Advanced proofing – spot colours

While accurate proofing always offers challenges of one sort or other, conventional four-colour proofing in newsprint or commercial print has been mastered for some years now by a large range of proofing systems. But printing and proofing spot colours still offers a challenge for most printers and vendors of proofing systems. Digital Dots has conducted a test of proofing systems, where the test form contains the normal four process colours, plus six selected spot colours.

There are several challenging issues when printing and proofing spot colours. One obvious one is that most colour printers are only loaded with a set of CMYK inks, so it may not be possible to reproduce a certain spot colour exactly. Nor is it enough to choose a colour printer with an as-large-as-possible colour gamut as the colour printer needs a RIP that can render colours in an efficient and accurate way.

Also, the RIP needs to be used properly. In a recent proofing test arranged by IPA, the US association of graphic solutions providers, proofing systems vendors were able to produce proofs with an accuracy which averaged Delta E (also written as ΔE) 1.1. But a selection of users who produced the same four-colour proofs could only manage an average ΔE of 2.2. So, although many proofing systems can produce very accurate proofs for four-colour printing, they need to be set up properly by well-trained operators.

The Digital Dots spot colour test form consists of a series of full tone and gradient patches of both the CMYK process colours and six selected Pantone spot colours.

In recent years Digital Dots has conducted tests of proofing systems using the ECI Altona Test Suite, and we closely follow the IPA and ECI proofing tests. But the Altona test forms primarily test conventional four colour proofing using the CMYK process colours. Our proofing test with a new and dedicated spot colour test form is the first, as far as we know, to focus entirely on testing a system's capacity to correctly reproduce selected out-of-gamut spot colours (meaning out of gamut for conventional CMYK process colours).

Measuring spot colours

Most designers are comfortable choosing a certain spot colour using the colour library in the layout or design application, be it QuarkXPress, InDesign or Illustrator. Very few people double check that the CIELA*B* values for a particular colour actually match what can be measured using a spectrophotometer reading a colour sample, such as, for example, a printed Pantone colour guide. Anyone measuring samples in a colour guide will notice that the values given in, for example, Adobe InDesign for Pantone Reflex Blue, most likely differ substantially from what the spectrophotometer says when you measure your own colour sample.

This is because many of the spot colours in design software seem to be based on a series of measurements made using a spectrophotometer equipped with a UV-filter. But most spectrophotometers sold to designers and printers today are not equipped with a UV-filter, so measured values will differ substantially from colour libraries based on measurements with a UV-filter. Other reasons for a mismatch are of course that your colour sample is old, thumbed, scratched or not printed at 100% according to target values for that specific spot colour.

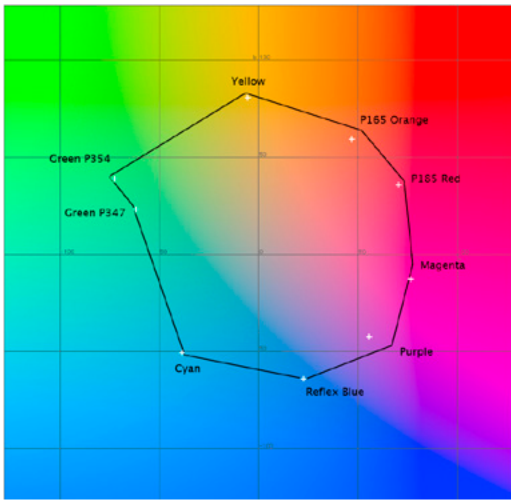
Measuring Challenges

Measuring with or without UV-filter mounted on the spectrophotometer is only one reason why it can be quite tricky to define spot colours as one single and definite set of colour values. Another factor is the substrate or paper used. Pantone, for example, uses three different paper types for its colour guides, glossy coated, matte coated and uncoated. The paper you actually print on may be very similar, but not exactly the same as was used for the colour samples you may have.

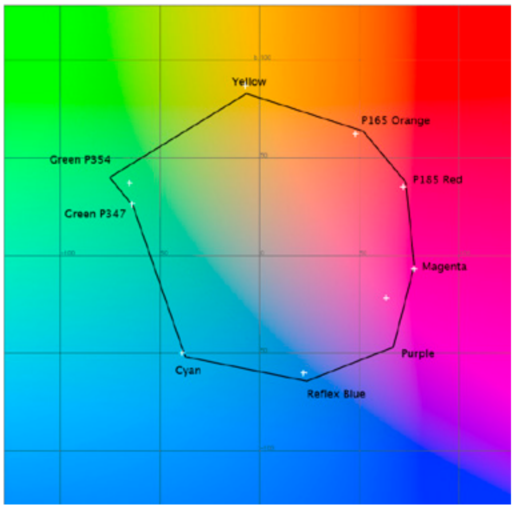
A third complication is to define what the target values should be for the press operator, when measuring at the press seconds after the paper sheet comes out of the press. At this point the inks can be considered as still being wet and the appearance of the colour will change during the drying process. The colour change is by its nature greatest in the early stage of the drying phase, usually during the first hour, but prints should not be considered fully dry and colour stable for the first 24 hours. So the dilemma for the press operator is that the colours wanted by the designer, and that can be measured on a colour sample, are very different from when measuring recently printed wet sheets.

We asked Pantone how they obtain a good colour match between batches of printed colour guides, and it turned out that they use colour and density data for wet inks stored within their scanning spectrophotometer as guides to achieve proper adjustment of press keys on colour-up. This is checked at the time by visual comparison with retained standards and previous printing runs. The press OK sheets are allowed to dry overnight and then measured again using a laboratory spectrophotometer. The resulting data is compared with standards to assure that the guides match from edition to edition and from run to run.

This leads us to the fourth challenge – ink formulas from different ink manufacturers. When asking the ink manufacturer what target values to use for a certain spot colour, you usually end up with slightly different answers depending on which ink manufacturer you ask. When we prepared this test we were faced with some five or six suggestions as to what the correct CIELA*B* value for a certain spot colour should be. One value we could read out from the design software, another from the control software for the spectrophotometer (the X-Rite EyeOne), a third from the press control software (in our case the Image Control software controlling a ten unit Heidelberg SpeedMaster CD 102 printing press), a fourth and a fifth value suggested by two different ink manufacturers,



*This illustrates part of the gamut of the CGS proof when using Oris Colortuner and a Canon IPF5000. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours. Ideally the white crosses should be exactly on the border line.*



*This illustrates part of the gamut of the Dupont proof when using Dupont Cromanet and a Blue2 proofer. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours. Ideally the white crosses should be exactly on the border line.*

and a sixth value kindly suggested by Pantone for wet ink based on their own measurements on site at their main printing plant in New Jersey, US.

We describe this dilemma since we are convinced that every printer and publisher who hopes to get the spot colours spot on, to get an absolute colour match will face the same problem. This is why it's a good idea to have fresh and updated colour samples and colour guides at hand. The designer and press operator/printer should also now and then check that the physical colour samples they use have a reasonable match, both visually and by measuring them with a spectrophotometer.

Multicolour ICC profiles

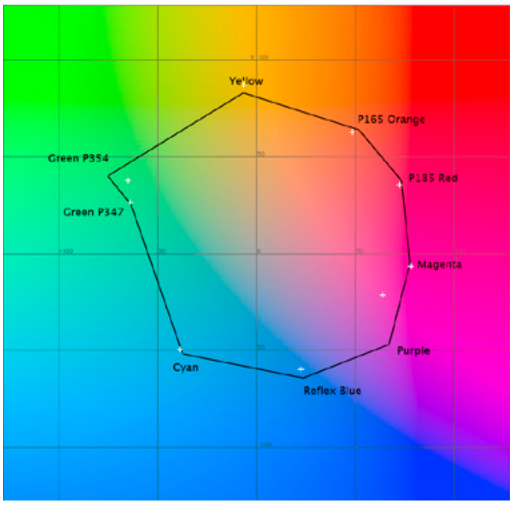
While you need pre-made colour libraries in the daily design work in order to select spot colours, one way of defining how a certain spot colour actually looks when printed on a certain substrate is to make a reference print, measure it, and save the colour data as an ICC profile. Most of the commonly used ICC profiles are for RGB devices (monitors, scanners and digital cameras), or CMYK devices (process colour printing).

But both the ICC standard and the Adobe PDF format also support multicolour profiles, called n-colour profiles (where n stands for any chosen number of colours). In practice it's unlikely that you will create an image using more than seven colours, CMY + RGB + black, but some of the software on the market for creating multicolour ICC profiles supports up to 15 colours in a multicolour profile.

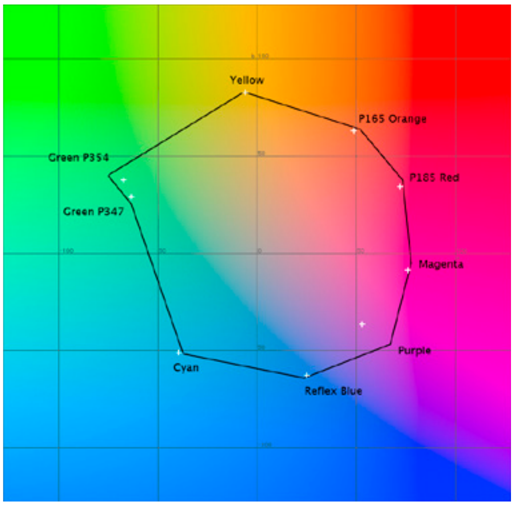
In our test we used the X-Rite ProfileMaker, to create a ten colour ICC profile, defining the four process colours CMYK plus a selection of six additional spot colours. While this was perfectly possible, it turned out that the Adobe Creative Suite software couldn't activate and use this profile fully. Neither could all of the proofing systems use this ten colour profile straight off, since some of them only support up to seven colour channels in the ICC profile.

This isn't such a surprise, since very few photographic images need to be printed in more than six or seven colours. Adobe doesn't support n-colour profiles without additional plug-ins from third parties such as X-Rite, and instead recommends using colour definitions in CIELA*B* and spot colour libraries. But it would help if Adobe provided better information on where their suggested CIELA*B* values for spot colours come from – if they are based on measurements with or without UV-filters, for instance.

For our test several of the proofing vendors did just that – skipped the provided ten colour ICC profile and instead built custom colour libraries for the spot colours using the measurement data we provided. But a more straightforward (and faster) way is to use the multicolour profile provided, and CGS, Perfectproof and Screen did this. Efi and GMG also



*This illustrates part of the gamut of the Efi proof when using Colorproof XF and an Epson Stylus Pro 9800 printer. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours. Ideally the white crosses should be exactly on the border line.*

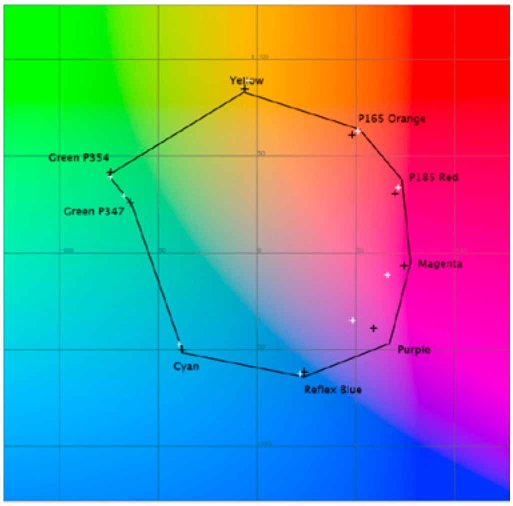


*This illustrates part of the gamut of the Esko proof when using Flexproof and an Epson Stylus Pro 4800 printer. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours. Ideally the white crosses should be exactly on the border line.*

support the use of n-colour profiles, but still chosed to create a custom colour library in order to achieve even higher colour accuracy.

The tested systems

We invited as many vendors of proofing systems as we could think of, including both stand alone systems and those integrated in workflow RIP systems, to take part in our test. Initially Agfa, Fujifilm and Heidelberg all declared their intention to participate but later had to pull out for various reasons, while Kodak declined from the start due to lack of resources in the time frame assigned for this test. But we plan to repeat this test again soon, and hope that these and other vendors of proofing systems, will participate in a second round. But nonetheless, we are pleased to be able to present the results from eight leading proofing systems, including those results from GMG which were done on three different colour printers.

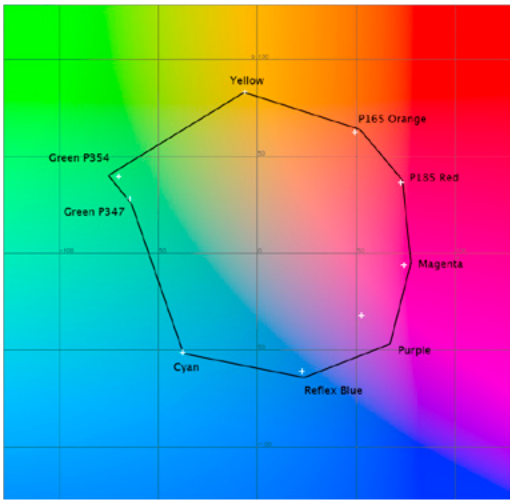


*This illustrates part of the gamut of the Gimle proof when using Absolute Proof and an Epson Stylus Pro 9800 printer. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours, on a halftone proof (the black crosses are the contone proof). Ideally the crosses should be exactly on the border line.*

CGS Oris Color Tuner

Oris Color Tuner from CGS is a standalone and open proofing system and RIP, which means the system can drive a whole range of colour printers. CGS has made the system as user friendly as possible by implementing a Set-up Wizard and Calibration Wizard. Color Tuner supports spot colour processing as well as Pantone Hexachrome ink sets. This is done by creating a colour library where LAB values for a certain spot colour are converted to the colour printer's CMYK values.

Dot gain, opacity and print order for the spot colour can be selected in order to simulate the press performance. If necessary the user can perform selective colour correction in order to fine-tune the result for certain CMYK colour combinations. Color Tuner supports double-sided printing and verification of proofs using the FOGRA control Media Wedge. The CGS Oris Color Tuner supports n-colour profiles, containing up to 15 colour channels in the ICC profile.



*This illustrates part of the gamut of the GMG proof when using Colorproof 04 and an Epson Stylus Pro 4800 printer. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours. Ideally the white crosses should be exactly on the border line.*

Dupont Cromanet

Dupont manufacture several lines of colour printers (see section below for the colour printers used), and the control software and RIP system is called Cromanet. Inside Cromanet is an Adobe Postscript/PDF interpreter, together with tools for linearisation and colour matching using CIELA*B* as a reference when converting to printer-specific CMYK. Although the Dupont colour printers only use CMYK inks, they are high density inks, so many of the spot colours that normally would be out of gamut for traditional CMYK process colours are in fact within the gamut of the Dupont proofing system.

Cromanet has a proprietary quality control technology called iCertification, which enables multiple systems, for example in a remote proofing scenario, to operate within a tolerance of less than ΔE 1 between devices. Cromanet does not support n-colour profiles straight off, but can modify the existing licensed Pantone spot colour libraries according to the data in an n-colour profile, or create a custom spot colour look-up table.

Efi Colorproof XF

EFI Colorproof XF is a modular client-server solution. The standard version support limitless clients, both PC and Mac, and one printer output. Additional printers can be added by additional Printer Output Options. Among the Product Options are the Color Manager Option on order to build or modify custom ICC profiles. An option for quality management is the Color Verifier Option, and then EFI also offer Dot Creator Option for screen accurate proofing, as well as the One-Bit Option for using screened 1-bit data from the RIP when producing proofs.

In this test the Spot Color Option was used to build custom spot colour tables. EFI Colorproof XF have ready made colour libraries for Pantone, HKS, Toyo and DIC spot colours. The EFI Colorproof XF does support n-color profiles, but up to 7 and not 10 colour channels. For the test a custom build spot colour table was used.

EskoArtworks Flexproof

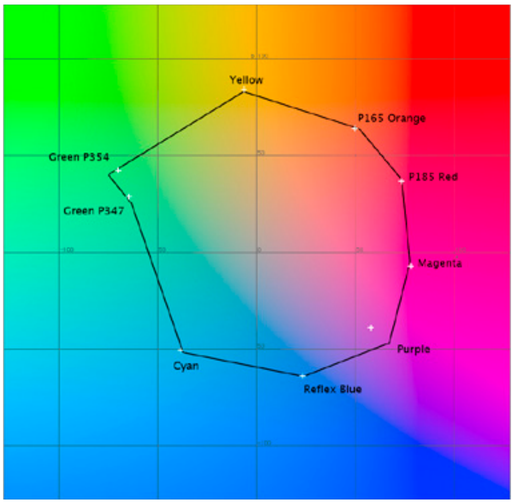
EskoArtworks FlexProof works in tandem with Esko FlexRIP and the Backstage workflow system, both part of what EskoArtwork calls Software Suite 7. This suite of software tools, which is targeted specifically at packaging pre-production, includes the Kaleidoscope colour management system. The Kaleidoscope software specialises in multicolour printing, and stores ink and colour data in a central database.

In order to simulate different screens and compensate for dot gain, FlexProof uses the Intellicurve Pro module, which compensates for each colour's behaviour on different presses and substrates. The Flexproof system supports n-colour profiles, but only up to seven colour channels in the profile. In our test, a custom colour library was created based on the measurement data provided. The Esko FlexProof proofing system supports a large range of colour printers.

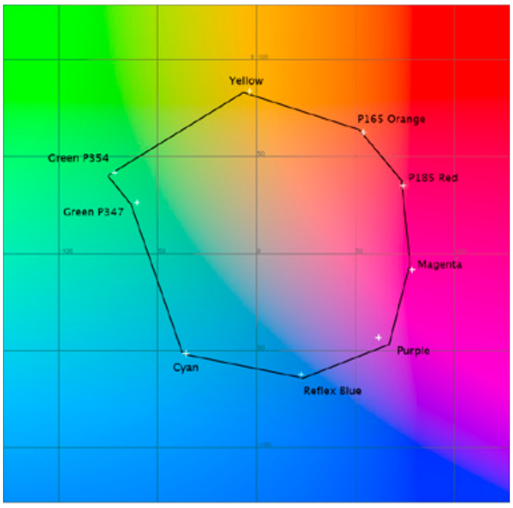
Gimle Absolute Proof

Gimle is a relatively unfamiliar name in the northern hemisphere however Absolute Proof was originally launched in 2000. Absolute Proof is now in version 5.0 and runs under Mac OSX. This proofing system is designed for colour critical environments, both CMYK and multicolour printing. Absolute Proof can be connected to any workflow system by using one- or eight-bit TIFF files or PDF for data exchange. Besides securing file integrity, this also allows accurate reproduction of the same halftone dots on a proofer as on the press.

Gimle worked in close collaboration with Pantone to facilitate the process of working with the Hexachrome ink sets for multicolour printing. Gimle claim to be able to simulate over 90 percent of the Pantone spot colours accurately when using Absolute Proof and the Extrachrome inks on an inkjet colour printer. Absolute Proof supports n-colour profiles up to eight channels, and was able to build a custom colour library based on the CIELA*B* colour data that were provided with the test form. AbsoluteProof is capable of processing over one hundred spot colour channels



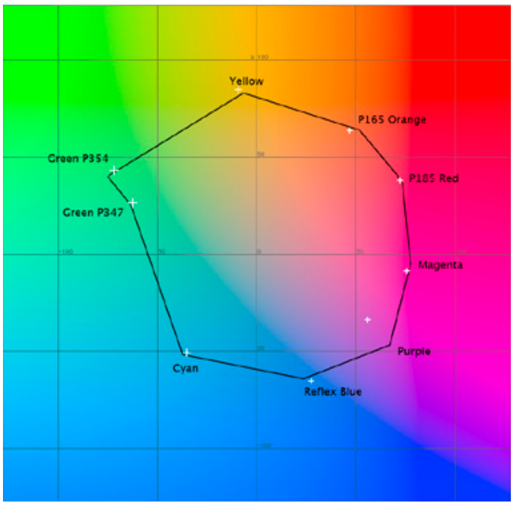
*This illustrates part of the gamut of the GMG proof when using Colorproof 04 and an Epson Stylus Pro 4880 printer. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours. Ideally the white crosses should be exactly on the border line.*



*This illustrates part of the gamut of the GMG proof when using Colorproof 04 and an HP Z3100 printer. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours. Ideally the white crosses should be exactly on the border line.*

in a single job and was the only vendor that provided a halftone proof as well as a contone proof for this test.

The standard version of Absolute Proof includes Pantone licensed libraries, a spot colour editor, metallic proofing, remote proofing, halftone proofing, n-colour support, double-sided proofing, dot gain edits, soft proofing, proof verification and the ability to drive unlimited units of a licensed printer.



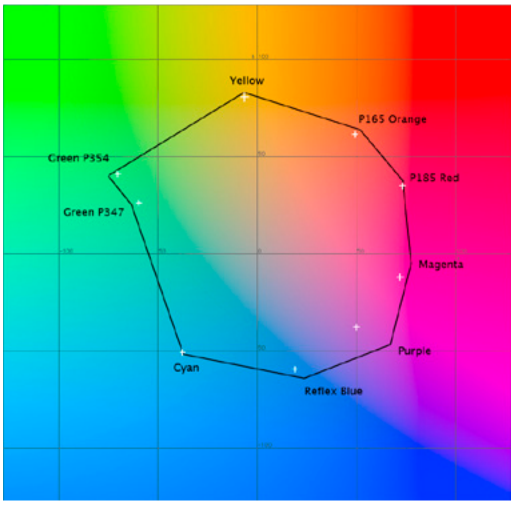
This illustrates part of the gamut of the Perfectproof proof when using Proofmaster v3 and an Epson Stylus Pro 7800 printer. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours. Ideally the white crosses should be exactly on the border line.

GMG Colorproof 04

The GMG Colorproof 04 is a modular proofing system with the GMG RIP Server at its core. Colour management is performed by what GMG call the 4-D Color Transformation Engine, which supports both the proprietary GMG colour profiles and standard ICC profiles. Quality assurance is managed through the use of the FOGRA Media Wedge, and a licence for this control strip is included in the base package. Other components are the Profile Editor and the Spot Color Editor. Among the options for Colorproof 04 are the GMG Dotproof, the one-bit to Contone Module and GMG Remote Calibration Wizard for remote proofing scenarios. Colorproof 04 can be integrated to most RIP workflow systems on the market. It supports unlimited channels in n-colour profiles, but the GMG RIP as such supports up to 64 spot colour channels in the page/image. However GMG created a custom colour table in order to better match the spot colours in the test instead of using the provided n-colour ICC profile.

Perfectproof Proofmaster v3

The Proofmaster proofing system is modular in nature, and can be extended to support large format printing as well as screen film production and cutting devices. The base module supports photo realistic output and contract proof production using standard ICC profiles, such as the ISO profiles for offset, gravure or flexo. The Proofmaster RIP Server works on both Mac and PC.



This illustrates part of the gamut of the Screen proof when using Lab Proof and an Epson Stylus Pro 7800 printer. The black border represents the colours of the reference print. The white crosses are the colour value measured in CIELA*B* for full tone samples of the CMY colours plus six selected spot colours. Ideally the white crosses should be exactly on the border line.

Among the options is the Certify quality assurance module, a one-bit option to connect to virtually any workflow system, and the Advanced Color option to create ICC profiles, including n-colour profiles. The advanced colour option is especially useful when handling spot colours, since it can simulate the textures of different substrates, and contains a colour foil library. There is a basic soft proofing capacity in the base version of Proofmaster, but the Softproof option extends this even further, in order to make accurate virtual proofing possible on a calibrated monitor.

Screen LabProof SE

The proofing system from Screen is called LabProof SE, and it works in tandem with the Trueflow workflow system. Part of the technology used in LabProof SE is provided by CGS through an OEM license, which means that LabProof, like CGS Color Tuner, supports multicolour printing and n-colour profiles.

However the user interface and integration to Trueflow and JDF is Screen's and has additional functionality such as support for remote proofing. LabProof SE contains ready made colour libraries for Pantone and DIC spot colour ink sets, and new custom made colour sets can be created using a spectrophotometer, or by entering colour values manually. As an option LabProof SE can create screen accurate proofs using one-bit TIFF files. One of the features of Screen LabProof SE is that it preserves black text and images by using black ink only, not a mix of CMY inks.

The Canon IPF5000 should be a particularly interesting colour printer for spot colour proofing, since it has red, green and blue ink added to the normal CMYK plus black.

The colour printers used

We allowed the vendors of the proofing systems to choose which colour printer they used, which led to quite a wide array of printers being used. As we had noted from previous proofing tests, using the same colour printer can produce quite different results, depending on what front end you use and what RIP system it's connected to.

Canon is represented by the IPF5000, a twelve colour inkjet printer with a large colour gamut thanks to the additional colours red, green and blue (it also has four different greys or blacks, as well as light magenta and light cyan).

Amongst the other printers used was the Dupont Cromalin Blue2, with its inline calibration technology which ensures constant quality. The Blue2 uses eight high-density colours to reach a gamut that extends normal CMYK process printing. The printer differs from many other inkjet printers with its external drum imaging technology - a technology used in many CTP devices in order to obtain high registration accuracy.

Dupont is one of the few proofing system vendors that build their own colour printers. The Dupont Blue series has built in calibration technology, and uses eight high density inks to achieve a colour gamut larger than conventional CMYK process colours.

Epson dominates among the printers test participant used for output, with samples from the Stylus Pro 9800, 7800 and 4800, as well as the new Epson Stylus Pro 4880, an 8-color printer using Epson's new Vivid Magenta inks. The lowest colour deviation achieved in this test was on print from the Stylus pro 4880.

For HP, the DesignJet Z3100, was one of the three printers GMG used in this test. This is a twelve colour printer using CMYK plus light magenta, light cyan, red, green, blue and two different blacks and greys plus gloss enhancer. It was when using the Z3100 the best match to purple was achieved.

The test form and test procedures

We produced a custom-made test form with a central element created using X-Rite's profiling software, ProfileMaker. Many other test forms we have seen on the market only contain spot colours as solid tones, but we wanted to check the colour rendition of gradations of spot colours. Next we created a linearisation test chart for all the ten colours. This was then printed on the Speedmaster CD 102 press in a first round, in order to establish a dot gain compensation curve (often called a RIP curve) for the CTP system, a Screen PlateRite PT-6600 which imaged Fujifilm's Brillia HD LH-PJE plates.

This proved more tricky than expected, since the dot gain curves for the spot colours didn't behave entirely as the more well know CMYK-curves. The Reflex Blue curve in particular showed an extremely high dot gain, and we finally realised was due to the dark blue pigments in the ink not being fully understood by the spectrophotometer. Our guess is that the standard algorithms are best suited for CMYK calculations, while the density for spot colours needs to be calculated for the exact wavelength for that particular ink. We instead created a dot gain curve manually for Reflex Blue that more or less followed the curve for black.

Once the press linearisation was done, (using the RIP curves), we produced a new test form in order to create the ten colour ICC profile. Here we found that many colour combinations were in fact unnecessary, and that many colour swatches in this test chart had much too high TAC (Total Area Coverage), or in other words used too much ink. This is something that needs to be addressed with more clever algorithms in the future, so that for example never more than four inks are used at the same time.

Epson printers are commonly used in proofing systems – here the Stylus Pro 4880 with the new Vivid Magenta ink set from Epson which enhances the colour gamut compared to the standard Ultra Chrome inks.

We then saved our test form as a PDF/X-file, with the intention to embed our n-colour profile using Adobe InDesign and/or Distiller. However we found that neither InDesign nor Acrobat recognised our newly created ten colour ICC profile, so we had to supply it to the proofing vendors outside the PDF. X-Rite has created a plug-in to Photoshop in order to be able to work with multicolour profiles when colour separating images, but that didn't help us, since we only used vector graphics in our test form. While it's possible to create six- or seven-colour ICC profiles in order to expand the colour gamut of photos, most of the artwork in, say, packaging print production uses four colours for photos, and spot colours for vector graphics.

The evaluation of the proof was made comparing the measured values from three different press prints, all measured three times each and then averaged. Every proof was in turn measured three times, and the averaged result was compared to that of the press run, printed using CMYK plus six spot colours.

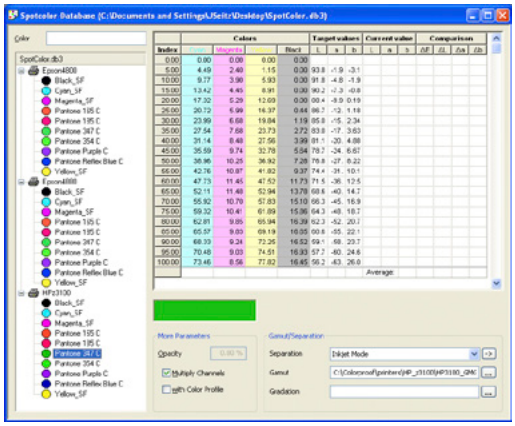
The HP DesignJet Z3100 was the printer that could reproduce the purple spot colour closest to the real print. This is because it's a twelve colour printer using CMYK plus light magenta, light cyan, red, green, blue and two different blacks and greys, plus gloss enhancer.

As a side project we wanted to estimate the measuring tolerance when using different spectrophotometers, and so conducted a limited gauge test. In parallel to sending out our spot colour test form and reference print, we also sent some print samples of our spot colours, kindly provided by Pantone. Those colour samples were measured by Pantone at its New Jersey printing plant, by us at Digital Dots, and by a number of the proofing vendors. When analysing those measurements we found that the tolerance wasn't as large as we had feared.

We have heard from different people that spectrophotometers of different makes (and sometimes even those of the same brand) can differ by up to ΔE 1 measuring the same sample which, if true, would have made presenting results with a decimal slightly silly. We found that if you measure with and without a UV-filter, the result can actually vary by up to ΔE 1, when measuring the exact same sample.

However, when measuring a series of samples, and then averaging the results, and only using spectrophotometers without a UV-filter, the variation was about 0.3 ΔE. This is still a quite high value, so when presenting the results we decided to only classify three levels of colour accuracy; below ΔE 3, below ΔE 4, and over ΔE 4 (where a low ΔE is better than a high).

When referring to ΔE values above, we mean the 1976 formula, based on calculations with CIELA*B*. Since then other formulas for how to calculate a colour difference have been suggested. The formula from 2000 is gaining recognition and is used by IFRA to evaluate colour consistency in newsprint. This formula is said to better match how the human eye perceives colour differences, as well as differences in luminance for grey-scales. However the 1976 ΔE formula, ΔE_{76} is still the most commonly used, and until the ΔE_{2000} is better understood and more widely used in commercial print, we'll have to continue referring to ΔE_{76}.



Several vendors created a custom spot colour library instead of using the provided ten colour ICC profile as the basis for colour matching. Here a sample of the user interface from GMG Colorproof 04.

Overall good colour accuracy

We measured each proof three times, and then averaged the result. We compared the results to the target values of the press run. These values were taken from three samples, each read three times and then averaged to give nine readings in all. We found that in general the proofing systems could match the spot colours quite accurately.

Proofing system	Printer used	Custom col dict	using ICC-profile	
CGS Oris Colortuner 04	Canon IPF5000		X	< 4 ΔE
Dupont Cromanet	Dupont Cromalin Blue2	X		< 4 ΔE
Efi Colorproof XF	Epson Stylus Pro 9800	X		< 3 ΔE
Esko Flexproof	Epson Stylus Pro 4800	X		< 4 ΔE
Gimle Absolute Proof	Epson Stylus Pro 9800	X		< 3 ΔE
Gimle Absolute Proof*	Epson Stylus Pro 9800	X		> 4 ΔE
GMG Colorproof 04	Epson Stylus Pro 4800	X		< 4 ΔE
GMG Colorproof 04	Epson Stylus Pro 4880	X		< 3 ΔE
GMG Colorproof 04	HP Designjet Z3100	X		< 3 ΔE
Perfectproof Proofmaster v3	Epson Stylus Pro 7800		X	< 4 ΔE
Screen Lab Proof	Epson Stylus Pro 4800		X	> 4 ΔE

*When creating halftone proof

The results table uses colour to show the categories of the results. There are separate columns to indicate those test participants who used the target values provided when making a custom colour dictionary, and those who used the ten colour ICC profile directly as the basis for the matching. Several vendors reported that while using a provided ICC profile is the quickest way to create a proof, a custom made spot colour dictionary for the actual paper and print method often yields a more colour accurate result.

The perfect colour match – summary

When defining the parameters for this test we tried to judge what colour deviation would be acceptable for spot colour proofs, and what might be possible to achieve with today's technology. FOGRA and ECI have previously suggested a target average ΔE_{76} of 4 as a reasonable goal for process colour proofing. We thought that this would be a good target also for spot colour proofing, even though we know that a colour difference of 2 ΔE_{76} actually is visible for a trained colour evaluator, with a proven high colour discrimination capacity. We were pleased to see that several systems were well below 4 ΔE_{76} on average, and some even under 3 ΔE. No system produced proofs with a colour deviation above in average 6 ΔE, so all systems show a good visual match of the spot colours in this test.

It's probably not reasonable to try and persuade the vendors of proofing systems to enhance their systems immediately, in order to try and reach, say, less than 2 ΔE when proofing spot colours. It will be difficult to maintain this level of colour precision on press in any case. There is as yet no ISO standard for spot colour printing in place, so before that happens we have to treat spot colour printing and proofing with some extra care: make sure the desired spot colour can be accurately reproduced on press.

As this test shows, many of the spot colours can actually be accurately reproduced on the high end proofing systems, using colour printers with high density ink sets, or using eight to twelve colours in the colour printer. The trick is to define the spot colours beforehand, to learn how to handle spectral data, both for wet and dry print, on different types of substrates, using inks from different vendors. And using multicolour profiles (n-color ICC profiles) is one way to go about, but not the only one.

– **Paul Lindstrom**

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Digital Dots Spot Colour Proofing Test Kit

The whole test package, including test documents on a CD as well as press reference print samples and detailed instructions can be ordered from Digital Dots. This is an excellent opportunity to test your own proofing system and configuration to see how well it fares in comparison to the above listed systems. The complete test package can be ordered through the Digital Dots website www.digitaldots.org after October 3rd at the price €350 plus shipping. The documentation describes how an evaluation should be made, but if you prefer us to measure your proof sample and send you the results, this can be done for an additional fee.