Heat Tolerance Testing for Digital Photos

by Chris A. Paschke, CPF, GCF

Photo 1: Samples—The assortment of 8½"x11" photo quality images were printed on an HPdeskjet 960c. Each image was split and heat tested; then a strip of laminate applied.

In my last Digital Directions article in February 2002, "Heat Tolerance Testing," I began with a layman's explanation of the basic digital technologies to help explain the similarities and differences of each. As framers we should be able to identify what we have before we can decide how to frame it; that is step one in the designing process known as definition. Hence, we must first define what type of digital it is, or might be (i.e.: piezo on paper, dye sublimation photo, thermal inkjet digital photo) in order to know how to best handle it.

I have recently come to realize two key things about framing digital prints. First, the design questions we ask must change. We need to ask questions that will help us identify the image. As frame designers we are taught to ask open questions during the creativity stage of the design process. These are questions that cannot be answered with a simple "yes" or "no." This is when we find out room colors, styles of furniture, and placement of the art.

With the digital revolution, we need to ask additional questions in attempting to establish where the image came from and to determine if it is a digital or traditional lithograph. We also need to know routinely if another copy is available and if the type of digital printer is known. (For this discussion I am not addressing fine art or limited edition giclées, but rather nondescript printed images—maybe poster prints or photos.) Requesting a duplicate image may have a negative connotation to us. This is probably because we fear we need a second one for back-up in case we destroy the first. But the request for a copy need not sound negative to the customer at all.

Asking additional questions that help identify the image are a must, not an option! It is just as important and positive as knowing the color of their carpeting. Ask in a positive tone about the origin and reinforce to them that only with a second copy can one be used for heat tolerance and moisture testing. This will ensure the best mounting technique for the visual enhancement of their image. This is not because you might damage the other one, but because you must first test the inks and papers as part of the entire positive framing process. It's a new concept, but one that needs to be adopted.

Equipment for the 21st Century

The second thing we must

As digital art becomes commonplace and consumers increasingly display this media, it's important for framers to be educated about it. Knowing how to identify, handle, house, and store these works of art enables you to assist your customer in deciding how to frame their items. In this six-part, bimonthly series, "Digital Directions," PFM has invited several writers in the industry to discuss the topics related to this subject today. This month, Chris Paschke reports on the results of her heat tolerance testing on digital photos.

consider when framing digitals involves the equipment we currently use to mount these items. For a while now, I have been educating framers and singing the praises of pressure-sensitives as the cold mounting alternative for today's digitals. As mentioned last month in "Mastering Mounting, Pre-Adhesived Boards: P-S and HA," the need to understand pressure-sensitives and their applications is imperative today. We must strive to better understand the differences and limitations of p-s adhesives as low, medium, and high tack. In turn, we must also consider the various application techniques of each. When high tack p-s materials are selected for mounting, the most time-effective and foolproof application technique will be with cold roller laminators.

In order to understand the digital world we need to speak the same language. In the digital and sign industry the term "laminator" means the fusion or bonding of multiple layers together, as in carpentry. In framing, we refer to laminating only as a layering of a vinyl glass alternative to surface of a mounted poster or photo. Roller laminators bond things to substrates, both beneath and on top of the image.

Five years ago few custom framers had CMCs, 10 years ago few had underpinners, and 15 years ago few had hot vacuum presses. Perhaps the roller laminator will be the next new machine in the framer's repertoire. With our growing awareness of heat intolerance when mounting digitals, it isn't a matter of production operations, but more of the best and safest way

Photo 2: Participating Papers—HP Photo Paper, Epson, JetPrint, Kodak, and Canon were among the papers tested.

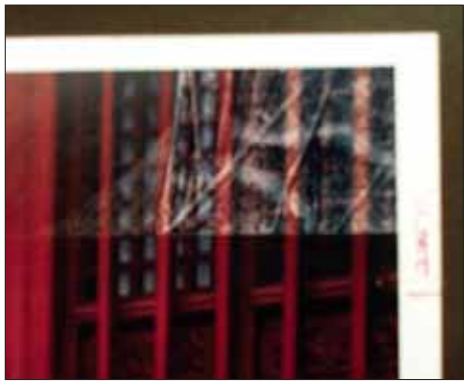

Photo 3: Laminating Damage—The upper right corner shows ink that was peeled away from the substrate when attempting to reposition the laminate within a minute of initial placement.

to mount an open edition digital.

Since framers often own heat mounting systems the roller laminator needed is a cold laminating version only. This would accommodate p-s polyester over laminating as well as cold adhesive high tack bonding. Both are perfect for digitals. There are new versions of these machines slated to hit the market within the year. I have been told that cold p-s versions, 41"-wide laminators with adjustable pressure to accommodate varied substrate thicknesses should be available for about $2,000.

At this point you may not be convinced that spending for another piece of equipment is necessary, but I guarantee that within a few years the volume of digital images will make this mounting process the least fearful of all of them. After all, I really did not think the CMC would catch on like it did.

The Testing Series

When conducting my initial heat tolerance test in July 2001 (with the results reported in *PFM*, Feb. 2002), I discovered that thermal inkjet (bubblejet) images on porous paper from an HPdeskjet 960c could tolerate heat from 150°F to 200°F, and also tolerated heat-set laminating using vinyls at 225°F. Oddly enough, nonporous from the same inkjet printer and inks could not tolerate even the lowest 150°F without surface image damage (See Photo 1). Thus triggered my second heat test in November 2001.

This test was devised to better determine the heat tolerances of digital photos while using only one printer source. In this way the printer technology would act as a control, inks would remain constant, and only the substrates would be variable in the test. It has been recorded that printout colors will change over the drying time of a printed digital and I wanted to be certain that all tested inks were as dry and set as possible. Any remaining moisture might impact the heat sensitivities. The same digital photo, enlarged to 8"x10" was printed onto full 8½"x11" photo papers and allowed to dry for one full week prior to heat testing.

All tested digitals were subjected to mounting temperatures of 150°F (66°C), 170°F (77°C), 185°F (85°C), and 200°F (93°C). Heat tests were conducted in a Hunt 210M-X Mechanical press, and the images were placed under

the clamped platen using single-sided release paper for periods of one, three, and five minutes as indicated. All tests were exactly the same (See Photo 2).

Then a strip of vinyl laminating film was applied across the top edge and it was placed into a 225°F (104°C) press to test both for heat tolerance and porosity. This is necessary to determine the tolerance of the printed inks under heat mounting and laminating conditions. Both perforated and nonperforated vinyl laminates were applied to the top end strip and placed into the hot press for full laminating temperatures of five minutes. Comparisons were made and the results are as follows.

Results at 150°F

The results were recorded on the chart whether positive tolerance or not (See chart on page 36). If an item is listed as "Yes," it passes the requirements to be a quality end product mounting that meets customer needs without damaging or threatening the digital image. If listed as "No," there was some form of visible damage resulting from the heat and pressure applications.

The viable alternative when a product image failed the heat tolerance would be a pressure-sensitive board, or non-invasive conservation hinging. At no time was lightfastness, monetary value, sentimental value, nor preservation noted, meaning that though a signed numbered limited edition giclée may tolerate the heat of a mounting process, it should still never be subjected to dry, wet, spray, or pressure-sensitive mounting.

In February's "Heat Tolerance Testing," the only image damaged at 150°F for one minute was the inkjet on photo paper, which prompted this more in-depth study. The damaged ink on photo paper from the original test was an HPdeskjet 960c printer on HP Premium Photo Paper mounted within two hours of printing. The same combination also failed this test, even after a week of curing the ink.

The new chart illustrates the dramatic results of only two digitals showing a heat sensitivity at 150°F—the HP mentioned above and Jetprint Photo Paper. There was also visible and unacceptable heat damage to the Jetprint papers by International Paper which are designed for use with all inkjet printers. It has recently come to my attention that Ilford has a line of paper called Jetprint also designed specifically for inkjet dye printers. Maybe this is a factor; the inks might require a specific printer and were impacted here. I still feel that at 150°F (66°C) a standard custom framer will be able to heat mount many digital items that are damaged at higher heats.

Higher Temperatures

With the press turned up 20 degrees to 170°F there was no significant difference or damage to the print surface over when mounted at the lower 150°F. At an even higher temperature (185°F), the same HP Premium Photo Paper and Jetprint Photo Paper were unacceptable, but the Kodak Premium Picture Paper-High Gloss also failed.

Laminate Results at 225°F

Laminates were tested as both perforated and nonperforated vinyl heat seal laminates. Temperatures were set at 225°F (104°F) and were kept in the press a full five minutes. All images tested created acceptable images when laminated and about half did not require perforated films at all. The heavy high gloss photo papers generally seem to react like traditional nonporous photos requiring perforated films for laminating. They also tolerate peeling after lamination to allow for canvas transferring. (Always remember to obtain copyright permission before doing a transfer.)

Other Observations

Since the test was designed to identify surface heat damage, I decided to test the use of Tullis Russell Hot Press Overlay Foil as is suggested to protect traditional gloss photos from release paper silicone. Two complete sets of photos were tested at all times and temperatures, one with new two-sided release paper and one with release paper and a sheet of Hot Press Overlay Foil-Acetate Sheet on the surface of the digital photo.

Results were varied. The HP Premium Photo Paper stuck to the overlay foil indicating an ink sensitivity to heat rather than silicone damage. Kodak Premium Picture Paper-High Gloss somewhat benefited from the overlay foil at higher temperatures, while the others all seemed only slightly improved.

The Epson Photo

Paper-Glossy showcased a high degree of orange peel in the

(continued on page 100)

Digital Temperature Chart

In the first heat tolerance test assorted printers and substrates were checked for heat tolerances. In this test assorted digital photo and inkjet papers were used to determine heat tolerances of images from a single standard HP 960c inkjet printer. It was subjected to normal dry mounting at both mounting and laminating times and temperatures. Tests were conducted using a Seal 210M-X mechanical press at temperatures of 150°F, 170°F, 185°F, 200°F, and the laminating temperature of 225°F for one, three, and five minutes as indicated. Specific problems are noted. The test was designed to help determine the acceptability of heat when mounting digital photographs as opposed to other available cold mounting methods.

Paper	Notes	Time	66°C 150°F	77°C 170°F	85°C 185°F	93°C 200°F	Laminate	104°C 225°F
HP Premium Plus Photo Paper		1 min	yes	yes	yes	yes		
HP Premium Plus Photo Paper		5 min					perforated	yes
HP Premium Photo Paper	Hot Press overlay foil sticks to inks	1 min	no	no	no	no		
HP Premium Photo Paper		5 min					perforated	yes
HP Photo quality Inkjet Paper Matte		1 min	yes	yes	yes	yes		
HP Photo quality Inkjet Paper Matte		5 min					not perf	yes
HP Photo quality Inkjet Paper Matte		3 min	yes	yes	yes	yes	not perf	yes
HP Photo quality Inkjet Paper Matte		5 min					not perf	yes
HP Photo quality Inkjet Paper Matte	Tested at higher temp, no laminate	5 min					no laminate	yes
HP Brochure and Flier Paper Matte		1 min	yes	yes	yes	yes		
HP Brochure and Flier Paper Matte		3 min	yes	yes	yes	yes		
HP Brochure and Flier Paper Matte		5 min					not perf	yes
Canon Glossy Photo Paper	Do not reposition laminate, inks peel off easily from paper base	1 min	yes	yes	yes	yes		
Canon Glossy Photo Paper		5 min					not perf	yes
Kodak Premium Picture Paper High Gloss	Release paper only, no Hot Press overlay foil	1 min	yes	yes	no	no		
Kodak Premium Picture Paper High Gloss	With Hot Press overlay foil	1 min	yes	yes	yes	yes		
Kodak Premium Picture Paper High Gloss	Temperature tested no laminate	5 min						no
Kodak Premium Picture Paper High Gloss	Release paper only, no Hot Press overlay foil	5 min					perforated	yes
Jetprint Photo Paper	All reacts to heat	1 min	no	no	no	no		no
Epson Photo Paper – Glossy	Orange peel in unprinted paper	1 min	yes	yes	yes	yes		
Epson Photo Paper – Glossy	Do not reposition laminate	5 min					not perf	yes
HP Multi Purpose Inkjet Paper		1 min	yes	yes	yes	yes		
HP Multi Purpose Inkjet Paper	Bleached out at highest temp	5 min					no laminate	no
HP Multi Purpose Inkjet Paper		5 min					not perf	yes

Though inconclusive at this point, it appears an image can be heat sensitive and not approved for dry mounting at the current average dry mounting temperatures of 170-185°F (77-85°C), yet still be approved for lamination at the higher 225°F (104°C) because of the vinyl coating. Many digital photos seem to tolerate the new low dry mounting temperature of 150°F available as a heat-activated (HA) mounting board, though not all accept even this low temperature. Recommendations will continue to be cold mounting over heat mounting for digitals unless the source is known or a secondary image is available.

Laminating adhesives do not liquefy and clump inks as the toners do with electrophotographic color copies, so laminating is an option for all digitals tested. Since some ink and paper combinations are more nonporous than others it is still recommended to use perforated films in the event porosity might be an issue. Numerous digital photos were porous enough to use a nonperforated film.

unprinted photo paper itself, prior to printing of the photo or bonding. The same image did not allow for the typical repositioning benefit of the vinyl laminate without significant ink removal and irreparable damage (see Photo 3). This is no doubt due to the fact that Epson printing papers are designed for the Epson piezo inkjet printer technology, and not the thermal inkjet printer that printed the photo for this test.

Final Chapter

At the February PPFA Conference/PMA Show in Orlando I unearthed a few new pieces for the digital puzzle. It seems I was under the misconception that Epson produced both piezo and thermal inkjet printers, when actually all of their printers, both wide format and desktop, are said to be piezo (a.k.a. micropiezo) technology. That tidbit of information has launched me on yet another quest, Heat Tolerance Testing #3.

With the support of Epson, I hope to complete yet another digital photo test similar to the one reported here. That test will use an Epson photo quality desktop printer with piezo technology as the control, appropriate Epson piezo papers, and the assorted substrates used here to check heat tolerances and quality. Welcome to the 21st century and our world of digitals! ■

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