Expanding Capabilities with expanded gamut

JAY SPERRY, Clemson University explains the advantages and challenges of expanded gamut systems

ADDING VALUE AND REDUCING COSTS WITH EXPANDED GAMUT

Imagine a workflow in which designers can use an unlimited number of spot colors in their package designs. Imagine free reign use of raster effects on backgrounds and image enhancements. Imagine an ink inventory of seven ink bases, not the hundreds of unused containers of special ink blends, and not washing up ink stations between production jobs. And finally, imagine running multiple iterations of label designs on the same press run, allowing smaller quantity orders to be run as efficiently as long runs.

These are some of the opportunities that an Expanded Color Gamut (ECG) system allows. Naturally, nothing is ever as easy or great as it seems. Production capabilities, process control, and accurate digital proofing, along with specialized software and knowledge are required for an efficient ECG workflow.

Expanded gamut printing introduces additional process color inks to the standard CMYK set-up. The primary logic behind ECG is the ability to increase the pressroom color gamut, to:

- Allow traditional spot colors, such as a PMS 165, to be reproduced using a standardized ink set, rather than changing the press set-up for each particular job
- Enhance vivid image reproduction, depth, and contrast
- Run multiple variations or flavors of a package or label design on the same printing form

Let's look in more detail at the four major disciplines involved in producing expanded gamut packaging: the design, prepress, production – and the customer.

DESIGN

The introduction of spot colors seems like an age-old problem with creative designs. Problem solving how to take a 10-color design and work it into a 6 or 7 color production file is often an arduous task for prepress operators. Gradients and raster effects lead to complicated decision-making and additional prepress time. With an ECG system, the workflow is established to 'build out' of a 7-color system from the outset, including the swatch colors used in the design process. This allows designers to use as many spot colors as they like, as each one breaks down into the same process color ink set.

Successful use of expanded gamut production relies on some rule changes in package and label design. Experienced packaging designers generally keep graphics relatively simple, using large areas of spot colors, single color vignettes, and minimalistic design principles. With expanded gamut, large solid areas of spot colors are more difficult to reproduce than textured or patterned backgrounds and color. Designing for success with ECG should take this into account. An example is shown in Figure 1.

> "As the marketing arm of the CPCs are starting to realize the benefits of extended gamut, we are starting to see more regionalized marketing that was previously not cost-effective to produce"

The ability to run multiple iterations of the same basic art on the same press form – for example different flavors of the same product – eliminates the need for extra plates, and increases run time on press. This concept relies on the structural design of the package, whether a label, carton or shrink sleeve, having the exact same die-line/production repeat. This concept needs to be introduced early in the design discussion. An illustration and production model is explained in Figure 2.

Expanded gamut also reduces the minimum order quantities typically associated with packaging, allowing for more trial designs, test markets, and new product launches.

PREPRESS

In the prepress or retouching stage of the packaging workflow, ECG puts pressure on proofing technology, color separation, and imaging/screening technology, as well as the toolset and knowledge to produce correct press-ready files. Kevin Bourquin, prepress manager, Cyber Graphics, comments: 'We had to challenge ourselves when it came to file preparation and have became more aware of what happens at each downstream step of the process that might influence the final result. Not catching a small error in the file could cause us to rebuild a file late in the game.'

The definition of spot, or PMS colors, in terms of build values greatly affects the success of ECG production files. For instance, if PMS 165 is used in the file, the CIELAB definition is L*=65, a*=59, b*=70. In a situation where the converter is using a 7-color process system of Cyan, Magenta, Yellow, Black, Orange, Green, and Violet, the correct tint values need to be used to create a build of PMS 165 with as little Delta E as possible – for instance 100 percent Orange and 30 percent Magenta.

When brand identity colors are used, the color must be reproduced as accurately as possible, and because production systems running ECG are unable to 'tweak' the press to match expectations, prepress faces intense pressure in achieving the correct builds and color separations.

Image separation should take full advantage of the extra color gamut available, but not at the expense of press performance. In flexography and gravure, image highlights are carefully managed to avoid hard breaks when fading to zero. This becomes a significant problem in ECG printing systems when the extra colors are not used in highlight or mid-tone areas, leading to hard breaks throughout the image. Advanced screening and high-end plating systems are required to allow colors to fade to zero without impacting image reproduction. On the other hand, this saves prepress time traditionally spent handling highlight tone issues.

Exact proofing of final press outcomes is crucial to ECG implementation, but there is a lot of work still to be done, as Bourquin notes: 'While we have improved accuracy with the addition of more complex color algorithms from companies like Kodak and EskoArtwork, and higher gamut output devices from Epson and HP, there is still a need for better proofing accuracy to meet the printer and CPC's needs.'

> "We had to challenge ourselves when it came to file preparation and have became more aware of what happens at each downstream step of the process that might influence the final result"

Particularly when using build colors for spot color reproduction, fully color-managed proofing systems allow users to adjust artwork and workflow settings to provide proper color separation, while also providing the customer with a realistic production target.

John Fulcoly, director at Packaging Client Productivity Resources (CPR) and former manager of PepsiCo's North American food flexible packaging, comments: 'For cases where digital proofs need to be supported by printing a press sheet of color targets, the practical application for [ECG] approvals is not much different than conventional printing – the digital proof is the compliance tool for process images and a printed color block is the compliance tool for manufactured brand colors. Yet it is imperative that the printer and prepress teams effectively profile the press and that the printer be able to verify compliance to the profile conditions to support multiple 'first time right' outcomes and at the same time to be successful at combinations.'

THE PRESSROOM

To take full advantage of the economic benefits of ECG, a printer should dedicate a press to running nothing but the expanded gamut system. You might leave one or two units for custom colors, varnishes, or whites, but seven units must be dedicated to process color bases that never shift outside of production tolerances.

You will also need, at a minimum:

- A press that can hold precise registration, usually within .005in
- A thorough preventative maintenance program for printing components such as anilox rollers and printing plates
- Measuring equipment such as spectrodensitometers
- A process control system to systematically keep base colors and tonal values within a predefined tolerance, usually similar to the tolerance expected with brand color reproduction

Press registration becomes critical: all text that previously would have been a spot color is now built out of two or three colors. More importantly, reverse text out of spot color is now reversed out of

FIG1. **DESIGNING FOR SUCCESS WITH EXPANDED GAMUT SYSTEMS**

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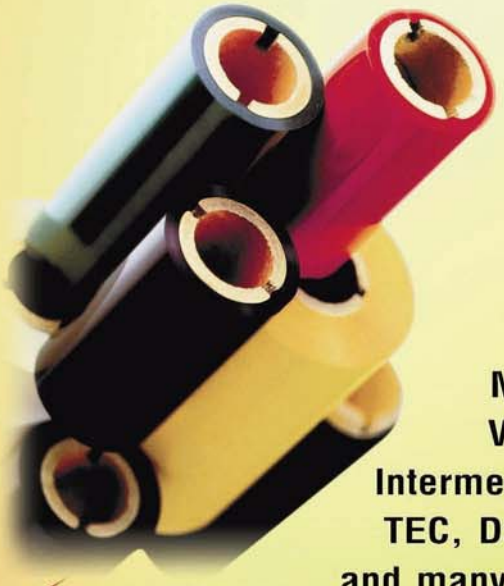

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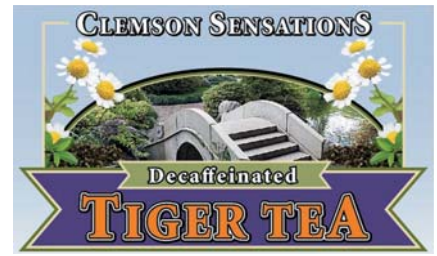
KOCHER + BECK

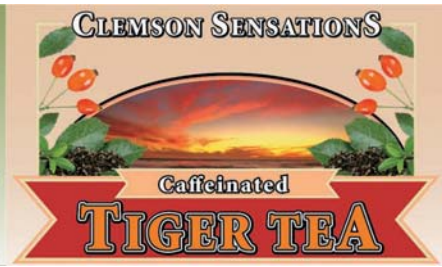
FIG 2. COMBINING DIFFERENT DESIGNS ON THE SAME PRINT FORM

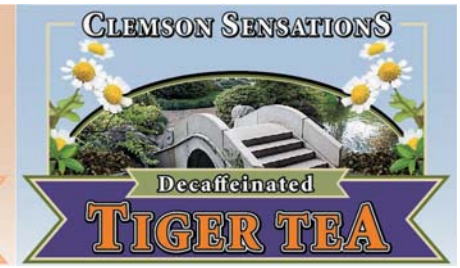
Design 1
CMYK plus 2 spots
2 Hour Make – Ready, 1 Hour Clean-up
100,000 feet @ 500 fpm
50% Up-time

Design 2
CMYK plus 2 spots
2 Hour Make – Ready, 1 Hour Clean-up
100,000 feet @ 500 fpm
50% Up-time



Design 3
CMYK plus 2 spots
2 Hour Make – Ready, 1 Hour Clean-up
100,000 feet @ 500 fpm
50% Up-time





One Combined Print Form
CMY, Orange, Green, Violet
1 Hour Make – Ready, No Clean-up
300,000 feet @ 500 fpm
90% Up-time

multiple colors. Fortunately, a significant number of narrow-web and wide-web printing presses can consistently hold 6 point positive and reverse text built out of three base colors.

As mentioned previously, pressrooms that are traditionally able to adjust the press to achieve a proof or customer expectation are no longer able to change ingredients on a job-by-job basis. This requires a high level of preventative maintenance on key ingredients to ensure consistent performance, typically benchmarked against the characterization run in which the press is fingerprinted for prepress calibration. To consistently manage print quality, a spectrodensitometer is required to regularly measure and report, not only on color reproduction of the solid colors, but more importantly the tonal values of those solid colors. Proper software needs to be installed to supervise the color consistency on the production line, and identify weaknesses within the preventative maintenance program.

The biggest pressroom advantage of correct ECG implementation is reducing production costs. That is achieved by:

- Increasing run length by running multiple package designs on the same set of plates or printing forms
- Eliminating job-specific color set-up and clean-up time and consumables
- Reducing ink inventory of spot color formulations and bulk buying expanded gamut ink bases

John Q. Hite, senior manager printing technologies at Bryce Corporation, speaks on his experience at the printer's Arkansas facility: 'No doubt there are some savings that can be achieved by reducing the number of ink and anilox roller changes, and potentially lowering coating weights. But the larger opportunity comes from the ability, when in this format, to combine items and eliminate setups. If each of those setups starts to produce two, three, or four production jobs instead of the typical one, a lot of additional production capacity starts to open up.'

Fulcoly expands on the opportunities found in combining jobs: 'Among the numerous examples of customers using some form of extended gamut printing, those who can maximize combination runs are in position to share the most cost savings. These can support lower prices and fund investments in market place news, sustainability, and support inflation offsets.'

CUSTOMER/CONSUMER PRODUCT COMPANY

A reported key to ECG implementation success is having a relationship with the print buyer or customer to promote a partnered buy-in to introducing the technology across a brand or series of brands. Concerns that must be addressed from the customer perspective, include:

- Less accurate reproduction of brand colors
- Proofing representation of final press output
- Changing design rules and coordinating workflow with creative design
- Transitioning in-store packaging to new expanded gamut packaging

These concerns already exist in many packaging supply chains with traditional CMYK plus spot color printing, but companies must properly educate customers on the capabilities of expanded gamut reproduction.

"The larger opportunity comes from the ability, when in this format, to combine items and eliminate setups"

'Suppliers can set the stage for future opportunities and conversions in advance of customers qualifying extended gamut printing by taking advantage of any and all chances to promote harmonizing cut offs, web widths, and structures,' Fulcoly explains.

Once the customer or consumer product company is educated on the process and implements the system, the advantages that can be realized are impressive, including:

- Shorter lead times to package production

- Lower minimums of order quantity, leading to aggressive pilot marketing programs and better engagement of target consumer through packaging graphics
- Higher quality image reproduction and overall packaging graphics
- Freedom in creative design to use a large number of colors and more aggressive packaging graphics
- Reduced packaging costs

Hite says,' we see this format continuing to expand in our business segment. The expansion has been slow but the potential for savings and the system's ability to really open the design aspects of the package, are steadily bringing more customers to take a look.'

EXPANDED GAMUT IMPLEMENTATION STEPS

The steps for implementing expanded gamut start with a collaborative effort between the customer and their packaging supply chain including design, prepress, and production. Generally the production processes are the first to be evaluated, with the most important considerations being number of colors available, registration tolerances, and a process control audit and evaluation.

If production settings lend themselves to implementation, it is time to calibrate the system for press fingerprinting. The steps needed for prepress implementation include:

- Implementing the CMYK system, including curve generation and targeting a CMYK color standard (see p. 48).
- Choosing the ideal extra colors. This is typically determined by single pigment ink choices from areas open to gamut expansion, including Red, Orange, Green, Violet, or Blue.
- Establishing understood plate curves and optimized solid color targets for the additional colors
- Press fingerprinting with determined run sequence and appropriate color management targets for expanded gamut profile creation
- Implementation of the press profile-to-proofing workflow and proof accuracy development
- Building and analysis of spot color conversion library and reproduction accuracy

Once this system has been established, verification or trial runs should be completed with the customer partner to build confidence in system performance and to verify production targets and tolerances. From these production runs, design specifications are discovered and communicated as widely as possible throughout the creative process. It is then the responsibility of the pressroom consistently to achieve the target color and gain values of the primary printing colors while maintaining the system to its calibrated condition.

New technology will allow better process control in the pressroom, seamless integration of ECG color settings, advanced proofing, improved ink sets, and improvement of printing components. This partnership makes expanded gamut implementation possible and drives a continuous improvement process through the packaging value chain.

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To learn more and evaluate Expanded Gamut hands-on, L&L readers are invited to visit Clemson University's 7-Color Process Seminar held throughout the year. This gives attendees the chance to implement an expanded gamut system in the Clemson labs and learn first hand the opportunities and challenges associated with the entire workflow.