KEEPING PACE

A Monthly newsletter devoted to the art of darkroom photography

Volume 9 March 1988

HOW TO PROPERLY HANDLE MATRIX FILM

How to expose, process, and run Matrix film

Matrix film has been around for a long time in one form or another. The first time I was introduced to it, it was used in the old wash-off relief system. The material was made with nitrate film. Many are the times when a fellow technician would flick his ashes into a waste basket that Contained a few scraps of film left over from tests, and woosh!, a cloud of black smoke would suddenly fill the room. This material, except for the fact that it was coated on nitrate base, was about the same as today's matrix film. Consider it as if it were a sheet of black and white paper. It has many of the same properties as black and white paper. It has a similar contrast and it also is color blind. The main difference is that it is an emulsion quite unlike any other and could be processed with normal black and white paper developers as well as film developers.

It used to be processed in any Metol developer and then bleached and hardened using a Pottasium Dichromate bleach and clearing it out with sodium chloride and plain hypo. This bleaching action actually hardened the emulsion where ever silver was present and produced a gelatin relief image. This phenomenon was discovered sometime in 1861. Gelatin relief images have been around for a long time.

However, in 1947 a new matrix film was introduced by Kodak and so was the new chemistry and the name of the process changed to Dye Transfer, instead of the Wash-off process. Basically, it is and was, the same process. except that the emulsion was now coated on an acetate base. Modern matrix film is now coated on a polyester base. The main difference in any of the variations where matrix film is used, is in the way different technicians used the materials. Some people just imitated what others have done and some people made inroads by experimenting with the process.

The new chemistry consisted of a Tanning developer and a simple non- hardening fixer. The main ingredient is paragollic acid (Pyro). The chemistry was supposed to have been a secret, but a few die hard photo chemists came up with their own formulas.

The tanning developer consists of two parts. The active ingredients are in the A solution and the accelerator is in the B portion.

Here is a formula for tanning A developer that works perfectly.

Start with 2000 cc of 125 degree water

Elon	16 Grams
Sodium Sulfite	8 Grams
Potassium Bromide	16 Grams
Pyro	18 Grams
Citric Acid	4 Grams

Stir all chemicals in their proper order.
Add water to make 1 gallon.

The Matrix B portion of the two part developer is Potassium Carbonate (Anhydrous)
9 1/2 pounds will make 5 gallons. Mix this in two gallons of 95 degree water and it will heat up to 120 degrees as you dissolve the powder in water. Add cold water to the mixture to bring it up to room temperature.
The "normal" use of these two parts of the tanning developer is :
One part A to two parts B.
Some of the recommendations that are supplied with the film are, in my view, not as accurate as they can be.
For instance, the recommended developing time is two minutes at 68 degrees. Then a water bath is next, for 30 seconds. The final stage is the fixer. I have used all kinds of non hardening fixer.
A simple mixture for one gallon is as follows:
A one liter graduate, filled with hypo crystals, mixed in warm water. Add a capful of Potassium Metabisulfite to the mixture which acts as a preservative.
You will be able to fix 6 sets of 16x20 matrix film in this one gallon of fixer. It will turn yellow, but still be an effective fixer.
But let us start at the beginning. The developer can be used anywhere from 66 to 72 degrees, as long as you repeat the temperatures. The actual time is not as critical as one may think. I have always favored 2 1/2 minutes. I have made tests and found that the extra 1/2 minute adds only a slight amount of density to the set, but allows for smoother development.
The tanning developer is such that it will quickly dissipate and oxidize once it is mixed. The literature that comes with the film says that you have a minute or two to adjust the developer to the right temperature. I contend that once you mix the two parts together you have a limited time in which to act. I have tested the results of development by adding the A and B together and waiting 5, 10, 20 and 30 seconds before processing and found a different result each time. I personally would not wait any longer than I absolutely had to. It's best to establish an exact time to wait before beginning the actual processing.

I mix my batch, rock the tray two or three times, and place my first matrix (the cyan printer) in the tray no later than **15 seconds** after mixing. The clock is set at zero. The film is placed into the tray emulsion down, then immediately turned over and rocked from side to side for ten seconds then flipped over again, emulsion down. At the 15 second mark, the next sheet of matrix (the magenta printer) is also placed face down, and then turned face up and also rocked for ten seconds. All of the film in the tray is moving and not sticking. After the film has rocked for ten seconds, it also is turned face down and then at 30 seconds on the clock, the third sheet, (the yellow printer) is placed into the tray, also emulsion down., then emulsion up for ten seconds then turned face down. At this point I interleave the film as follows. The bottom sheet is pulled out and placed on top of the pile. Every 5 seconds the act is repeated with the next bottom sheet. This goes on for 2 1/2 minutes on the clock.
The next stage is a critical one for me. The literature says to place the sheet of matrix in water in order to stop any further development. I don't feel that this is adequate. I use two liters of 1% acetic acid rinse instead. I also time

the film in this solution. I made tests and found that after 35 seconds all action was stopped. I therefore leave my films in the stop bath for 45 seconds, just to be sure.
Now, back to the processing. At exactly 2:30 minutes the first sheet is placed into the stop bath with the same ritual that I used when going into the developer. At 15 seconds intervals the three sheets will all be in the stop bath. at 3:00. When the clock reaches 3:15 minutes the first sheet will be placed into the fixer. Allow 5 seconds time for draining the sheets. Every 15 seconds another sheet will be placed into the fixer. When all three sheets are in the fixer, keep interleaving them until all three sheets are clear. The clearing process shouldn't take more than 20 seconds.

Lights on at this point. Wash off each sheet, emulsion up, in a tray all by itself with hot water (120 degrees) until you think it is clean then wash it two more times. Wipe off any emulsion that may adhere to the edges of the film. Use your thumb nail.
What have I done that seems different than anyone else? Not too much, except for the fact that I constantly worry about being consistent and accurate so that the film will be developed evenly. I make sure that I don't ever get panicky. Take your time and develop a smooth style that is repeatable. I had employees that would get so exited in the darkroom and felt that lots of agitation was necessary in order to get even development. They had chemical stains on the ceiling of the darkroom. This is not the way to work. Agitation will not create a difference in contrast, as many would think. The question of contrast is the sole concern and responsibility of the proportion of the A and B you have in your developer mixture. If you want more contrast, add more B to the solution.
One part A and two parts B is normal. But if your negative is too contrasty, make the mixture one part A, and one and one half B. This will lower the overall contrast of the image in your matrix film. I have gone as far as one part A to six parts B for a special effect. Some labs have softer enlargers and rather than adjust the contrast of the separation negatives, they would rather adjust the A and B portions of the developer.
One of my students, David Levy, in New Jersey is getting excellent results using a Jobo processor. The masks and negatives are processed cleanly and to the proper contrasts with no problem, however, he has had a special tube made for him by the **Jobo** people in An Arbor, MI., that will allow him to insert an oversized 16-1/2 x 21- 1/4 sheet of matrix film and gets perfectly processed matrices. Only one sheet is processed at a time, but it is immaculate. The entire processing of three sheets takes about one hour. Is it worth it? Apparently the answer is yes. Many people write to me and say that they wouldn't take any chances by processing three sheets of film at the same time. If you have doubts about your ability to handle three sheets, consider a Jobo.
Evans-Avedesian, a rather famous New York lab has eliminated processing the film by hand. They have built a device that resembles a clam shell. The three sheets of matrix film are placed into this contraption and the process is automatically handled from there to its conclusion. He has even eliminated the fixer totally when making matrices. The development is basically the same, but a 2% acid rinse is used for the stop bath, and while still in the dark, they place the matrix film through the hot water stage and proceed to wash off the matrix. The results will look rather strange, since the silver is still in the emulsion. But it works, and that is what counts. In fact, when the film is dyed up

and then transferred to the sheet of Dye Transfer paper, the cyan dye that is in the matrix will leave the matrix as it is being transferred and you can tell when it is all transferred. This next step has some people confused. Most of the professional labs in the country place the matrix film directly into the dyes as soon as they have been washed off in hot water. I used this technique for many years. It works fine, except for a few important exceptions. Kodak recommends that the film be dried first, than added to the dyes. If you have ever taken the time to compare the difference between the two techniques, you will find that the first prints from each system will not look the same. However, the rest of the prints will look about the same. The main reason for this difference is the amount of water that must be replaced by the dyes when going right into the dyes from the hot water rinse.

The most important thing to consider here is just what happens to a set of matrices that have just been added to the dyes, straight from the hot water rinse. The emulsion is extremely soft and easily scratched. They are susceptible to picking up all kinds of specks of dyed emulsion and dust and there is no way in the world that they can be removed, short of drying the films and etching them clean with a sharp blade. Keeping the dyes clean is one way of eliminating these annoying dust and dirt problems. I filtered my dyes each morning with a 5 micron system, but I still picked up dirt.

The solution was established by **Bob DeSantis labs in Los Angeles.** He determined that if the dirt kept coming back, no matter how often the dyes were cleaned, than why not harden the mats and dry them, and all that had to be done during the transferring process, was to wipe the matrix clean with a "Handy Wipe" cloth that is available in any food market. He used a formaldehyde solution mixed with water and a few drops of photo flow. At first his formula consisted of 50 cc per gallon of water. This made anyone's eyes water. But it worked. The blades normally used for etching would wear out much sooner than before. Eventually he has reduced the amount of formaldehyde to 5 cc per gallon. The film is placed into this solution for two or three minutes then hung up and dried. That's it.!

Some production time is lost because the film is dried first, but the time and aggravation that is saved by hardening the matrices is worth it. I have been hardening my mats for years. Make sure that you have plenty of ventilation when using formaldehyde. It isn't the best thing for your health.

Different methods used to establish the correct exposure for your matrices.

Exposing the matrices is done differently by almost every lab. Some use the readings of the grey scale derived by using a densitometer. Some will use a density reading of a neutral area in the image and compare all three reading and make the adjustments from these, and some will actually make a set of black and white prints (called bromides) and visually compare different neutral areas in order to get a "balance". When a balance is determined, then finding out the difference between the paper and the film is the next obvious step. I have done all of these things. Some labs will use a densitometer and read the grey scale that is placed next to the image and determine what the balance should be.

I have a different system than most. After doing just about what everyone else has been doing I came to a conclusion that the best place to determine the balance of the print was on the easel. I determined that the image would be altered because of the fact that I

was going through an aerial system and subject failure would occur. By taking readings of the middle step of a three step grey scale, through the lens, and on the easel, you will have eliminated the need for trying to guess at what the subject failure has done to the balance.

Let me explain what subject failure is.

If you had a transparency of a little red haired girl wearing a red dress and a red hat and she was standing against a red wall, and you made separation negatives using the standard red 29, green 61, and the blue 47b, what do you think your separation negatives would look like? I can tell you. The cyan printer (red negative) would look pretty dense. The magenta printer (the green negative) will look quite thin. The yellow printer (the blue negative) will be the most thin of all. She may be wearing a white flower on her coat lapel, and the flower may have identical negative readings, according to a densitometer, but, I can assure you, that the three exposures will not be the same if you are using an enlarger to make your matrices. The amount of flare produced by the thin negatives will be enough to almost light up the room when the enlarger is turned on. This will cause flare and change the amount of light needed to make a proper exposure. You will be out of balance when making a print. Any kind of print. It doesn't matter. Subject failure is one of the problems that you will encounter when ever an enlarger is used and you are using any "negative to positive", or "positive to positive" printing processes. Subject failure is not present with today's scanners, since they use a very fine and sharp laser beam to separate the image and no optics are involved. If you shot large negatives and made contact prints then flare is also not present.

You do remember Edward Weston? He was such a purist that he made contact prints from 8x10 negatives. He was very aware of the problems encountered with enlargers. Besides the subject failure to contend with, he also had to worry about inadequate lenses.

I use a Wallace fisher Easel meter that reads actual densities. However, any quality easel meter will do the same thing. I pick out the middle step of my three step grey scale (Kodak's Q6C). This is used only to determine a balance. And If I want to, at this stage, I can make changes in the balance according to my own personal wishes and either subtract or add the changes logarithmically to my normal balance.

For instance, if my exposures were 10 seconds for each negative, and I wanted to add a magenta equivalent of 10cc, I would add .10 to my exposure for the magenta, using a slide rule of a scientific calculator.

The new exposure would be 12.58.

Regardless of which system you plan to use when making matrices, I strongly suggest that you make a small print (8x10) of any area that you feel is important and make your corrections based on the small version.

Make sure that the amount of developer used in making the small print is accurately determined. It should be the same proportion as the larger set of matrices. Measure the square inches of each size and make sure the amount is in the correct proportion.

Running the print is probably the easiest part of the process and yet, it is the most important part. An inexperienced worker can completely screw up a good set of matrices, and a good worker can probably save a job made with poor matrices. The trick is to make little contrast adjustments to the dyes and density adjustments to the rinses in order to achieve your final goal. If you are a qualified transfer person, you should be able to make a scenic look as though it were shot on a warm sunny July afternoon

or a cold February morning, just with the controls that you now have on your work table. This does take experience, but it is easily learned and is one of the reasons for the success of Dye Transfer. Adding contrast to the dyes is accomplished by adding small amounts of 28% acetic acid to the dyes. In order to lower the contrast of the dyes, add Triethelalomine (10%) to the dyes. Kodak supplies you with the exact amounts for going up or down using these chemicals.

The Paper Conditioner should be checked frequently for its accuracy in holding its PH. A simple PH meter is available from Edmund Scientific, in Barrington, New Jersey. This will alert you when things are not right. Too acid a mixture (low PH) will result in very long transfer times. and too alkaline a mixture (high PH) will speed up the transfer, but the dyes will bleed and cause even more trouble.

One of the problems that you will encounter when running a print is if any air bubbles get trapped between the register pins and the paper and matrix, you will get a phenomenon called "skipping". This trapped air can be avoided by using plenty of acid rinse just before the contact area before attempting to make a transfer. Using a good squeegee will help to eliminate this headache. With a little practice, you will easily master this problem.

A lot of talk has been going on about the archival properties of various kinds of prints. And a lot of hyperbole has been generated by various manufacturers about acid free boards and boxes. Let me put you straight. Cibachrome print material has much longer lasting dyes than do the Dye Transfer prints. However, much progress has been made by Morey Bard, in Florida, who has made various kinds of dyes that can be used in the dye transfer process, and that will outlast anything known to man.

But the important thing to remember here is that no matter which dyes last longer, the separation negatives, and the matrices are truly archival. The polyester bases on both the negatives or the matrices will last indefinitely, and the silver content is as good as gold. In other words, the main parts of the dye transfer print will last "forever". You will have to walk on the matrices or negatives with golf shoes in order to damage them. If the dyes ever do fade, and they all will eventually, just pull out the mats, (or have your great-grandchildren do this) and pull another print.

The next thing to consider is whether or not the dye transfer print should be kept in an acid free box? Considering the fact that the dyes are made with strong acids and the rinsing of the print is made with 1% acetic acid and even the paper Conditioner is made using strong percentages of acetic acid, what difference in the world would the box make, whether it is acid free or not?

The next thing to consider is just what are you trying to accomplish by making a dye transfer print? If you were serious about making a really fine color print, at the very beginning of the process, you should have already seen the finished print in your minds eye. In order to make a fine print, you must think like an artist. The finest artists already know what their painting is to look like before they even start to squeeze the paint out of the tube. You must be aware of what kind of contrast you want. The color balance is not a happy accident. It must be planned. The mood of the photograph can be lost if care isn't taken so that the mood is kept throughout the entire process. True, most of the dye transfer process has to do with mathematics and procedures, but the real dye transfer printer knows what kind of an effect he is looking for and works towards that end.

How can you "retouch" a print without really retouching a print?

As you know, Eastman Kodak has had their own dyes formulated for the Dye Transfer process. The colors consist of cyan, magenta and yellow. These dyes have been around for many years. Newer dyes have been produced that will last longer and give better renditions of color for a quality print, but the loud noise that you hear will be coming from the retouchers. They have spent the better part of their lives learning how to retouch a Dye Transfer print using bleaches and dyes. Opaque colors are no longer acceptable because of the accuracy of the scanner in picking up any foreign surface.
The only real corrections that should be made by a lab technician are mostly superficial. Leave the retouching to the experts. For instance, if you wanted to make a black dye, you would think that equal amounts of dye, placed in a small vial, would produce a black. Not on your life. Equal amounts of color density will produce a black only if they they are transferred, but not if they are actually mixed together. You can mix the three primary colors together in disproportionate amounts and get what may look like a black, so if you wanted to add a black printer to your dye transfer print, you could, and then get added depth and saturation for achieving a special effect. But transferring the dyes will produce a real black. Once the print has been finished to the best possible color balance and you are still not totally satisfied with the final result, what can you do to improve the "look" of the print? There are a number of things that can be done. Remember, you are working with three matrices. They represent the cyan, magenta and yellow printers. You can add any color or colors to the matrices in any area and double transfer the matrice in order to affect a color change. All of the professional labs have been doing this for years. This is one approach that Elliot Porter has been using very successfully for many years.
But what about cleaning out dark spots or unwanted amounts of color that may appear after running the final prints?
Lets start with lightening or removal of a cyan spot. Using a solution of 2% acetic acid, add some Potassium Permanganate(just a pinch) add a few drops of Sulphuric acid and use a # 0 or #00 or even a #000 brush to add the permanganate mixture to the print. The color of the mixture will govern the kind of cleaning out you will get. If the mixture looks weak, then the action will be slight, but if the mixture is dark, then the action will be strong. Wipe the brush on a piece of toweling in order to make as sharp a point as possible. Touch the spot with the tip of the brush and wait a few seconds. Then use a small piece of cotton moistened with a clearing solution of Sodium Sulfite or Pottasium Metabisulfite. (one teaspoon to a liter of acid rinse). This should clear the spot. You may need more than one application to completely remove the unwanted spot. Never use water in any of the solutions or in the rinses. Always use a 1% acetic acid rinse otherwise the dyes will run and bleed.

The only alternative to this method is to dry the matrices dyed up, then etch the matrice with a sharp blade. This, however, will leave scratch marks on the print and this will be even harder to correct.
The strength of the solution depends on how you much permanganate you add to the rinse. You can mix the Permanganate to a color anywhere from rose wine to a deep burgundy color. The deeper the color the more it will bleach out the spot. If after clearing the spot with the bisulfite solution a brown stain persists, use a stronger mixture of Bisulfite

instead of what was described. Be careful, however. Too strong a mixture will destroy the fibers in the paper and possibly ruin the print.
If you wanted to remove a light **cyan** cast from a larger area, simply mix a weak permanganate solution (rose wine) and use a piece of cotton to wipe it on, and another piece of cotton to clear it. When you are satisfied with the result, use a fresh piece of cotton soaked in 2% acid rinse and wipe the print. If you are removing a dark spot, use the stronger solution (burgundy) and touch the spot with the smallest brush and let it sit for a moment, then clear the spot with the bisulfite solution.
The **magenta** spot can be removed using either Kodak's Photo Flow, # 200 or # 600. Place the photo flow on the spot and let it stand for a minute. Then just wipe the area clean, using acid rinse. Try not to let the photo flow stand too long as it will cause bleeding and possibly soften the image. In order to remove a large portion from a face or any other area on the print, dilute the photo flow with acid rinse and use cotton to flow it on and cotton soaked in acid rinse to wipe it off.
The **yellow** has been the most difficult color to remove for many years. Kodak recommends that Sodium Hypochlorite (Clorox Bleach) be used. It will remove the yellow and even the emulsion. Some retouchers have used Pepsodent toothpaste and say that it works fine. Others have used Woolite and still others have secrete concoctions that seem to work.
Here is one that I know works great. Sodium Thyocyanate (a 25 % solution) mixed with acid rinse will clean out yellow very quickly. You will be able to see it on the cotton swab that you use to wipe it off. At first, the area will turn purple, but as soon as you clear the area with acid rinse, the true color will once again be evident. These are some of the things that you can do to improve your print before the client or a retoucher gets it. This is not a retouching course, but simply a cleaning course.
And a further note. For those of you who are interested in making multiple pieced strip-in dupe transparencies, look for some news in the not too distant future from the makers of the lysle Camera, in Fountain Valley, CA. They have been working with the camera designer, Don Mitchell, of Image Concepts in Kansas City, MO. The new system will have a 4x5 enlarger head and a precise registration carrier. The easel will have X, Y and X movements and all sizing , color balance and exposures will be controlled by a computer. This will offset the advances being made by the digitizing scanners because of its low price. The greatest advantage is that it will allow you to present to your client a piece of film that is complete and ready for separation, by whatever means. This should be very cost effective. If you have a lab that is specializing in making large prints or transparencies for "point of purchase" use, consider the ability of adding lettering or other photographic elements to your companies list of services. This will keep the "wolf" from the door. Scanners should not be able to invade the display field.

For those of you who have not yet subscribed to my news letter, the back issues are available for $5. ea and the yearly subscription is only $50.

The book, "The art of Photo Composition" is still available for $50 per copy.

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