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Fibrillation (fuzzy shirts)

Fight that faded-out, fuzzy look caused by fibrillation by understanding the causes of this pervasive printing problem.

When the first complaint came, screen printer Greg Kitson thought it was an isolated incident. One of his customer's salesmen was unhappy with a print, complaining that his T-shirts didn't have enough ink to withstand repeated washings. "He thought the print looked too washed out," recalls Kitson, president, Mind's Eye Graphics, Decatur, Ind., "so we reprinted 100 shirts as a make good."

But the problem was far from over. Within days, dozens more of the customer's salespeople were upset about the T-shirts, forcing Kitson to reprint countless more garments. The culprit? Fibrillation, a problem that wound up costing Kitson nearly $50,000. "The customer wanted this old-fashioned look where there's a half-inch of ink on there, and nobody told us that," he says.

Like Kitson, many screen printers struggle with fibrillation, a frustrating print problem with underlying causes that are sometimes difficult to pinpoint. However, by understanding what fibrillation is and the factors involved, printers can more readily find solutions and avoid taking a financial hit from unsatisfied customers.

Fibrillation Defined

Fibrillation occurs when a garment's cotton fibers break through the ink film's surface, creating a washed-out, "hairy" look due to the color contrast of the ink and the fiber. Although the problem usually begins when ink isn't applied thickly enough to encapsulate the garment's fibers, it isn't revealed until the end customer washes the garment, explains Steve Hedge, Techincal Service Manager for PolyOne/Wilflex.

"The natural adhesion characteristics of plastisol and cotton are not such that they bond strongly," he says. "And any time there's a high contrasting color between the ink and the shirt-like red on a white T-shirt-the fibrillation is very obvious to the eye. If you have yellow ink on a white shirt, it's negligible."

Also, Hedge says, the washed-out look isn't the fault of the ink washing out. If that were the case, the print would look faded in a random manner rather than fairly consistently throughout the design, as is the case with fibrillation.

Fibrillation Factors

Ironically, as the screen printing process has improved resulting in a print with a softer hand, the problem of fibrillation has increased. As printers put less ink on 100% cotton garments to get a soft hand, they decrease the "mat down" of the shirt's fibers and increase the likelihood of problems. "It's become more predominant in recent years because people are printing with such fine mesh counts," Hedge says.

Another irony is that fibrillation is actually more likely to occur on a higher-quality garment than a cheap one, according to industry consultant Charlie Taublieb, owner, Taublieb Consulting, Englewood, Colo. "If the shirt is cheap enough, there isn't even enough fiber there to stand up," he explains. "Then when the printer goes to a better shirt, he goes nuts because he doesn't know how to handle it."

The problem also is more likely to rear its head during true process jobs, Taublieb says. "You're putting down such a thin ink deposit with process work," he says. "Anytime you're going with a thin deposit of dark ink on a light-colored shirt, you're going to have issues. With process work, you're looking for rich colors, and fibrillation kills the contrast. So it's not that fibrillation doesn't affect spot jobs, too; it's just that it's more objectionable on a process job."

Fibrillation is less of a noticeable problem with dark shirts, Taublieb adds, where fibers that may pop through are difficult to see. "It doesn't matter on a black shirt. Even if the fibers stand up, black fiber will continue to appear black," he says. "Also, when you're printing on darks, you're using a heaver mesh count and more opaque ink."

Fibrillation Solutions

Unfortunately, fibrillation isn't the type of problem that has a single, clear-cut solution, due to the variety of variables involved, including garment type and brand, and ink type and brand. For instance, some inks designed for high-speed automatic printing have less opacity and fillers, while athletic ink may have more fillers. (More fillers translate to better mat down.)

Curing also plays a role, with an under-cured film less likely to fully mat down fibers, says Claude Rainford, senior research chemist, Union Ink, Ridgefield, N.J. "One of the things you can do is increase your temperatures or slow down your dryer belt," he says.

More ink. Kitson has found a simple solution, at least for his athletic customers. He does things the "old-fashioned" way: more ink. "We have regressed, and we're putting down a lot more ink and doing lots of flashing. We've created a price list for athletic printing that assumes

everything will be print/flash/print," he says. "Red on white, black on white, pink on green-everything gets a print/flash/print."

Many customers actually prefer this traditional athletic print over the soft-hand print, Kitson says, prompting him to change from 175 and 140 mesh to 110 and 94. "With one customer, we said, "We're going to charge you 13% more, and we're going to lay down a lot of ink, like the old Russell Athletic tire prints," Kitson says. "And they've been extremely happy."

Clear coatings. Even for nonathletic customers, Kitson uses a thicker ink deposit, often flashing the first color to encapsulate the fibers. And depending on a job's requirements, he may print either a clear underbase or top coating. Precise registration isn't required with a clear top coating, he says, making the job easier to deal with. "If your registration isn't 100%, you can get away with it, especially if you're printing something with a halftone fade," Kitson says. "The dots don't have to match."

Hedge agrees that putting down a clear underbase and then printing on top of that can solve many fibrillation woes. "For spot printing, that's one of the better solutions," he says. "But if you're doing process printing, you don't want to do that because you're putting flash on top of flash. You're better off printing everything and then putting a clear topcoat to lock the fibers in place."

The overprint, which should be applied with a 205 mesh, doesn't add much to the hand, Hedge says. "There may still be some issues, but it helps extend the life of the print," he explains. "If you're looking for something that lasts 50 washes, this isn't going to do it."

More suggestions. Hedge also suggests trying a fast-fusion, low-curing ink that stands up to abrasion and washing better than other inks. However, this ink has a glossier look and a tacky feel that clients may find undesirable. Additives for plastisol ink also are available to improve adhesion, he says.

Other suggestions:
Use transfers, which force fibers down and hold them in place, Hedge says. Switch T-shirt brands. "I've seen some brands where no matter what you do, you get fibrillation," Rainford says. "And I've seen some brands where fibrillation isn't a problem at all." Switch T-shirt types. "Ring-spun cotton is a bit nastier than an open-end, spun cotton because it has two different fibers," Rainford says.

No matter which combination of solutions you try, it's imperative to perform a wash test, as it's not possible to spot fibrillation problems when the shirt comes out of the dryer. "You can examine the print with a magnifying glass for loose fibers," Hedge says. "A wash test is the best, most obvious thing to do."

D.S.