SEPARATIONS:

Different colors on different plates

When we have colors on a document, we have to consider how we are going to SEPARATE those colors onto different plates, so the press can apply the correct colors of ink.

There are several different issues within the topic of separations, which we will handle one at a time:

RED ISN'T RED; IT'S MAGENTA AND YELLOW

Most of the colors we see printed are made up of a mix of shades, or screens, of the four process colors: Cyan, Magenta, Yellow and Black. Below are examples of how process colors combine to create other colors:

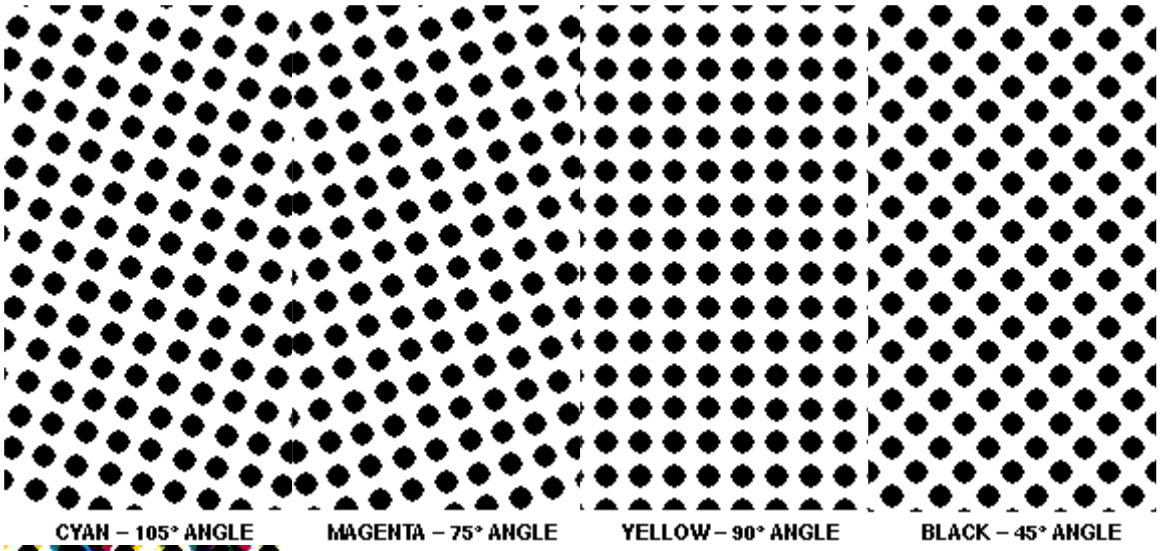
CYAN INK	MAGENTA INK	YELLOW INK	BLACK INK	ALL INKS
100% CYAN	-	100% YELLOW	-	*GREEN*
100% CYAN	-	100% YELLOW	25% BLACK	*DARK GREEN*
-	100% MAGENTA	100% YELLOW	-	*RED*
-	100% MAGENTA	100% YELLOW	25% BLACK	*DARK RED*
100% CYAN	50% MAGENTA	-	-	*BLUE*
50% CYAN	75% MAGENTA	100% YELLOW	-	*BROWN*
45% CYAN	30% MAGENTA	30% YELLOW	-	*GRAY*

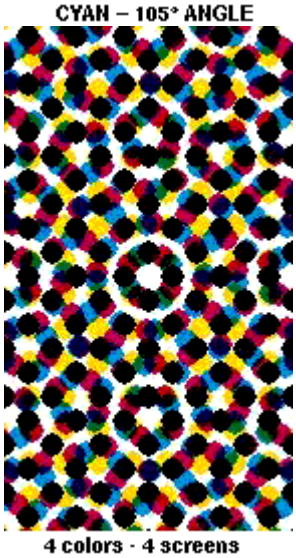
Note that the black ink is used to add darkness or richness to colors.

Different combinations of cyan, magenta, yellow and black can create **millions of different colors**, but only a fraction of the colors that a human eye can see. Take green, above, as an example. If we add 25% magenta to it, it will become forest green. If we take out half the cyan, it will become lime green. If we take out half the yellow, it will become turquoise. Even adding or subtracting as little as 1 or 2 percent of one of the inks can change the color noticeably.

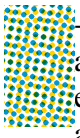
SCREENING INKS TO CREATE LIGHTER AND DARKER SHADES

When colors are screened, as in the 50% screen of cyan in BROWN, above, the same ink is used as 100% cyan. To make it appear lighter, it is reduced to a pattern of dots. Smaller dots make the ink appear lighter, larger dots make it appear darker. Below is how 30% screens of the process colors will appear when magnified:




4 colors · 4 screens

Notice that each color is screened at a different angle. If the screens weren't at different angles, the dots would print on top of each other, and we wouldn't see any color variation


– just a muddy yuk. When the screens are set to different angles, the inks are each able to reflect the color of light they are supposed to, all of which combine in our eye to make us see one color. In the example at left, we combine a screen of cyan and a screen of yellow. You can see the dots clearly as those colors. But if you move away from the monitor, the individual dots disappear and the image appears to be light green.

Professional graphics applications will all separate a color document at the push of a button. For example, let's look at a photo of a model on a boat, both in its separated state, and as it would be composed, or combined, on the press:

Process Separations, from l - r: Cyan, Magenta, Yellow, Black, and Composed

Each of the four colors you see above will be output to a separate negative, burned onto separate plates, and inked on separate rollers on the press. After the paper has been impressed with each inked plate, the composed image will appear, in full color.

ONLY GRAPHICS APPLICATIONS CAN SEPARATE COLORS

We can create color documents in Microsoft Word until the cows come home, but those documents will never be printed on a printing press. Microsoft Word, Microsoft Publisher, and Microsoft PowerPoint are NOT professional graphics programs. They cannot separate colors into their component CMYK colors. They don't even know what CMYK colors are, because they are RGB applications.

If you send a color document in any of the above applications to a print shop, they will laugh at you behind your back, or even in your face. Those programs are intended for a secretary to print a handful of a company's newsletter on a little office printer. Those programs have absolutely no relationship to the *real world* of graphics or printing. Don't blame your printer - if you feel deceived because "Microsoft Publisher" sounds like professional publishing software, then call Bill Gates and ask for your money back.

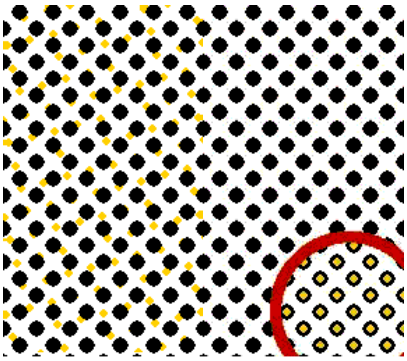
If you want a color document printed on a printing press, and don't have professional graphics software like QuarkXPress or Adobe PageMaker, then you must have your print shop or a professional graphic artist lay out your document.

MIXING SPOT COLORS AND PROCESS COLORS

Using spot colors in printing is a popular and economic way of adding color to your printed piece. The one problem with spot colors is that they, by default, screen at a 45° angle. We learned above that 45° is also the screen angle for black. The problem is that when spot colors are used, they are usually used with one other color: Black. They both have the same screen angle, and that is a potential disaster.

Let us suppose that your document has a duotone in it consisting of black and a spot color. If the spot color and black have the same screen angle, then you will have a dot-on-dot duotone, in which the black dot prints exactly on top of the color dot, totally obscuring it. Gradient screens, or any other mix of the two colors will also be dot-on-dot.

The solution is to force the spot color to print at a different screen angle, preferably 75° (30° off of black's 45° angle). Professional graphics applications like QuarkXPress and PageMaker allow the user to change screen angles, either in the print dialog box or in page setups.



RIGHT – angles offset 30° WRONG – dot on dot duotone

If you are combining a spot color with all four process colors, and screens of all colors overlap somewhere, then 75° won't work either, as it is already in use by Magenta. In that case, the specific angle will depend on the hue of the spot color. Consult your printer.

If your document uses only solid (100%) spot colors, with no shades or screens, then the screen angle doesn't make any difference. Solid is solid - there are no dots to arrange at an angle, anyway. Similarly, if your spot color is screened, but your blacks are solid, then, again, the screen angle doesn't matter, and indeed the default 45° angle is best. It is only where screens, or percentages, of the two colors collide that a problem occurs.