

Matching Electrophotographic Color Printing to Offset Lithography - Color Measurement Targets Perform Magic

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Key Words

process matching, profiling, electrophotography and offset, proofing, digital printing

Abstract

Today dry toner electrophotographic production color printing systems can match the appearance of commercial offset lithography. This paper discusses the benefits of the combination of these two processes, briefly outlines their application and explains how the printed demonstration samples were produced.

Introduction

Advancements in computerized digital image controls coupled with the commercial success of today's electronic production color printing technology are opening an enormous range of opportunities in printing. Some of the capabilities brought by digital production printing are completely new. An example is the ability to mass produce personalized print communications. While continuous press runs are often in the thousands, the new capability provides printed message content customized to an audience of one. This variable printing offers print customers new ways to improve the performance of printed communications. It has led to startups in the printing business and to many new software vendor entrants helping print facilities produce "relationship printing."

Another and equally powerful new capability is that this new technology integrates with and complements offset lithography and other conventional forms of printing. The integration of offset lithography with color electrophotographic printing, using a Kodak NexPress digital press and color management, is the topic of this paper. It is the intent of this paper to help the trade production color shop obtain similar results.

Today we have interchangeable electronic production color printing processes, where digital color presses produce proof sheets and initial run quantities for longer offset print

runs. This feat was demonstrated in a test performed at the Rochester Institute of Technology's Printing Applications Laboratory in conjunction with the *Technology Watch* newsletter (Freedman, 2004).

Many Benefits from Wedding the Processes

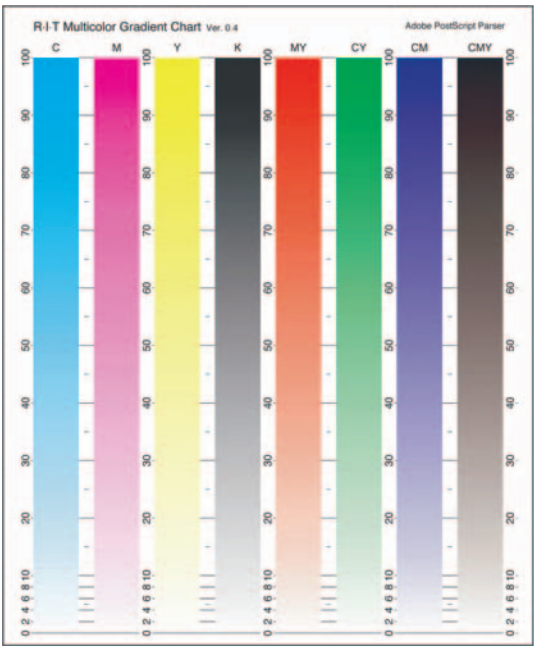
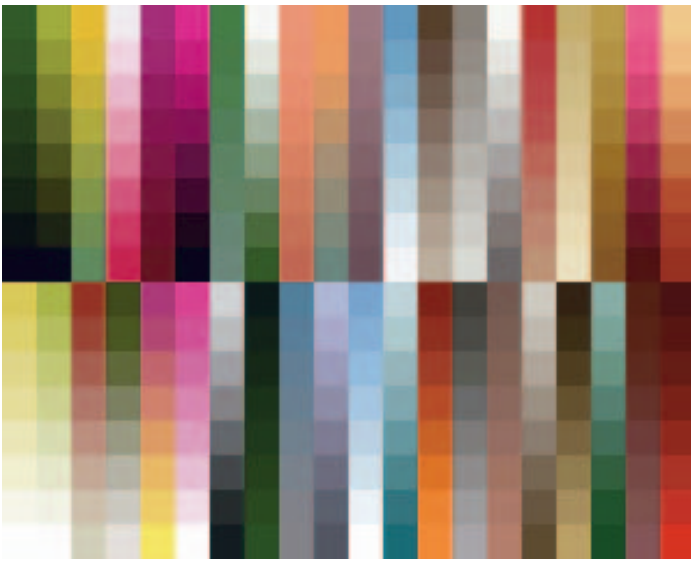
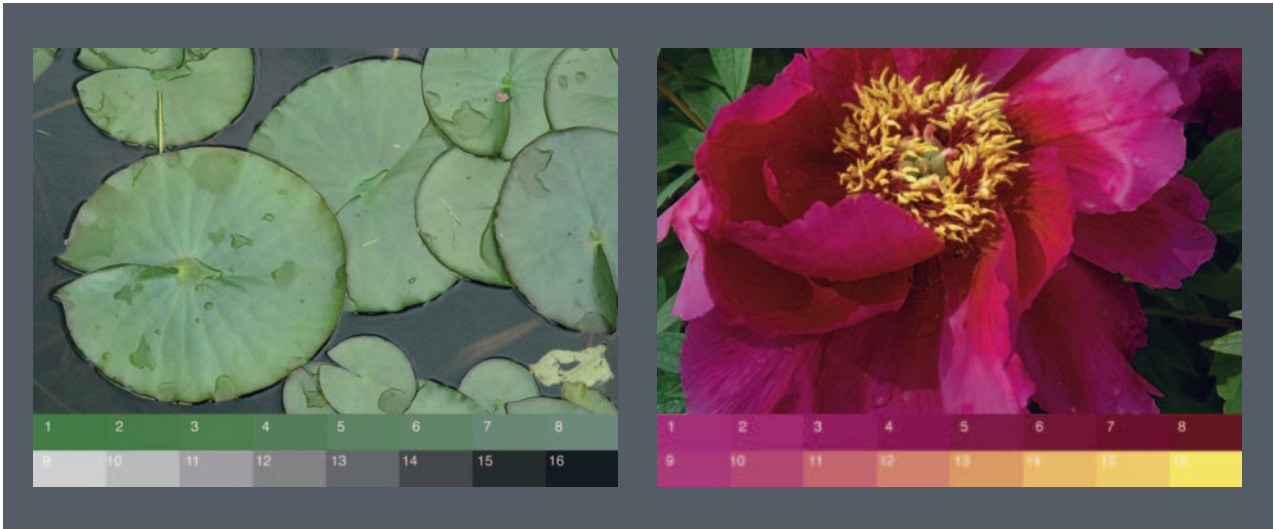
The ability of one production process to emulate economically a different printing process offers powerful flexibilities for printing production facilities. In particular, the ability of a digital color press to match the image quality of an offset lithographic press has many practical benefits. To start with, digital color production printing greatly changes the economics of print. You can see samples of this here in your own hands on pages 34 and 35 of this issue of *Test Targets 6.0*.

A Short List of Benefits

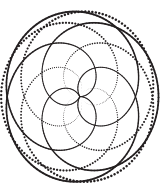
The most impressive benefits of process integration and substitution of offset lithography with electronic digital color production printing include the following:

1. Electronic printing can proof offset printing.
 2. Electronic printing can share prepress workflows.
 3. Electronic printing can be used for low volume color runs (up to 10,000 pages), large volumes can be produced by offset lithography, and additional low volumes can again be printed electronically.
 4. It is possible to have signatures of both processes in a single publication, as was done in this one.
 5. Electronic printing can affordably provide printed dummies of a large run for close examination prior to longer press runs.
 6. A small shop can produce print quality competitive with the best output of larger firms.
- To accomplish this, proper color profiling of both processes is essential. The following is the step-by-step method that was used to match the printing on the next two pages.

Testing Color Agreement between Offset and Digital Printing



This test page and its facing page demonstrate a cross-system color match between the Heidelberg sheet-fed offset press and the NexPress 2100 digital press. Two workflows are involved in producing these two pages: (1) RGB images are first converted to offset press CMYK space; and (2) CMYK images from the offset color space are then converted to the NexPress space with the use of a device link profile. In this case, the offset print acts as the reference and the NexPress print acts as a color proof. The same paper was used for both printing processes. A match is rarely perfect; the question is, how well did it work: for the average customer, for a print professional, for a color scientist?

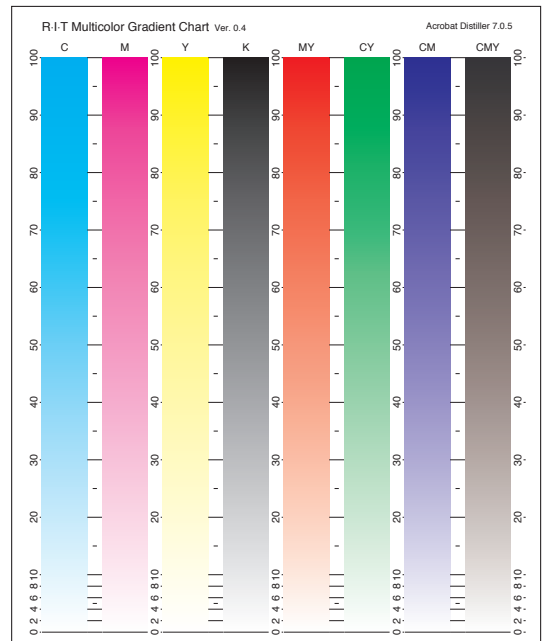
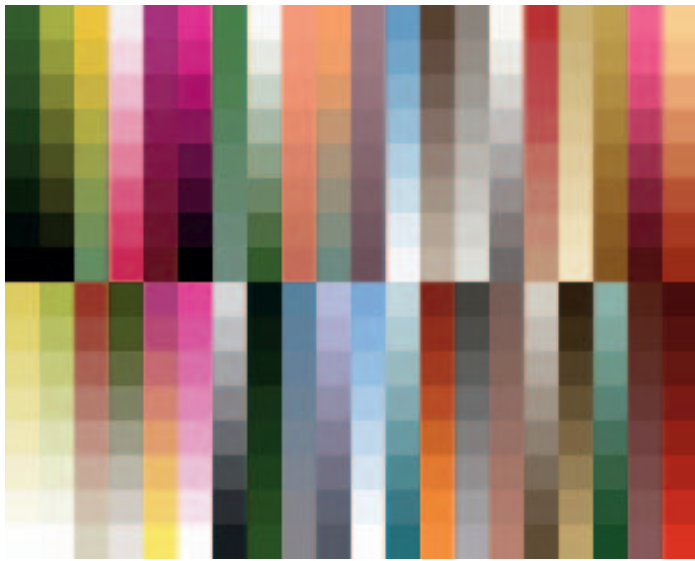
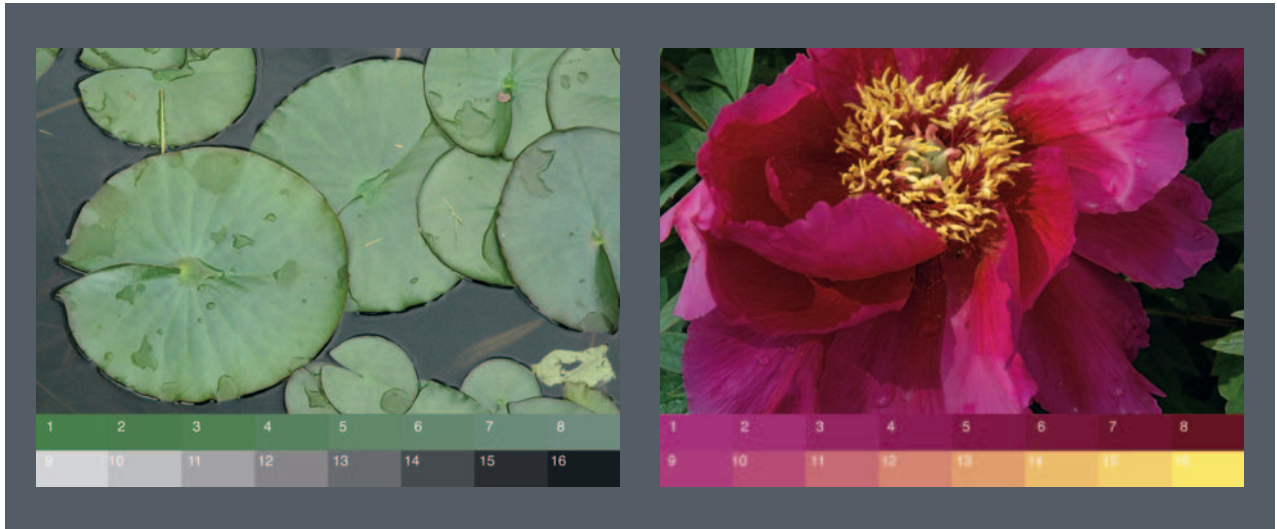


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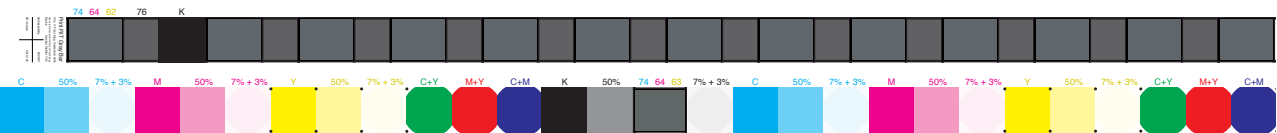
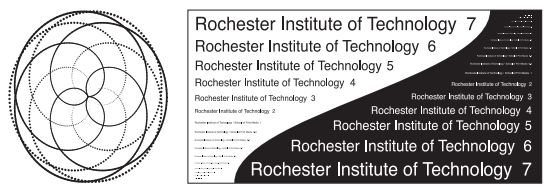


Kodak NexPress 2100

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Heidelberg SpeedMaster 74

How This Process Comparison Was Printed - a Technical Discussion

The process requires proper production color targets and proper “printing by the numbers” controls, as described below. The side-by-side demonstration on pages 34 and 35 shows that the Kodak NexPress 2100 print engine provides the fundamental capabilities for delivering offset-compatible color and image detail. Note, however, that color management is required to adapt the digital color data that has been prepared for a lithographic offset colorant set so that the colors are correctly remixed for the digital colorant set. This color adjustment does not run automatically out of the box. However, like all properly managed printing processes, outstanding results can be achieved efficiently with color management and experience.

RIT’s Printing Applications Lab has a Kodak NexPress 2100 print engine and a Creo CTP platesetter. It was a natural to select Kodak and Creo to attain a quality result. Connected to the Kodak NexPress was the appropriate NexStation RIP. The following methodology was used to match the images from the two printing systems:

Reference printing condition

There was a previous press run in June 2006 at RIT for CGATS on the Heidelberg Speedmaster 74 press, where press conditions were carefully controlled and documented. The IT8.7/4 profiling target was printed in two orientations, the measurements were averaged and profiles were generated using GretagMacbeth ProfileMaker 5.05 with 320% total area coverage. This press run and its profiles is taken as an internal reference at RIT and is the basis for printing this Test Targets booklet.

Printing the Offset Page (page 35)

The images for the Test Targets offset run on page 35 were prepared for printing by converting the RGB originals to CMYK in Photoshop using the profile from the CGATS run with perceptual color rendering. They are printed using the same press conditions as the CGATS run, which were:

Dry aim: K 1.65, C 1.35, M 1.45 and Y 1.02 (GRACoL 6 v. 2002, Status T Density)

Wet aim: K 1.76, C 1.39, M 1.51 and Y 1.03 (Dryback determined June 17, 2006)

Paper: SAPPI New Somerset Gloss 100# with optical brighteners.

Printing the Digital Electrophotographic Page (Page 34)

The IT8.7/3 profiling target was printed during a calibration run on the Kodak NexPress 2100 digital press at RIT. The press had previously been optimized for the same paper which was also used for the CGATS run.

The NexPress color profiles were generated using GretagMacbeth ProfileMaker 5.05 with 280% total area coverage.

To prepare the images on page 34 for the NexPress run, CMYK images from the offset color space are converted to the NexPress space with the use of a device link profile. In this case, the offset print acts as the reference and the NexPress print acts as a color proof.

Process control

The requisite components for this match are an offset press, a color manageable digital press, appropriate IT8 and other test targets, a spectrophotometer, and appropriate color profiling software controls for the digital process. A consistent run quality on the offset press is essential, which requires the use of test targets such as color control bars and exposure control targets on the plates.

If both processes were to print on the same sheet of paper, (which was not the case here), reduced anti-offset spray powder is suggested. Additionally, the ink type run on the offset press must be compatible with the digital press so that problems will not occur on the latter from fusing/drying.

Once a match is accomplished and repeated, the benefits described herein are available for your printing production runs. This is all made possible by the use of printed image targets and printing by the numbers controls.

Acknowledgment

A special thanks to the RIT Printing Applications Laboratory for its support in the production of the offset imagery used for the match and for the NexPress electrophotographic color press run.

Reference

Technology Watch, (2004 Fall), Press Runs Matching the Xerox Docucolor 8000 With a Heidelberg Offset Lithographic Press. Vol. 9.