Color Management in Packaging

Shorter lead times, increasing pressure on pricing, and consistent quality have become almost a commodity in packaging. Matching color is not a commodity among package printers.

PACKAGING IS PROBABLY THE MOST VISIBLE COMPONENT OF THE MARKETING MIX. AND, IT’S BECOMING MORE IMPORTANT. RESEARCH SUGGESTS THAT COMPANIES ARE SPENDING LESS ON TRADITIONAL ADVERTISING BUT ARE INCREASING THEIR BUDGETS ON PACKAGING ITSELF. BRAND OWNERS STAKE THEIR LIVES ON MAINTAINING BRAND CONSISTENCY AND INTEGRITY. YET, ALMOST IN CONTRADICTION, THEY WILL FIGHT TO RUSH TO MARKET AND SQUEEZE EVERY POSSIBLE BIT OUT OF COSTS.

SHORTER LEAD TIMES, INCREASING PRESSURE ON PRICING, AND CONSISTENT QUALITY HAVE BECOME ALMOST A COMMODITY IN PACKAGING. UNFORTUNATELY, MATCHING COLOR IS NOT NECESSARILY A COMMODITY AMONG PACKAGE PRINTERS. JUST AS IMPORTANT, IT MUST BE NOTED THAT BRAND MANAGERS ARE ALSO NOT VERY SAVVY WITH COLOR.

BUILDING THE BRAND

PACKAGING OF ALL TYPES HAS MANY FUNCTIONS; THE MOST IMPORTANT IS TO VISUALLY IDENTIFY THE BRAND. IN MOST CASES, THE CONSUMER PRODUCT COMPANY’S MAIN BRAND ASSET IS THE COLOR ASSOCIATED WITH THE PARTICULAR BRAND. WHO DOESN’T ASSOCIATE RED WITH COKE OR ORANGE WITH TIDE WHEN WALKING DOWN GROCERY STORE AISLES?

THE MAJORITY OF PRINTED PACKAGING TODAY IS MULTICOLOR IN NATURE; MEANING THAT IT’S NOT JUST YOUR STANDARD CYAN, MAGENTA, YELLOW AND BLACK INKS, BUT MORE LIKELY THOSE COLORS AND TWO, THREE OR EVEN FOUR SPECIAL COLORS THAT HELP TO IDENTIFY THE BRAND. LARGE CONSUMER PRODUCT COMPANIES HAVE MANY BRANDS, AND WHEN YOU ADD BRAND EXTENSIONS TO THEM, YOU CAN IMAGINE HOW MANY DIFFERENT INK COLORS MIGHT BE ASSOCIATED WITH JUST ONE BRAND AND ITS BRAND EXTENSIONS. THINK OF THE COMPLEXITY AND, EVEN MORE SO, THE COST ASSOCIATED WITH PRINTING ALL OF THIS PACKAGING.

MORE THAN JUST A PROFILE

ALL PACKAGING SUPPLY CHAIN PARTNERS FROM BRAND OWNERS TO PRESS OPERATORS HAVE BEEN CONDITIONED TO THINK OF COLOR MANAGEMENT TOOLS AS PROFILERS OF PRINT DEVICES TO GENERATE ACCEPTABLE CONTRACT PROOFS. ALTHOUGH THAT CERTAINLY IS AN IMPORTANT FACET OF COLOR MANAGEMENT, THERE ARE MANY OTHER FACTORS THAT AFFECT ULTIMATE JOB QUALITY ON PRESS. AT THE END OF THE DAY, THERE IS A LOT THAT GOES INTO COLOR MANAGEMENT IN PACKAGING TO ENSURE A LEVEL OF PREDICTABILITY THAT MAKES PACKAGING BUYERS...
comfortable that the proof they sign off on actually matches the printed result and therefore the actual product on the shelves. In simple terms, a color management system is expected to color correct and match the press. Of course, a color management system should be able to measure color—both CMYK and spot colors. However, it's the level of spot color handling that is the benchmark, particularly for packaging. Quite a few color management systems claim to simulate spot colors. Yet, they rarely measure spot colors and never refer to color databases. And, these systems are usually stand-alone solutions often linked to certain devices. They aren't color solutions that are fully integrated in a RIP and a workflow. It requires more sophisticated issues such as handling dot gain, spot colors, understanding the order of colors on press, the characteristics of opaque inks and any combination of these elements.

Color management incorporates a lot, including color conversion (for example, RGB to CMYK), extended gamut ink sets, ink selection, and dot gain on press, to list just a few.
COLOR MANAGEMENT

This may seem very basic to anyone who has followed the IPA Proofing RoundUP, but as a reminder: it was not long ago that most people were matching the press to the proof, rather than the other way around. Unfortunately, I’d hate to tell you how many people we still see who are doing it.

Of course, the objective is to match a proof to the press, so it is a good determinant of how the press will print a job. One of the more important reasons for this is very significant: a 4-color press typically has a smaller gamut than an inkjet printer. If you are looking for flexibility in a printed result, you’re going to get it from the printer, not the press. Fingerprinting a press is also an investment that pays off quickly. Jobs are pulled to a color OK faster, which means you save makeready time (and money), on a job-to-job basis, and also increase press uptime for all work.

Data Collection Do’s & Don’ts

When you are proofing to the press, the press has less color gamut. I like to promote simplicity. Many people collect data on press profiles, read the profile from something printed on the press, then go directly from that or optimize the press. The priority for any printer has to be to achieve predictability of the printed result, regardless of how immersed you get into color management. The printer needs to be able to create a predictable proof of press performance. My suggestion is that you put your press in the most consistent running state (the same as your proofer). You always calibrate the proofer, and rely on the result day after day. Given that, a printer should never try to let a press sheet—used for proofing calibration and profiling—represent the best that can be done. It has to be representative of the press during a production run. That’s the only way you can link a proof back to press predictability.

Optimize the press first. Build your curves and create the right SWOP value and ink densities and then create your press profile. You’ll have a greater degree of repeatability. We have global customers who have followed that philosophy to each press.

If you do not use the stock that something is to be printed on, there will be issues of laydown of ink, saturation and whiteness. If you create a profile with the same ink, substrate and plate, theoretically you should have the same profile. We suggest that customers use a SWOP curve and accommodate the flexo highlights.

Two-color Management Systems In One

Color management can be broken down to two approaches: colorimetric and spectral.

Colorimetric color management systems are based on the CIE L*a*b* color space—an excellent method to specify colors on a very wide gamut and an exceptional means to verify color accuracy. This measuring system relies on printed characterization charts containing patches of different CMYK percentages and combinations. Colorimetric color management systems describe the resulting effect of colors, but not the underlying mechanism of how they interact.

For print operations where no standardization on a fixed set of inks has been made, a system is required that is flexible enough to work with a number of spot color combinations. This is what spectral approach can provide. Spectral color management systems determine the characteristic of inks. They rely on measuring the spectrum of inks individually and in overprint with other inks. Just as important, they measure the opacity of inks affecting the combination of inks on press. Opaque inks and metallic colors have a different level of opacity than traditional CMYK inks. Measuring how they will affect overprinting is crucial. Using a database-driven mathematical model, the spectral color management system provides the only practical solution for special colors. It is perfect for profiling special ink gradations and solids. By extrapolating the behavior of colors to any set of inks, it describes the underlying mechanism that drives the final result—and assures a correct “read” on overprints by measuring the level of opacity of inks.

A good packaging color management system combines both colorimetric and spectral color management systems to provide the best of both worlds: the accuracy of CMYK along with a database of special color profiles. Thus, the overprint between spot colors and CMYK are accurately predicted.

Combining colorimetric and spectral management systems, a good packaging color management system...
works with a profiling chart for CMYK, while referring to a spectral profiling chart for special colors.

With the spectral chart, the color management system can profile any multicolor process set and special colors, such as metallics and Pantone inks, for proofing or converting jobs to the target color space. These profiles can be optimized for minimum ink usage and maximum color depth.

The system mathematically predicts any mix of any set of inks in the database and correctly previews and proofs. It is easy to add custom inks to the database.

The ICC color profile specification is a popular buzzword and promises to provide a standard format. However, with different vendors, there are different color matches and private tags. ICC offers very limited results for non-CMYK workflows and has no support for opacity levels or overprinting spot colors. Therefore, it is important in packaging to use a color management system that provides full support for ICC profiles, but goes beyond the capabilities of the ICC specifications.

**Multicolor Process Printing**

As consumer product companies seek ways to reduce costs through the supply chain, one mentioned often—but not implemented often—is the consumer product company’s desire to standardize a particular brand and its brand extensions’ packaging on one multicolor ink set. The problem is how do you standardize on one, multicolor ink set while maintaining the visual identity of all the packaging for a brand and its brand extensions? And how do you convert all of those digital assets, in their own unique color space, to the color space of one multicolor ink set—all the while maintaining the individual visual brand and brand extension identity?

Printing economics and print buyer requirements are starting to convince printers to adopt a multicolor process printing (MCPP) color set rather than using spot colors. Typically, MCPP sets use a combination of CMYK and two or three additional colors such as orange, green and blue. Examples of popular MCPP ink sets are Pantone® Hexachrome, FMSix (MYPrintech) or Opaltone. Brand colors previously printed with spot colors now are created with multiple inks. The purpose of MCPP is to produce the same gamut as spot colors; so spot colors are no longer needed. Printing with MCPP has a number of advantages for the brand owner and converter alike. Because the same inks are on press most of the time, there is no need to clean stations for each new job. And, because many package designs can be printed at the same time, less product inventory can be kept—there is more freedom to return to the press to print a specific package. With less spot colors, there is reduced ink inventory while providing the designer adequate color latitude to create appealing packaging. In short, MCPP creates more visually appealing packaging by preserving the balance between visual brand identity and printing economics.

However, it is crucial to use smart tools that make the implementation of a multicolor printing process smooth and easy.

**Proofing is more difficult with multicolor process printing. Making full use of the available color gamut on proofing devices is only one of the elements that will determine success.**

With MCPP color sets, brand colors previously printed with spot colors now are created with multiple inks. The printability of the design becomes of paramount concern. Failing to produce these colors accurately can affect brand identity and prevent consumers from buying specific branded product. While printing with MCPP can save money, extra prepress costs are incurred to make jobs printable in MCPP. Trapping of MCPP jobs is more cumbersome, because pullbacks are much more intricate. What if black is not used? Can this affect the readability of a barcode? How can one predict colors for new designs and images when special inks are combined—particularly in a separation? Can the new gamut of colors cover an image appropriately? How do two Pantones overprint?

Proofing is also more difficult with MCPP. Making full use of the available color gamut on proofing devices is only one of the elements that will determine the success of proofing for MCPP.

At the heart, you need a tool that can easily convert digital assets to any target color space, using multicolor (ICC) profiles or lookup tables to convert entire jobs or user selections, on images and/or linework. By showing instant deviation of the conversion, it is easy to predict if colors are in or out of color gamut. You should use a color conversion system that is capable of supporting a number of MCPP systems.
listed previously and any other custom multicolor system, including metallics, white, and varnishes.

**Screen vs. No Screen**

Many vendors can provide systems to produce reasonably color-managed screened and unscreened proofs. Other than the obvious reason of detecting possible moirés, there is a more important reason to consider screened proofs in packaging.

If you are working with a package or piece of art where you cannot readily detect the dots from an arm’s length away, an unscreened (or dotless) proof provides more room for accuracy in color management. If you can see a dot structure from an arm’s length away, then consider producing a screened proof. The reason is quite intriguing.

Remember, a lot of packaging is still printed using coarse screen rulings. A coarse dot structure can influence visual color. Although the eye may not actively consider it, there is a lot of white space in-between the dots in a rosette. That white space becomes a part of the color of the image. This is particularly the case in 100-line or less screens. (Above 120 line screens, I receive a lot of arguments from users who prefer to use unscreened proofs, and I cede to their requests.)

In proofing, the best color management for screened materials may be screened proofs. Generally, when you produce an unscreened proof, you are working with LAB color management. For example, for the color green, you are reproducing a green LAB value. However, when you create a screened proof, it is a mixture of a cyan and yellow dot.

Accuracy for dot proofs is even more critical, because both dot size and color constantly interact. Many systems tend to forget that not only the press has dot gain but also the digital proofer as well. Particularly with flexo, you must ensure that flexo-specific printing behavior is adequately mirrored on both screened and unscreened inkjet proofs. Only then can you facilitate extremely precise reproduction in the highlights and shadows.

**Create once, output many:** It only makes sense that if a file is RIPped once for both the proof and printer, it is the most reliable and consistent method to view color.

**Separating yourself from others:** Some companies are finding more creative ways to print with their own custom ink sets. Some systems replace one of the process color inks (CMY) with a spot color—one step beyond traditional MCPP. Imagine the challenge: Create a good separation of a photo using the replacement ink(s). It’s something that some systems have a hard time doing.

**Master the Color**

While many of the principles of package printing color management are, of course, the same as commercial printing, the nature of the substrate, the unique inks, and unusual color sets make it a much more complicated endeavor. Matching proofs spot colors that exceed a proofer’s gamut, understanding the synergy of two inks on press as well as on a digital proofer, wondering if a coarse screen might affect viewing perception, and creating an acceptable system—both color management and proofing—for multicolor ink sets are all challenges a converter faces every day.

If and when you are ready to print packaging, make sure you have mastered the color, first.