COLOR MANAGEMENT WITHOUT COST

The ideal was to construct an all-purpose ColorSync-based desktop prepress color management workflow. Our first goal was to build one with current in-house software and proofing solutions. But as we discovered, there's more than meets the eye.

BY STEPHEN HERRON

IMAGE COURTESYPHOTO COLLECTIVE (VOLUME 1: BUSINESS AGENDAS)

In the last issue of Graphic Exchange I described the theory of ColorSync-based color management and its importance. Now let me relate my experience with attempting to implement a color management system in a real world test.

I work for Isis Imaging Corporation, a software development and engineering company, which occasionally performs design and prepress functions. We do not produce film, nor do we scan all our images in-house. Our prepress vendor is LithoTech Canada Ltd., located here in Vancouver, B.C.

Ideally, Isis Imaging wanted to set up a color management system that would result in the same reproduction regardless of input source, whether the image was scanned internally, or at LithoTech, or taken from the Internet or a CD-ROM. Currently LithoTech provides images only in CMYK color space optimized for its Fuji Color Art proofing system. However LithoTech would like to provide images to its customers for use in a variety of applications. As well, LithoTech and Isis Imaging wanted to implement a color management system without purchasing additional software, using only Apple ColorSync and existing ICC profiles.

THE OBJECTIVES

We defined two goals for our color management scheme:

1. That LithoTech would implement a workflow based on ICC profiles parallel to its current method of scanning in CMYK space. The ICC

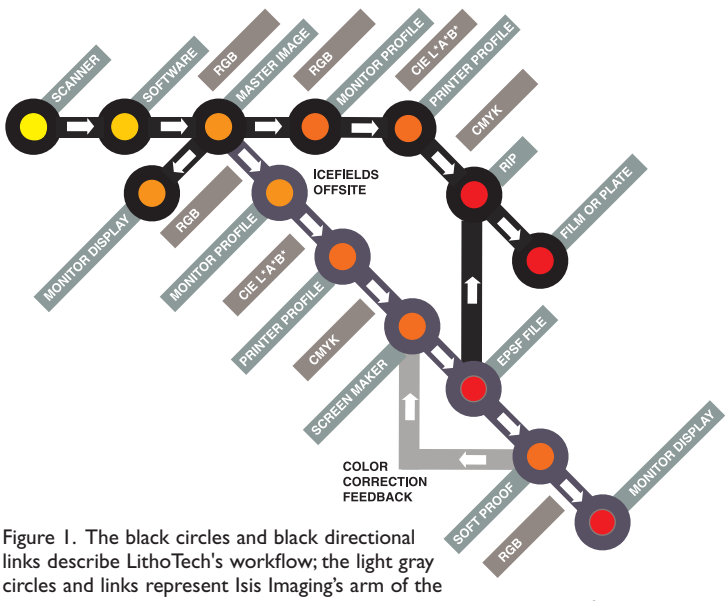

Figure 1. The black circles and black directional links describe LithoTech's workflow; the light gray circles and links represent Isis Imaging's arm of the workflow. The vertical link from the Isis workflow arm to LithoTech's workflow directs Isis' output back to LithoTech.

profile color transformation method would have to match the quality of current color separations.

2. That LithoTech would be able to supply customers with scans that they could use for any purpose. If the customer wished to translate the scans to CMYK and return them to LithoTech for film and proofs, then those images would be exactly the same as if LithoTech produced the transformations. For example, both LithoTech and Isis Imaging would scan in RGB color space and perform color correction in RGB. ColorSync would be used to perform the translation to CMYK at either site. (see *Figure 1*)

Isis Imaging uses *Icefields* 3.0 to transform images to CMYK while converting to FM screens. (Matching color spaces in this case would be counter-productive since *Icefields* provides a larger gamut than halftone screening.) *Icefields*' screens are saved as EPSF documents for transport to LithoTech where film and proofs are made.

We envisioned that LithoTech would use *Photoshop*'s ColorSync plug-ins to embed a monitor profile within the TIFF document. The embedded profile when combined with the printer profile would result in the same color transformation onsite or offsite.

This color management system would use Apple's ColorSync 2.1, Apple OS 8.0, and canned ICC profiles, with any or all of Adobe *Illustrator* 7.0, *PageMaker* 6.5, *Photoshop* 4.0, *QuarkXPress* 4.0 and *Icefields* 3.0. Each of these applications uses ColorSync color management in various ways.

IMPLEMENTING ICC PROFILES

The first step was to procure an ICC profile.

I contacted FujiFilm, who informed me that they have not produced a canned profile for Fuji Color Art proofing. My Fuji contact described their system as being very consistent; therefore, custom profiles would be a duplication of effort. Yet Fuji was unable to provide those ICC profiles! (I had requested profiles for three type of substrates and with three types of under color removal [UCR] for a total of nine profiles.)*[Editor's note: Fuji says ICC profiles will be available by the summer.]*

I searched the Apple ColorSync website for canned profiles and found three SWOP profiles — one for each of three substrates. Profiles by amount of UCR are unavailable.

I decided to begin our testing with one canned ICC profile supplied by Apple Computer, and selected LinoColor's Short Key Profile as I liked its short black generation curve, and also because it performs UCR well.

A white-page monitor profile provided by Apple would be used as the input profile and would be embedded in the TIFF documents produced by LithoTech to ensure input profile consistency.

THE TESTING PROCEDURE

Our workflow would be comprised of the following steps:

- LithoTech would scan an IT8 reflection color print and produce film and proofs as per normal CMYK production; the same IT8 target would be scanned a second time, this time in RGB
- *Photoshop*'s ColorSync import/export plug-ins would be used to transformed the target to CMYK space
- film and proofs would be produced, and the two proofs measured with a spectrophotometer
- if any ColorSync patch deviated more than two or three delta E from the conventionally separated test, further color correction would be performed and new film and proofs made

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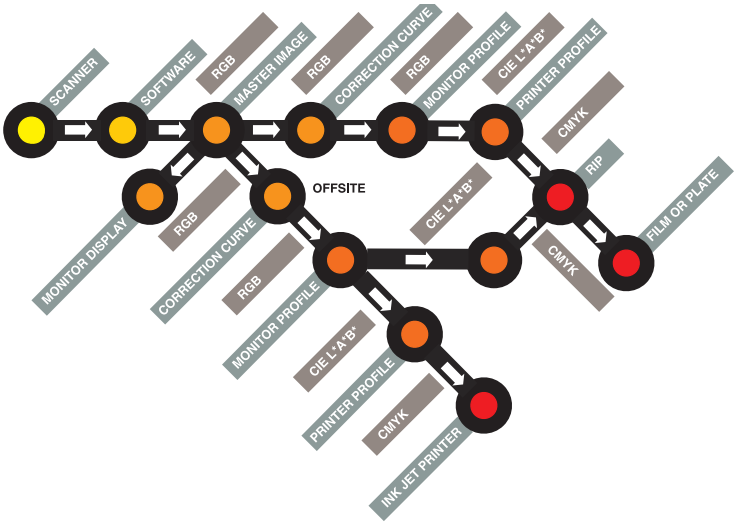

Figure 2. This workflow shows the master image used in three ways — viewing on a monitor, making film and plates, and the customer's offsite duplication of LithoTech's procedure. The customer can also use the master image for other output devices.

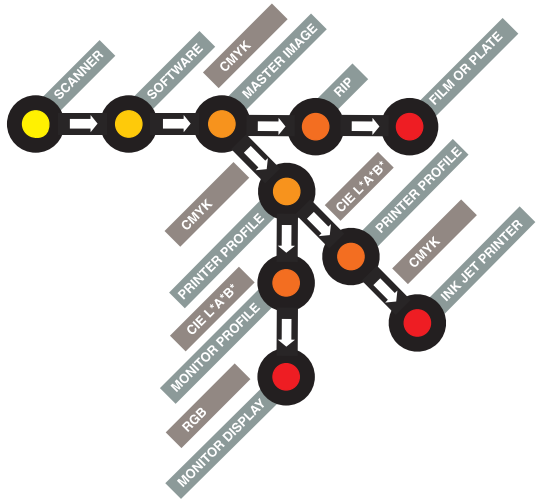

Figure 3. Workflows that start with a scan targeted toward a specific output device suffer from a limited-gamut master image. The flow should be in the direction of image degeneration, otherwise the master image limits the color gamut of the other output devices.

- the new color correction procedure would be noted and temporarily made part of the color management system; a test image with high and low key areas would then be scanned and transformed as a further check on the accuracy of the transformation procedure

We noted that a better procedure would be to change the ICC profile rather than perform additional color corrections on the RGB image. But since we were using a canned profile which could not be adjusted, such a solution was unavailable.

Isis Imaging would use the same scanned IT8 target, test image, monitor profile and ICC profile plus an *Icefields* compensation curve document. Using *Icefields*, Isis would create screens in CMYK, then film and proofs would be generated from *Icefields* screens.

A similar comparison would be made with the IT8 target and LithoTech's halftone image. This comparison process would be repeated until all proofs and monitors matched the original halftone proof.

Isis would then use Icefields *Soft-proofer* to soft-proof images, and know exactly how they then appear before they were printed. The color management system should be able to forecast printed results.

WHY WE LIKED A COLORSYNC APPROACH

We saw these benefits to the ColorSync process:

- LithoTech and Isis Imaging could have an ICC profile and an *Icefields* compensation curve document that would assure color output consistency to the image displayed on the monitor.
- LithoTech would be able to provide its customers with accurate generic RGB scans in the largest possible color gamut with the assurance that the image file would be as accurate as those which LithoTech has always provided. More important, LithoTech would be able to provide scans for many more uses than just print. The customer would now be an offsite arm of LithoTech's color management system.

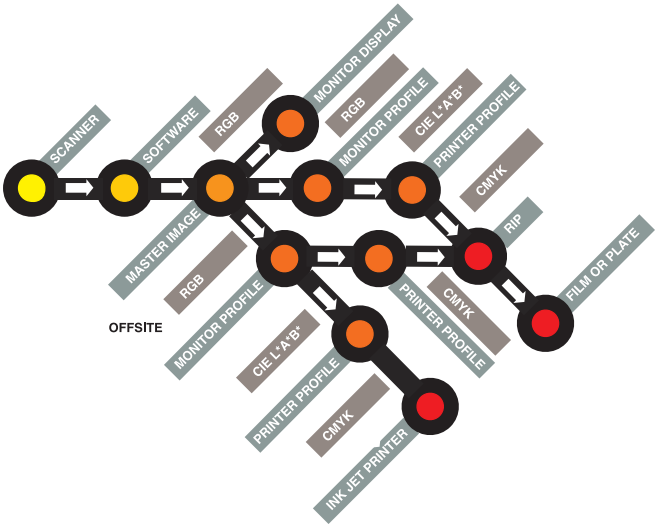

Figure 4. A workflow that begins with a master image with the largest possible color gamut can be used for any output device and by any number of users. This diagram shows a main workflow as well as a secondary customer workflow with a link back to the main workflow.

TRYING TO MATCH A PROOF TO THE PROFILE

First, we tested the ICC profile transformation. The canned ICC profile, SWOP LinoColor ShortKey, produced very dark shadows with light midtones. Apparently LinoColor's measurements were taken from a press with very different characteristics than Fuji's Color Art Proof. Also the RGB to CMYK transformation resulted in yellows with a slight green cast and browns that were too cold.

In order to improve the printed output, drastic color shifts were required in the RGB source image, resulting in an image on the monitor which displayed unacceptable color shifts. Normally the color on the monitor would be ignored since the quality of the printed image is of primary concern. However, the goal was to match the monitor's displayed image to the printed image. An image file with an embedded monitor profile should appear correct since ColorSync does RGB to RGB transformations.

We believe that shifting the image's colors to compensate for problems in a printer profile, then shifting them back for accurate display on a monitor is not the proper method. The color — whether in RGB or CMYK — should always be as accurate as the equipment allows. A displayed image should look like the original when viewed on a monitor controlled by a canned monitor profile.

REGROUP AND TRY AGAIN

At this stage, three plans were proposed.

1. Make a source image in RGB that appears accurate on the monitor and a set of *Photoshop* curves that would shift the image to produce acceptable printed output. The RGB files, ICC profiles, and *Photoshop* curves would all be provided to the client. (see *Figure 2*)

There were several problems with this plan. Color correction would take additional time; LithoTech would be forced to rely on the client to be meticulous in its use of the profiles and curves; and only *Photoshop* could be used. One of the goals was that the color transformation must work with any of the software programs listed earlier. Another goal was to use ColorSync only — not *Photoshop* curves.

2. We examined the Dainippon Screen workflow (see *Figure 3*). It had the advantage of allowing the scanner operator to produce CMYK in the traditional way; but it required two versions of each scan — one file in CMYK and another in RGB.

The biggest difficulty with this suggestion was that the RGB version would be limited to CMYK gamut and would not serve well as a master file for other uses. What would happen

if the client changed the RGB image and expected the change to be imaged to film? That was not part of the workflow.

3. An ICC profile could be created specifically for LithoTech's Fuji Color Art Proof, following the color management workflow diagramed by Apple (*Figure 4*). We considered purchasing profile-making software and densitometers, allowing the potential to make very accurate color transformations using various custom profiles made specifically for printers and substrates.

This proposal seemed optimum — but it was not within the guideline which presupposed that we would not implement new color management software and hardware.

WHAT WE LEARNED

Our ColorSync test yielded these conclusions.

First, LithoTech's closed loop color correction procedures produce better color than is currently possible from a canned ICC profile and the current color correction and color transformation procedure will continue to be the basis for the majority of LithoTech's work. A workflow variation for clients that request RGB images is to be implemented (although not as of the publication date of this article).

Second, an extended color management system whereby offsite CMYK image transformations might work, but only with custom ICC profiles. Nevertheless, accurate color correction is the product of experience, and when an image is corrected in one environment, it could still appear incorrect in the offsite environment. Ultimately, the desire to perform further color corrections offsite must be avoided.

Third, Isis can only work with RGB images from LithoTech and must perform further color correction as necessary, as well as RGB-to-CMYK transformation and FM screening. The goal of achieving consistent color at both LithoTech and Isis Imaging cannot be met at present. LithoTech must continue to make film and proofs from Isis Imaging's *Icefields* files, acknowledging that color will be somewhat inconsistent. LithoTech, a prepress provider at the forefront of the Vancouver prepress industry, must continue to rely on its existing color management system.

Meanwhile, I am still searching for the perfect software profile making program — software that allows me to open a canned printer profile, adjust the black generation curve, the amount of UCR and correct the color gamut shape.

While the perfect profiling software program or the perfect canned profile may not be available yet, I believe that the canned SWOP ICC profiles available from **colorsync.apple.com** are sufficient for average reproduction. For Isis Imaging's purposes, they can enable the production of color images more accurate than any but the best proprietary color computer systems, given proper tweaking of images and the application of *Icefields* compensation curves.

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