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Water-Based Screenprinting

All Topics in Silkscreen Printing:

https://www.nontoxicprint.com/screenprintingcontent.htm

Converting to water-based technology

Roni Henning | Henning Screenprinting Solutions

'I have been a printmaker (primarily screenprinting) for over thirty years, making fine art editions for artists, both emerging and well known. Among those artists were...'

Agnes Martin, **Romare Bearden**, **Jack Youngerman**, Alice Neel, **Andy Warhol**, **Red Grooms** and Larry Zox.

Roni Henning in her NYC studio

⊕ **Making a Screened Watercolor Monotype**

⊕ **cmyk Printing Made Easy**

Eighteen of those years were spent at The New York Institute Of Technology's Screenprint Workshop as their masterprinter-in-residence. The Workshop was a unique facility that allowed artists to make limited editions of their art in collaboration with the masterprinter. It also permitted the students to have an opportunity to watch prints being made professionally by established and prominent artists. In that way it functioned as a teaching facility.

I also taught the screenprinting, etching and design classes at the college. At that time the Screenprint Workshop was a solvent-based facility with oil-based inks and naphtha and acetone as the cleaning materials. Although there were fans there was no exhaust system to remove the bad air and replace it with fresh. Such a system was very costly and the college couldn't afford it. It was after completing a forty color edition of 600 prints that I started to question what I was doing to myself, the environment and my students.

Printers are a rigid breed and once they have developed a system of printing that works well, they are reluctant to change. I myself had felt this reluctance. I didn't realize that if something is poisoning you and the environment it can hardly be considered to be working well, even though the product looks good. Once, when I was working for another print studio in New York City, and I was traveling home on the subway, I overheard two people commenting on how they thought they were painting the subway cars. But I knew it was only me, my clothes smelled of silkscreen ink.

Looking for Waterbased Options

There were water-based inks out there at this time that were used for crafts in the schools but they had a limited, poor color range and because of the water content they also buckled the paper. Some art colleges were using a toner and transparent base system but none of that was professional enough for the artists and galleries that I worked with. I was a printer that was used to mixing colors from gallons of opaque ink with a large diverse palette. I could then add transparent base if need be, but I would also have the opacity if that were what the print required. So I started to look around for options.

TW Graphics is a silkscreen supplier located in California. They were recommended to me

by a fellow printmaker. They offered a line of opaque water-based inks that they claimed was comparable to their oil-based line. So between 1985-86 I tested and printed with their 1000 series. It's one thing to print your own art work and maybe accept some imperfection but not when you are editioning for other artists and major publishers like Pace Gallery. So it took time to get the results that I needed. There were problems; particularly with ink not drying thoroughly and having prints stick together when they were stacked. When working with water-based inks you have to change your methods. Everything has to be blocked out from the inside of the screen not the back. The emulsion must be resistant to water but able to be reclaimed.

According to
Stanford University
Airborne Fumes and Toxins
are **1000 x Times**
more harmful when used
indoors

When you pull the squeegee across the screen it isn't as fluid as oil-based ink. All of those issues had to be dealt with. Today those inks have been reformulated and the sticking problems solved. Even the slippery quality of the ink is better. There are other manufacturers like Speedball who have greatly improved their water-based acrylic inks. There are also a few other companies like Standard inks in New York that will give you a good professional result. Createx inks work with a base and toner system and the color range is very good. Even though there is nothing comparable to oil-based fast dry enamel and lacquer inks there is enough variety in the water-based line to make any health and environmentally concerned person switch. Every artist that I work with tells me how wonderful it is to work in a toxic free print shop.

The reason I wrote my first book, *Screenprinting Water-Based Techniques*, was to showcase the creative, high quality prints that were made with water-based inks and to assist serious printers and artists in their transition from an oil-based system.

When I was experimenting with perfecting my printing techniques with the water-based inks I started playing with other watersoluble materials to see if I could print them through the screen. That's how I started making monotypes with a screen. First I tried various watersoluble crayons and pencils but soon discovered how to use watercolor and gouache to create unique monotypes and monoprints. My second book published by Watson-Guptill, *Water-Based Screenprinting Today*, devotes a chapter to making a monotype, or monoprint with a screen, and showcases a variety of prints made by other artists working with me.

Roni Henning - Water-based Screenprinting

Interview with Roni Henning

Making a Screened Watercolor Monotype

A monotype or monoprint is simply a painting that is made using a printing process.

Traditionally they are made using an etching or litho press. The distinction between the two is determined by how the artist begins.

A monotype begins with a blank stretched screen and a monoprint starts with an image or stencil already on the screen. The instructions below are for making a monotype.

Begin the process with a screen stretched with a white 195-230 mesh monofilament fabric. A higher number will give you a finer mesh and image, and a lower number will give you a slightly coarser mesh and image but heavier deposit of color.

Block out the area of the screen that you don't want to print, leaving only the opening that you want the color to pass through.

The simplest method for blocking out a screen is to draw an opening (square or rectangle etc.) with a pencil and ruler on the inside of the screen. Then apply wide transparent packing tape on the outside of the lines to create the opening. This thin, tacky tape adheres securely and doesn't come off with the pull of the squeegee.

Cover the rest of the exposed screen to the edges with clear contact (shelf) paper, available at any hardware store. This leaves only the area to be printed open. There are more permanent methods of making an open area on the screen with screen filler or photographic emulsion, but I find that the taped screen is fast and efficient. It's especially useful for the artist that likes to change the size of the opening without having to clean off a permanent stencil.

Once the screen is prepared you can begin the painting process. Each artist approaches a

monotype differently. You can paint or draw directly onto the screen just as you would onto paper or canvas, or you can rely on a matrix. This gives you something to work from like a photo or drawing.

Painting The Screen

Screens can be painted anywhere, not just on a printing table. I used to take a screen outside in my garden to paint it. All you need is a table or flat board on which to prop the screen. Raise it slightly off the surface so the paint doesn't go through. Then begin.

Any brand of watercolor or gouache will work. Some just work better than others, usually the cheaper brands that have less pigment. Watercolor will release from the screen more easily than gouache which is denser and tends to resist in the screen. This quality gives the monotype an unpredictable result. Experiment with various paints and techniques to develop a more informed idea of how to get the desired results.

If you paint too thickly or one color on top of another, it could cause the colors to resist so only the edges of the painted areas print. You may like these effects, otherwise print in multiple steps if you want to layer colors. The pigment concentrations in different brands also produce varying results. Dry the paint with a hair dryer before printing to prevent it from smearing.

Printing The Screen

All you need to print the monotype is a table, or a board with hinge clamps to attach the screen. Hinge clamps can be purchased at most art or silkscreen supply stores. There is no need for expensive printing equipment. You print monotypes and monoprints with transparent water-based screenprinting base. TW Graphics, Standard, Speedball and Createx are some of the suppliers. You can also get Speedball at Dick Blick.

Although you can print on any paper or surface I like 100% cotton rag paper, such as Arches cover, Arches 88, Rives BFK, Somerset, or Stonehenge. The smoother, harder paper like Stonehenge is a good choice when printing detail or pencil and charcoal drawings.

Fasten the prepared screen into the hinge clamps. Hold the front of the screen up with a small block of wood. Mix 10 - 15% retarder into the transparent base to retard the drying time and help the watercolor release from the screen. Two good retarders are Golden Acrylic and Propylene Glycol. Align the paper under the screen and mark its position with registration guides like small pieces of cardboard or masking tape. Place two on the front of the paper in front of the screen and one on the right side. Tape the paper down if you are not using a vacuum table. This will allow you to print more than once without the paper moving. You use a squeegee to flood the screen, that means pushing the base across the image while the screen is up. That re-wets the painted area. Flood the screen back and forth 2 or 3 times until you see the color start to dissolve and show on the squeegee's blade.

Remove the block of wood and lower the screen directly onto the paper. Keep the squeegee at a 45-degree angle and pull it across the image. Always end your flood stroke away from you so you can print by pulling the squeegee toward you with even pressure. Lift the screen and examine the print. If it is too light and not enough printed you can either flood and print again or you can print on a second sheet of paper. That would give you two prints that you could print on again when you repaint the screen. Sometimes you can get 4 or 5 lighter versions (called ghost images) like that, to print over in a variation of the original colors and create a series. Whenever you pull the squeegee across the image make sure that you don't reflood with base that is full of color. That will cause streaks on the next printing. Scrape that base off and pour fresh base in the screen. You can use the tinted base to add to silkscreen ink to make it transparent. Don't discard it.

The printing process adds its own dimension to the character of an image, different from a direct drawing or painting. That is why artists love monotypes and monoprints. There is always the element of surprise after you print and look at the image. Experiment with drawing and painting techniques. Try painting thickly and thinly or wetting the screen and then painting. Once you get used to painting on the screen add watersoluble crayons. Next try graphite pencil and charcoal. Even though they are not watersoluble the pressure of the squeegee forces them through the screen onto the paper.

Once you are finished printing, scrape all the base out of the screen and remove the tape and contact paper. If you have a sink that is big enough for your screen you can wash it there with a good hose. Otherwise you can wash the screen on the table with a sponge, paper towels, and a container of water. It's so much more pleasant than the old days with solvents. I used to dread cleaning the screen with naphtha. If the watercolor and gouache is hard to remove with water just use simple green or any detergent and a scrub brush to remove the stubborn spots. RH
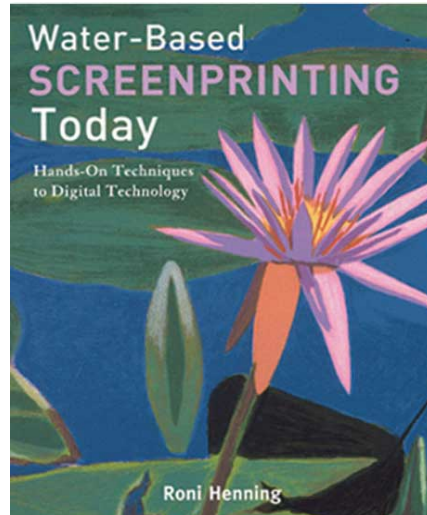
HENNING SCREENPRINT WORKSHOP

Roni Henning is available for contract printing specializing in Monotypes and Monoprints and consultations for converting to non-toxic screenprinting.

Water-based Screenprinting weekend workshops are held monthly at her studio and one-day tutorials upon request. Check the website for dates and times.

In addition to teaching at her studio Henning teaches on an on going basis at The Lower East Side Print shop in NYC.

Roni Henning's latest book
Water-Based Screenprinting Today
published by Watson-Guptill is also available at amazon.com

Editorial: Master printer Roni Henning has embraced water-based screenprinting for its benefits to both the environment and her personal health. In this insightful guide, she has gathered the works, techniques, and experiences of many of the talented artists and printers with whom she has crossed paths during her own illustrious career, printing editions with the likes of Romare Bearden, Andy Warhol, and Jack Youngerman.

Through the work of Bearden, Youngerman, and Gene Davis, among other top artists, you are guided through the traditional screenprinting process, from building and stretching a screen to color separations, color mixing, proofing, and printing. Henning discusses advances in techniques and process since the rise of water-based screenprinting, the collaborative relationship between artist and printer, and monoprints and monotypes as art forms. Finally, the use of computers and image manipulation software to complement screenprinting is also investigated.

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Roni Henning - Water-based Screenprinting

Screenprinting Four Color Separations:

c m y k Printing Made Easy

CMYK refers to the traditional four separations that Litho and Screen Printers use with process color inks. Cyan, Magenta, Yellow and Black. These colors have been formulated to work together to create a complete color picture.
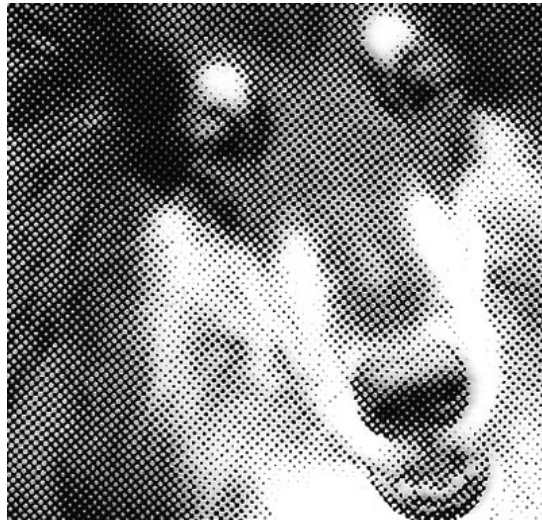
The separations are made on the computer using Photoshop to break down each color into halftone dots, which are printable through the mesh of the screen. The size of the dots and how close or far away they are from each other creates the illusion of continuous tone.

Printing a screenprint using CMYK separations and process color inks will never give you the finest resolution that a digital print will. The mesh of the screen cannot print dots that are too tiny or to close together. However, what the screenprint loses in very fine resolution it makes up in an interesting textural surface. I often encourage my students to combine CMYK with hand separations, posterizations and dithers to layer colors and create an even richer surface. All screenprinters have their own methods when working with CMYK; this is mine.

Making the CMYK Film Separations

1- Choose an image that has a nice range of colors and print it out to have a color reference.

2- Open it up in Photoshop. These films were made with PhotoshopCS and an inkjet printer.

3- Go to image, scroll down to image size and change it to the size you want to print.

4- Go back to image mode and scroll down and click on CMYK. The four separations should open up on the right. If they don't go to windows and scroll down to channels and click on that. They will open.

5- Once you have the separations you need to turn each one into a halftone. You do that in bitmap. The separations should be in grayscale already.

6- Click on a separation. Go to image mode: bitmap. A box will open up. Resolution. Make the output higher than the input. If the images that you want to print are large there should be less difference between the input and the output. Click ok. A new box will open.

7- Halftone Screen. It will have Frequency, Angle, and Shape. I set the frequency at 40 for beginning screenprinters. That makes the dots easier to print. If you want a finer resolution make the frequency higher. Then put in a separate angle for each color.

a halftone: levels of gray and color are translated into grid-like dot patterns of varying sizes, each color layer has a different structure and angle of dots

8- These are the angles I use: C 22.5 | M 82.5 | Y 7.5 | K 52.5

CYAN 22.5   MAGENTA 82.5   YELLOW 7.5   BLACK 52.5

note: printers call black 'K' or key color

Each separation has to be bitmapped with the appropriate angle. Make the shape round. THE SEPARATIONS WILL APPEAR DIFFERENT ON THE COMPUTER THAN WHEN PRINTED ON FILM. Print on paper first to see if it looks like a precise dot pattern (see picture above).

9- Once you have all the separations print them out on film. The film must be appropriate for your printer either inkjet or laser. It must be able to print opaque black. I use films that I get from Victory Factory. www.victoryfactory.com (Inkjet 2 film for film positives) But there are other films available.

screened cmyk transparencies. (top) cyan and magenta, (below) yellow then black

progressive cmyk proofs: black | black and cyan | black and cyan and magenta

the finished four color screenprint and a close-up. The overlapping dot patterns
that create the full color effect are clearly visible.

Dithers

You can also make CMYK films with a random dot pattern. Click on a separation go to
Image â   Mode â   Bitmap. A box will open up. Resolution. Make the output higher
than the input. Click OK. New box opens. Halftone. Change it to Dither. You donâ   t
need to put in any angles. The random dots appear like a mezzotint pattern or a litho
crayon drawing. The finished print has more of a grainy quality than the halftone print.

   PICTUREâ ¦ DITHER PROGRESSIVE PROOFS

   PICTUREâ ¦ FINISHED FROG PRINT

Preparing The Screens

Choose a screen that has the right mesh (fine, medium, or coarse) for what you are
planning to print. Remember a very fine dot pattern requires a finer mesh. These films
were burned onto 195 polyester monofilament. Film separations are exposed (burned)
onto screens coated with photo emulsion. The emulsion should specify use with water-
based inks. I like the Ulano emulsions 925, TZ, and LX660. YOU MUST WORK WITH
THE EMULSION UNDER A YELLOW SAFE LIGHT.
The emulsion is applied to the flat side of the screen with a metal scoop coater. I only use
one even coat. Start from the bottom of a screen that is leaning against a wall wedged
against something so it doesnâ   t move when coating. You can see how to do it in
pictures in my book WATER-BASED SCREENPRINTING TODAY. Pour the emulsion into
the scoop coater and while holding it firmly against the screen tip it towards the mesh, so
the emulsion is touching, and pull it up to the top of the screen in one fluid motion. Be
careful not to let any of the emulsion drip back onto the coated screen when you pull it
away after coating. I dry it with a floor fan. The LX660 takes about 20-30 minutes and it is
ready to use.

PICTUREâ ¦ COATED SCREEN

Simple Homemade Exposure Unit

Decide what size you want the exposure unit to be. That depends on the size of the screens you have. There is also a picture of a homemade unit in my book.
Start by building a box frame. You can use 2x3's or 2x4's for the framing wood depending on how big or strong you want it to be. Make a shelf with plywood 6-8 inches from the top. Cover the top with a heavy piece of glass. Place 8-10 florescent light fixtures on the shelf, evenly spaced. Replace the lights with ultraviolet lights.

a strip-light UV exposure unit, note that this type is ideal for silkscreen
but unsuitable for photo-polymer work

The Exposure

Tape your 1st film separation face down onto the flat side of the coated screen after it has dried. It should look the correct way from the inside of the screen (printing side). The screen has to be exposed to a light source to burn the image onto the screen. The light hardens the emulsion that is not covered with the black dot patterns of the cmyk films. It remains soft there and is then washed out with water to reveal the image.
You can use any light source to expose a screen. You just have to adjust your exposure time. For example 9 ultraviolet 20 watt tube lights will expose a screen in 2 minutes. A 5000 watt Halide light takes only 10-15 seconds and Photoflood lights about 15 minutes. The best thing to do is to make some test exposures. If your exposure time is too short the emulsion will wash off. If the exposure is too long some of the image will not wash open and you'll lose detail.
Lay the emulsion coated screen (with the film separation taped to it) onto the glass top facing the lights flat side down. Make a board cut to the inside dimension of the screen and cover it with a soft fuzzy material (like an old sweater). Place that board inside the screen. Then lay heavy weights on it to create a tight contact between the film separation and the coated screen.
You can use anything for weights. Bricks, cinder blocks, gallons of paint etc. It is important that the contact is very tight. The fuzzy board distributes the pressure evenly under the weights. Turn on the lights and time your exposure. You are ready to wash it out. Remove the separation from the screen.

Wash Out

It helps if you have a sink with a hose attached to your faucet with a spray nozzle on the end. But I have even washed out screens with just a spray water bottle. Spray the screen on the flat side until the image starts to appear. The water should be cool to warm. Turn the screen around and wash it through from the inside (printing side) until the emulsion washes away and the image is revealed.
Make sure you wash it enough so you actually see the open mesh that corresponds with the film positive. It will look milky at first and then open up and become clear. The screen should not feel slimy when you are done. That means that there is still a transparent residue left on the screen. Wash it again as that residue will drift into the open mesh and

block the ink from going through. Remember too short an exposure and the emulsion will all wash away. Too long an exposure prevents all of your image from washing out. Dry your screen and you are ready to print.

PICTUREâ ¦ WASH OUT SINK

Printing The Image

Attach HINGE CLAMPS (available at most art and printing suppliers) to a table or a sturdy board for printing the screen. They should be far enough away from each other to clamp onto each end of the screen. Place your screen into the hinge clamps and tighten them. Check the screen for any areas that are not covered with emulsion. You can tape them out with clear packing tape. The only open areas of the screen should be the image that you washed out.
Have all your paper cut to size and ready to print. You need 2 straight edges, one horizontal and one vertical to ensure that you will have good registration. Tape your film separation onto a sheet of paper exactly where you want to print it. Then place the paper under the screen and line it up to the image on the screen. When it matches tape it down so it doesnâ   t move while you set up registration guides. I usually use 3 small pieces of illustration board (1â   x1/2â   ). Place 2 against the paper in front of the screen and 1 on the right side of the paper secured with masking tape. Other printers may use a punch hole method to register the paper. It is important that each piece of paper fits exactly into the registration guides so you print the color in exactly the same place on each sheet of paper.

PICTUREâ ¦ SCREEN SET UP

Process Colors

I generally print the process colors with black first, cyan second, magenta third and then yellow. The black doesn't need to be made more transparent but I do adjust the transparency of the other colors based on my original photo. You can usually judge if the color is too intense as you print each separation on top of the previous one by referring to your color printout. If so, cut the intensity with transparent base. It requires some proofing of the colors to get the right mix.

With the dog print I could control the green that I wanted by how transparent my yellow was. I also felt the black wasnâ   t intense enough so I printed it a second time as my very last color at the end.
When you print halftone screens it is important to keep your squeegee at a 45 degree angle when you flood the screen and with the printing stroke. So to begin add some retarder to the ink to keep it from drying in the screen. You can use any acrylic retarder or propolene glycol. I like Golden's Acrylic Retarder. It flows nicely. Add about 8-10%.

Lift and hold the screen up in front with a block of wood. Pour the ink in a nice ribbon from one side of the image to the other being careful to not let it go into the open area. Now take the squeegee and push the ink across the image away from you to the back of the screen (flooding). You should be able to see the ink filling the image. If you can't see it you have pushed too thick a deposit of ink. Lower the screen and with nice even pressure pull all the ink toward you as you print it onto the paper. When you raise the screen and look at the print it should match the separation. If it's not all there you didn't print with enough pressure. If too much color is there you pressed too hard.

When you have finished printing all your paper scoop out the ink into a container and wash the screen with water. You can do that in a sink with a spray hose or on the table with paper towels and a container of water. Make sure you get all the ink out of the screen. The emulsion is removed with any strip made for removing emulsion. I like Nazdar's 'strip'.
Set up the screen with color separation #2.

Take the 2nd separation (cyan) and place it on one of the prints in register to the image.

Tape it down. Then line it up under the cyan screen so it matches, tape down your registration guides and print the cyan. Continue the same process for printing each color.

Stripping The Emulsion from The Screen

It is very important to remove all of the ink from the screen after you have finished printing. It is equally important not to wait too long after you have printed your last piece of paper. You don't want the ink to start drying in the screen.

Every company that makes emulsion recommends their emulsion remover but as I said before I like Nazdarâ   s Stripp. It if fast and efficient. You can also remove emulsion with Bleach. Printers have used that for years but they then follow it up by cleaning any ink residue from their screens with acetone. Yuk. Bleach takes longer.

This is my method:
After my screen is free of any ink I remove it to a wash-up sink and spray it on both sides thoroughly with the Stripp. Make sure it is completely covered. You will start to see the emulsion loosen. Give it a minute and then stand it up in the sink and blast it with a pressure washer or a hose that has a lot of water pressure. It should start to wash away immediately. If it doesnâ   t, apply more Stripp and blast it again. Do not let the Stripp dry on the screen before washing it off.

There is usually a ghost image or stain from the ink after the emulsion has washed away. I remove that with Simple Green cleanser and Baking Soda. Spray the Simple Green onto both sides of the screen. With the screen lying flat sprinkle a generous amount of Baking Soda onto it and scrub it with one of those green scrubbing pads that you use for dishes. Scrub both sides of the screen. Blast it with the hose. It should all come out but if not repeat the process.

Probably the emulsion and 'Stripp' are the part of this process that requires protective measures (the material is a skin and respiratory irritant, but not very toxic) so I recommend wearing surgical gloves and using good ventilation. But you should not have to touch either one of those products.

Eye Wash Station from .labsafety.com. Wear googles, gloves
and a plastic apron when stripping screen emulsion
and ensure good ventilation.

Nazdar Stripp
is regarded as a particularly effective emulsion remover by silkscreen printers. As most emulsion removers, it contains Sodium Metaperiodate as the active ingredient (about 1 to 2 %). It is not recommended to purchase the chemical in its pure form as the metaperiodate crystals are highly corrosive and capable of causing severe skin or lung damage. Products that are sufficiently diluted and in liquid form are relatively safe to use (the product is non-carcinogenic, non-mutagenic, and non-neurotoxic), but prolonged exposure to the corrosive fumes needs to be avoided.

(Nazdar msds:) *Use only with adequate ventilation. Use ventilation adequate to keep exposures below recommended exposure limits. See MSDS. In case of insufficient ventilation, wear suitable respiratory equipment. Ensure that eyewash stations and safety showers are close to the workstation location.*

Nazdar.com The company make a wide variety of both solvent based and water based silkscreen ink systems. Today, a comprehensive set of msds sheets are available online for each product. Check all ingredients and safety measures before considering using any solvent based inks, as these have a much poorer safety record than waterbased products (the cancer hazard is significant, even for short term use).

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