

# IPA Testing Shifts to Production-Level Digital Color Printing

By John Parsons

The IPA's sometimes controversial color testing has tracked — or possibly motivated — significant quality improvement in inkjet and other digital proofing systems. This year the group's testing efforts have changed to a new but related process: production-level color digital printing.

For the past five years, the annual IPA Technical Conference has featured a quasi-competitive “roundup” of digital color proofing systems, including both hard copy (primarily inkjet) and virtual display output. The first event was met with considerable trepidation by some vendors — so much so that the results of specific systems were not disclosed to the general public. The vendors themselves were given the results, however, which undoubtedly spurred many to improve their products and prepare for what they (but not the IPA) considered a competition.

Over successive roundups, a clear trend began to emerge. Digital color proofing, both by vendor experts and by users, had improved to the point where further testing was problematic. The majority of the mainstream systems could reliably produce excellent results. Although proofing vendors wanted the event to continue, IPA leadership determined that it was time for a change.

## The Switch to Digital Print Testing

Like inkjet proofing, production digital print is relatively new, compared with its analog counterparts like offset or gravure. From their office copier antecedents, digital presses have evolved dramatically into high-quality print devices, displacing more expensive conventional presses in many environments. Color quality, speed and other parameters have been dramatically improved, making print buyers' and service providers' decisions much more complex.

Unlike most digital proofing systems, however, digital color print is mostly toner-based. (This is also changing as inkjet technology advances, as we will discuss later.) Preconceptions surrounding toner-based digital presses have tended to cast doubts on whether today's digital presses are actually comparable to offset or gravure quality. However, most of the major digital press vendors now argue that such quality objections are outdated. The time was right, in the opinion of IPA leaders, to uncover the facts.

Other factors also coincided with the decision to switch the test focus. The emergence of the G7 process and the latest version of GRACoL have provided a common specification against which print output can be quantitatively compared. Although the science itself

is still being improved, a measurement-based suite of tests was now theoretically possible.

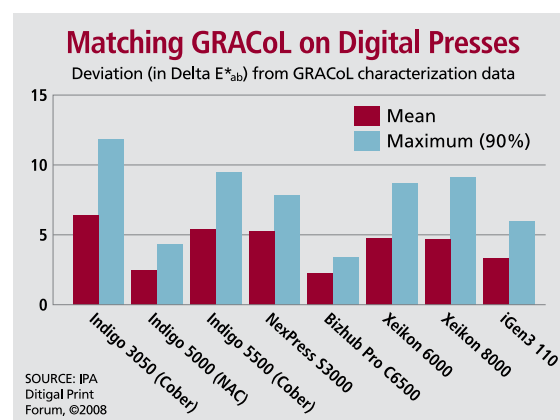
## Test Overview

The timeframe for this year's event was remarkably short. Test planning began in October 2007, with intensive vendor discussions well under way in January and output/testing beginning in March. Understandably, not all vendors agreed to participate. Event officials emphasized that those who did were “brave,” and kept the door wide open for next year.

Although **Hewlett Packard** did not participate directly, its digital presses were well-represented by end users, with Cober Printing submitting results for the **Indigo 3050** and **Indigo 5500**, and North American Color doing so on the **Indigo 5000**. **Kodak** output the test files on a **NexPress S3000**, while **Konica-Minolta** did so on its low-cost **Bizhub Pro C6500**. **Punch Graphics** submitted results from two devices, the **Xeikon 6000** and the new **Xeikon 8000**, to be launched at Drupa. **Xerox** also entered the fray, with output from the **iGen3 110**.

For comparison purposes, the test files were also printed on a Heidelberg XL 105 sheetfed offset press. In some tests, GRACoL reference characterization data and Pantone L\*a\*b\* data were used.

The test files themselves covered a vast array of printing characteristics — so many that there was insufficient room for all the test objects on the offset sheet. For a test conceived only six months ago, the sheer



Digital press vendors were required to print to GRACoL specifications for an IT8.7/4 target (results shown here) but not for other images in the test.

number of test conditions was formidable. The 14 different tests that were identified ranged from color fidelity and resolution to media durability and recyclability. Although each participant was allowed to select an optimum paper brand, they were all instructed to use a common basis weight (80lb or 120g/m<sup>2</sup>) coated gloss sheet. Color variance was reported using the older Delta E\*<sub>ab</sub> method, although more current Delta E formula measurements were also recorded.

### Color and Tint Consistency, Resolution

One of the common preconceptions about digital print is the belief that color varies widely, even within the same press run. To determine if this is true today, testers measured color density values every 100 sheets of a 1,000-piece press run. Interestingly, except for what appeared to be an anomalous reading on one device, the typical density variation for digital devices was only slightly greater than that of the offset run, and in one case was considerably less.

Another complaint about digital printing is the consistency of uniform screen tints, which is directly related to the resolution of the device. Most of the devices did a reasonably good job reproducing a three-color gray tint and a 50% black-only tint, although none as cleanly as the offset results. Much greater variation was evident in the resolution test, where the larger spot sizes and lower imaging resolutions often created undesirable results with small objects and type, compared with the 2,540spi, 10.0μ spot used by the RIP for offset output.

The participants were not required to print to a specified press condition, which was somewhat controversial for some. Instead, each participant was asked “to produce good output quality as if for a typical customer job” using whatever controls were available to the respective systems. Discussion on this approach revealed a significant difference of opinion. Some felt that systems optimized to specific market requirements should not be required to emulate press conditions that would effectively limit desired qualities, such as spot color simulation. Others pointed out that device color output consistency, a vital element of brand control, could only be achieved if a common characterization was required.

The test did include an IT8.7/4 target for determining each device’s ability to match the GRACoL specification. (Ironically, the Heidelberg offset press sheet did not have room for this target.) The results varied widely (see chart) which suggested that there is much room for application of proof-style color management software incorporated within each device’s digital front end. This was also highlighted by the fact that the CMYK colorants used by each device varied significantly from the colorimetric values of the offset inks. Assuming that brand management consistency trumps specialized color requirements, future IPA events will undoubtedly track GRACoL matching more closely.

### Special Colors

The offset portion of the test confirmed the reality that

traditional CMYK printing can encompass only about 40% of the Pantone color library, which is a reason those colors exist as spot channels. However, seven of the nine digital presses demonstrated (using data from a separate IT8.7/4 target) the capacity to simulate more of the Pantone spectrum, sometimes a bit over 50%. This result justifies the use of different CMYK colorants, although in some cases it would create an insurmountable disparity between offset and digital output within a brand campaign.

Reproduction of in-gamut Pantone colors was also part of the test. Ten colors were selected, and each participant was given a Pantone sample book, presumably from the same batch. Measurements of digital output were compared with measurements taken of the actual Pantone samples, with average variations ranging from 3 to just over 6 Delta E. It appeared that the published L\*a\*b\* values for the chosen colors were at odds with the measured values, however, which posed a problem for a “print by the numbers” approach and raised questions in some about dealing with customer’s visual expectations.

### Wear and Tear — and Lifecycle Issues

Another common misconception about digital print is the notion that toner is simply not as durable as offset ink. Two of three tests in that area suggested that this is no longer the case, and in some cases the opposite may be true. A heavy black image was folded in two directions and the crease measured for increased white, while four CMYK patches were tested for “rub resistance” at RIT’s Applications Laboratory. In many cases, the digital output fared as well as or better than the offset output. A test for fading under extreme light conditions was not completed in time for the initial report.

A “de-inking” test was also conducted, to determine how much toner could be removed from the printed output using the common “flotation” process. In most cases, there was a marked increase in lightness and brightness of the processed digital output, suggesting that a significant amount of toner had been removed. While this suggests that digital output might be recycle-friendly, there were no other, comprehensive tests on sustainability issues, such as energy cost per page.

### Conclusions

The preliminary report (available at [www.ipa.org/digitalprint](http://www.ipa.org/digitalprint)) is worth reading, and will be followed by a more comprehensive update in the fall. It is only a start, however, as IPA officials readily agreed. Other vendors and devices must be brought into the process, including the new generation of inkjet devices, and the test parameters must be refined. Given the IPAs success in the proofing realm, however, we are confident that this will happen. For information publishers of all types, such studies will be welcome indeed. **TSR**

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