID is to use the LUX exposure process and Membrane 200. This gives both a very stable LUX flat-topped dot and imparts surface roughness to an uncapped plate. The LUX dot has a number of additional print benefits, such as highlight dot stability and impression latitude, but the surface roughness induced by Membrane 200 gives a boost to SID as an added bonus. Typical improvement is shown in *Figures 3 & 4*.

The use of Membrane 200 requires the use of the LUX exposure process, which involves the simple lamination of a thin membrane over the mask of an imaged digital plate. This new step not only allows the SID improvement seen, but also gives all the additional benefits of LUX flat-top dots, including reduced impression sensitivity, more robust highlight dots, and "type-high" uniform dot height.

SOLID SURFACE PATTERNING

For the ultimate in SID increase and mottle reduction, it is hard to beat the use of the latest digital surface patterning technologies, such as Esko's MicroCell. For many years, platemakers put 95-98 percent tones in their solid areas because they often observed that these tones gave higher SID than a true solid. Surface patterning technology works on much the same principle, but advancements in imaging technology have led to the use of carefully designed surface patterns that can provide increases in SID and reductions in mottle that are often dramatic. See *Figure 5*.

Although MicroCell patterns work well on plates imaged in standard digital format, the effects of MicroCell can be boosted even further by combination with the LUX exposure process. The LUX process sharpens the MicroCell pattern in the same way that it sharpens dots and reverses, yielding a more precisely defined surface pattern in the solids (*Figure 6*).

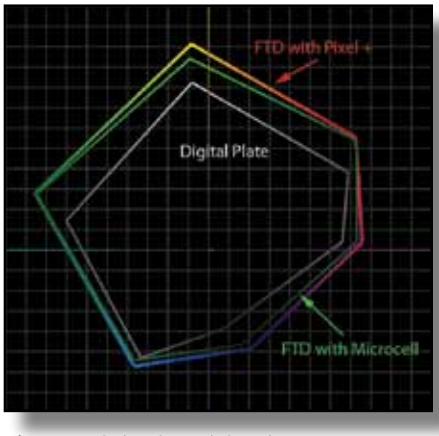

Figure 7: Color Gamut Graph.

The use of LUX with MicroCell not only improves the maximum performance available from MicroCell patterns, it increases the number of MicroCell patterns that work. The latest update of MicroCell, called Pixel+, has taken the capabilities of this technology to even greater levels. This improvement affects both SID and color gamut.

Figure 7 shows the color gamut increase that is possible compared to standard digital plates. ICC profiles for this graph were gathered from dot gain compensated IT8.7/4 targets printed at Fox Valley Technical College on white polyester film. The gamut increase is not only due to the higher solid ink densities, which Pixel + provides, but also due to more effective ink trapping of color overprints. Significant gains in trapped color saturation throughout the tonal range are possible.

The sophistication and capability of MicroCell + LUX are the ultimate in solid color reproduction, but reaching this level of performance does require investment in hardware, software, and testing to find the best combination of patterns for a given application.

MicroCell patterns work better on some substrates than others, so it is strongly recommended that one study the options available and test directly before investing in this advanced imaging technology. But as the color gamut in *Figure 7* shows, when done properly, the combination of MicroCell Pixel+ and LUX delivers color reproduction capabilities that are state-of-the-art.

SUMMARY

Today, the platemaker and printer have options to select from when choosing a method of increasing SID and improving the quality of their solid print.

Three plate-based technologies available for doing so are compared in the table positioned at the start of this article. With these options available, flexo platemakers and printers now have a broad arsenal of technologies at their disposal to produce the most vibrant and consistent colors possible. ■

About the Authors: *Dr. Timothy Gotsick is the Vice president of technology for MacDermid Printing Solutions. He possesses a Ph.D in Organic Chemistry from the University of Tennessee. He has been with MacDermid for nine years.*

Brian Cook is the senior applications development manager for MacDermid Printing Solutions. He received his BA in Graphic Arts from Clemson University.