



Expanded gamut printing 101

With press manufacturers actively promoting 7-color ink systems for flexo converters, Chris Baldwin at Nilpeter USA looks at the requirements, challenges and advantages of Expanded Gamut Printing

So what is Expanded Gamut Printing? Basically, it's seven color process printing: Cyan, Magenta, Yellow, Black with the addition of Orange, Green and Violet. It's also referred to as Extended Gamut, Hi-Fi Printing and Fixed Pallet Ink Set. For this article we'll use Expanded Gamut or EG Printing. The scope of this article will try to answer a few of the common questions that are asked by companies considering whether or not they should be doing EG printing. A few of the questions are: Why do it? What's needed to do it? How to do it?

It's been said that EG seems to point to the quality aspects of the process while Fixed Pallet Ink Set points to the economic aspects.

Why do it?

There are several reasons for considering EG Printing, but most of them fall into two categories: financial and quality. How to be more profitable and how to print higher quality labels and packaging. Since the main reason companies are in business is to make money, we'll start with this one. As most business owners know, there never seems to be the time and the margins they were used to when selling their labels in the 'good old days'.

With the rising costs of substrates, inks, plates etc and buyers from the companies you sell to demanding lower prices and shorter lead times, it's becoming harder and harder to

make a profit or, worse, stay in business. Since external factors such as the cost of substrate, petroleum prices etc are out of your control then the factors that you do have control over are the internal ones. This is where we'll focus: how to become more efficient and profitable with the help of EG printing. Since efficiency and cost savings go hand in hand, how can EG help?

- **Ink savings** – The average printing shop has numerous liters of ink on their shelves that are half used or used for certain jobs with special colors. Sometimes there can be hundreds of liters of ink in inventory that aren't making you any money. With EG you only need seven colors.

- **Fewer anilox rollers** – With EG, since you are only running seven colors you can reduce the number of anilox rollers needed. While you'll still need a few extra rollers for coatings, opaque whites and line colors that are outside of the gamut range, your anilox inventory can be significantly reduced.

- **Reduced wash-ups** – Since you are mainly running the same seven colors you will no longer have wash-ups between job changes. Not only will this reduce your set-up times for the next job, it will also allow you to run more jobs and increase capacity. Essentially you will only have plate changes.

- **Ganging jobs** – In most cases ganging jobs together has always been dependent on items running the same spot colors. With EG you are no longer limited. You will have the ability to run many shades of different colors at the same time, which in turn will give you more through-put each day.

- **Material savings** – With EG once you have standardized your process you will no longer have to use your press as a very expensive ink proofer. Matching colors on press is one of the biggest culprits of wasted time and wasted substrate. If you consider just the material savings alone this is more than enough reason to seriously consider Expanded Gamut Printing.

As you can see from the five examples listed there is a great opportunity to improve on the internal factors that are in your control and increase your company's efficiencies – and more importantly, profitability!

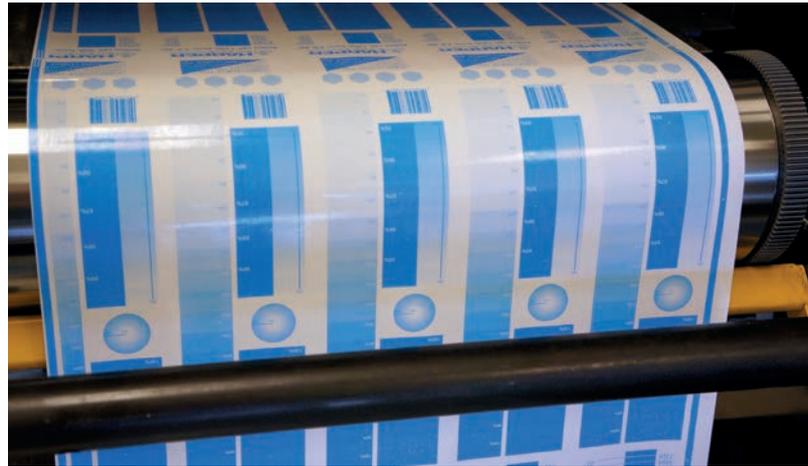
Higher quality

Now we will focus on how EG printing can help you produce higher quality labels.

With EG printing you are able to print a greater range of colors due to the ability of hitting a larger color gamut (Expanded Gamut). With four color process, flexographic presses can match approximately 50 percent of the Pantone book, while EG Printing can



Key parameters to control include registration, impression and drying/curing



Banded anilox roll test

match 75 percent or more.

A common question that's asked is: 'Is it worth adding three more colors for only 25 percent more?'

That's a good question and in short the answer, in my opinion, is yes. In G7-ISO color standard specifications you need to be at a Delta-E of five or less on color matches. Obviously some CPG companies with larger brands require tighter colorimetric tolerances, but other companies' standards may not be as strict.

Although with the additional three colors you can only achieve around 25 percent more Pantone colors than standard four color process, the colors that are outside of the gamut range are much closer with seven colors than four. As an example, let's say there are a thousand spot colors in a color book. With four color process you can match 500 of those and with EG you can match 750. That's 250 more colors that are achievable with the addition of only three more colors to the process. This is not including any special match colors.

With EG, jobs that have a lot of orange, green, violet or purple shades are more vibrant than standard four color process. The additional colors will enhance any labels and packaging that have photographic images and give them more 'pop'.

But from a practical standpoint, a lot of jobs are vector images or line copy. This is where Expanded Gamut really shines. Being able to print 75 percent or more of Pantone spot colors from only seven colors is the real advantage. As a note, the majority of the spot colors are only made from two or three colors, which in turn helps with registration.

Hopefully now you've been given enough reasons to help answer the question of 'Why do it?'

What's needed to do it?

Now that you are considering EG printing you will need to determine if your existing equipment is up to the challenge. Here are several things you need to verify before you get too far into the journey.

- **Registration** – Depending on the line screen that you intend on running you will need to determine what register tolerances your press is capable of holding. Since you are building spot colors with half-tone dots you need to hold tighter register to prevent shifts in color. Ideally you should be able to hold .002 (.05 mm) register for tighter Delta-E control.
- **Color management** – You will need to determine how well your press can maintain density at running speeds and throughout speed changes. To be able to maintain tighter and more consistent color matches, verify with a densitometer that your density stays within a few points.
- **Impression settings** – Verify that you can print with even impression on both sides of the web. With a densitometer you want

to be at 3 percent or less from one side of the web to the other. Also check that you maintain impression at different press speeds, and that your impression comes back consistently during starts and stops.

- **Drying/curing** – Typically wide web presses use solvent-based inks on a central impression drum but narrow web, inline presses use UV inks. UV inks are more consistent and are easier to maintain and are recommended for EG printing. Verify that your lamps are curing properly at production speeds.

Once you have determined if your existing equipment is capable of EG printing, or you need to invest in a new press, then the next question is:

How to do it?

Before going to press with the EG process, a thorough evaluation of several things needs to be performed to achieve an acceptable end result. The first step in the evaluation process is:

Optimization

During optimization you will need to identify:

- Substrate(s)
- Plate DPI/LPCM
- Ink system
- Plate material
- Mounting tape
- Anilox rollers

Once you have chosen these components you will be ready to proceed.

- **Banded anilox test** – One of the best methods for selecting anilox rollers is a banded anilox test. A banded anilox roll has multiple engraving bands across the roll that consist of different line screen counts and volumes. Typically there are five engraving bands on a narrow web test. Once you have worked with your anilox supplier and determined the cell count/volumes that you want to test, and the banded roll has been made, then you will do a print test. The print test consists of a photopolymer plate that has tints, solid targets, etc. that has been designed to match the engraved bands of the anilox roll. Please refer to image above
- **Ink set** – The inks that are chosen for the EG process are not typical process inks. The CMYK colors have to hit a Delta-E value of 5 or less to be compliant within the G7-ISO L*a*b* ink color standards. The OGV inks need to be mono pigmented and need to fall within the proper hue angles of Flexographic Image Reproduction Specifications & Tolerances (FTA-FIRST), while achieving the most chroma.



Performing a fingerprint test using a spectrophotometer to measure color and densities



Profile test using a set of plates with the curve applied from the fingerprint

- **Plate package** – To achieve the highest level of print quality the durometer of the plate in combination with the best compressibility of mounting tape (plate package) needs to deliver the smallest highlight dot while achieving the optimum Solid Ink Density (SID).

Note that for best results all of your testing needs to be done at production press speeds. You will also need to repeat the tests on each substrate you will use.

The next step in the process is:

Fingerprint test – After optimization is complete a fingerprint test will be performed to help determine the print characteristics of the press. The purpose of the fingerprint is to:

- Linearize the press to an industry standard such as GRACoL/G7
- Neutralize press for gray imbalance
- Produce neutral print curves

To be able to achieve repeatable results during production runs, the fingerprint must be run under normal conditions, at production speeds, using virgin ink along with clean anilox rollers.

Note that if the tests are not done in normal press room conditions it will be extremely difficult for the press operator to repeat the same results on production jobs.

During the fingerprint a spectrophotometer will be used to measure color and densities as well as check for even plate impression, which needs to be three percent or less from operator side to gear side of press. (Example: using the dot area function on your device measure a fifty percent patch and keep impression deviation at three percent or less). Close attention needs to be paid to ensure there are no skips or dirt on the data targets or the test results will be inaccurate. See image above.

After the fingerprint data is collected and extrapolated, a near-neutral curve will be applied to the seven colors and added to the profile target.

The next step in the process is:

Profile test – After the fingerprint test is complete, the next step in the EG calibration process is profiling. The profile test will use a

set of plates with the curve applied from the fingerprint. Note that the profile test must be printed under the same conditions as the fingerprint trial.

The profile target used is an IT8.7/4 consisting of 1,638 patches of different CMYK color combinations for overprints. Images are added to the test form as well to help validate the proof. First run the target plates in the CMYK stations to create a traditional CMYK profile. Next place the cyan plate into the orange station and run the target with mykO. Put the cyan plate back into the cyan station and place the magenta plate into the green station and run the target with cGyk. Put the magenta plate back into the magenta station and place the yellow plate into the violet station and run the target with cmVk.

Once the four data set combinations have been run and the information is extrapolated, the EG profile is ready to be validated. After validation of the data is complete, conversion of screen builds into spot colors can be accomplished through prepress software. Once the EG separation is complete you will be ready to go to production. See image above.

Working with a trade shop experienced in Expanded Gamut printing will be invaluable and vital to your success.

The EG process, like any other, is a journey; it will take a commitment of team leaders to make it happen. This process, along with the sophisticated and automated inline presses of today, make this a very achievable and realistic advantage to the narrow web packaging market.

That being said, I wish you success in your Expanded Gamut journey.



Chris Baldwin has been in the packaging industry for more than 28 years. Starting as a printer in a label shop before moving over to flexo press manufacturing, Baldwin has held numerous key positions, including R&D manager, print trainer and capital equipment sales. Baldwin is currently technology center manager for Nilpeter North America. He is a First Certified Implementation Specialist through the FTA and an acting FTA awards judge