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Printips

Designing for Digital Printing: Tips and Tricks

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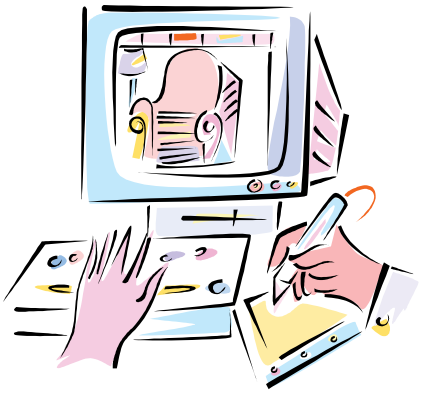
Are you familiar with all the ways today's modern print shop has integrated digital technology into the printing process? It starts with desktop publishing, continues through electronic prepress, then goes on to platemaking for offset printing or raster image processing for output to a digital printing device.

Digital technology as applied to design and desktop publishing gives us more control over layout, special effects, and the ability to make alterations. It also allows us to build a digital file to obtain the best output image, whether using an offset press or a digital printer. In this issue of *Printips*, we'll provide some tips and tricks for preparing a file specifically for output on a digital printer.

Why use digital printing?

Digital printing is a great companion to offset printing. Because it eliminates the need to print from a fixed master, digital printing has little makeready time or cost. This means that a run length of one is economically feasible and that a job can go into production as soon as the file is prepared. With digital printing, small quantities are cost effective, even in full color; print runs can be produced on-demand or with extremely fast turnaround printing; and personalized printing is possible. Digital printing allows a company to print brochures, labels, and personalized direct mail with up-to-date information when it is required. Last-minute revisions and corrections can be made at minimal cost and inventory closely controlled.



Digital printing is the technology of choice in these situations:

- *Small quantity*. If the print run is fewer than 500 (or, in some situations, 1000), then digital printing should be explored. This is especially true for full color printing.
- *Tight turnaround time*. If the job needs to be completed in a day, digital printing may be the only option.
- *Quantity uncertain*. When you are not certain what quantity eventually will be needed, digital printing allows for a small initial printing without a heavy cost penalty.
- *Personalization*. Because it doesn't use a press plate, digital printing allows each print to be different from every other one.

Digital printing technology

A common digital printing technology used in printing companies like ours is *electrophotography*, also known as *xerography*. Originally developed by Chester Carlson in 1938, two companies – Battelle and Haloid – worked with Carlson to perfect his invention and in 1948 demonstrated

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"Try to select colors that are within the digital printer color gamut..."

electrophotography to the world. The first photocopiers were introduced a year later, in 1949, but didn't become popular until the Xerox 914 (named because it could handle paper up to 9 x 14 inches) fully automated copier was released in 1951. An Ohio State professor coined the term *xerography* (from the Greek words *xeros* for "dry" and *graphos* for "writing") and Haloid later changed its company name to Xerox.

In electrophotography, a latent image is created by a laser beam on a photosensitive plate drum (or a belt). The image is then "developed" by depositing dry toner particles onto the substrate. The process is based on two natural phenomena: that materials of opposite electrical charges attract and that some materials become better conductors of electricity when exposed to light.

File preparation for digital printing

Our digital printing equipment uses dry toner to form the image, and this means that the image resolution is lower than that of our offset printing equipment. This has several implications for design and file preparation.

Vignettes

Also known as *blends* or *gradients*, a vignette occurs when one color blends into another or when the tint value changes from lighter to darker or vice versa. Narrow tint ranges force the use of wider bands of tint values, resulting in a visible line between bands. To avoid this, set tint values with a fairly wide range (such as from 15% to 85%) or make the gradient smaller.

Toner Coverage

When printing in full color, it is possible to set toner coverage at 100% for each of the four process colors (CMYK or cyan, magenta, yellow and black), producing 400% total toner coverage in parts of the sheet. The result is a visible layer of fused toner – thick, shiny and palpable – that not only looks bad but is prone to cracking if folded. Keep total toner coverage at no more than 320%, and select black rather than creating it with CMYK.

Folding

As mentioned, toner is subject to cracking when folded. This is especially true when the fold is against the paper's grain. To minimize the possibility of cracked toner, design the piece so that there is low toner coverage in the fold.

Color gamut

The *color gamut* is the range of colors that can be viewed, displayed, or printed. Digital printing equipment has a different, narrower color gamut than a computer monitor, so may not reproduce color exactly as you see it on your monitor. Try to select colors that are within the digital printer color gamut rather than those entirely outside it.

Additive and subtractive color

Color on the computer monitor is formed by combining red, green, and blue (RGB) light in various levels to produce the image. RGB are the primary colors of white light and cannot be produced by the combination of any other colors. When the three are combined at full strength, they produce white light in a process known as *additive color*.

When two primary colors of light are combined, they produce a secondary color which are the primary colors of the *subtractive color process* – cyan (100% green and 100% blue), magenta (100% blue and 100% red), and yellow (100% red and 100% green).

Just as the combination of the three additive colors (RGB) at 100% strength create white, the combination of the three subtractive colors (CMY) at 100% strength should create black. However, since the color pigments aren't perfect, they actually create a muddy dark brown and a thick, shiny layer of toner. Therefore, specify black (K) when it is used alone rather than creating black out of CMY or CMYK.

We hope our discussion has been useful in helping you understand how to optimize your digital print project. If you have any questions, please contact us and we'll be happy to provide more information.

Personalize Your Printing

One way to incorporate personalization into a printed piece is to use a combination of offset and digital printing. This approach takes advantage of the strengths of each process and saves money by doing so. When planning and designing the piece, keep these considerations in mind:

- *Design the marketing or informational brochure so that its finished trim size is 8½ x 11 inches*. This allows us to feed the trimmed sheet through our digital printing equipment to have the personal information added.
- *Select the font and point size for the personal information to optimize results from the digital printer*. In general, digital printing equipment provides a lower resolution than an offset press plate. A sans serif font of at least 9 points is usually a better choice than serif.
- *Take care to use colored and black ink in such a way that that the personalization in black ink is fully integrated into the design.*
- *Use paper that is optimized for digital printing.* Some coated stocks and stocks over a certain thickness may not feed well through the digital printer.
- *Toner does not adhere well to areas of heavy ink coverage*, so have the digital image print directly onto the paper. If you must overprint digitally, use a halftone screen to achieve the desired color.

Because the heat in our digital printer can be as high as 400° Fahrenheit, we will be using an offset press ink that is heat- and thermal resistant so it won't smear when going through the digital printer. We ask that you not specify metallic or fluorescent inks as part of the design, as metallic flakes can build up on fuser rollers in the digital printer.

For specific information about paper that works well in our digital printing equipment, call us. We'll be glad to help.

IDEA CORNER

"A sans serif font of at least 9 points is usually a better choice than serif."

Q. *What is electrophotography*

A. Electrophotography, also known as xerography, is a six-step process. Dan A. Hays, a senior fellow at the Xerox Corporation's Wilson Center for Research and Technology, explains:

- **Charge.** Inside every copier and laser printer is a light-sensitive surface called a *photoreceptor*. It is charged in the dark by applying a high DC voltage to adjacent wires, creating an electric field across it.
- **Expose.** Next, the image is exposed on the photoreceptor with a scanning modulated laser. The areas of the photoreceptor exposed to light are selectively discharged; the darker areas retain their charge.
- **Develop.** Pigmented powder used to develop the image is called *toner*. Toner particles (made of colorant and plastic resin) have precisely controlled electrostatic properties and range from about five to ten micrometers in diameter. The particles are charged by static electricity. The electric field associated with the charge pattern of the image on the photoreceptor exerts an electrostatic force on the charged toner, which adheres to the image.
- **Transfer.** The powder image is transferred from the photoreceptor onto paper by bringing the paper in contact with the toner and then applying a charge with polarity opposite to that of the toner.
- **Fuse.** In the fusing process, the toner comprising the image is melted and bonded to the paper. A heated roll melts the toner, which is fused to the paper with the aid of pressure from the second roll.
- **Clean.** Toner transfer from the photoreceptor to the paper is not 100 percent efficient, and residual toner must be removed from the photoreceptor before the next print cycle.

Q&A
questions and answers

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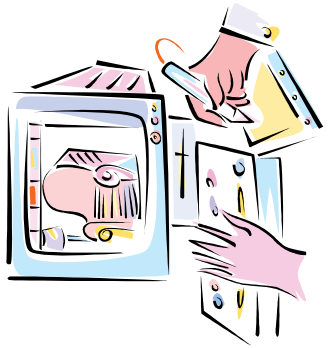

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PRINtips

Digital Printing Papers
Selection Tricks & Tips

Just as with offset printing, the selection of paper for digital printing is crucial to the success of the project. However, owing to equipment limitations and the electrophotographic process itself, the range of papers that can be used for digital printing are much more limited than for offset. For instance, the paper's basis weight needs to fit within the equipment's specifications.

Our equipment manufacturer has provided us with a list of recommended papers, and because we like to stay within these specifications, we may not be able to digitally print on a stock you particularly like.

Here are some tips for selecting papers for digital printing:

- Papers with a smooth finish and good formation (an even distribution of fibers) provide the best results in digital equipment. Bright white paper contrasts with toner making colors look more brilliant.
- Toner does not adhere well to uneven paper surfaces, so heavily textured or embossed papers are not recommended.
- The paper's basis weight should fit within the equipment's specifications.
- Best results will be obtained by using fresh, ream-wrapped stock rather than stock from your inventory.
- When planning to print on both sides of the page, we recommend using a paper with higher opacity and sufficient weight.

As always, we will assist you in selecting a stock that is within the specifications for our equipment and will produce an outstanding result for your project.