WHITE PAPER

COLOR MANAGEMENT FOR DIGITAL LABEL PRESSES

GLOBAL GRAPHICS® software

Contents

Introduction

Digital presses require front ends that can provide accurate color management that is adapted to the specific characteristics of each model. This white paper explains the challenges and opportunities presented by the inks or toners and color reproduction of the different common digital print processes used in these sectors.

It also explains how Global Graphics' Harlequin® products offer sophisticated color management tools to press developers and end users.

A Glossary with notes on the concepts is provided at the end.

Recent years have seen a rapid growth in the adoption of digital printing processes for commercial production of labels, and a surge in development of digital presses for various sectors of packaging. There has been a proliferation of different digital processes and ink or toner types. This is leading to a need for new technologies for accurate management of color in a variety of new workflows.

"Conventional" non-digital processes such as flexography, offset lithography, gravure and screen processes are long established. The workflows from original file through color separation, screening, plate/cylinder/screen and press are often designed to match widely used international standards for media, ink and print colors.

Digital printing processes are still being developed and refined from year to year, with considerable ongoing potential for further improvement in speed, quality, tonal range, gamut size and media type supported. At present this diversity means that there is far less uniformity of results and the international standardization processes have not yet completely caught up with the potential of digital print for label & packaging.

For this reason it is particularly vital for the front end software that controls color and screening to obtain not only the optimum quality from a particular printing press, but where necessary to modify the results so the color will match existing processes and standards.

Global Graphics has more than thirty years' experience in developing industry-leading front end software for conventional pre-press film and plate making systems. For half of that time it has also been developing these for digital production printing systems. This includes a lot of knowledge and experience in generating halftone screens and managing color.

This expertise with color management knowledge is particularly important as Global Graphics is offering its systems to OEMs in the digital press markets for label & packaging.

Backgrounder: digital label printing processes

So far four main processes are used in today's digital presses for label & packaging: liquid toner, dry toner, UV-cured inkjet and aqueous inkjet. These are often aligned with the selection of conventional print technology that would be used for the same product:

- toner for high-end labels for which offset would traditionally be used
- UV inkjet for industrial labels that would have historically been printed using flexography
- aqueous inkjet for corrugated board that would use offset for medium to long runs, etc.

This alignment is not necessarily permanent, however, and may well change as press technology develops further. As an example, most folding carton and flexible packaging presses in production use at this time use liquid toner, mainly because Indigo was the first vendor to bring production quality presses to the mass market. It seems very unlikely that inkjet will not make some progress here as well.

Single-pass inkjet

At present the predominant liquid toner label presses on the market are HP Indigo models. These are the most commonly used high productivity digital label printers worldwide.

More traditional electrophotography (i.e. dry toner) is used by Xeikon at the high productivity end of the commercial labels market, and it is fairly common in low volume presses, such as those based on engines from Oki Data. Xeikon claims to be number 2 in terms of worldwide digital label press installations, and has recently added liquid toner presses.

Single-pass inkjet, almost always used with UV-cured inks, is used by the majority of label inkjet press models available today, even though sales numbers in higher volume sectors of individual brands so far are lower than the HP Indigo or Xeikon presses, largely because this is a newer technology. The same single-pass approach is also being used in various UV and aqueous inkjet presses for folding carton and corrugated board; use in flexibles is likely to come soon.

Single-pass means that the print heads are fixed, and the substrate moves past them. The substrate can be either sheet-fed or as a web on a roll. Single-pass is used primarily because it can be much faster than the multiple-pass technology often used in the wide format market. Web-fed presses can usually achieve higher printing speeds than sheet-fed, commonly up to around 85m/min for UV Inkjet or 300m/min for aqueous. But web-fed presses may not fit as well into the supply chain or integrate so well with converting processes for certain packaging segments such as folding carton in small to medium companies, especially for very short run custom products.

Additional ink types are used for inkjet printing in other print sectors, such as oil-based or latex. To date the variety of ink types used in label & packaging is fairly limited, but it's perfectly possible that this will change in the future.

Just as for conventional print, the profitability of runs of very small numbers of labels or packages depends hugely on significantly reducing wastage of time and materials in preparing the press for the next job. An hour's wash-up and make-ready on a flexo press, taking a couple of hundred feet of media, might be acceptable when the job will then run on press for several days. As jobs, or versions, etc, lead to shorter and shorter press runs it's becoming common for the shortest jobs to be on press for a few minutes, meaning that many more jobs must be turned round in every shift. Minimizing the time to switch from one job to the next and automation of the entire supply chain are vital.

Brand challenges

Accurate reproduction of brand colors is particularly important in the label & packaging markets. However, it is frequently not possible to achieve an exact match for a particular brand color using the four-color process sets of inks (i.e. cyan, magenta, yellow and black, or CMYK), especially with "conventional" non-digital offset or flexographic ink sets.

On a conventional press with standard inks the solution is to use extra ink colors that are specially mixed to be exact matches for the brand colors and to use these either as spot colors or in a non-standard process set.

For various technical and practical reasons, it is rarely possible to use special colors on digital presses. One reason is the cost of making a special ink, which is much higher than for conventional offset or flexographic inks. Another problem that particularly applies to inkjets is the difficulty and expense of cleaning out the ink feed lines and print heads if you need to change between different special colors frequently.

Because inkjet inks are not subject to the same historical limitations (or standards) as offset and flexo presses, it is common for them to show greater purity in the CMYK process colors. This means that even a UV-cured CMYK inkjet press will often be able to cover a wider color gamut than is possible with CMYK offset or flexo inks. Aqueous inkjets have their own challenges which tend to limit the achievable tone range and gamut, but this can be mitigated by selecting the appropriate substrates or pre-coating.

Extended gamut inkjets

Inkjet manufacturers also sometimes extend the gamut still further by adding channels for additional process colors for a total of six or seven. Typically these will be CMYK + orange + green (and/or violet), or CMYK + red + green + blue. These are often abbreviated to use just the initial letters of the colorants, such as CMYKOGV. Pantone Inc.'s Hexachrome is a specific variant of a CMYKOG ink set.

In practical terms an extended gamut means that a greater number of brand colors can be matched satisfactorily. "HiFi color" was coined in the 1990s as a generic term for the concept of achieving an extended gamut in print. More recently the term "extended gamut" or "expanded gamut", abbreviated to XG or XCG (extended color gamut) has become more popular.

One of the primary value propositions for a digital press is its ability to handle shorter run lengths and avoid wastage of time or materials; being able to address many brand colors without washing up the press and changing inks is a vital part of responding to that opportunity. This is where an extended gamut ink set comes into its own, in allowing accurate emulation of a larger proportion of brand colors.

Opaque white, clear and metallics

Opaque white colorants are also being increasingly offered with both inkjet and toner presses, especially for label & packaging, although they can also be used for specialty prints in the graphic arts space as well. White will normally be used as separate undercoat or overcoat layer on clear or metallic substrates, however, sometimes it can also be integrated as a variable halftone with the main color image, to produce pastel shades. Several presses now also offer the ability to apply both inkjetted and analog spot varnishes in-line with the inks themselves.

Another recent addition to toner based label printer capabilities is a clear toner option. Designers will need to be made aware of this feature to be able to incorporate it into their designs but so far sample labels have been impressive. A cold can of beer with water droplets on it can be made to look as if the final label is actually wet. Another example is highlighting certain images with a clear coat.

Metallic inks are available with some large format inkjets and for some UV-cured inkjet presses, but at the time of writing they are not yet widely used. Note that so-called "digital foiling" tends to be used to describe a model where cold foil is applied in finishing, guided by the use of specific colors in the printed piece, rather than actually applying the foil on press.

Global Graphics' color management solutions for digital presses

Global Graphics has developed high quality color management technology that is used with its Harlequin® products. It is supplied in the Harlequin Host Renderer as an SDK for integration within a Digital Front End (DFE, sometimes known as a controller) built by a press vendor or integrator. It can also be supplied as part of the Global Graphics Fundamentals package of DFE components with the BreakThrough service to integrate, or assist in integration.

The Harlequin ColorPro™ color management system delivers accurate and optimal use of the printer's gamut. The color is calculated within the RIP and the output raster from the RIP is delivered in the most appropriate format for the press.

Global Graphics provides expertise, documentation and other assistance in the final encoding of the raster delivered so that it can be stored, post-processed and/or forwarded to the printer controller for delivery to the marking engine (laser/drum for EP presses or heads for inkjet presses) as efficiently as possible.

Profiling

Output profiles must be built on sound color science principles to produce color accurate proofs or final print color gamuts.

Accurate and reproducible color printing is only possible if a color profile is created to describe the actual output achieved by that press for a given combination of ink, substrate, screening and resolution, and if the color produced by the press is stable. Global Graphics supplies a wizard-based color utility called Harlequin SetGold™ that is designed to prepare a press for profiling by establishing an optimal "Golden State."

By setting gray balance and ink limiting separately from the process of creating an ICC color profile Harlequin SetGold ensures that the final color reproduction is more stable as environmental variables such as humidity and temperature change slightly in the press room.

A gray balanced profile is the first step in building an output profile for a new printing device. This procedure, guided by an informative GUI, can determine the correct inking & gray balance and correct the tone scale values for a new device. This important step improves profile accuracy and avoids over-inking and is often overlooked.

This "Golden State" is then captured and calibration tables can be created for several color measurement device types and/or measurement systems, such as density, %dot, Status-T, Status-A etc, so that any non-reference printer can be adjusted to this "Golden State" using single-channel calibration curves, without requiring a full re-profiling. This means that profiles made by the OEM in their color labs on their test presses can be used on a press installed in the field and still be reasonably color accurate straight out of the packing crate.

Gray Balance

Alignment of press color output with measurements of color neutrality also ensures that the output of neutral colors in a print is more robust with variations in media and ink/toner colors, caused by temperature or humidity changes, for example. This means that colors intended to be neutral are more likely to remain visually neutral. In the same way, in-production color variation can be more easily adjusted for with a lightweight calibration process that can be completed quickly and easily without expensive equipment.

Limiting Ink Coverage

For inkjet presses the separation of ink-limiting from regular ICC profile creation also allows responsibility for the two steps to be split. Over-inking on a UV-cured printer can lead to excess ink standing on the substrate or in extreme cases even running across it, risking contact with rollers and other press components which would then need careful cleaning to avoid marking other work. On an aqueous inkjet excessive ink lay-down can lead to the substrate being saturated with water, leading to failure to dry, stretch, cockling and other problems.

The OEM, press vendor or integrator can use Harlequin SetGold, Global Graphic's wizard-based color utility, to place a press in an appropriate golden state, or to develop standardized golden state profiles that are shipped pre-installed in DFEs for all presses. The end user can then use off-the-shelf profiling software, safe in the knowledge that they cannot over-ink the press even while printing test forms for profile creation.

Of course, one challenge is that the optimal ink limit can vary significantly with the substrate in use. A very low ink limit is probably required for a very lightweight, uncoated stock; but applying that same low limit to a heavier, coated stock will reduce the achievable color gamut and tonal contrast, in other words, degrade the color quality. A variety of ink limits may therefore be required for different media.

Color gamuts and color matching

The gamut of a color printing device describes the size of the subset of all possible colors that can be printed on that device. The gamut achievable on most digital color printers using toner or UV-cured inks is larger than that of many conventional press technologies, including flexography and offset litho. Equally important, that gamut more or less encapsulates the gamut of conventional printing processes when using CMYK inks, which means that virtually any color that can be printed using those traditional technologies can also be printed on a digital press.

This is important because one requirement for at least some label & packaging printing is to match conventionally printed pieces. There are many reasons for that need, including:

- because some copies of the same product are produced conventionally and some digitally, and the different print runs must match
- because the product is printed in a hybrid fashion, where some or most of the print is done using a conventional press but additional imagery is added using a digital print head, either in-line with conventional press stations or in a separate converting process
- because labels and packaging must match other uses of the same imagery, which may be produced using conventional printing technologies, such as collateral and magazine advertising, point-of sale, or even packaging or labels used for other products from the same brand

ICC profiles

Harlequin ColorPro includes the ability to use multiple ICC color profiles to specify the color behavior of the digital press on which the jobs are being printed, and that of a conventional press (or standard press characterization) that must be emulated.

To demonstrate this capability, Harlequin has been certified by Fogra against ISO 12647-7 (the contract proofing standard) in matching no fewer than 7 standardized press characterizations.

This certification was performed on an Epson Stylus Pro 7890, which is clearly a more stable device than a high-volume production press, but it is notable that Harlequin is the only Fogra contract proofing certification achieved on an Epson printer to date with off-the-shelf Epson media and inks.

It's unlikely that a production press would be stable enough to achieve contract proofing standard, but the Harlequin certification demonstrates that Harlequin ColorPro can help an output device deliver consistently accurate color; the only limitation is the stability of the device. Many production presses can probably achieve 12647-8 (validation proof) certification.

Why extended gamut?

So, if CMYK colorants on a digital press can usually enable accurate emulation of a conventional print process, why use gamut expansion using extended gamut color spaces? The answer is that brand colors are extremely important in label & packaging printing, and many brand colors fall outside of the gamut of CMYK, even on a digital printer.

When using a conventional press brand colors are usually achieved by using specially formulated spot inks, but the use of custom colorants on digital devices is very rare because of their cost, the long development time, and the difficulty of changing colors and cleaning ink/toner feed systems after use without contamination of the next color, not to mention the wastage of time and material involved.

Pantone®

It's been estimated that only around 40% of Pantone colors can be achieved using a standardized CMYK space in conventional print (e.g. G7). The proportion that can be printed using CMYK colorants on most digital presses is likely to be slightly larger than this. But that still leaves a significant proportion of brand colors outside of the achievable gamut, whether they're specified using Pantone or not.

An extended gamut space using a larger number of colorants, such as CMYKOGV (i.e. CMYK + orange + green + violet), greatly increases the press gamut, and it's been estimated that around 80% of Pantone colors can be printed accurately in this way. That reduces the proportion of brand colors that can't be printed exactly from 50-60% down to 20%. It also reduces the reproduction error for that remainder, because they are less far outside the achievable gamut of the press. Whether brand owners are willing to accept the remaining discrepancy will vary between companies. Remember that most magazine advertisements, often including brand colors, will be printed in CMYK on offset or gravure and will be signed off by the brand owner, even though they will almost certainly vary more from the target color than a carton or label printed using an extended gamut colorant set. But remember also that different people within a brand sign off on the two!

Using Harlequin with brand colors

Harlequin includes look-up tables for Pantone colors so that a brand color within the PDF or PostScript file submitted for color management and rendering can be transformed accurately.

Additional tables can be created for colors from other libraries and for custom colors, and entries can be over-ridden if a brand owner wishes to adjust the reproduction of a color away from the formal Pantone definition for any reason.

A brand color look-up table can be specified in a device independent color space (XYZ-D50), so that the requisite color data is transformed through the appropriate output profile for the press/media/colorant combination in use. This means that the same specification will produce an appropriate emulation on every substrate because selecting the correct output color profile for that substrate will ensure that the color is accurately transformed.

Alternatively, a brand color look-up table may be defined in the output color space of the digital press, whether that's CMYK or extended gamut. This allows for manual tweaking of the brand color emulation to take advantage of every last corner of the gamut of a particular press, which can sometimes be useful for brand colors that are right on the edge of that gamut.

Finally, look-up tables may also be defined to map from one separation name to another, e.g. to unify the output where files from several sources are used together.

Emulate all colors

In order to match the reproduction of a conventional print job using both process colors and brand colors, it's possible to configure ColorPro to emulate that conventional print process for all colors in the job other than the brand colors. The brand colors can then be rendered into the process space of the digital press, but without emulation, so that they use as much of the digital press gamut as they need.

Of course, in those cases where the press is set up to print with real spot inks, either because they're special inks such as white, varnish, metallics etc; or because a spot ink has been specially formulated for a significant print buyer, the Harlequin RIP can be configured to produce appropriate rasters for those colorants.

And technical separations such as die-lines, fold lines, live area indicators etc can be printed either alone for lead-in sheets to check register, or with the graphical page content for proofing. In a production print run the technical separations would normally be ignored completely so that they don't knock out of graphical content, even if an operator in the creation workflow didn't set them to overprint.

Color output from Harlequin

The Harlequin RIP is capable of outputting rasters in a variety of formats, suitable for delivery to most monochrome and color printers. The output configuration can be split up into a number of dimensions:

Color space – what colorants are used for physical output. ColorPro can manage color in all output color spaces that the Harlequin RIP can deliver data in:

- monochrome
- mono plus spots
- CMYK
- CMYK plus spots
- extended gamut spaces such as CMYKOG, CMYKOGV
- extended gamut spaces plus spots
- PhotoInk spaces, which use light variants of process inks in addition to the fully saturated inks such as CcMmYKk to increase smoothness of gentle tonal graduations
- PhotoInk plus spots

Spots can include varnish, metallics and white colorants. Structural and other non-color separations used in the supplied data file for die-lines and other technical (as opposed to color) usage can be explicitly ignored or output separately.

The interleaving of the supplied colorants can be controlled, both in the delivery order, and in whether the separations are delivered interleaved by pixel, by line, by band or by frame.

Raster depth can also be controlled; output can be provided:

- as 1-bit per pixel halftone screened data
- using multi-level screening (e.g. for grayscale or multi-pass inkjet heads) and packed into 2, or 4 bits per pixel
- as 8-bit or 16-bit unscreened contone data

Screening is dealt with in a separate Global Graphics white paper.

The Harlequin RIP can consume PostScript (including EPS), PDF and XPS as well as image formats such as TIFF, JPEG etc. The ColorPro color management engine applies equally to all input formats, meaning that only one integration is required to achieve consistent color management across all formats.

Conclusion

Digital printing has already altered the economics of label printing, and has started to make the same changes for several segments of packaging printing. Very short runs, just-in-time ordering, smaller inventories, frequently changed designs and some degree of variability, such as localization, versioning or even just batch numbering on press are all feasible with costs-per-copy that end customers are likely to accept. It's still important, however, to ensure that you're looking at the total cost of printing, rather than cost per copy, when comparing digital to conventional print. Cost per copy does not take account of wastage of excess inventory or the cost of warehousing etc.

However, brand color matching, as well as the requirement to achieve similar overall color appearance to other printed and digital media, remain vital to the acceptance of digital printing within this market.

The technical nature and economics of the primary digital press processes mitigate against specially mixed inks to achieve brand colors. Extended gamut process ink sets are used instead.

This in turn requires high quality color management to achieve accurate color matches and predictable colors that are consistent on the same press over time, as well as the ability to match colors across different presses and even different print processes.

Global Graphics' color management was originally launched in the mid-1990s and has been continuously developed ever since, becoming more powerful, gaining additional features and becoming an indispensable component of a digital production workflow. The technology is well proven in the field and forms a key element in solutions from multiple digital press vendors.

Harlequin ColorPro is now an indispensable component of the Global Graphics Fundamentals technology and engineering support package for building a DFE for a digital press for labels & packaging.

Glossary and notes

Brand Color:

See Spot color

Color Channel:

In imaging software, a color channel is the data description for a single color component, such as red in an RGB set, or magenta in a CMYK set. Spot colors can be preserved as separate channels. They are interpreted in the RIP and may be emulated in the process color separations, or preserved and directed to a separate ink channel in the case of special colors such as white, silver, varnish or a specially mixed brand color.

In inkjet printing, a channel is an individual ink path leading to a print head. At the basic level there will be four channels, for CMYK, but there may be more with additional channels given over to white, varnish and/or extended gamut process colors such as orange and green.

Note that some inkjet print heads contain two channels, as separate rows of nozzles. Depending on the press configuration, sometimes they will both print the same color, to build up density or increase resolution, and sometimes it will be different colors.

Color Gamut:

The set of colors that can be physically printed by a combination of press, ink and substrates. A larger gamut means that more brand colors can be printed accurately (see also Extended Gamut).

It's also important to look at the shape of the gamut for a press, especially if it is to be used to emulate conventional press work, perhaps from a flexo press. Ideally the digital press gamut should completely enclose that of the flexo press, meaning that all colors that could be printed on the flexo press can be reproduced on the digital press.

If the job was printed on a flexo press using a non-standard process ink set (in other words, not CMYK; perhaps replacing the Black with a Dark Blue because that matches a brand color in the job) then the flexo gamut will also be non-standard and it may be harder to match such gamuts on a digital press.

Color Separation:

This is the procedure used to divide a full-color original image into the four, six or seven ink colors of a process set. The full color original will often be a photograph that normally starts as RGB color values from a digital camera or film scanner. However, separation can also be applied to text, tints and line art that may be defined in CMYK, RGB, LAB or Pantone® values and needs to be split into process colors for printing.

Separation can be performed at several stages in the workflow from original to printer. If it is performed in the design or imaging editing software it will normally be split into CMYK values, although Pantone's six-color Hexachrome® is an option in some software. These can be set to either preserve brand and special colors as extra channels, or to combine them into the process colors depending on the user settings.

Where Pantone values are required (or other brand values that have been specified in the Named Color lookup tables in Harlequin), these should be left as separate spot color channels. This allows the Harlequin software to make the best allocation of colors to utilize the maximum gamut of the printer's inks in the separation process and to process spot color interactions with live PDF transparency correctly.

If a job has already been separated for printing on a conventional (e.g. flexo) press, that may mean that it has been separated for a non-standard Process Color set. This will often result in a file with graphic elements specified in a combination of brand and other spot colors which must be re-separated to the digital press colorants while RIPing. Fortunately Harlequin ColorPro is extremely good at emulating spot colors in the process colors of the digital press, even when they're used in combination, overprinted, or used together with live PDF transparency (e.g. for a drop shadow).

Color Space:

This is the technical term for a defined range of colors (or reference colors) within the theoretical whole of a color model such as RGB or CMYK. For instance sRGB or Pro Photo RGB are color spaces for original camera/scanner images, and these are subsets of the theoretical complete RGB color range (most often described as CIE LAB, which itself is a subset based on the color sensitivity of the average human visual system). Fogra 39 is a standardized CMYK subset, primarily intended for offset printing. Color space is subtly different from gamut, which describes the actual range of color values obtainable from a device in that a color space includes the relationship between the numerical representation of a color and its appearance.

Colorant:

An ink or toner actually imaged on press. Individual colors defined in the artwork for the job may be color separated to be printed as a build of colorants representing the process colors (e.g. images separated into CMYKOGV), or may be printed as their own colorants (e.g. a white or varnish).

Several concepts here are extremely closely related: Color Separation generates data that is delivered as Color Channels to the heads to be marked onto the substrate using Colorants.

Extended (or expanded) Gamut:

Using a set of inks that can achieve a wider range of colors than the standard CMYK set used by non-digital offset lithography or flexography print processes.

Because non-digital CMYK sets were standardized many years ago with relatively impure shades of cyan, magenta and yellow it's possible to achieve wider gamuts with purer, but non-standard CMYK sets. Many digital inkjet presses use purer CMYK sets, so they can credibly be claimed to achieve wider gamuts than offset or flexo. Even so, their gamuts are still relatively restricted, so some inkjets are also being offered with additional colors.

So far there are no ISO standards for extended gamut ink sets, which means that digital presses from different vendors often have rather different color gamuts, which in turn vary with the substrate being used.

Process Color:

A set of more or less transparent colored inks that can be used together in various combinations to achieve a wide range of colors (the range achieved being called the Color Gamut). The most common process set is cyan, magenta, yellow and black (CMYK), often called the four-color set.

There are many colors that cannot be achieved satisfactorily from these colors alone (for example the popular Reflex Blue, and pure shades of orange, green and purple). Therefore some presses can apply additional (more or less) transparent colorants, usually a choice of green, orange and violet, but sometimes red, green and blue.
The importance of these extra colorants being referred to as part of a process set is that they can be part of a modified color separation process and are used in variable amounts as needed to generate particular parts of the consequently expanded color gamut.

Extra ink colors that are called spot or special colors are defined as separate channels or layers within the original digital image. The usual intent is that they are printed as special colors on the press, although if this is not available on a digital press, they can be merged into a process color set by the color separation software. While they can be integrated into photographic images (for example adding a metallic silver behind a car), the process is usually done by manually defined masks and not part of the automated color separation software process. See Spot Color and Color Separation.

Turning that on its head, one definition of a Process Color (as opposed to a Spot Color) is that it's a colorant that may be marked by any page element originally specified in a device independent color space. Spot colors can only be knocked out by such separation, not actually marked.

The advantage of using an extended gamut process set on a label press is that you never need to worry about changing special inks. You may also be able to achieve multiple different brand color matches side by side or sequentially on the same run.

Spot Color:

A common term for a specially mixed ink color that is not part of a process set of inks. Also called Special Color or Brand Color. Typically this will be a brand color that cannot be matched satisfactorily by combinations of the standard CMYK four-color process inks.

Alternatively, special or decorative effects inks, such as metallics, or white under/over coating inks, or spot/pattern clear varnishes, are also regarded as spot colors.

The artwork for a label or package may also include one or more "technical" spot colors, e.g. to specify where a die line should fall.

ColorPro enables the operator to determine whether any individual Spot color should be printed using a build of process colorants, or if it should be printed as a separation in its own right. Also see process color.

XG:

Abbreviation for Extended Gamut

About the author

Martin Bailey, CTO, Global Graphics Software

Martin Bailey works to analyze and understand current and future needs for workflows across many sectors of print. This enables him to guide Global Graphics' industry-leading printing technology. He represents Global Graphics on a number of industry bodies and standards committees including acting as the primary UK expert on the committees working on PDF, PDF/X and PDF/VT.

Martin has over 30 years of experience building, using, supporting and improving products for processing digital documents and the print industry in technical support, product management and programming as well as in consulting, and production environments.

About Global Graphics Software

Global Graphics Software http://www.globalgraphics.com is a leading developer of platforms for digital printing, including the Harlequin RIP®, ScreenPro, Fundamentals and Mako. Customers include HP, Canon, Durst, Roland, Kodak and Agfa. The roots of the company go back to 1986 and to the iconic university town of Cambridge, and, today the majority of the R&D team is still based near here. Global Graphics Software is a subsidiary of Hybrid Software Group (Euronext: GLOG).

GLOBAL GRAPHICS® software

v3 May 2025

Contact us.
info@globalgraphics.com

www.globalgraphics.com

Global Graphics Software Inc.
6601 S Tamiami Trail,
Suite 176
Sarasota
FL34231, USA
Tel: +1-941 925 1303

Global Graphics Software Ltd
Building 2030
Cambourne Business Park
Cambourne, Cambridge
CB23 6DW UK
Tel: +44 (0)1954 283100

Global Graphics KK
610 AIOS Nagatacho Bldg.
2-17-17 Nagatacho, Chiyoda-ku,
Tokyo 100-0014
Japan
Tel: +81-3-6273-3198