Eliminate Fibrillation

or, Having *Fun* with Fibers

BY RICK ROTH

Fibrillation is defined as the rapid, irregular, and unsynchronized contraction of the muscle fibers of the heart. We aren't talking about that type of fibrillation in this article, although many a screen printer has felt like he was *go*ing to have a heart attack over the type of fibrillation that we *are* going to talk about in this article. Fibrillation in screen printing is when the fibers of a shirt stick through the ink deposit, giving a shirt, post-washing, a faded or even hairy look. Yesterday's nice, brightly printed shirt looks faded in tomorrow's wash and most days that is not a good thing.

Mike Beckman who works with EFT in Turkey and Egypt said to me, "What is so frustrating is that, generally, the better the shirt quality the more it fibrillates!" Here is the dilemma: Everybody wants softer and softer shirts and thinner and thinner ink deposits, but softer shirts tend to fibrillate more and thinner ink deposits tend to let them.

We are going to explore a few methods that can reduce or eliminate fibrillation, short of what Mirror Image ace printer Pete Vargas suggested to me: "Get a different shirt."

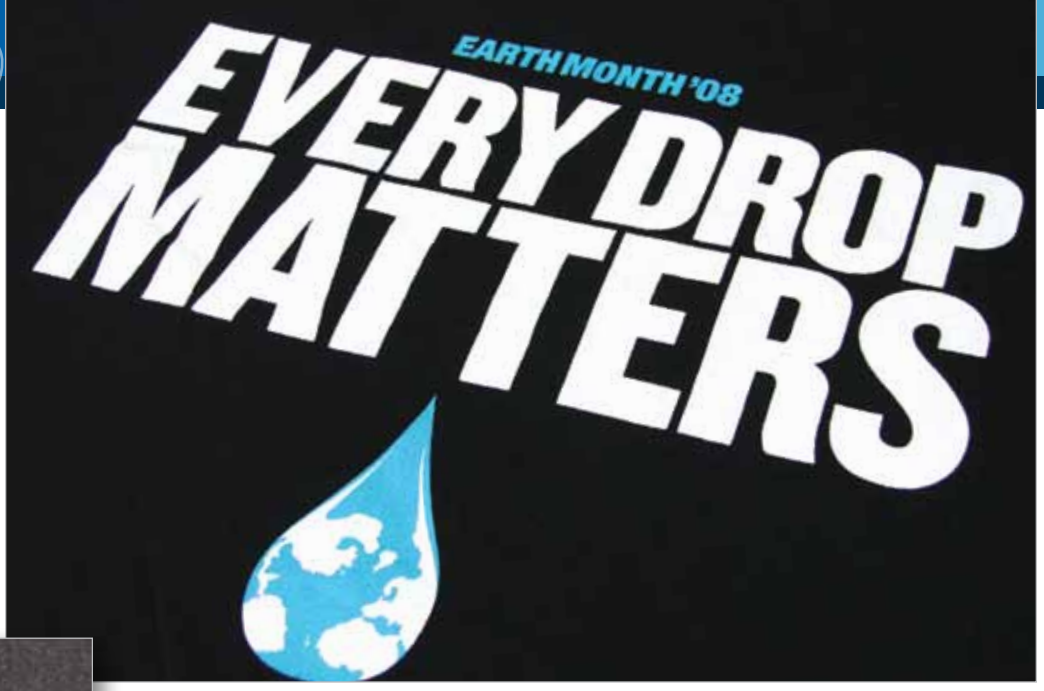
"Vanna White"—aka Denissa, of Mirror Image—shows off *the grand prize!* It's a lovely washer/dryer set, permanently installed in the author's plant. He allows employees to run the occasional load of laundry, as long as they throw in a test shirt now and then to check for fibrillation.

I am not a garment-construction expert, but I can tell you that some of the nicest, softest shirts seem to fibrillate the most, regardless of what people mean by "soft": 1. As in the plush sense of being thick fabric and, perhaps, ring spun, combed or carded cotton; or 2. Soft as in the thin, tight yarn, silky-smooth sense of soft. Either way—lots of cotton fabric or lots of cotton yarn—you are talking about lots of cotton fibers that are just waiting to break through the ink deposit and make the print look furry and faded.

Is fibrillation predictable?

Besides making an educated guess that the nicer the shirt the more fibrillation is possible, you probably should find *out* before your customer returns 1,000 shirts on Wednesday—one of which he wash-tested—and wants you to make sure the other 999 will be okay for his event on Saturday. If you didn't deal with it during the printing stage you are pretty much up the creek without a paddle.

So you need to obtain sophisticated testing equipment . . . which we call a washer and dryer. Hey, make your employees happy and let them do some laundry every once in a while. Throw in a test shirt from time to time, particularly when dealing with a brand of shirt with which you are unfamiliar. There is no substitute in my book for doing what your customer is going to do, wash and dry the shirt, if possible numerous times as cotton fibers can continue to break lose with repeated washings. Note: And please don't confuse fibrillation with under-cured ink. Fibrillation typically looks uniformly faded across the whole shirt and under close (or even not so close) examina-



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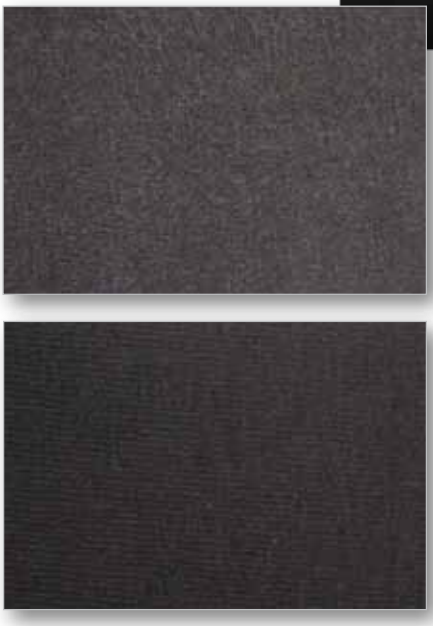
This figure shows a print with a relatively soft hand, and *no* fibrillation due to the author's having printed it with three thin ink layers—separated by flashes—to penetrate the shirt's surface, lock down the fibers and, finally, overprint all. (Images courtesy the author.)



These figures show the before and after results of printer Brian Lessard's experimentation with a fibrillation-fighting ink catalyst known as Fiberbond.

tion will look like fuzz all over the surface of the print; under-cured ink will come off in a "splotchy" uneven way.

Here is where I could insert a long discussion of whether increased fibrillation problems are caused by the ink or the shirt. Position one (as maintained by ink companies) maintains it is the fault of shirt manufacturers now making shirts with yarn that untwists and, in other ways, comes undone in the wash. Position two (as maintained by shirt manufacturers) is that inks have too much filler, not enough of the right quality pigment, are not elastic enough and, therefore, don't adequately keep the fibers down. This argument chases its tail and reminds me of PC versus Macintosh arguments that never get settled (even though Macs *are* superior.) At the end of the day, as printers we have to give our customers shirts that are not fibrillated, rather than excuses for why they are.

Shooting for moderation

So you know that fibrillation is going to happen with certain shirts, now what? If you are printing pastel colors on white shirts, the fibrillation will be present if you look at the shirt with a magnifying loupe, but won't be otherwise noticeable. The *most* noticeable fibrillation will be with large areas of dark ink on the lightest colors of shirts (particularly white) and that is where your effort to reduce fibrillation must be directed.

One solution is to simply lay down more ink, to lay down such a thick coating that the fibers are kept under a continuous film of ink. It is possible in many cases to just use a good ink company's good ink and lay down enough of a deposit to keep the fibers down.

But, as with so many things in life, you are shooting for moderation. Too little ink and the fibers poke their nasty selves through it; too much ink and you will have a harsh "plasticy" feeling print with a heavy hand. Printing even a moderate coat of ink is, of course, always aided by having a well-maintained, well-calibrated press with level platens and level, well-tensioned screens.

What you are looking for in a "good" ink is creaminess, long body (it will stretch without breaking), good crock resistance (when you rub a blank shirt on the cured surface it doesn't transfer pigment), that it doesn't build up on the back of subsequent screens, and that it lays consistently flat when you print it.

How much ink is just right? Okay, everybody get out your micrometers. What's that? You left your micrometers at home? Well, in any case, seek to print shirts consistently, keep notes about your consistent methods—and to what shirts they were applied—and don't forget to deploy your sophisticated testing equipment, as detailed above.

You will learn that, if you use the same squeegee, squeegee angle, off-contact, mesh, coating technique, ink, flood and print stroke you *once* used successfully . . . you won't get fibrillation the next time.

But what if you do?

Or maybe you *aren't* getting fibrillation, but your print has become nearly bulletproof in order to keep the fibers in place. I spoke with two of the best printers I know about this problem. Mike Beckman (developer of high-density ink) and Brian Lessard (winner of many industry printing awards while he worked at Mirror Image) who both acknowledged that some shirts just present a tougher problem than others.

Both acknowledged, though, that when dealing with problem shirts, one possibility is always to print multiple thin layers of ink, ideally three layers. If you have room on your press, you can print-flash-print-flash-print, creating a layer that penetrates the shirt, one that locks down the fibers at the surface, and a final layer that covers it all.

The figure above shows such a print that has a relatively soft hand (you'll have to take my word for that) but held down the fibers well compared to similar prints we tried with just two layers.

Lessard recently ran some tests on an ink catalyst called Fiberbond that, when added to plastisol inks, basically glues the fibers

down. The figures above-left show before and after washing appearance, and the effectiveness of such an approach. The downside to such an additive is it lessens the pot life of the ink and you cannot re-use the ink the way you would a standard plastisol.

Lessard also recommends putting down a curable clear ink—such as primer clear—which also can keep fibers down before the print even goes on. He said he's had particularly good results with this approach when, for one reason or other, his print order won't allow the black ink to print last and it might be picked up on the backs of other screens causing even more fibrillation than normal.

Lessard also detailed another approach, which involves printing a clear over the whole design at the *end* of the print order. The downside here is that it can leave more of a gloss finish than desired; but the upside is that you get bright colors that stay bright after repeated washing and you stop fibrillation. The procedure is to create a screen that covers all the other screens and, after all colors are printed, you flash and print a clear curable-base ink, then run the shirt through the dryer.

I recently saw a shirt that we printed in this way (over a process print, which are especially prone to fibrillation) over 12 years ago. It was on the back of a construction worker and the Sam Adams bottle in the print still looked good despite the shirt looking visibly beat up.

Ink manufacturers generally recommend printing such a final clear through a 230-tpi mesh. In our shop, on a good press with good technique, we sometimes use up to a 305-tpi mesh and get less gloss in the final clear, with just enough clear ink down to keep the fibers in place.

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A very delicate balance

Another approach to taming errant fibers is to do so with water-based ink. This can work well with white shirts, the ones that show fibrillation the most. Water-based ink can penetrate and color the fibers of the shirt so that, even if they *do* pop up, they're mostly the proper color. Water-based inks, despite new improvements, have the usual problems of drying in the screen, not being re-useable, and difficulties with coverage on dark or even medium shades.

On light colors, though, you can have good luck with water-based inks beating fibrillation. But another trade off is that you will probably have difficulties with ink color matching since the color of the fibers may not be *entirely* covered by the ink color.

Mike Beckman indicates that, at ETF, they often deal with fibrillation because of the fine cotton shirts they're usually printing. They also often have customers with very demanding testing for fibrillation that can include having to stand up to 15 washings. To pass these tests and combat fibrillation, Beckman generally prints a first-down clear using a longer-bodied (thicker, more elastic) clear base. He finds that even the best printer with the best efforts can't always keep fibers down, and must sometimes resort to using such a first-down clear with what Beckman acknowledges are his favorite shirts: the plush ring spun cotton shirts that are very soft. "They're the best to wear, but sometimes the most difficult to print."

I agree, and I must confess that it is simply a very delicate balance (can you say Zen and the art of screen printing?) between getting just enough ink down to enable the print to keep the fibers under control, but at the same time not have a print with a harsh hand.

To me, it is clear, though, that armed with clear inks the printer—whether printing over or under the actual design—can strike a balance and keep the fibers in check better than merely printing thicker coats of pigmented inks.

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