Underbases Why, When & How

Understanding underbases can dramatically improve your printing quality.

Using an underbase is a great way to avoid a wide range of garment printing problems. In plastisol printing, a proper underbase can:

- Keep the color of a shirt from influencing the printed ink colors
- Safeguard against bleeding and dye migration
- Prevent fibrillation
- Boost color vibrancy
- Help create special effects
- And enhance the overall visual quality of a print.

However, an underbase can give a print a heavier hand and add an unnecessary step to the printing process. The trick is knowing when to use an underbase, what kind to use and what to monitor when using one.

An underbase, or underlay, is simply a layer of ink that is printed directly onto a garment to provide a base for the colors that are printed after it to create the design. The underbase seals off the fabric, and prevents it from showing through the print. At the same time, it keeps the inks, which are printed on top of the underbase, from soaking into the garment. This gives the print added opacity, which is why underbasing is most commonly used when printing light-colored or translucent inks on dark shirts. See Figure 1, page 24.

"When printing directly on a black or red garment, for example, putting down an underbase first blocks out the background so the fabric color doesn't show through the subsequent colors," explains James Ortolani, National Sales Manager for Hix Corp. (Pittsburgh, Kansas).

An underbase makes colors look brighter on dark shirts by sealing off the fabric and providing a light background, which makes inks that are printed over it appear opaque, says Geoff Baxter, Vice President of Sales for Martin/Atlantic (Baltimore, Maryland). See Figure 2, page 24.

Another common use for underbases on dark shirts is to protect against the migration or sublimation of garment dye into the ink. "You can use low-bleed and 'non-migrating' inks, but there are certain garments and colors where dye migration tends to be particularly bad. And an underbase adds an extra layer of protection," Ortolani notes.

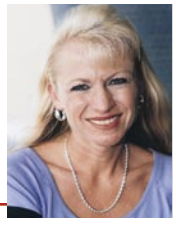
Underbasing also can be helpful in achieving special effects on color garments. "Many specialty inks, such as high density, are more effective if they don't soak into the fabric," Baxter says.

Consultant Douglas Grigar agrees. "Underbasing helps add layers and ensures that high-density ink has a good surface to sit on, if you feel you need it. And printing a clear underbase and flashing it — then printing a layer of crystallina with a tinted clear base over it — can lift the print off the shirt, creating shadows under the glitter and adding dimension," he says.

The printed fabric's texture and properties may be another reason to use an underbase. Some, like Grigar, find an underbase helpful in combating fibrillation. Underbasing also allows a smoother print on certain specialty fabrics, Baxter says.

To Underbase or Not

As helpful as underbases can be, they're not always necessary — or desirable. In some instances, there are other ways to address a garment printing problem and achieve a better result. "There's a tendency for anyone who is printing on a dark color to think he has to use an underbase," asserts consultant Charlie Taublieb of Taublieb Consulting (Englewood, Colorado). "That's not the case."



For instance, spending an extra $10 a gallon for a better-

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Figure 1: The best type of white ink to use for an underbase is one that is designed for flash curing. An example is Bright Cotton White offered by Union Ink. This is a high-opacity, direct-printed ink that flashes fast with no after-flash tack. Photo courtesy of Union Ink.

Figure 2: In this close-up shot, you can see the print after the red and the blue colors have been printed. Neither one of these colors would be able to maintain its integrity — as they have here — if they had been printed directly onto the black shirt.

quality ink may provide sufficient opacity to make an underbase unnecessary. Too often, printers lay down two colors to get one, when they wouldn't have to with the correct ink. Even if they have to print a color, flash it and print it again, that process can be preferable to using an underbase, because they don't have to worry about accuracy as much as they would with an underbase.

"I think underbases are most appropriate for intricate work, such as simulated process color on dark-colored garments. But, you have to evaluate the specific parameters of each job to determine whether you need an underbase, and if so, what kind," Taublieb says.

Similarly, a lot of printers underbase an entire print when only a portion is required, Baxter says.

Creating the Best Underbase

In considering an underbase, the first things to look at are customer specifications such as:

- The color of the garment (light or dark)
- The garment fabric (cotton, polyester or a specialty blend) and weight
- The design parameters (size, colors, special effects and additional embellishments)
- And the end use of the garment (for instance, a heavier hand may be acceptable or even desirable for an athletic shirt as opposed to a fashion top).

Solid or Percentage

You also need to consider if a solid or "tonal" underbase made up of halftone percentages is better for the job. A solid underbase, which is a solid, flat sheet of ink that underlies the entire design, is easier to create, but results in a thicker, heavier-finished print.

In a halftone underbase, the underprint is broken into dots as opposed to being a solid print area. This makes it possible to vary the tonal value of the underlay beneath several colors or design portions, which allows for tonal gradation and enhanced dimension in the finished print. Solid underbases are most frequently used in athletic printing and jobs involving solid color blocks. Tonal underbases are preferred for simulated and process-color applications and are more widely used in garment printing. See Figure 3.

Choosing a Color

Although white is the first color that comes to mind for underbasing, not all underbases are white, nor should they be. In fact, pros often prefer gray, light blue or other colors.

"One of the biggest problems with underlays is that everybody thinks they have to be white," Taublieb says. "In some applications, such as simulated process printing, it's easier to get good results if your underbase isn't white. Too often, when printers use white, they focus on making the underlay the whitest white possible. "

"To do that, they have to lay down several layers of ink. And in the process, they spread the dots to the point where they lose the halftones. They end up with a solid mass of white ink and a very bright print that looks flat. It's important to remember the reason for the underlay is to seal off other colors. If you allow your white to gray out a bit and don't crush your dots, you'll get a nice tonal gray and a dynamic finished print," Taublieb says.

Sometimes, you don't want an enormous contrast between your background and other colors. There are fabrics, such as heather, that gray covers better than white, Baxter notes. "I have even used a metallic color as an underbase. The only problem is metallics flash slower."

If you look at your design, you may find a light color that could sit under the other colors if they're opaque. "You can redesign for [the colors] and save yourself a screen," Taublieb says.

If your inks are opaque, a clear base may be an option. "By underlaying some colors with clear and printing others directly on the shirt, you can create the appearance of multiple tones without adding colors," Grigar notes.

Design for Success

What's important is not having "tunnel vision" when it comes to underbasing. "What makes the difference is actually designing for printing on a dark background instead of designing for a light color, then laying down a solid white and printing on top of it," Taublieb stresses. "That's where you lose, instead of gain, from underbasing."

When designing underlays, it is also important to allow for the correct amount of choke or overlap of inks printed on top, Grigar says. The underbase typically is smaller than the color(s) printed over it, he explains. See Figure 4.

Underbase "plates" can be computer generated with separation software. Although the quality may be decent, these underlays are only a starting point. "The computer output is fairly generic," Taublieb explains. "You can't just push a

button and be set. You have to customize the underlay for your needs, bringing up some areas and backing off others to enhance your results."

Printing Components

Mesh counts for underlays range from 80 to 305, depending on the desired effect. Basically, you want the underlay to be as thin as possible while still accomplishing your objectives. If the underbase is too thin, it may be uneven and ineffective. But if it's too thick, the underbase presents curing problems and ultimately adds weight to the print, Grigar notes.

Baxter recommends starting with a 110 mesh count for basic printing and 230 for halftones, while Taublieb says he frequently uses a 156 mesh count for simulated process printing on T-shirts but may go to 230, especially if the print is on a medium color. "If I was more concerned about sealing off the fabric than about the color showing through, I might go to a higher mesh count to achieve a very soft hand," Taublieb adds.

For halftones, Ortolani determines mesh count by multiplying the line count by 4.5. "This gives me just enough threads to support the dots and minimizes the thickness of the underlay," he says.

Screen tension also is important. "The lower the screen tension, the more pressure you have to apply to get the ink onto the shirt," Taublieb stresses. "The underbase may end up going through the shirt and contributing to a stiffer hand. You use more ink, more energy and more time, and in the end, you have a costlier, less-attractive print. A higher tensioned screen helps keep the ink on top and makes it look brighter."

Inks should be creamy for easy application, have high opacity and flash quickly, Ortolani says. He also recommends a matte as opposed to a glossy finish to promote mechanical bonding of the underbase with the inks printed on top of it.

It's important to use an ink that will flash quickly, Baxter says. "If it takes a while to flash or leaves a sticky resin, it might not be dry enough to overprint."

All in all, understanding your inks is critical to maximizing the quality and efficiency of your underbasing, Baxter stresses. "For example, you need to always remember that any time you use a plastisol additive, it can impact the ink's fusion time."

Printing is most efficiently accomplished with a very hard flood stroke, followed by a light stroke to lay the ink down without forcing it into the garment, Grigar says. "But that's not always how it's done. It is [common] to see automatics do multiple strokes on an underlay. When this happens, [the machines] are not flooding hard enough or deliberately driving the ink into the shirt."

Flashing properly is a critical step in underbasing. "You don't want to cure the underbase; you just want to gel it," Ortolani says. "If you totally cure a plastisol underbase, the inks you print on top will not stick to it."

Instead, quickly flash the ink to a gel temperature of about 88 degrees Celsius (190 degrees Fahrenheit). Over-flashing also can cause the underlay to become blotchy and cracked.

Taublieb recommends turning down your flash unit when flashing underbases. "Most people cook their underbase," he says. "If you run a very hot dryer, the two layers may not come together correctly, resulting in bubbling and pitting."

Plastisols cure between 135 and 160 degrees Celsius (275 and 320 degrees Fahrenheit). They gel between 104 and 121 degree Celsius (220 and 250 degrees Fahrenheit). "I like to keep the temperature as low as possible because the ink cools off faster," Taublieb says.

A good way to monitor this is to shoot the print with a heat gun as you remove your flash or as your shirt indexes, Taublieb says. "I look for a temperature between [93 and 121 degrees Celsius] 200 and 220 degrees Fahrenheit coming out of the flash, and touch the print to make sure it's dry."

Despite the challenges, underbases are fairly simple. The biggest mistakes printers make are assuming that it's always necessary to underbase or underlays are too difficult and not using them when they should.

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Figure 3: For this multicolor print on a dark shirt, a white underbase was first applied. This type of underbase is tonal, not a solid. You can see that instead of a solid sheet of white ink, the white is printed in varying degrees of opacity.

Figure 4: When designing underlays, it is important to allow for the correct amount of choke or overlap of inks printed on top