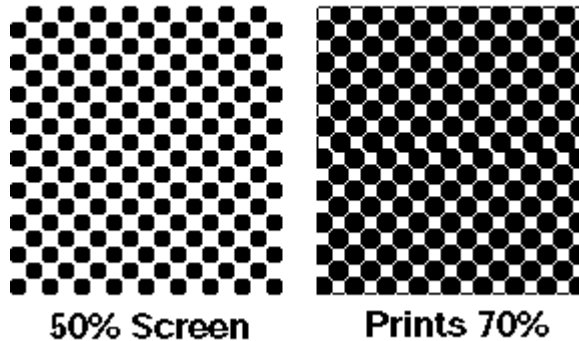


DOT GAIN & INK DENSITY:

Affects of Dot Gain



When working with screens of ink, a designer must always remember that things tend to get darker on a printing press. This happens when the ink absorbs into the paper and spreads outward, making each dot spread out and grow larger.

When you make a 50% screen of ink on your computer, it will actually come out closer to 70% on most web presses. Screens higher than 85% will likely plug in to solid. This is called DOT GAIN. Photos and graphics that aren't adjusted for dot gain will likely come out too dark on the press.

Dot LOSS is also an issue of dot gain. This is where a dot is so small that it disappears. A 1% screen of any color will not show up on a press. A 2% screen probably won't, and a 3% screen will be tough to hold on the press. Screens under 4% in a photo or graphic should be bumped up a little to make sure they will print, unless the area is a specular highlight such as the sun reflecting off of a shiny surface. If you look at "whites" in real life, you will find that they are more accurately shades of gray; extremely light shades of gray, but shades of gray, nonetheless. Even snow has *some* color to it.

The dot gain you will experience depends on the press, the paper, and a host of other issues which affect how the ink will be absorbed into the paper. Ask your printer what their average dot gain is, and adjust your images accordingly.

The specific amount that images should be adjusted varies, because no two photos (and no two presses) are the same. As an example only, a grayscale image might be adjusted like this for a 20% dot gain:

DARKEST SHADOWS (95 - 100%): Adjust to 80% (glossy paper), or 75% (offset paper)

MID TONES (50%): Adjust to 35%

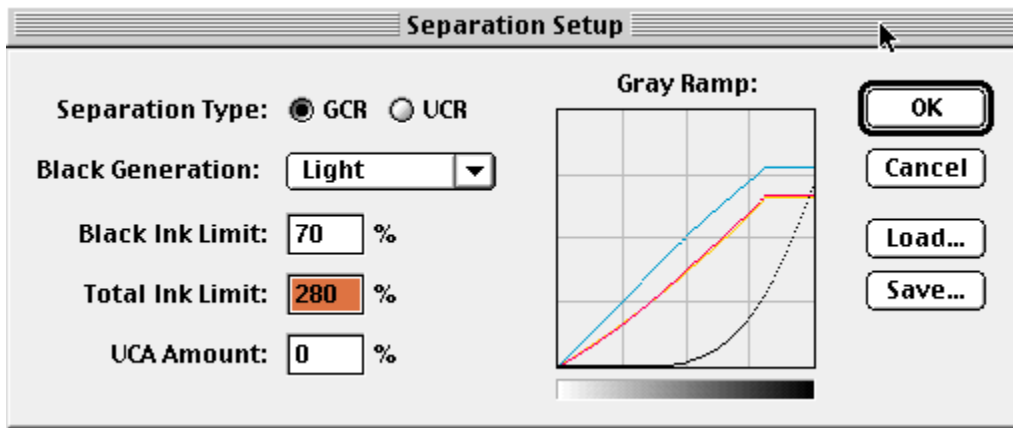
WHITES (0%): Adjust to 4%

After adjusting a photo for dot gain, it may appear somewhat flat. Don't worry, as the effects of dot gain should return good contrast to the image on the press.

Remember: All photos and papers are different. A photo that is already very light might not need as much adjustment, and a dark photo might need more. And glossy papers experience less dot gain than matte papers.

Setting Up PhotoShop

At , Copriso we have a dot gain of about 20% (again, depending on the paper). For color photographs to print well, we prefer a combined total ink density of 280, with a maximum black of 70%. Combined total ink density can be simply calculated by adding the percentages of the four process inks in the darkest portion of a photograph. If Cyan, Magenta, Yellow and Black add up to more than 280, the total density is too high, and your photo will probably print too dark. If you have Adobe Photoshop, you can have it make density corrections for you.



To correct total ink density in PhotoShop, set up your **Separation Setup** dialog box as follows:

- **Separation type: GCR** - Gray Component Replacement tells Photoshop to replace black with appropriate mixes of cyan, magenta, and yellow. Reducing the amount of black in a photo will help to keep it from becoming too dark. (UCR or Under Color Removal is the opposite: Replacing mixes of cyan, magenta and yellow with appropriate levels of black.)
- **Black Generation: Light** - Black is used in photos as a contrast builder, rather than a major component color. Selecting "Light" for black generation creates what is called a "skeleton" black plate which is desirable in offset printing.
- **Black Ink Limit: 70%** - Again, too much black is not good. This setting makes sure that black never, in any part of the photo, goes above 70%. This is an amount that the press can control while still showing appropriate shadow detail. Black inks above 70% in a color photo tend to destroy detail in the shadow areas, making for a plugged-up, muddy appearance.

- **Total Ink Limit: 280%** - This setting will ensure that all four inks, when combined, don't equal more than 280%. This setting will go a long way toward compensating for dot gain in most photos, although it will not adequately do so for all photos. Again, each photo is different, and many will require additional adjustments (using Adjust>Curves) in the mid tones.
- **UCA Amount: 0%** - Under Color Addition adds cyan, magenta and yellow where black is present in a photo. UCA is generally not desirable in offset printing, and shouldn't be used unless the dark areas are absolutely devoid of those colors. Use UCA only after studying its affects carefully as it can cause disastrous results if you don't know precisely what you are doing. In its defense, however, let it be said that UCA can also turn a flat, lifeless photo into a much richer, more attractive one, *if one knows what one is doing*.

Your Separation Setup preferences will have no effect on a photograph until it is converted from another color mode to CMYK mode. If your photo is in RGB mode, then simply changing it to CMYK will apply the separation setups you have entered. If your photo is already in CMYK, then you will have to convert it to another color space first, and then convert it back to CMYK. We recommend converting your photo from CMYK to Lab, rather than from CMYK to RGB. The difference isn't huge, but it does exist: PhotoShop's native color space is Lab, so colors will remain truer if converted to that mode rather than to RGB. Do not convert your photos back and forth too many times, because your colors will change subtly each time.

When viewing images in PhotoShop that are to be printed on a press, you can view the effect of dot gain by checking the Dot Gain box in the File>Printing Inks Setup dialog box. Also in that dialog box, you will see options for the type of inks to be used. Select SWOP Inks (Standard Web Offset Press) for color and black-and-white, and select "Use Dot Gain for Grayscale."

The Separation Setups do not affect grayscale (black-and-white) images, so dot gain in grayscale images must be adjusted for manually, as demonstrated above.

Using Coarser Line Screens to Help Control Dot Gain.

You can also help control dot gain, especially on soft, lower quality paper, by using a coarser line screen. Dot gain will still be present in coarser screens, but its effect won't be as disastrous, simply because there is more space between the dots in coarser screens. It is easier for any press to hold dark screens at 120 or 133 lpi than it is to hold the same screen percentage at 150 or 175 lpi.

This solution won't work for all printing projects, but where a fine line screen is not required; a coarser line screen can actually print and look better, especially in dark grayscale images.