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 However, most of the major digital press vendors now argue that such quality objections are outdated.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
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/m²) coated
gloss sheet. Color variance was reported using the older
Delta E*ab method, although more current Delta E for-
gloss sheet. Color variance was reported using the older
track GRACoL matching more closely.

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 mea-
sured 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 vari-
ation 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 con-
sistency 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 re-
sults 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 contro-
versial 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 re-
spective systems. Discussion on this approach revealed
a significant difference of opinion. Some felt that sys-
tems optimized to specific market requirements should
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 colo-
rants 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 colo-
rants, although in some cases it would create an insur-
mountable 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, presum-
ably 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 fold-
ed in two directions and the crease measured for in-
creased 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 de-
terminate how much toner could be removed from
the printed output using the common “flotation” pro-
cess. In most cases, there was a marked increase in
lightness and brightness of the processed digi-
tal output, suggesting that a significant amount of
tonner 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/dig-
talprint) 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, includ-
big 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.
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