



Making paper fun

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Separations and Screens

Printing on uncoated paper requires a different approach in pre-press. Since uncoated stocks are more absorbent and softer than coated stocks, adjustments should be made to compensate for dot gain, where fourcolor process dots spread in shape. Typically this is done in the final stages of pre-press just prior to making the printing plates. First, images should be scanned and proofed identically as if you were printing on coated paper. Any retouching can be done as you normally would. Once the proofs are accepted and approved, the pre-press department applies a “press curve” to the images that diminishes the size of the dots to compensate for the “gain” on press. An image that is proofed after it has had a press curve applied will appear slightly washed out. Average recommended line screen is 175.

TIPS:

- For uncoated stock, more open images and less heavy coverage is recommended where possible.
- Images do not need to be scanned differently for printing on uncoated stock. For optimum results, the digital images just need to be adjusted, or “opened up,” prior to going to press.

For every paper—coated or uncoated—separations must be tailor-made, which is probably the most important step in the whole production process. Because of absorption and, to some degree, surface texture, halftone dots tend to spread, deform and connect where they are not intended to when ink is applied to paper—any paper. In anticipation of this phenomenon, known as “dot gain,” separations for uncoated paper, with its soft, relatively open surface, should be “opened up” to reduce the size of the dot proper and to increase the space surrounding it. Then when the dot is printed, it will be crisp and well defined.

On uncoated paper, dot gain may range from 18 to 30 percent. If this is not prepared for, shadows will lose their detail, highlights their sparkle, and midtones their smooth textures. By opening up the separation, image degradation is minimized, finer screens can be used and higher densities of ink—for better color and more uniform solids—can be applied. Because dot sizes range from large in the shadows to small in the highlights, they must be adjusted differently. Formulas for making adjustments vary among individual separators and printers. Commonly, highlight dots are reduced by 5%, midtone dots by about 25% and shadow dots by about 15%. Exact percentages depend on many variables, including desired image appearance, paper surface, ink and type of press that the job will be run on.

Choice of dot shape—square, round or elliptical—is determined by both press requirements and



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aesthetics. Square dots, which are the most common, are thought to give the best definition of fine detail but may cause midtone “chop” or roughness in large, smooth areas such as skies. For jobs where these tones are particularly important, elliptical or chain dots may be used. Because 50% elliptical dots connect only at their ends, they also mitigate the effects of dot gain, yielding smoother gradation among adjacent tonal areas and reducing “tone breaks” or rough textures in, for example, skin tones. When heavy dot gain is predictable, such as on newsprint or on highspeed web applications, the best choice may be round dots. They do not connect until they reach about 70 percent of maximum size; thus, they extend midtone range and minimize loss of midtone and highlight quality. (For a dot of a different kind altogether, see Stochastic Screening.)

Screen Ruling

Screen ruling determines dot size and frequency. The finer the screen, the smaller and more numerous the dots. Because small dots produce cleaner lines, smoother tints and a closer match between separation and original photo, clients usually specify the finest screen practical. For a better sheet, that’s usually 130 to 150 lines. However, when separations are properly made, the press carefully monitored, and the sheet selected has a smooth, highly refined surface, screens of up to 200 lines and more can be printed successfully. But keep in mind that there is a direct relationship between screen ruling and dot gain. A finer screen does not automatically produce a better image. Fine screens, in fact, increase dot gain, regardless of paper type or quality. For best reproduction, therefore, don’t specify a screen finer than needed and do select a paper with a smooth, refined surface.

TIP:

- The recommended line screen for Cougar Opaque is 175, although some printers feel more comfortable with 150 and others can handle as fine as 200 Stochastic.

Special Effects

To convey a sense of hard-edged realism, a photograph may be given the newspaper look when half-toned or separated with an extremely coarse screen, say 40 dots per inch. Or, by computer, it may be “pixellized” and its tones captured as small squares on a grid. Other special effects can be achieved with line conversions and textured screens—circles, waves and fabric patterns. These techniques can be used alone or in combination. Not only are they effective in adding visual interest, they can also save a mediocre photo by converting it into a graphic.

Variable Line Screens

“Variable line screens” refer to the technique of using different line screens for each of the four process colors, as opposed to using a common line screen as in most conventional printing. Using this technique can eliminate the traditional “rosette pattern” that is visible in conventionally printed four-color process images. Images can look more continuous tone. Once a printer develops a system that works best for them, they use that formula consistently. It does not “vary” from image to image.



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Printers have found that variable screening can be used to significantly improve flesh tones and moiré. In a hypothetical application, black is screened at 200 dpi for uncoated paper (black is where the viewer perceives sharpness in an image), cyan and magenta are screened at 181 dpi, and yellow is screened at 175 dpi. Using standard screen angles, moiré is significantly reduced or eliminated.

Stochastic Screening

Stochastic screening is one of a new generation of screening techniques that redefine the halftone. Developments in digital technology have produced the modern digital pre-press where image preparation and manipulation are far more flexible than with the older traditional film based approaches.

Instead of structuring dots in a uniform grid of columns and rows, a stochastic screen distributes them somewhat like grain in a photograph—heavily in the shadows, sparsely in the highlights. This approach is called FM (Frequency Modulation) screening.

Because screen angles for process colors are thereby eliminated, we no longer face problems with moiré or are bound by the number of inks for which angles are available. Stochastic screens enable us to print as many inks as needed to match virtually any color. Moreover, because of the small size of their dot—the largest is tinier than a 1% dot in a conventional 150-line screen—stochastic screens can produce sharper images.

This technology is compatible with existing press equipment and platemaking procedures. It is also a logical complement to another innovation, “HiFi” printing. HiFi, which utilizes a palette of seven or more inks (orange, green and violet, in addition to the standard four), extends the color gamut well beyond what is possible with conventional printing and produces cleaner, more saturated color. Managing all these colors is made considerably easier by stochastic’s “screens without angles.”

Staccato® is a registered trademark of Creo, Inc. and is comparable to Stochastic. For more information, visit <http://www.creo.com>.

Staccato® Screening

Staccato® screening produces high-fidelity, artifact-free images that exhibit fine detail without halftone rosettes, screening moiré, gray-level limitations or abrupt jumps in tone—with no impact on RIPing or rendering time. Staccato screening also improves color and halftone stability on press, making it a perfect complement to consistent “by-the-numbers” printing. For more information about staccato screening, visit:

http://www.creo.com/global/products/color_screen_calibration/offset/staccato/default.htm



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Four-Color Process

A method that uses dots of magenta, cyan, yellow and black to simulate the continuous tones and variety of colors in a color image. Reproducing a four-color image begins with separating the image into four different halftones by using color filters of the opposite (or negative) color. For instance, a red filter is used to capture the cyan halftone, a blue filter is used to capture the yellow halftone, and a green filter is used to capture the magenta halftone. Because a printing press can't change the tone or intensity of ink in varied areas, four-color process relies on a trick of the eye to mimic light and dark areas. The human eye blends the dots to recreate the continuous tones and variety of colors we see in a color image.

Halftones

A printed image composed of dots of varying size and shape printed in a uniform pattern that produces tonal gradations to simulate continuous tones, such as photographs.

Black and White in Color

Some of the most impressive “black and white” photographs printed on uncoated paper are not black and white at all. Their great depth and sparkling highlights are not achievable, in fact, with just black ink on white paper. The most common way of creating an out-of-the-ordinary black and white image is to print it as a duotone, tritone or quadratone, using multiple inks, plates and screen angles. But to capture every nuance—or to reinterpret the image and create special effects without compromising essential qualities—you may need the four-color process.

Duotones

A two-color halftone of the same image created with two screens, two plates and two colors, generally black and a second color. The full range of tones is printed black and the middle range of tones is printed in the second color, offering more richness and depth than a one-color halftone.

Tritones / Quadtones

Reproductions of black and white images, with perhaps a touch of color. Tritones are printed with three screens and three colors, such as one black and two grays, used to enrich the contrast between light and dark areas. A quadtone is a black and white image printed with four halftone screens and four colors.

Touchplates

To gain even greater control over your colors, consider a touchplate. Many presses now provide extra units, which allows you to add a special color (such as a PANTONE® matched ink) or to hit just a specific area of an image with additional process color. This allows you to build density for better halftones and separations, smoother solids and exact color matches. An extra impression can also help to build shadow density for photos with wide contrast range.



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Touchplates are used when certain colors are difficult to achieve through conventional four-color process. Typically a screen value of a particular PMS (match) color is integrated with the process image. An example would be to add a match red to a process screen-mixed red in an image to accentuate the color.

Touchplates are also used in printed pieces where there is a need for “bright” colors—like tail lights in automotive ads. Touchplates also allow the use of enhancers like fluorescents and varnishes.