
Six degrees of separation:

A look at the hexachrome™ high fidelity color reproduction system

by Scott Fry for Professor Dan Wilson

A broadening of the gamut of reproducible process colors would be welcomed by the printing industry. The quest for better process inks have been a step in the right direction but still has not produced “perfect” inks. With the advent of extra-ternary color separations (more than three primary colorants) printers have been exploring the possibilities by which colors gamuts could be expanded (Lamparter, 1994, p. 52–3). The Hexachrome™ system from PANTONE® has offered one viable solution for printers who want to expand their color capabilities. This package, consisting of a few software plug-ins, plus a calibration program, will allow printers to reproduce a broader color space with only minor changes in prepress workflow.

The term hi-fi color (short for high fidelity color) was coined by Don Carli as a comparison to high fidelity stereo equipment, which reproduces sound with little distortion (Jeffrey, 1995 p.

46). A hi-fi color reproduction system dates back to 1972, when it was devised by Harald Küpper. His theory was to increase the printable gamut by using cleaner ink pigments and adding orange, green and violet. This system was researched by German ink manufacturers who developed the Küpper colorant set. Other high fidelity systems, like the Davis Hi-Fi Color Project, use CMYK +RGV inks to expand the color gamut (Lamparter, 1994, p. 53). A system by DuPont, called HyperColor, uses only CMYK inks to reproduce an image. However, HyperColor achieves its expanded color gamut by increasing ink film density. “Bump plates” are added to printing units to print additional layers of ink in one or all four colors (Whitcher, 1998, p. 70).

PANTONE introduced Hexachrome in 1994. This color reproduction system takes the basic CMYK inks, reformulates them, and adds green and orange inks to the process (Hexachrome

Q&A, 1998, p. 1–4). The addition of these two colors to the reproduction process allows Hexachrome to exceed the RGB spectrum in all but the green area of the spectrum (see Figure 1.1). Through this system, offset printers can now reproduce colors beyond the gamut of the monitor and even into the fluorescent and pastel range (Jeffrey, 1995 p. 46). In addition to this, Hexachrome can accurately reproduce 90% of all PANTONE spot colors, compared to the 55% of matches available from conventional CMYK process (Wilson, 1995, p. 31).

Installation of Hexachrome

To produce Hexachrome separations, the minimum desktop requirements are a PowerPC or 68040 or better Macintosh, Adobe Photoshop 3.0 or later, and a page layout application capable of placing a DCS 2.0 file. As it currently stands, PANTONE only manufactures this



Figure 1.1. Hexachrome color gamut

system for the Macintosh platform (Studio Soft, 1996, p. 2.4).

Three main components are loaded during the installation of the PANTONE HexWrench software. First loaded is SAME (Studio Appearance Matching Environment), a control panel which acts like a color management tool for the purpose of compensating color differences between input devices, output devices, and monitors (Mac World, 1998, p. 46).

Second loaded is HexWrench, which consists of two Photoshop plug-ins. These plug-ins are what allow the six-way separation to occur. The biggest advantage that these plug-ins offer is the ability to control the separation process. Users can select image segments and alter the separation settings and then view the effect via soft proof. Differences between coated and uncoated paper, total ink limit, screening and even CMYK vs. Hexachrome can all be proofed on screen before any separation takes place (Studio Soft, 1996, p. 5.1–5.14).

The hard drive contains the HexWrench folder, which consists of a PDF manual and the third piece of the puzzle: HexWrench Tuner. This is the calibrator of the system. After printing a control swatch, measurements can be taken from each patch with a ColorTron or Spectroline colorimeter to create an ICC profile, which HexWrench then uses to create separations. The result of this calibration is what HexWrench uses to determine dot gain compensation (Studio Soft, 1996, p. 6.2–6.10).

Hexachrome workflow

With these software elements in place, the Hexachrome workflow can begin. Scanning and image capture can be performed as usual, but all images must remain in RGB space. If images were to be transformed into CMYK at any point, their viability

would be lost due to gamut clipping (Hexachrome Q&A, 1996, p. 4). Changing the color space of an image from RGB to CMYK can result in a 25% reduction in color range (Whitcher, 1998, p. 70). No special alterations are necessary during the image manipulation process. Color casts, sharpening, and all other image correction techniques are unaffected by Hexachrome (Hexachrome Q&A, 1996, p. 4).

Once an RGB image is ready to undergo separation, pulling down the “filter” menu and going to “color” will initiate the HexWrench plug-in. Here a control window appears, displaying the image and the settings for creating separations (see Figure 1.2). This is where the user may select whether they want to create an image screened at 175 lpi, 200 lpi, 14 μ or 21 μ stochastic. The user also selects coated or uncoated paper and adjusts the total

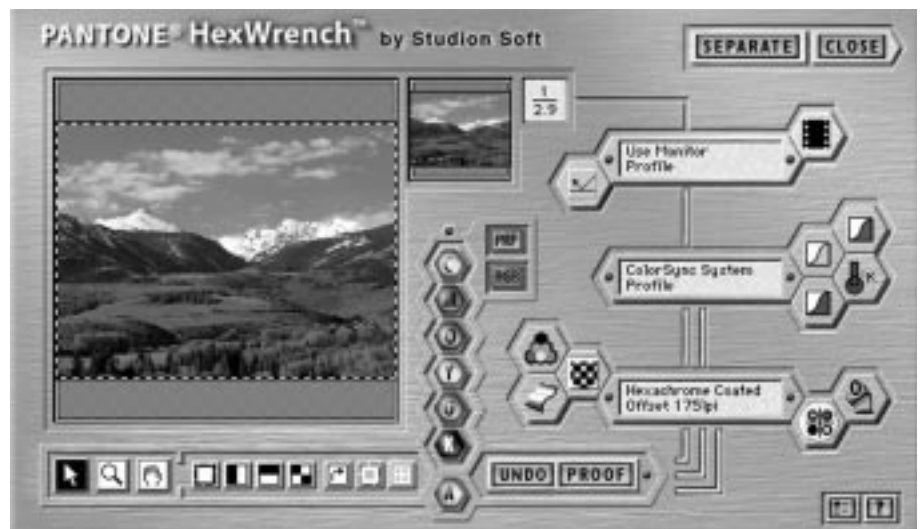


Figure 1.2. Creating separations with Pantone HexWrench

ink limit (which PANTONE calls the black modifier). Information about the origin of the image is also specified. HexWrench inquires as to the nature of the original media, reflection or transmission and which scanner profile captured the image, allowing SAME to compensate for color variation.

After the settings have been changed to their correct positions, a set of separations are generated by clicking the "separate" button. After the separation process is complete, seven files will appear on the desktop. Six of these files are color channels and one file is a DCS 2.0 that can be placed into almost any page layout application (Studion Soft, 1996, p. 5.1-5.14).

With the release of new application versions that support Hexachrome, a less complex workflow is available. While image capture and manipulation still follow the same procedures, rather than creating separations out of Photoshop they are made upon output from a page layout application. With Hexachrome supported software, RGB images can be placed directly into the application. Once placed, programs like QuarkXPress 4.0, Adobe PageMaker 6.5, Corel Draw and Macromedia Freehand 7.0 will automatically create separations. The advantage of this workflow is that the user is required to perform fewer steps. However this is also the workflow's disadvantage because few-

er controls are available regarding the nature by which the images will be separated (Moretta, 1998, p. 6-8).

Proofing concerns

Proofing systems are available for Hexachrome, but mainly in analog form. Agfa, Dupont, Fuji, and TransCal are the major suppliers of proofing materials for the Hexachrome System (Hexachrome Q&A, 1998, p.4). Digital proofs can be made to simulate Hexachrome output. Some digital color output devices have a gamut that is over 50% greater than conventional process color work. For example, the gamut of the Scitex Iris proofing system for example, encompasses almost all of the Hexachrome gamut, making it an acceptable digital proof for hi-fi color (Andersson, 1998, p. 21). The Epson Stylus Pro 5000 can also be used to create Hexachrome proofs. Both of these printers can give designers an idea of what the printed result will look like. However they are not considered a contract grade proof (Whitcher, 1998, p. 70).

Hexachrome calibration

HexWrench Tuner is a stand-alone application that produces ICC profiles for presses. The creation of a profile is critical to producing good Hexachrome separations. The profile for the target device is asked for when

creating separations in HexWrench. This is the only way that dot gain compensation can occur. By reading the test patches with a ColorTron or Sepectroline colorimeter, the profile will be built and incorporated into the SAME list of profiles (Studion Soft, 1996, p. 6.2-6.10). Profiles are also requested in making separations from QuarkXPress 4.0 and any other Hexachrome compatible software that integrates color management directly into the application (Anderson, 1998, p. 12).

Press considerations

When someone uses the term "hi-fi color," the thought of a six-color press printing stochastic screens comes to mind. With this scenario comes some serious press concerns. While many printers assume that stochastic screening is used exclusively for hi-fi, this is not the case. Hexachrome repeats two of the screen angles to eliminate a moiré pattern with conventional screens. Orange is printed at the same angle as cyan. Green is printed at the same angle as magenta (Whitcher, 1998, p. 69).

Another substantial concern to experienced lithographers is how to control the total ink limit. To print a total possible 600% ink film would represent a nearly impossible task with the marking, picking, curling, and drying difficulties that would occur.

Unfortunately, this is a weakness of Hexachrome. The black modifier in the HexWrench plug-in is the only place that the total ink film can be regulated. Here, only three options are possible: from normal (0); thin (-2) and thick (+2) (Studion Soft, 1996, p. 5.10).

One aspect of Hexachrome that experienced lithographers will appreciate is its ease of color modification on press. For example, press operators can enrich the greens in a reproduction of a lush woodland scene by increasing the amount of green ink. This is significantly easier than increasing cyan and yellow. By only altering one color, operators will not have to be concerned with changing an image's gray balance (Jeffrey, 1995 p. 48).

The standard process color inks used in conventional color printing cannot be used in the Hexachrome process. PANTONE specifies a set of special Hexachrome process inks that must be used for this process to properly achieve the expanded gamut. According to PANTONE, these inks have been reformulated for more than the purpose of tack control and wet ink trapping. PANTONE research and development experts experimented to find cleaner process inks. Through testing, an optimum formulation was found by combining fluorescent and conventional pigments. For example, Hexachrome yellow is composed of the traditional Diarylide yel-

low pigment, but with the addition of fluorescent pigments. This yellow has more than double the lightfastness of its traditional counterpart. Hexachrome magenta is based on the rubine pigment (rather than rodamine), but with the addition of fluorescent pigments. Cyan is without fluorescent pigments as its purity was increased by reformulation, yielding 20% more potency. Green and black are also without fluorescent pigments.

Despite the relative simplicity that this system offers on the desktop, Hexachrome perhaps most significantly represents an advancement in ink formulation (Lustig, 1998, p. 82). The importance of this innovation in ink is that printers who only choose to run the reformulated CMYK inks can still benefit from an increased color gamut (Jeffrey, 1995 p. 47). For a six color press the suggested run sequence is black, cyan, green, magenta, yellow and orange (Studion Soft, 1998, p. 7.1).

The Hi-Fi debate

But why bother with hi-fi color? Some among the industry believe that Hexachrome and other hi-fi color systems are just a gimmick and will never become commercially successful (Lamparter, 1994, p. 53). A commonly held opinion is that modern presses are printing better color images at higher resolutions than ever. Along with new technolo-

gies, like stochastic screening and waterless lithography, there is no justification for the modified workflow and increased budgeted hourly rates that six color process printing would require (p.54). Some experts believe that for a magazine, a switch to hi-fi color could add an extra 20% to their printing cost (Wilson, 1995, p. 31).

Others among the industry recognize that there has been, and always will be, a market for printing of the highest caliber. For example, educational publishers are starting to use hi-fi to create bold textbook covers. A vivid design on the cover a math or reading book attracts the attention of its end users—children and teenagers. Some print customers can actually save money using hi-fi color. For example, clients who specify multiple spot colors can save money by running hi-fi because of the number of spot colors that it can reproduce. (Whitcher, 1998 p. 70). Another economic advantage of hi-fi color, according to PANTONE, is savings made in paper buying. Printing can be done on lower priced, cheaper grades of paper, and, due to hi-fi's vibrant color, can still result in high production quality (Wilson, 1995 p. 31).

For now, hi-fi color is considered by most to be a niche. Mark Tennant of Anderson Litho, a Hexachrome beta test site, says "Our clients have the highest demands and are willing to move

beyond four-color process if it differentiates their products” (Jeffrey, 1995 p. 46). In the final analysis according to Mills Davis, “...it’s like high tech gas at the pump: it costs more, but not a lot more” (Wilson, 1995 p. 31).

Final thoughts

In this age of increasing digital technology, print customers are demanding more out of a traditional media. Printing must strive to meet the new expectations of its customers. High fidelity printing is a step in this direction. Traditional print customers are interested in the cutting edge that this new vibrant color can give their products and images. As this market steadily grows and high fidelity print becomes more commonplace, printers will be forced to take a second look at this process. Competitive printers have already adapted their workflow

and print all or most of their products with hi-fi. Realizing the opportunity to give their customers a value added service has kept them up to date in an ever changing market.

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About the author

Scott Fry is a student in the Printing & Publishing Technology degree program at Pennsylvania College of Technology.