DIGITAL output™

AUGUST 2005

VOL. XI, NO. 8 • $6.95 USA

www.digitaloutput.net

design for LARGE FORMAT

Selling Vinyl Graphics

Grand Format Building Wraps

Hexachrome Print Process

THE ONLY MAGAZINE DEDICATED TO >CAPTURE >CREATION >OUTPUT >FINISHING

DIGITAL output
THE ONLY MAGAZINE DEDICATED TO CAPTURE CREATION OUTPUT FINISHING

REPRINTED FROM DIGITAL OUTPUT AUGUST 2005.

Hexachrome Print Process

Primary Considerations for Implementing Hexachrome Printing

by Dan Reid

Have you considered what Hexachrome can add to your printing process?

Hexachrome was created with the intent to provide a wider color gamut for the print and design world.

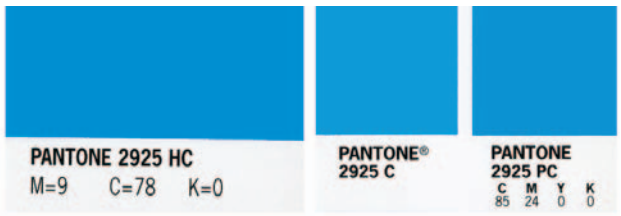


Figure 1: Depiction of of Solid PMS 2925 coated, Process coated, and Hexachrome coated

Figure 2: SWOP inks vs. Hexachrome CMYK inks simulation

Brighter greens, more vibrant purples, and truer skin tones are enough to raise brows. Hexachrome has been said to be everything creative, pre-press, and print professionals need to drastically improve color reproduction.

When Hexachrome was introduced in 1994, CMYK was the standard within the industry, and it was questionable whether users would invest in an expensive upgrade. Although said to dramatically improve color range and accuracy over traditional four-color process printing, years went by before the popularity of Hexachrome appeared. Now the technology is catching on and retaining loyal users.

Pantone, Inc., a well-known and unquestionable standard in print, has a long history in color communication and color standards. Originally an offset printer in Manhattan, the company grew out of commercial printing to offer a system for communicating color reproduction. The ubiquitous Pantone Matching System (PMS) is widely adopted and supported by almost every professional printing device in the creative industries.

The original PMS is based on mixing special inks to provide a unique color. The Pantone color is used in conjunction with black ink or in addition to standard four-color process inks. Known as a bump plate or spot color, this additional color is a safe way to ensure important colors are reproduced correctly. The downside of using Pantone spot color is the additional cost of using a special ink. Each additional Pantone spot color incurs more expense and is limited by the number of inks a press can print in a single run. The additional printing cost of using a special ink has always been difficult to sell to customers. A four-color build is more cost-effective to print since most presses are already configured as such but lack the vibrancy of using a special color.

Realizing customers were hesitant to budget for a special ink, Pantone seized the opportunity by offering a Pantone Process simulation library, which allowed designers to select a four-color equivalent of spot color. The new library proved to be a huge success, allowing designers to communicate color to the print provider, but without the added cost of using special inks. The downside—only about 30 percent of the original Pantone spot color library was reproducible in standard four-color process inks. The ubiquitous Pantone Solid to Process guides—now renamed Pantone Color Bridge—show the spot color alongside a

Figure 3: Top: SWOP separation to Hexachrome proof; Bottom: Proof of correctly separated RGB to Hexachrome

four-color simulation. This lets the designer know when to use the real spot color instead of its lesser clone. *(Figure 1)*

After experiencing the huge success and adoption of the Pantone solid to process library, Pantone was ready for a new challenge to improve spot color simulations beyond the constraints of four-color process, and thus the Pantone Hexachrome print process was born.

Many vendors immediately jumped on the bandwagon and began to offer film proofers and Pantone-certified Hexachrome inks; but designers and customers did not embrace the new print process as readily as Pantone hoped. Designers saw it difficult to create jobs with an unfamiliar cutting-edge printing system. It was simply easier, cheaper, and more readily acceptable to create four-color jobs with additional spot colors specified as needed. And so Hexachrome has not enjoyed the same success and industry adoption their four-color library garnered in the early nineties.

Arguably, Pantone's Hexachrome print process, other high-fidelity color systems, and color management in general have been the slowest technologies adopted by the print industry. The postscript revolution of the early nineties and computer-to-plate (CtP) of 2000, have enjoyed quicker acceptance and adoption with print providers. Yes, running six colors can be more costly than running four-color, but the ability to print almost the entire spot color library and improve color fidelity of RGB originals are certainly compelling reasons to leverage Hexachrome advantages. Unfortunately, designers never did get past the additional cost or the differences in workflow of designing for a six-color system, perhaps due to lack of education on the print process, or lack of interest from clients.

The Pantone Hexachrome print process was introduced at the cusp of color management emerging on Macintosh and PC computers. Pantone embraced color management by leveraging the architecture to translate RGB and CMYK files to Hexachrome. They enlarged the printable color gamut by exchanging typical process cyan, magenta, yellow, and black inks with brighter and purer CMYK inks. *(Figure 2)*. Standard CMYK inks appear dirty when compared to the more vibrant Hexachrome CMYK.

In addition to the cleaner CMYK inks, orange and green inks were added to complement the brighter CMYK colors, and to maximize simulating the original Pantone spot color library. Therefore, you cannot really take advantage of the Hexachrome print process by just adding orange and green to standard CMYK inks. Since it's tempting to add orange and green inks to standard process CMYK inks, Pantone licenses ink manufacturers who market and offer Hexachrome inks, to ensure customers can achieve the true advertised benefits of Hexachrome.

Pantone developed the six-color print system because many print providers had six color printing presses at that time. It is still common for a print provider to offer standard four-color printing with the option of running additional Pantone spot colors. Pantone's marketing strategy did not extol this benefit well enough to entice print providers to change their common, and comfortable, printing setup.

At this point you may have surmised improved color reproduction of photographic images is an ancillary benefit of Hexachrome. For this reason, Pantone chose to market high-fidelity printing of images and colorful designs to customers. The Pantone Hexachrome print process is well suited for reproducing highly-saturated colorful RGB images from digital cameras and scanners. Images and artwork in RGB contain a richer data set that is better represented in Hexachrome. The benefits of RGB and color-managed workflows are certainly apparent and gaining more acceptance. It is much better to use RGB images for Hexachrome rather than CMYK. RGB also works well for any color-managed workflow, CMYK or Hexachrome. CMYK files that are confined to process ink color gamut can be translated to Hexachrome, but won't benefit from the additional color gamut unless further adjustment is done after the conversion.

At the time Hexachrome was introduced, color management was just emerging and print providers had not yet embraced the technology, nor were they comfortable converting RGB files to CMYK or CMYKOG. Hexachrome's reliance on RGB originals and color management were stumbling blocks for many printers.

Color management, and specifically ICC profiles, are the keys to translating vibrant images and corporate colors to a more colorful dynamic print in Hexachrome. The Hexachrome print process doesn't improve CMYK images, but merely offers a larger color palette in which the converted CMYK document can be adjusted to take advantage of the additional color gamut.

Print providers have taken CMYK plates and put them up with Hexachrome inks to get a more vibrant, if not garish, print. The correct method would be to re-separate CMYK files to Hexachrome, so image integrity is preserved without introducing a color distortion. *(Figure 3)*

Another issue is how design software will work with the technology. Neither Adobe Photoshop nor Illustrator directly support Hexachrome or any print process with more than four-colors. However, QuarkXPress does support Hexachrome, and it can separate RGB and CMYK files to Hexachrome without additional software.

Pantone offers a suite of software plug-ins for Adobe Photoshop and Illustrator called Pantone HexWare, to enable these programs to color select, color correct, soft-proof, and separate to Hexachrome. The Pantone ColorSuite for Hexachrome also includes printed guidebooks for visual selection of Hexachrome colors and Pantone spot color simulation. The best results are derived by creating your own Hexachrome ICC profiles that encapsulate how your press is printing. Both GretagMacbeth and X-Rite offer color management packages that can create Hexachrome ICC profiles.

As traditional film proofers continue to dwindle due to the trend of CtP, proofing Hexachrome press separations has become more challenging. The trend of inexpensive inkjet proofing and advancements in color matching have provided the platform for proofing Hexachrome.

Dan B. Reid is a veteran color management consultant and an expert in Hifi printing and Hexachrome print process. His company, RPImaging, helps businesses migrate to using color management and expanded gamut printing including the Hexachrome print process. RPImaging offers color measurement hardware and color management software sales and accredited training. Dan can reached at dreid@rpimaging.com or toll free at (866) RGB-CMYK.

DIGITAL output
THE ONLY MAGAZINE DEDICATED TO CAPTURE CREATION OUTPUT FINISHING

REPRINTED FROM DIGITAL OUTPUT OCTOBER 2005.

Working With Hexachrome

A Look at Hexachrome Proofing Options

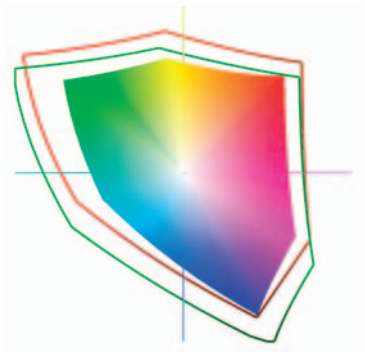
by Dan Reid

One of the biggest challenges in designing and printing Hexachrome jobs is proofing how the final piece will look. The Pantone Hexachrome print process provides an enhanced color gamut with the addition of orange and green inks to CMYK. Typical proofing scenarios are more accustomed to CMYK plus spot colors, not a color model based on six colorants. Still, there are several proofing options available depending on what you are hoping the proof to depict. Proofing can run the gamut from soft proofs—computer display—to various types of hard proofs. Correctly assessing your proofing needs will guide your selection of an appropriate Hexachrome proofing system.

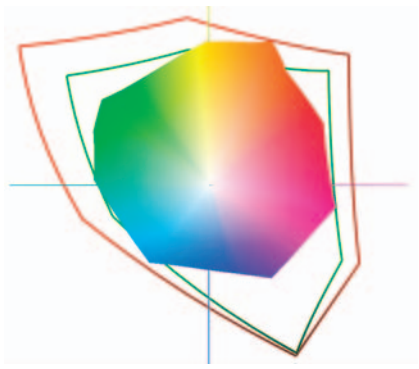
The CG220 LCD display from Eizo Nanao Technologies Inc.

Soft Proofs

The common computer display has very similar color regardless of brand. The subtle differences between computer displays is attributed to the type of phosphor guns used, such as those from Mitsubishi, NEC, or Trinitron. The LCD market is enjoying steady growth which has fueled the development of high fidelity color displays for the graphic arts market.



This graph depicts the color range of a Sony Artisan monitor against Adobe RGB (green) and the Eizo ColorEdge CG220 (red). Notice that the CG220 has almost the same shape and color gamut of the Adobe RGB color space.



In this graph, we can see that our Hexachrome profile is within the CG220 color space while the Sony Artisan cannot display 100 percent Hexachrome Orange or Hexachrome Yellow. The CG220 color profile is red, Sony Artisan is green, Roland Hexachrome CTP Med is colored graph.

Late last year, Eizo Nanao Technologies Inc. introduced the CG220 LCD display, boasting a color gamut close to the ubiquitous Adobe RGB color space found in Adobe products. Adobe RGB is the preferred RGB color space to use for Hexachrome jobs since it encapsulates a larger range of colors reproducible in Hexachrome printing. The pairing of the Eizo Nanao CG220 and Adobe RGB allows more colors to be seen uncompromised by the display's color gamut.

Viewing an Adobe RGB file on a Sony Artisan display is going to have more colors compromised compared to the larger color gamut Eizo Nanao CG220 LCD. Even still, Adobe Photoshop does a pretty amazing job of dealing with this discrepancy, providing impressive screen proofs.

So why not use a smaller color space like sRGB or ColorMatch RGB to define your files since they are based

upon a typical computer display? These color spaces are much smaller and do not take advantage of the larger color palette of Adobe RGB that contains more printable Hexachrome colors. Having a computer display closest to Adobe RGB is ideal.

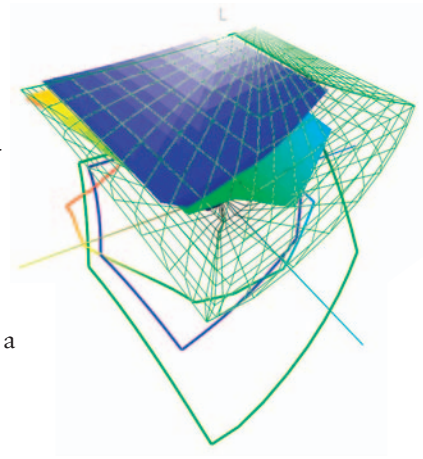
Separating Vector and Raster Objects

Adobe Photoshop CS2 and earlier do not provide correct previews of Hexachrome separations on screen, nor the functionality to convert jobs to Hexachrome. Third party Photoshop and Illustrator plug-ins are necessary to convert files to Hexachrome in Adobe products. Both GretagMacbeth, makers of ProfileMaker color profiling software, and Pantone offer solutions for Adobe products. Both offer similar functionality but with subtle differences.

Printed Proofs

There are numerous advantages and challenges of printing Hexachrome. Content creators, graphic designers, and photographers are afforded with an optimized color palette resulting in a more dynamic printed piece. For a content creator, it's almost impossible to correctly predict actual Hexachrome print conditions since there aren't any guidelines or standards to conform to. Each print provider has a different look because their printing system is configured differently, and thus unique.

The best approach for creating jobs destined for Hexachrome is to work within the RGB color model for bitmap files and specify



This graph illustrates the deficiency of sRGB and ColorMatch RGB color spaces for use with Hexachrome. By confining your document color to ColorMatch RGB, you prematurely truncate printable color available in Hexachrome. ColorMatch RGB is blue, Adobe RGB is green wire-frame, colored graph is Pantone Hexachrome CTP Med.

color in vector jobs using the PMS spot color library or RGB values. The print provider will invariably do a better job converting your job to Hexachrome than you could do on your own, since they know their print conditions intimately. Separating files and sending them to a print provider will almost always require color correction and thus incur additional cost to print the job.

The most practical method of proofing Hexachrome separations for content creators is to evaluate the color on a properly calibrated computer display or in-house inkjet printer. Proof the RGB bitmap and vector files on a well calibrated inkjet printer that is not configured to simulate any print standard, just the best color rendering of the file. Though this method will not proof how the job is separated to Hexachrome, you will have a good sense of what is possible on press. A print provider Hexachrome proof is still required for confirmation of press Hexachrome color.

Fine Art and Reprographics

For print providers there are two general markets for printing and proofing Hexachrome jobs. The first market is where the final job is printed in Hexachrome on large format inkjets or solvent ink printers. This market is ideally suited for checking color and tonal balance on a computer display with a large color palette.

Mimaki, Mutoh, Roland, and Vutek offer products that can be configured with a Hexachrome ink set. These printers are commonly paired with either ColorBurst RIP or Onyx PosterShop. These RIPs allow Hexachrome calibration and specification of Hexachrome output ICC profiles for conversion of RGB, CMYK, and spot colors. They are capable of proofing press Hexachrome separations but are not usually configured to do so on large format printers.

Flexographic and Lithographic

Print providers whose final product is on a flexographic or sheetfed press have different requirements of their hard copy proofs. This market needs to proof actual press separations typically as 1-bit TIFF or EPS files. While Hexachrome dot proofing systems have been available since the late nineties, many of these analog dot proofing systems are no longer being used because of the transition to computer to plate (CTP). Those that have transitioned to CTP use digital proofing systems and inkjet printers. High-end digital proofers like the Fuji FinalProof, Kodak Approval XP, and Latran Prediction 1420 (formerly PolaProof Digital Halftone Proofing System), are a few common Pantone licensed Hexachrome proofers configured with special high fidelity donors to meet Hexachrome's expanded gamut. These systems work well but are costly to create proofs.

A veteran of Hexachrome inkjet printing and a Pantone-recommended Hexachrome inkjet printer, the Roland Hifi Jet Pro series has for years been the only available option to proof press Hexachrome separations on inkjets without a conversion to CMYK typical of most inkjet solutions.

RIP Requirements

A suitable RIP is needed to correctly communicate and calibrate in Hexachrome, not just CMYK and spot colorants. For years, that solution has been the AbsoluteProof product from Gimlé Limited. The AbsoluteProof can separate to Hexachrome for full gamut printing or proof press Hexachrome separations on a Hexachrome configured Roland Hifi Jet Pro printer.

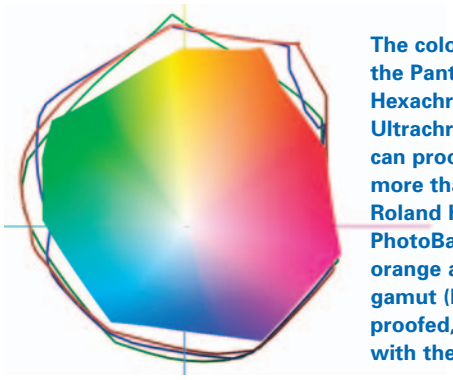
Introduced at GraphExpo last year, Gimlé Limited's AbsoluteProof Extrachrome solution uses the Epson UltraChrome inkset found in Epson 4000, 7600, 9600 for the base CMYK inks, but it replaces the light cyan and magenta with orange and green inks. According to Gimlé, the light cyan and magenta are not necessary

since Epson has improved their inkjet technology to produce a smaller dot that obviates the need for the light inks.

Most RIPs that support Hexachrome capabilities do so by converting RGB or CMYK files to Hexachrome or just plotting postscript separations. Only a handful of products support proofing of six-color separated files to a six-color inkjet printer like the Roland Hifi Jet Pro II printer. This workflow is necessary for lithographic and flexographic printers. These users need to proof actual press separations on a proofer capable of rendering the file's full color balance uncompromised by the inkjet inkset.

Proofing RIPs that only support CMYK inkjets must convert the press CMYKOG to CMYK. If the RIPs don't support Hexachrome input ICC profiles, then the only method of proofing is to send an RGB proof file from either Pantone HexImage or GretagMacbeth MultiColor plug-ins.

The more mature RIPs support a six-color separation, typically a DCS 2.0 EPS or 1-bit TIFFs, to be the source file and proof to an inkjet. This is the recommended approach to proofing press Hexachrome separations since file integrity is maintained, no interim conversions back to RGB are required, and the Roland Hifi Jet Pro II color gamut is larger than press Hexachrome color. Thus, press Hexachrome separations can be accurately assessed for contone color proofs or optionally as a dot proofer. Both EFI's ColorProof XF and Gimlé's AbsoluteProof offer this functionality with the Roland Hifi Jet Pro II inkjet. Onyx Poster Shop supports press Hexachrome separations and provides a means to specify a Hexachrome input and output profile for the color matching, but does not offer a dot proof option.



The color graph is of the Pantone CTP Coated ICC profile installed by the Pantone HexWare software. It represents an estimate of a CTP Hexachrome press color on some coated stock. The Epson Ultrachrome inks and Epson Premium Luster 250 paper (green line) can proof most of the Hexachrome separation except those with more than 60% orange ink cover or 90% green (estimates). The Roland Hifi Jet Pro II (red line) Hexachrome inks and Roland Glossy PhotoBase paper can proof 100% coverage of Hexachrome press orange and green on the inkjet. The AbsoluteProof Extrachrome gamut (blue line) shows that most of the CTP Coated gamut can be proofed, 100 percent CTP Hexachrome Cyan is just out of gamut with the Extrachrome inks.

Your technology investment depends on what you want your proofs to convey. There are high fidelity LCDs and inkjet printers along with companion software to communicate another printing device's Hexachrome color characteristics. Epson Ultrachrome proofs can show the majority of press Hexachrome, but with some compromises. Roland Hifi Jet Pro II is still the leading solution for Hexachrome proofs, with its larger color gamut and correct hue angle. The Eizo CG220 LCD closely resembles the venerable Adobe RGB color space and provides enough color gamut to proof Hexachrome color on screen unlike traditional CRT computer displays.

Carefully evaluate the proofing needs of your customers to help assess which expanded gamut proofing option is best for them. Adding Hexachrome proofing can provide improved customer satisfaction and less surprises in a final Hexachrome printed piece. ◘

Dan B. Reid is a veteran color management consultant and an expert in Hifi printing and Hexachrome print process. His company, RPImaging, helps businesses migrate to using color management and expanded gamut printing including the Hexachrome print process. RPImaging offers color measurement hardware and color management software sales and accredited training. Dan can reached at dreid@rpimaging.com or toll free at (866) RGB-CMYK.