Consistent Coloration

Color standards evolve to digital print.

By Amber E. Watson

Part one of three

Digital print enables the production of quick, cost-effective, short run color output. To achieve new goals and quality expectations, digital printers require skill and advanced color management tools.

"Color management is still a bit of science and art," shares Roland Campa, product manager, EFI. "The idea is to have a color managed 'handshake' between all the different devices in the chain to provide an accurate representation of the required output from beginning to end." Frequent calibration of devices is required to provide accuracy across the board.

The ability to provide consistent and precise color is increasingly important in digital production. The competition wins if a provider cannot regulate color quality and meet evolving standards. Luckily, color management tools exist to help control the process.

Current Color Standards
Like much of the industry, Rick Hatmaker, worldwide technical, CHROMiX, Inc., is waiting on standards specific to digital. In the meantime, his company uses popular specifications like Specifications for Web Offset Publications (SWOP), General Requirements for Application in Commercial Offset Lithography (GRACoL), and G7 calibration, to help digital equipment work alongside other printing technologies.

"Although the standard was designed for offset, G7 is currently popular even for digital production in the U.S.," explains Campa. EFI Fiery XF 4.5.3 takes this trend into account, providing new verification tools for G7 Contract Proofm, G7 Greyscale Compliant, and G7 Compliant Proofing System. EFI's linearization, profiling, and profile optimization wizards assist with passing verification for these categories.

Fujifilm North America Corporation also fully supports and participates in the ongoing efforts of organizations like IDEAlliance in developing certification processes, such as the Digital Press Certification, for the benefit of the industry.

Most digital printers target the GRACoL and ISO coated—Fogra 39 standards. This is relevant to bright white printing substrates. "From our experience, companies with digital presses are working toward SWOP standards," says Marc Welch, director of strategic accounts, GMG. "A number of label and packaging companies are starting to work toward color-consistent processes by adopting G7 standard specifications."

Agfa Graphics adopted GRACol and other standard for digital printing. "GRACoL isn't a standard of color but a calibration to create consistent gray balance. That has translated to the wide format arena," explains Larry D'Amico, VP of digital imaging, Agfa Graphics.

For wide format applications, many utilize offset color models because the sign market has no real standards. Some digital print providers use SWOP as a standard for printing signs. D'Amico cautions that these digital devices feature larger color gamuts than a press, so by adhering to an offset guideline one is limited to a print standard, if it is a CMYK color space.

"Part of the problem is that many commercial campaigns have an offset component to them. In color management you have to take the lowest common denominator and that is the commercial print component. You don't want to create a standard on a digital device that can't be recreated in a commercial print space if you are trying to match a Pantone color," explains D'Amico.

George Adam, president, Techkon USA, says current color digital print standards are similar to existing ISO print standards, especially when the press seeks to produce offset quality prints. "These standards led to the development of new high-speed inkjet printheads; highly reliable media transport systems; high-end computer systems capable of processing the large volume of data captured from a digital press

running at a speed of 1,000 feet per minute (fpm), and intelligent spectrophotometer technology that keeps up with the press to ensure every print is accurate and matches the color quality required by the customer," he adds.

Developing Standards and Tools
X-Rite Inc. developed its X-Rite Graphic Arts Standard (XRGA) for companies and professionals involved in digital production printing to adhere to ISO standards, ensuring that data sent or received from all links in the supply chain are reliable and repeatable. "In today's global marketplace, it is imperative that companies are able to communicate precisely where a color resides in the space using digital data, regardless of the make or model instrument used," says James Luttrell, field marketing manager, X-Rite.

XRGA incorporates ISO-13655 with other best practices in color science methods to reduce measurement variation among instruments due to different calibration standards. This ensures handheld and benchtop colorimeters and spectrophotometers, formulation and quality assurance software packages, and equipment such as pressroom color scanners are measured and communicate using the same standards.

XRGA is an outgrowth of X-Rite's integration of its own technology with that of GretagMacbeth, Pantone, and other entities that X-Rite has acquired. This standard aligns all X-Rite instrumentation to a single standard, regardless of the point or date of manufacture of a product. For instance, XRGA eliminates measurement variations for vendors that may be using both X-Rite and former GretagMacbeth instruments on the same project.

X-Rite's Color Exchange Format (CxF) is a universal digital format that allows companies to communicate advanced color attributes that are not part of the standard ICC workflow. The format is an XML container that includes rich data to make color and appearance better defined so that color can be communicated accurately through CxF aware applications and solutions. CxF is available to developers to enhance solutions and provide high levels of color information to users.

Inline Spectrophotometers
New digital presses that incorporate inline color spectrophotometers capture 31-band spectral measurements while the press is running up to 1,000 fpm, explains Techkon's Adam.

Other benefits include the ability to interface to a PC or tablet for remote viewing and reporting of color performance on press, giving the customer the ability to track the color quality of the job while it prints. Additionally, inline spectrophotometers enable automatic calibration of the press on a user-controlled schedule, which provides accurate color measurements for closed loop color control over long periods of time in an industrial, non climate-controlled environment.

"Applications made possible with an inline spectrophotometer embedded inside the digital press include quickly bringing ink color up to proper density quickly without operator intervention; checking the uniformity of the density across the entire width of the sheet; monitoring color density during a press run without stopping the press, and building an ICC profile on the fly when a paper roll is changed, the ink is replenishing, or after the press is serviced," adds Adam.

Moving Forward
Color gamut differs between ink sets and with specific color spaces that work in conjunction with substrates and coating, presenting an ongoing challenge for print providers to produce a product that is as faithful to the original as possible.

As standards improve, so must a print shop's capabilities. Access to and understanding of the latest color management tools helps print providers produce the highest quality product possible.

Part two of this series details several color management tools available by some of the top manufacturers

The Proper Tools for Color

A roundup of digital color management devices.

By Amber E. Watson

Digital print providers offer customers accurate, consistent, and quality color with the correct tools. Several devices are available to control color; helpings print service providers (PSPs) achieve an accurate, high-quality product.

Tools for the Job

CHROMiX Digital PressWatch is a digital printing service that combines full-page diagnostics and automated measurement routing with standard Maxwell features such as notifications, multi-dimensional reporting, and multi-user Web browser access. The combination allows press operators rapid target scanning and at-a-glance diagnostics. The cost is $999 for one press per year, or $2,499 for three presses per year.

In addition, CHROMiX recently introduced two new features for Maxwell—Multi-Dimensional Reporting and the new DashBoard.

Using Web Control Center in Fiery XF, EFI enables color-managed files to be distributed to multiple locations.

EFI developed an iterative gray balance optimization within the EFI Fiery XF linearization, specifically for EFI VUTEk printers. It balances the CMY gradation curves and leads to very neutral grays even before color management takes place.

Additionally, EFI developed a dynamic rendering intent that analyzes the reference or source profile, the media or output profile, and the specific colors of a job. Based on this analysis, the ideal rendering intent is automatically proposed to the user.

The Esko Color Engine is a central color database for all color critical data. In combination with the color database, The Color Engine maintains consistency throughout a production environment by ensuring every application and operator works with the same color critical data. It manages color in the CMYK space or with an expanded gamut workspace, assuring accurate brand and spot color matching. The Esko Equinox tool for Adobe Systems Incorporated Photoshop allows the accurate reproduction of images in an expanded gamut. The Equinox tools for ArtPro and PackEdge allow users to remap color spaces for linework and images, based on the color gamut and scheme of any particular press—digital or traditional.

Fujifilm's ColorPath is a cloud-based verification and alignment color management solution, which also focuses on remote access and continues to increase in utility and versatility while maintaining a user-friendly interface.

Last year, Konica Minolta Sensing America's, Inc. introduced the FD-5 and FD-7 spectrodensitometers. "These units were the first two spectrodensitometers to meet the latest ISO 13655.2 specifications—graphic technology, spectral measurement, and colorimetric computation for graphic arts images," shares Russell Doucette, business development manager, Konica Minolta Sensing America's, Inc. "This standard defined a new measurement condition—M1—basically that that spectral power distribution of the illuminating light source of the measuring device should match CIE illuminant D50," he explains. This condition should be used when optical brighteners are of concern.

Techkon's SpectroEdge is an inline Spectrophotometer developed to enable press manufacturers to achieve offset-like print quality. This technology is currently integrated into new digital presses. "In the next three years we expect most digital presses to be equipped with inline spectrophotometers, shares George Adam, president, Techkon USA. "Recent advancement of electronics hardware and software development tools make it possible to inexpensively develop a full CPU-driven spectrophotometer that can be packaged small, and rugged enough to be embedded inside a new—or retrofitted to an existing—digital press," he adds. The ability to measure color while the press is running, and automatically adjust the ink heads to achieve the desired result, provides closed loop color control.

The SpectroEdge is suited for a range of printing presses. It offers design features with 3,000 samples per second, scanning spectrophotometer with inline color measurement, and reporting of 31 spectral bands. It also features a Linux operating system, capable of automatically identifying color patches using image recognition algorithms. It operates at 3mm height, accommodating ±.5mm change in distance from media. Its metal construction is designed to withstand vibration or the impact of broken media.

The new X-Rite CAPSURE tool provides publishing creatives with the ability to accurately measure the color of virtually any test surface while on the go, and digitally match the color against a digital library of thousands of colors. The palm-sized spectrophotometer takes measurements with the click of a button and distinguishes up to four colors in intricate patterns. To ensure the colors appearing on displays exactly match those rendered at proofing and printing operations, X-Rite developed a range of i1 color management tools to meet the needs of photo, pre-press, digital pressroom, and publishing professionals.

Additionally, i1 color management tools such as i1Display Pro and i1Publish target specific requirements. The i1Display Pro uses an advanced colorimeter and software to create profiles of displays and projectors that take into account ambient light conditions. The i1Publish is geared for graphic arts professionals who need to organize prepress workflow using digital standards, including new assurance validation and verification functions.

With a free online utility Pantone's PANTONE PLUS digital libraries are integrated into the most commonly used graphic design systems made by Adobe and other companies. For graphic designers, this means that all of the PMS colors formerly defined in fan decks, along with hundreds of additional Pantone colors are easily selected on a computer monitor.

Testing the Market
Finding the right tool, or combination of tools, to achieve proper coloration is a matter of investigating options that are currently on the market and weighing the pros and cons. Factors such as cost, usability, and quality affect one's decision on the best color management device.

Part three of this series discusses recent advancements and upcoming trends in digital color standards. **dps**

The Future of Color Standards

Advancements and trends with digital color standards.

By Amber E. Watson

Part three of three

Evolving digital print technologies present the need for new digital color standards. Many factors influence these trends. For example, manufacturers of color digital presses push the limits to offer an expanded color gamut.

"Manufacturers are far exceeding what has been achievable from years past. Thus, we are beginning to see some new color standards that are mostly geared to digital because the capabilities of these presses are starting to surpass analog," notes Larry Moore, director of software services, EskoArtwork.

Tightening guidelines and loftier color matching expectations push the standard for digital color management further each year.

Standard Evolution
The current color standards were set with the International Commission on Illumination—CIE for its French name, Commission internationale de l'éclairage, points out Roland Campa, product manager, EFI. "Standards have now increased to address printing on a variety of substrates including glass, plastics, and substrates of different thickness."

There is healthy industry debate surrounding the role of color standards, especially in regards to the increased role of digital print.

Marc Welch, director of strategic accounts, GMG, does not believe existing GRACoL and ISO standards will change. "Instead, the change will be the ability of the devices to remain accurate to the standards in the production world across multiple printing substrates," he says.

Larry D'Amico, VP of digital imaging, Agfa Graphics, questions the purpose of a standard at all. "I'm not sure if a standard is necessary, but rather better tools to implement color consistently," he says. "Digital print providers need to be able to quickly get to an acceptable calibrated state and be able to stay there."

George Adam, president, Techkon USA, foresees an industry demand that high-end digital presses improve in color quality, speed, and cost per print. "Historically, high-speed digital presses were intended to produce transactional types of printed documents, while the new breed of color presses produce offset quality color at high speeds," he says. Over the next few years, Techkon expects most digital presses to incorporate technology that facilitates this.

Digital presses are also expected to expand capabilities to handle more than the traditional CMYK inks and a wider range of print media in order to expand the color gamut. "The current limitation of only CMYK inks will change rapidly to allow customers to achieve all the capabilities that currently exist on traditional presses," explains Adam. The intent of new print technology is ultimately to print as many jobs as possible in one shift. Therefore, continually improving the process of quickly getting to the right color at startup time is critical.

The ability to perform in-image color measurement, for logos or unique colors anywhere on the page, is also a noticeable trend with the central computer of the press knowing exactly what is being printed and where. "The idea is that the press would be able to take color measurements of spot colors while the press is running, making adjustments as needed. This is unique to digital presses and would eliminate color bars printed on the side of the page, which would save significantly on ink and paper," explains Adam.

A Few Trends
James Luttrell, field marketing manager, X-Rite, expects three trends to continue in the near future—tighter tolerances throughout the printing industry, increased use of spectrophotometers, and practical standards for addressing inks and substrates containing optical brightening agents.

Luttrell explains that specifies are tightening the delta E tolerance of their brand colors printed on various substrates with different processes. Specifiers are now asking even corrugated converters to provide color measurement data with shipments of basic packaging. This trend is driven by the desire of specifiers to enhance and control their brands and manage their market position though the consistent use of color branding.

Aligned with the first trend, spectrophotometers gain further use among companies and professionals in the digital publishing industry as instrument features advance and cost of entry declines. Spectrophotometers provide a precise way to define where measured colors reside in color space and accurate predictions as to whether colors are subject to metamerism.

Digital print providers need to implement practical and universally accepted standards that catch up with today's prevalent use of optical brightening agents in inks, papers, films, and other substrates. "Paper manufacturers and ink formulators raced ahead of the digital printing industry during the past ten years by offering products that contain OBAs, and now the printing industry needs to develop standard methods of communicating how the presence of these OBAs affect the perception of finished goods," says Luttrell.

Another consequence of a trend towards better color management is software/workflow that helps control color. "Online configurations allow the latest software, RIP, and profiles to be updated manually or automatically, perfectly matching substrates and ink," says Campa.

Additionally, digital printing continues to move toward automated color calibration. "Many of the high-end print platforms have integrated measurement devices that assist in keeping the color consistent. In this scenario, color management is inside the printer operating in a closed loop method," explains Welch.

Domino Effect

Current trends and expectations encourage the adoption of more strict color standards. Those looking to stay ahead of the competition are challenged to keep up. As digital production continues to grow, improvements in color consistency, standards, and specifications continue to improve. **dps**