Profiling Through Laminates

BY RICH ADAMS, RYERSON UNIVERSITY

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Have you ever laminated a print and found that the laminate you used gave the print an annoying color cast? According to Brian Gibson, national technical and applications manager at Neschen Americas in Toronto, Canada, laminates frequently impart color casts to printed material. The culprit is the adhesive. And it's true that cast-free laminates are available, but they tend to be more expensive than ordinary laminates.

Valérie Boileau-Matteau, exhibitions coordinator at the Mira Godard Study Centre, Ryerson University School of Image Arts, is familiar with the ways in which laminates can impart color casts. Last year Boileau-Matteau coordinated "The Celebrity Persona" show (see **Figure 1**), a large exhibit of black-and-white prints that she and her staff printed using an HP Z2100 eight-color aqueous-based printer. "After lamination and display in the gallery, the prints had a reddish color cast," she says. "We fixed the cast by editing the profile in X-Rite ProfileEditor." Profiling through the laminate and incorporating an ambient light reading into the profile may have helped solve the problem, too. "Editing the profile fixed the cast and saved the show," she added.

Figure 1

Images printed for Ryerson's "Celebrity Persona" show suffered from color casts imparted by the laminate and the mixture of artificial and natural light. The cast was removed by editing the printer's ICC profile with a profile-editing program. Profiling through the laminate and incorporating an ambient light reading into the profile could have helped, too.

PROFILING THROUGH LAMINATE

Profiling refers to creating an ICC printer profile for your printer, media, and RIP. This involves printing a color test chart with up to 2,000 color patches, reading the patches with a spectrophotometer, and making the profile with profiling application software. The resulting ICC profile can be used with Photoshop or other ICC-compliant applications or with your RIP. The profile helps ensure that prints, regardless of media, match the color of the original file.

Users typically profile media, or use manufacturer-supplied profiles. If a laminate imparts a color cast to the media, it can be helpful to laminate the profiling test chart (see **Figure 2**) and read it through the laminate. Following is a procedure for making a media profile through laminate and comparing its color to that of an un-laminated print.

PROCEDURE

Before You Start

1) Create a test page with photos and test targets representing your work. Consider including:

a) - high-key (light), low-key (dark), and normal-key photos

b) - color images with "memory colors" (e.g. red, green, and blue) and flesh-tones

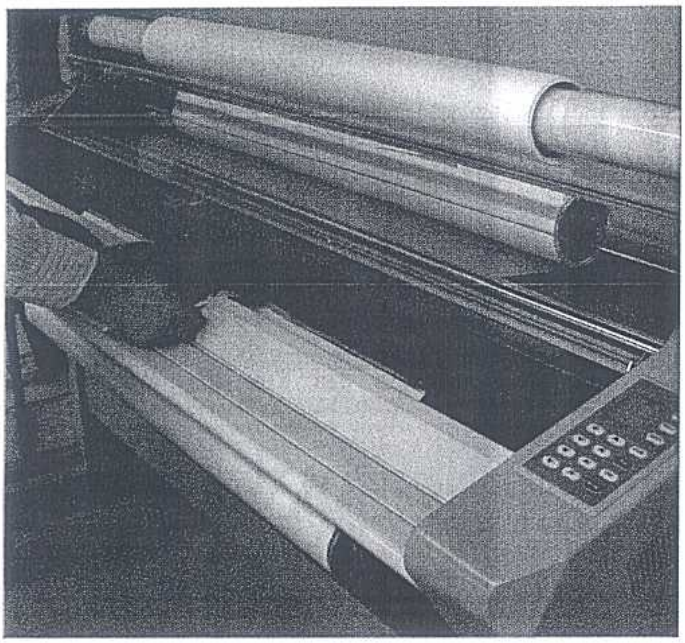

Figure 2

When profiling a media that you intend to laminate, the laminate material will likely reduce the color gamut and impart a color cast to the print. To compensate, laminate the profiling target and profile "through the laminate."

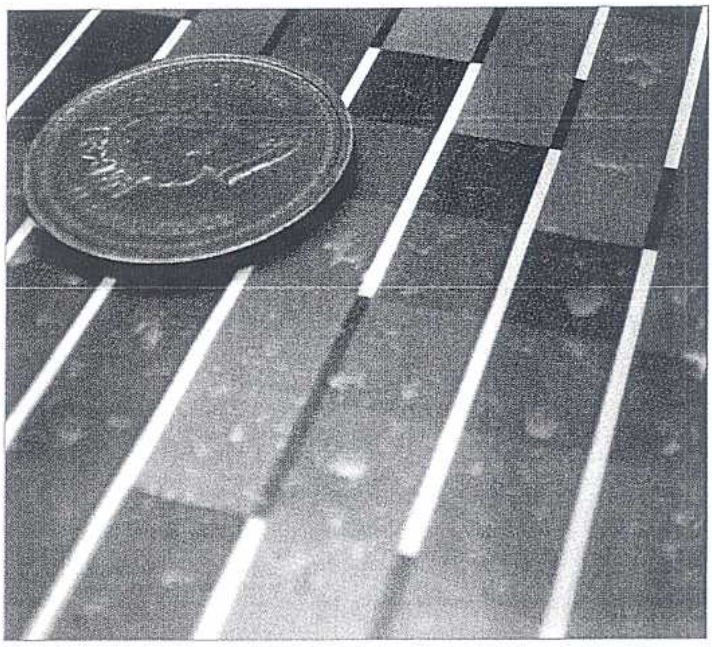

Figure 3

After laminating the target, inspect it for bubbles, which could throw off the spectrophotometer's color readings. Surprisingly, this target with abundant bubbles, measured only four delta-E color difference units from one that was smooth. (The minimum observable delta-E is generally considered to be two.)

c) - grayscale images

d) - gray patches (e.g., RGB 127 127 127, grayscale, blends)

When Profiling

1) Print two color targets.

2) Laminate one target and keep the other un-laminated.

3) Inspect the laminated target for bubbles (**See Figure 3**) which could throw off the readings.

4) Read both targets.

5) If the color management application permits, compare the color difference between the two targets (see **Figure 4**). This will indicate whether the laminate imparts a color cast.

6) Create the ICC profile.

7) Check the color gamut of the two profiles (laminated and un-laminated) to see if the laminate has reduced or altered the color gamut of the media (see **Figure 5**).

INCORPORATING AMBIENT LIGHT

Room or gallery lighting can also be sources of apparent color casts.

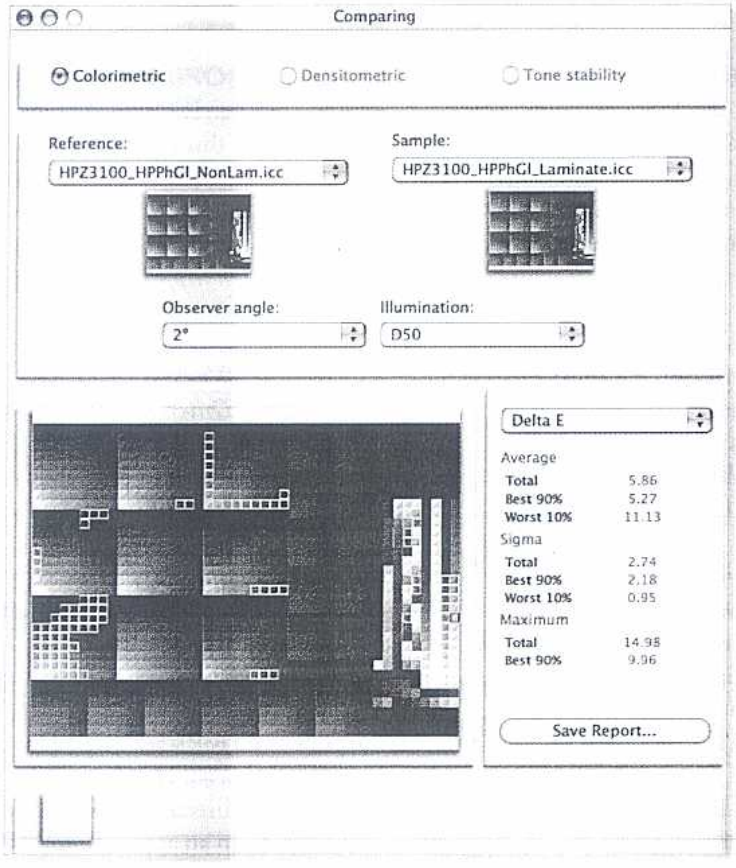

Figure 4

This dialog box from X-Rite's MeasureTool "Compare" tool, which compares the color difference between two measured target, shows that the laminated target differs from the un-laminated one by an average of 6 delta-E color units, which would produce a noticeable difference.

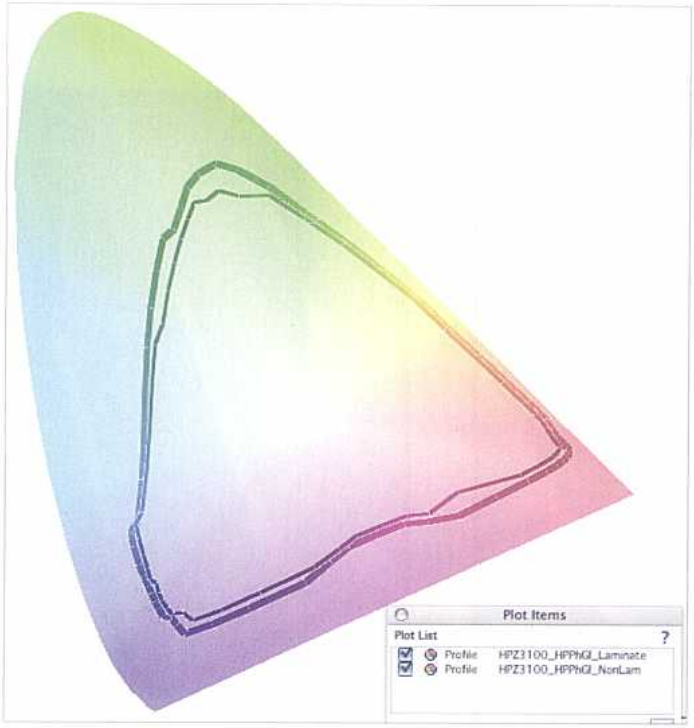

Figure 5

The color gamuts of the un-laminated and laminated targets, displayed in Chromix ColorThink's gamut view, show that lamination slightly reduces the color gamut of the test chart. This reduction is due to differences in light reflectance and could vary with the laminate's surface gloss.

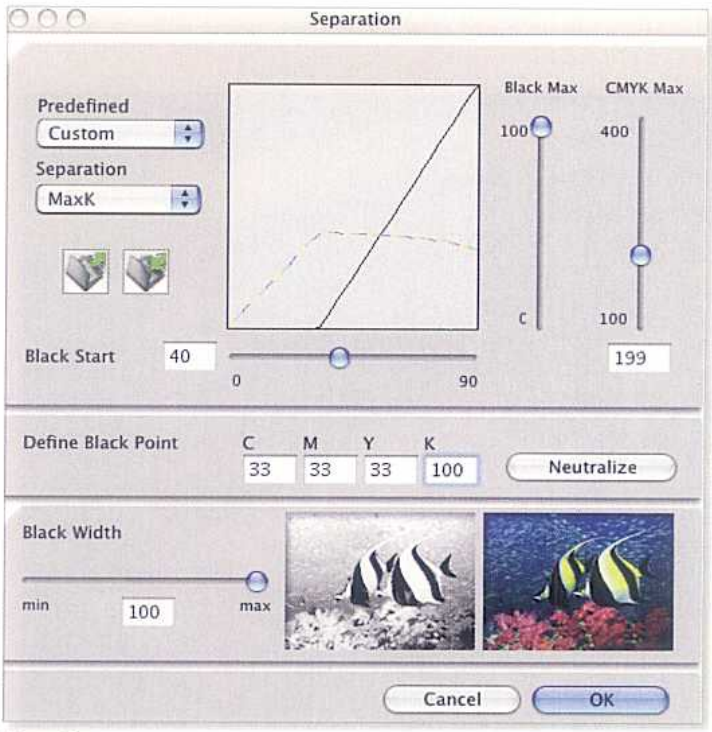

Figure 6

When making ICC profiles for a color-casted laminate, increasing gray component replacement (GCR) to a maximum and decreasing total ink coverage to a minimum will help reduce color casts. GCR reduces colored process inks where they produce gray and substitutes black.

Lighting can interact with the laminate, ink, and media to show *metamerism*, a phenomenon where colors look different depending upon the lighting conditions. ICC profiles are made to match color under graphic arts standard viewing conditions, which specify neutral white light at 5000 K color temperature. Galleries can include daylight, office fluorescent, mercury vapor, incandescent, or a mixture of lighting which can throw off colors. But, it's possible to get light readings of the ambient room light and incorporate that information into the profile.

A spectrophotometer, such as the X-Rite Eye-One, when equipped with an ambient light-reading attachment, can read ambient lighting. Your custom light reading can then be used in place of the standard 5000 K illuminant, which means that printed color will match the original file under that specific lighting condition.

USING THE PROFILE

Once you've made an ICC printer profile, including one made through laminate or incorporating an ambient light reading, you can use the profile to print from an application, such as Photoshop, or with a RIP.

Printing from an Application (e.g., Photoshop)

1) Install the profile on the Mac (*Library > ColorSync > Profiles*) or Windows (*WINDOWS > System32 > Spool > Drivers > Color*) where it can be read by the application.

2) The image you want to print should be in a standard working space (e.g., Adobe RGB).

3) Select *File > Print with Preview > Let Photoshop Manage Colors*, and select your profile. This will convert colors on output to the profiled color space.

Printing from a RIP

1) To print with a RIP, select the profile in the color management section of the RIP.

2) Upload files directly to the RIP, or print to the RIP from an application with files set to *Let Printer Manage Colors* or *No Color Management*.

EDITING PROFILES

Profiling through laminate is not completely foolproof. The spectrophotometer "sees" colors differently from the human eye and may not compensate completely for the color cast. In this case, you should be able to remove the cast by editing with a profile-editing program. Editing modules are included with major profiling applications, but can be confusing to use.

Profile Direction

When editing a profile, the first thing you need to know is which profile direction to use. According to the ICC specification, printer profiles must have two directions, representing the transformation of color out of and into device-independent color space (LAB color). LAB color is a mathematical model

based on the parameters of human vision. It is used to "connect" different devices in a color-managed workflow so that color matches from device to device. Since LAB color models human vision, it represents the "greatest common denominator" of color. When printing an RGB file with a CMYK profile, you convert color from RGB, through LAB, to CMYK. Thus the first profile direction is LAB to CMYK. Edit this profile direction to change a printer profile.

Printer profiles can also be used for simulation, or proofing, of one device on another. The ability to mimic a specific device is provided by the second profile direction, CMYK to LAB. Editing the CMYK-to-LAB profile direction is only useful if you're trying to get a proof to match output from a production printer more closely.

Test Photo

A test photo is helpful in previewing the results of your edits. To speed up the editing program, resample a photo you want to use to 72-dpi screen resolution.

What to Edit

Profile-editing programs give you the ability to edit what is technically known as *tone reproduction* (contrast), *gray balance* (color balance, or casts) and *selective correction* (color hue and saturation). To remove a color cast, first identify the color of the cast (e.g., red, yellow, green, etc.). Then move the gray balance of the profile toward the color opposite that of the cast. For example, to remove a yellow color cast from a profile, move the color towards the opposite color, blue.

Saving the Edited Profile

When saving your edited profile, don't overwrite the original profile in case your edits don't work correctly. Instead, attach a suffix, such as "A," "B," "C," etc., to the profile to indicate the stage of editing. This is helpful in keeping track of the profiles if you want to refine your edits.

As you can see, there are a variety of ways to deal with color casts imparted by laminates and room lighting conditions. If profiling through the laminate doesn't remove the cast completely, try incorporating the ambient light into the profile. If these fail or time is of the essence, editing the profile should work. DG

Figure 7

If a laminate produces a color cast that is still visible after profiling "through the laminate," you may be able to reduce the cast by editing the profile in a profile-editing program. This example illustrates how to reduce the color saturation of a profile for use in printing black-and-white reproductions with colored inks.

Making a Profile for B&W Printing

Black-and-white prints made with a four-color printer are particularly tricky because grays reveal color casts easily. A couple of profiling tricks can help reduce color casts in black print production. When making the profile:

1) Set GCR to maximum and reduce total ink coverage to minimum (see **Figure 6**). This replaces the most color with black and produces a stable profile that is more likely to be color cast-free.

2) To remove color from the profile, open the profile in your profile-editing application and reduce color saturation to a minimum (see **Figure 7**). This enables you to print accurate grays using a four-color printer.