

TOP 10

Quick Start Secrets To Printing Better Halftones

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Halftone printing is all about the dots. The whole concept of printing various tones by fooling the eye is the very definition of a halftone. The tones we get are determined by the accuracy of the dots we print. Big dots mean dark tones. Small dots mean light tones. Where printers get themselves in trouble is they forget the simple fact that in order to print accurate tones or values, we have to accurately print the right size dots.

What follows is a collection of neat, quick techniques that will definitely help you to print better work, faster, easier, and more profitably. This is not a fix all, cure all program, but rather the beginning of a journey where you will ultimately be able to print any job, the first time, with great results and minimal hassle.

Only deliberate practice and experience will get you there. The goal here is to concentrate on the easy, quick methods that will go the furthest toward making your work look great with the least amount of effort.

How we See Tone and Color

It helps a great deal to visualize what you are trying to achieve. Our natural vision sees color as tone. We see light pinks, vibrant crimson reds, and deep, rich mahoganies.

By printing a deep red with dots of various sizes, we can achieve all of these colors with only one color ink. It is the same for all colors we print and combine. If we are not accurate in printing the right size dot, the color will be wrong.

My approach is to start at the beginning of the process and work through to the end. Each step along the way has an impact, and you cannot easily build on a step that was performed poorly.



The process is sequential. Each progressive step is based on the properly prepared previous step. Another way of saying this is, if you screw-up in the beginning, it can only get worse from there.

Before you even begin the separation process, ask yourself how accurate you need to be. If pleasing color is good enough, you can easily be very successful.

Pleasing color is the best place to start. This means that the color only needs to look believable, it does not have to match.

If you need to have a perfect match of 10 different corporate logos, you are pretty much up against it. These are called memory or reference colors. The closer to a match you are, the more careful you have to be. My suggestion is to avoid this kind of work in the beginning.

A good rule of thumb is to ask yourself if the image looks hard to print. If it does, it will be.

With that out of the way, here are my Top Ten Quick Start Secrets to Better Halftone Printing. I can't cover everything in the detail I would like here. This will get you rolling, with really good results.

Halftone Tip #1 - RGB Files

Start with good art. Use RGB files that are between 200 and 250 pixels per inch resolution at the final size of the image. Avoid JPEG files like the plague. They are corrupted and contain damaging artifacts that can cause moiré and other bad effects. To determine a damaged file, look at each channel individually at 200% – 300%. Use a plug-in like Alien Skin's Image Doctor to fix corrupted files.

You will know if the image has JPEG damage if the edges of the detail look smoky or out of focus. You can also detect excessive pixel clumping. This makes the image look blocky. *[FIGURE 1]*

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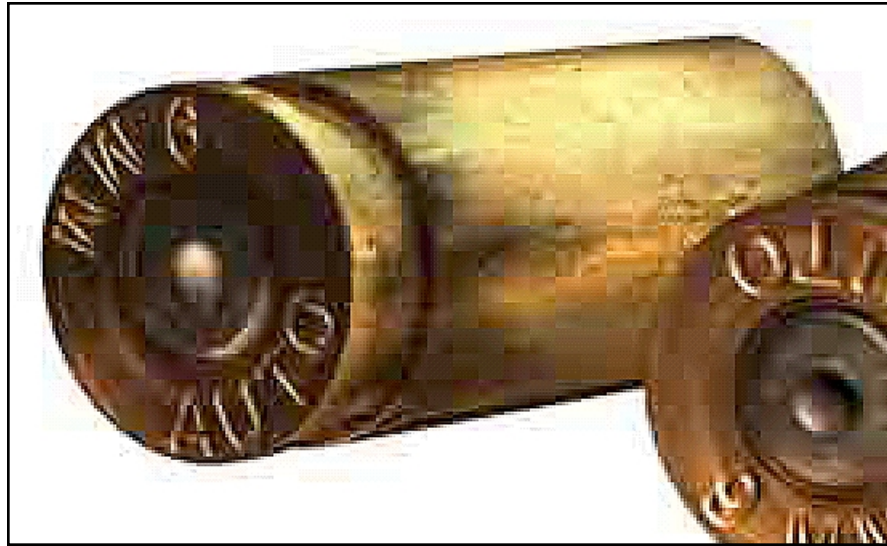


FIGURE 1

Below is the Green Channel, clearly showing the damaged pixel blocking and the “smoky” fringe. [FIGURE 2]

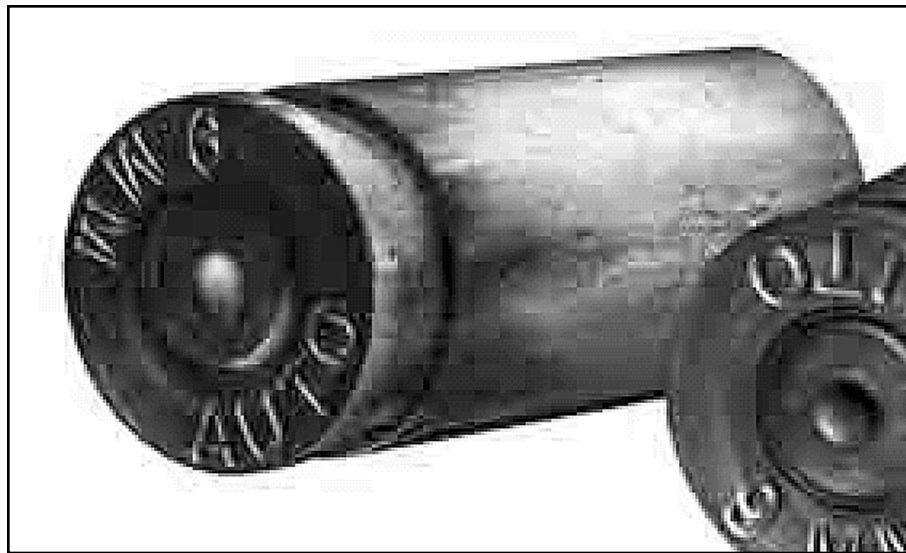


FIGURE 2

With Four passes of Alien Skin's Image Doctor Photoshop Plug-In with Remove Artifacts set for 100, Blur Edges set to 4, and Add Grain set to 0. Notice how much improved the image is. *[FIGURE 3]*



FIGURE 3

Halftone Tip#2 - Correct RGB>CMYK Setup

Use a good separation program with the correct settings. These are not the default settings for paper printing. If you are new to Adobe PhotoShop, start learning it now. This is the single most important program you will use when it comes to image editing, manipulation, and separation. There are specific screen printing settings to use for best results.

The major obstacles you face for screen printing are the type of ink settings, and the dot gain settings. When it comes to inks, our color sets are different than those used by offset litho.

Photoshop assumes that you will be printing on paper, and it expects values for paper. We need to over ride these assumptions.

[FIGURE 4] Shows the Color Settings panel in Photoshop 6. In order, these are the items you must change.

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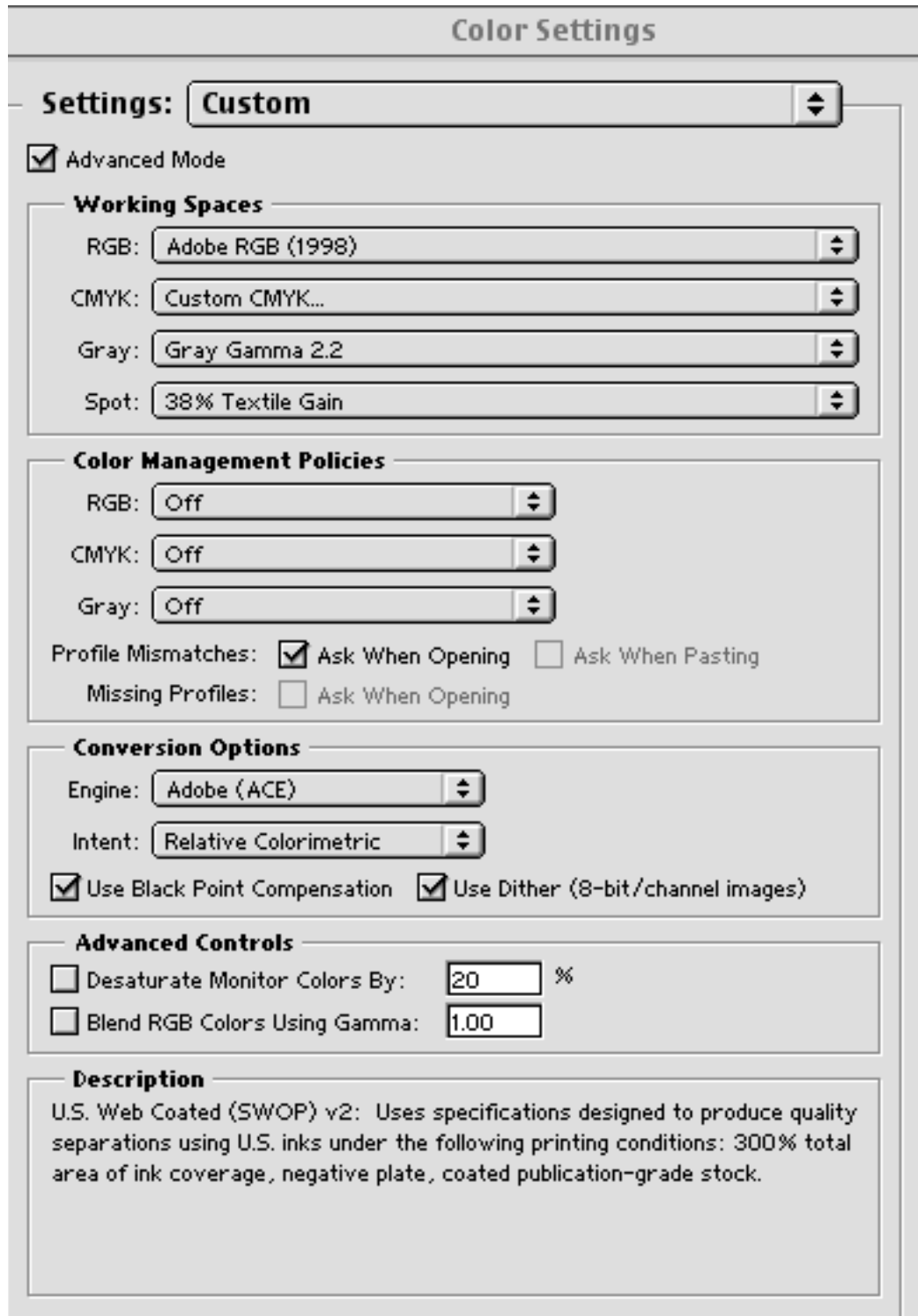


FIGURE 4

Working Space: RGB - Set to either Apple RGB or Adobe RGB. These settings give you viewing at graphic arts quality. The default is sRGB IEC61966-2.1. This corresponds to a desktop inkjet color gamut on average quality paper, not good enough for what we are doing.

Working Space: CMYK - This is the big one. These are the values PhotoShop uses to convert and RGB file to CMYK. It is a one time, one way conversion. You lose data on the conversion that cannot be recovered. If you mess it up, you will have a damaged file that cannot be easily repaired.

The CMYK values are those supplied by the individual ink companies like Union or Wilflex. I will get into this in a minute. Right now, you need to know that this is where you will be making your major parameter changes. *[FIGURE 5]*

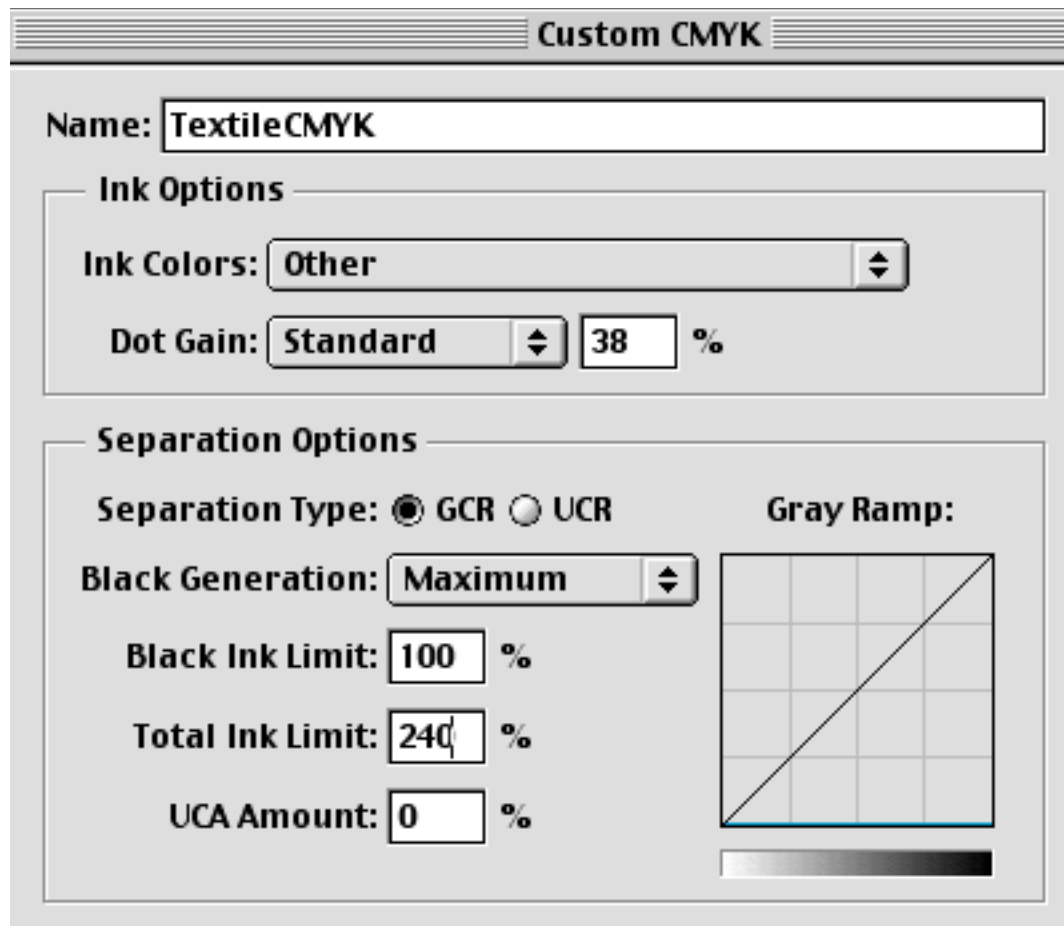


FIGURE 5



Working Space: Gray - Set this to Gamma 2.2. This corresponds to a calibrated PC monitor. It used to be that Apple Monitors were set to 1.8, but that has changed. Now both PC and Mac use Gamma 2.2 as the reference point that corresponds to a Color Temperature of 6500° Kelvin.

Working Space: Spot - This setting is used to display the Dot Gain Values in spot channels. This is very, very important for textile printers, especially when doing Simulated Process separation work. I will show you how to set Dot Gain shortly.

For now, just keep in mind a recommended value of 38% to start. You can go higher, and it would probably not be a bad idea to do so. It is much better to set the value higher, rather than lower.

The single biggest problem I see with textile printers is setting the Dot Gain value too low. This causes all kinds of problems when you cannot hold the lower values.

If you set it high, and the image looks too light, just add more pressure. That takes care of the problem. If the value is set too low, you cannot compensate for it.

The image suffers badly as you try and compromise your way out. When you back pressure out of the squeegee to make the image look lighter, you lose ink penetration into the garment. This results in a washed out looking image and fiberlation during washing.

This is the dialog when you click on the Working Space CMYK arrows. The settings are critical.

Under Ink Options>Ink Colors: navigate to Other and Click Load to load brand specific color sets. These color sets are available from you ink company, and are usually located on their website. They can be downloaded for free.

When you load a specific ink set, the name will appear in the box in place of the word "Other".

Dot Gain will be entered exactly as the Spot Color. The directions for doing this are in the next tip. Under Separation Options, choose the GCR button.

The logo features the name 'Mark Coudray's' in a blue, stylized font with a drop shadow, and 'Halftone Secrets' in a red, sans-serif font below it. The background is a light blue and yellow gradient with a faint grid pattern.

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Black Generation: Should be set for Maximum. This means that any shading will be made up of Black Ink. You sacrifice some color accuracy when you make this choice, but you will have a much easier time of printing, especially if you are a beginner.

As you become more experienced, and gain more control on press, you can decrease the amount of Black Generation until you get to Medium. Do not go below the Medium setting.

Total Black Limit: Set this for 100%. This is also a very important setting. When you set this value for 100%, it means that when you are printing at the correct dot gain value (we will start at 38%) the Black ink will print as a solid value.

Now, if your image looks light, and you increase your pressure, you push the solid Black ink into the garment. This is highly desirable from a durability point. You are putting enough ink down on the garment to resist the laundry process.

If the value is less than 100%, and/or your dot gain is set TOO LOW, you must back pressure OUT. This causes a thin film to be deposited and you end up with fiberlation and washout. Your customer will be upset with you. We don't want that.

Total Ink Limit: This value should range between 210% - 240%. If you go above 240, you run the risk of plugging and massive dot gain. This is because you are laying down too much ink, and the garment cannot absorb it all. The ink sits on the top of the garment and mashes around.

If you set the value on the low end, you run the risk of too thin an ink deposit. The image will look weak and washed out.

I use the maximum value of 240% with very good results.

UCA Amount: Leave this value at 0%

Halftone Tip#3 - Set the Correct Dot Gain

Dot Gain is set in two different places for two different reasons. The first setting is in Working Space CMYK Other or Working Space>Spot.

Set your Dot Gain higher than you would normally think. I know of very few screen printers that have less than 35% dot gain.

High dot gain is not bad; it just must be managed properly. Low dot gain causes you to back the pressure way out. This makes the print look weak and washed out. There is too little ink deposited and what ink is there will quickly launder out. Not good.

A very quick test to determine if your dot gain is set too low. Take the printed shirt and gently stretch the image in an area that is completely printed. As the shirt pulls apart, can you see the white of the threads? In other words, has the ink penetrated the garment? If not, your gain setting is too low.

When you move the value higher, you must press harder to get a dark print. In the process, you push the ink into the garment. You develop a full, complete, deep penetration and continuous ink film when the shirt is cured. The washability of the garment is several times that of a shirt where the gain was set too low. Note the excellent detail and ink penetration on the close up this actual garment sample.



FIGURE 6

Set the gain for at least 38%. You can go as high as 50%. The good thing about over-correcting is that if the image looks light, you can put more pressure into the print. I have never seen a printer that has a problem with putting MORE pressure into a print. More pressure means you will get better penetration into the garment, a much richer looking print, and greatly improved washability. Dot Gain can be set in two different locations in PhotoShop. The first is for CMYK and the second for Spot Color.

To set your Dot Gain in PhotoShop follow this path:

>Edit>ColorSettings>WorkingSpace>CMYK>Custom>Ink Options>DotGain

or

>Edit>ColorSettings>WorkingSpace>Spot Color>CustomDotGain

In the 50% box that appears, enter 88%. Dot gain is always measured and added at the 50% value. In this example, you are correcting for 38% gain. You can use any value you want above 35%. I would recommend going higher rather than lower.

[FIGURE 7]

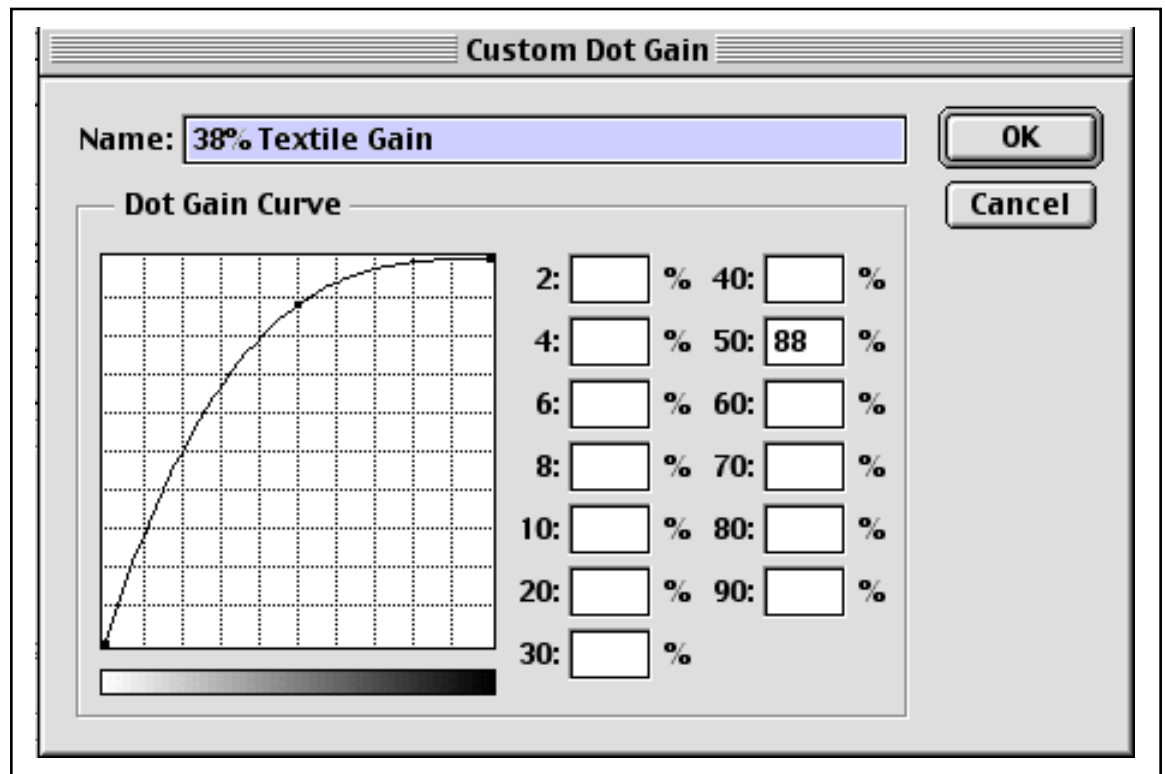


FIGURE 7

Halftone Tip #4 - Use Good Film Positives

When it comes to output, do not use vellum. I know that it is very popular, and cheap, but it just does not cut it. The better way to go is ink jet, thermal, or traditional image-setter film. The very best results are still obtained using wet processed silver-based imagesetter film. The essential thing you are after is a dense, black, well-formed halftone dot.

Go down to Radio Shack and buy a 50X or 100X lighted microscope for less than twenty bucks. You don't know what you have until you can see it. This is one of the easiest things you can do to really begin understanding how printing happens.

To determine if your positives are good enough to use, make a test image. This image should be a grayscale tone ramp that goes from 0% to 100% solid. Make it large enough to easily evaluate. I would recommend at least 12" long.

To make the test image in PhotoShop, create a new Grayscale document that is 1" x 12". Set your foreground color to 255,255,255 and your background to 0,0,0. Use the Blend tool and make a gradient from Left to Right. This will fill the document with a gradation from White to Black.

Next, go to >Image>Adjust>Posterize. Choose 11 as the value. This will convert your gradient to an 11-step grayscale with the first step being White. Save the file as: Gradient11Step. *[FIGURE 8]*

Using your output device, image a positive of this file. Make a screen and examine each step of the scale against the screen. Note where you begin to see dots, and where they end. This is the tone range you can image with your device.



FIGURE 8



Halftone Tip #5 - Use Bigger Dots

Use as coarse a dot as you can get away with. Unless there is incredibly fine detail in your image, use line counts around 40 – 50 lpi. Machine printing should rarely go over 55 lpi. Your control issues escalate geometrically as the line count goes up. There are only 1600 dots per square inch at 40 lpi, but 4225 dots at 65 lpi. Simply dropping down to 55 lpi will reduce the number of dots per square inch to 3025. The fewer dots you have, the easier it is to manage and control. Your color accuracy will be greater and there will be less moiré and dot gain.

High halftone line counts are becoming less common. In the past, 65 lpi was the most common, with some printers using 85 line. I think this came about mostly because separations were being done on the outside with service providers who were used to working with litho paper printers. In that business, 133 - 150 lpi was common. For them to drop to 85 line, common for newspapers, seemed a reasonable solution. In reality, this was still not enough.

The key for you is what I call visual reality. Use as coarse a line count as you can get away with. Look at the shirt at 4' - 6' and make your decision. You will not be able to see the dots, and the image will be crisp, clean, saturated, and very bright. The higher the line count, the darker and muddier the image will be. Not to mention the fact it will be much, much harder to control.

Halftone Tip #6 - Correct Mesh Count

Use as fine a screen as you can. I recommend either 280 - 305. The thread diameter should be 34 - 35 microns, and in Plain Weave (PW). You may not know what this means, but it is important in making sure that you hold as many dots as possible. You can tell what mesh you are working with as the necessary information is stamped on the edge of the mesh. You will typically see 305.34 PW or 300T/34/PW to indicate the mesh count in threads per inch, thread diameter in microns, and the type of weave. *[FIGURE 9]*

The thread diameter determines how open the mesh is. This, in turn determines how easy it is to print. If you get Twill Weave (TW) or a 40 micron thread diameter, it will be much more difficult to print. This is typically the case when manual printers com-

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plain about how hard it is to print through fine mesh. They have not bothered to determine what the percentage open area is of the mesh they are using. The higher the percent open area, the easier it is to print. However, as the percentage gets higher, the mesh becomes more fragile and is easily broken.

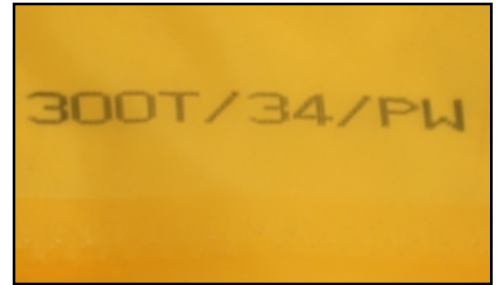


FIGURE 9

To make matters worse, low tension requires much greater squeegee pressure to get the ink to pass. When you combine low mesh tension, incorrect thread diameter, an incorrect weave, you have a recipe for high pressure, fatigue generating, wrist torturing printing.

The 280.34 PW and 305.34 PW mesh counts are chosen as the best compromise between holding the fine highlight dots, and having enough ink laydown to hold up to everyday wear and tear, including washing.

Mesh counts below 280 will put down too much ink. The result will be excessive dot gain, and rapid build-up on the back sides of the screen. This is especially true if the squeegee is dull.

In the past we would use 355.34 PW or even 380.34 PW. Experience has shown that these mesh counts are too fine and do not deposit enough ink to avoid fiberlation. This is the appearance of a premature image washout in the laundry. You need enough ink deposit to hold onto the cotton in the t-shirt, but not so much that the dot gets squished or squashed as the other colors print down on it.

If you find yourself faced with needing to hold finer detail than 305 can deliver, or you want to minimize dot gain, you can use 355.34 PW, but you will need to put a Flash before the black printer AND you will need use a Clear Printer. I won't get into the Clear Printer here, as it is a bit involved. To avoid the need for a Clear, use the 305 mesh instead.

Halftone Tip #7 - Correct Mesh Tension

Start with mesh tension in the 25 N/cm range. I usually recommend 25 ± 2 N/cm as the workable range. You can be lower, but not below 20. It is always better to have higher tension, but it is much harder to keep the screens from being damaged or ripped in production due to poor handling. The most important thing is that each screen be consistent with the others. I would rather you be low but consistent from screen to screen. As you gain experience begin to move the tensions up a Newton at a time.

You have two choices, static and retensionable. By far, the best choice is retensionable. You can do excellent work with either type, but in the long run, you definitely want to go with retensionable. Besides cleaner printing, less dot gain, faster set-ups, and tighter register, retensionables guarantee your ability to come back to the same tension range over and over. [FIGURE 10]

If you do not own a tension meter, buy one NOW. This is such an important piece of equipment, I cannot over emphasize it. Tension meters are available from every major supplier in the industry. If they are selling retensionable frames, they also sell the meter. [FIGURE 11]

Even if you are buying wooden or aluminum screens stretched on the outside, get the meter. You will never know what is going on until you can measure. When you order your screens, order them at a specific tension, and check them when they come in. I have seen brand new screens off by as much as 8 Newtons, and the printer thought he was getting great stuff!

Knowing your tensions is critical. It helps you to balance the screens in a set. Make sure that the tension does not vary more than two



FIGURE 10



FIGURE 11

The logo features a stylized yellow and blue grid pattern on the left side. The text "Mark Coudray's" is written in a blue, cursive-style font, and "Halftone Secrets" is written in a red, sans-serif font below it.

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Newtons from frame to frame, and no frame is less than 20. What you will find is that one time you are making a set at 20 N, the next time it may be 24N. The more variation, the greater the differences in how the print looks.

What happens if you are less than 20 Newtons?

Be prepared for two things. The first is more dot gain. The lower the tension, the more stretch is in the mesh. This means that it will be harder to print clean dots. A really sharp squeegee will help, and try to keep off contact as low as possible. When you increase off contact, you will get higher tensions at the print surface. You are stretching the mesh with the squeegee. The danger is that you will prematurely push the ink through the screen before it gets to the surface of the shirt. If this happens, welcome to dot gain city.

The sure bet indicator of this is where the first one or two shirts look great, the third to fifth gets darker and darker, and you are wiping the back of the screen by the first dozen. You will end up repeating this sequence for the entire run length.

High tension means not having to wipe the screens. All the printing will be consistent and the image will not wander as described above.

Build-up is the second problem caused by low tension. Mesh contact with the garment is longer. This means the ink has more time to stick to the backside. You end up with rapid build-up, more dot gain, and more wiping. You also lose information as the build-up blocks any halftone areas.

Your image quickly starts to look terrible. Dark areas go solid. Highlight areas disappear and midtones get dark and muddy.

Bite the bullet and go the right route. This is retensionable frames. Start with a dozen and add a dozen every month or two until you are converted. **DO NOT** intermix retensionable with static frames, or you will defeat the entire purpose. Keep the high tension frames together and keep the tensions the same between screens.

Halftone Tip #8 - Emulsion Type

Use high solids, dual cure direct emulsion, or capillary film. This will assure that you have enough emulsion-over-mesh (EOM) to fully form the halftone dot. The EOM is one of the key factors in reducing or even cancelling moiré that exists in the screen.

A very common cause of moiré is the blocking of the halftone dot opening by the mesh thread. The smaller the opening, the greater the chance a thread will interfere with the hole. The result is a printed dot that does not look like a round dot. The shape of the dot changes from dot to dot, in a progressive manner. This means that the dots will vary in size. Our eye picks up the variation as banding, if it is in one direction, or as a checkerboard if it occurs in both directions.

To help overcome this, additional emulsion is coated on the screen. Normally this is accomplished by coating additional wet-on-wet passes on the squeegee side of the screen, pushing it through to the print side. The additional coating is called Emulsion Over Mesh. *[FIGURE 12]*

This effectively creates a cell or pocket on the print side of the screen as can be clearly seen in this microphoto from KIWO USA. Even though the halftone dot is incomplete, the ink flows out and around the blocking thread, filling the cell. This causes the dot to reform, canceling the moiré.

I am not a big fan of pure photopolymers for halftone printing. They can definitely be used, but they foster the use of less than perfect light sources. Because they exposure so fast, black light tubes, florescent lamps, flood lights, and other low quality sources can be used to make a photo screen. While this may work for simple line work or athletic lettering, it will not work for halftone printing.

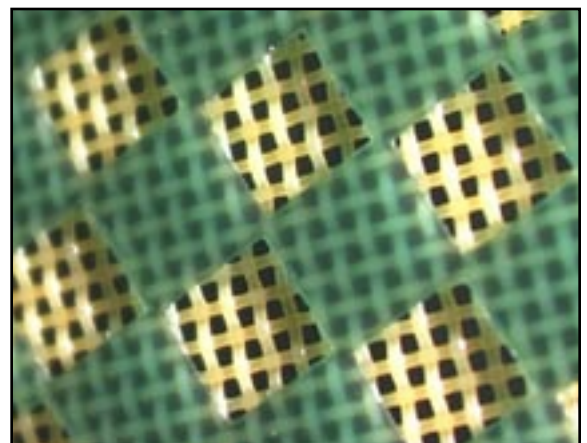


FIGURE 12

If you are going to use photopolymer emulsion, look into an inexpensive UV sunlamp. More on this in the next tip.

Halftone Tip #9 - Light Source

Invest in a good quality metal halide or mercury vapor light source. This will assure that you have correctly exposed stencils that capture all of the detail and halftone information that exists. Lights with low UV output will translate only part of the information, and will result in a weak screen that requires you to underexpose. All of these things are bad and will hurt your printed quality. If you must use a low output light, make sure your halftone dot is as big as possible.

Here is a great tip. Most medium to large lithographic printers have made the move to Computer-To-Plate (CTP) systems in the last couple of years. This means they no longer use film to make the plates. All of their high-end, metal halide exposure equipment has been pulled out of service and is most likely sitting in a warehouse or tucked away in the back of the shop. You very well could make a great deal by taking it off their hands. It is definitely worth a phone call or two.



FIGURE 13

Ask them if they have any surplus metal halide exposure equipment, with integrators, they would like to sell. Look for 5KW or higher. Brands like Olec, Theime, Berkey, Pako, and Douthit are common and will work nicely. You will probably be able to pick the exposure unit and integrator up for less than \$1000. Start low, make them name their price. Remember that whatever price they tell you, wince visibly. Say something like “that’s more than I expected for old technology.” It works wonders.

If you are on a real budget, check out a medical supply company. They sell indoor sun-lamps that use mercury vapor. The bulbs are smaller, usually in the 800 W range, but they are cheap, cheap, cheap. I really like the Sperti lamps, I started out with them 30 years ago and was doing really good

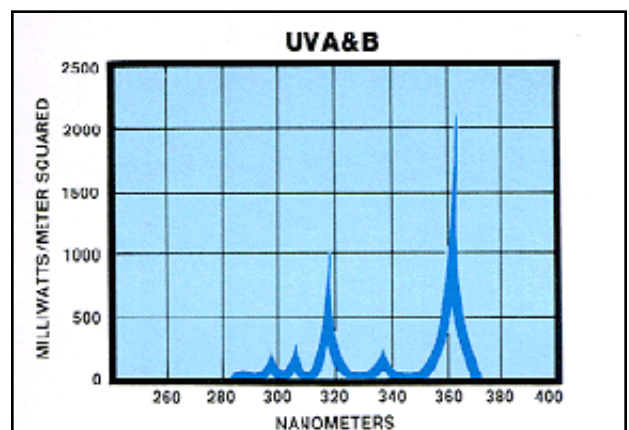


FIGURE 14

halftones before anyone knew what a halftone was on a t-shirt. You can order directly at the link below.

<http://www.promolife.com/products/sunlamp.htm>

They have several models available for less than \$200, some are less than \$150, and they do a great job. I particularly like the models rich in UVA, this is the spectrum ideally suited for good photostencils. *[FIGURE 13]*

Here is the spectral output of the Sperti. While not as good as a metal halide lamp, this spectrum will work very well to start. You can clearly see the major peak at 360 nm, ideal for screen print emulsions. *[FIGURE 14]*

Halftone Tip #10 - Press Setup

Great printing requires the proper machine set-up. This means a razor sharp 70/90/70 durometer squeegee. Look down the edge of the blade. Is it perfectly straight? Lightly drag your finger over the edge of the blade. Can you feel the ridges of your fingerprints? If not, you need to sharpen the blade until it is both straight and sharp.

Machine set-up means no more than 1/16" off contact (.0625") If you cannot measure this, put four nickels on each corner of the pallet and make sure the screen is barely touching each one. This is an excellent no tech approach to an accurate set-up.

Don't forget to print with an ink that was designed for halftone printing. They are a bit more expensive, but worth it. These inks are creamy smooth, easy printing, but hold the dot shape perfectly. If you do not have halftone inks, you can make any ink a halftone ink by adding 2% high density base (by weight) to the ink. This will keep the ink from flowing together.

Finally, use minimum flood and print pressure. Too often printers mash the ink through the screen. If you mash the ink, you will mash the dot, and your tones will collapse together. With a very sharp squeegee, minimal pressure is needed. The blade should not bend. If you see deflection, you are using too much pressure. If the pressure is right, you can wipe your finger across the screen after a print stroke, and not transfer any ink to your finger.

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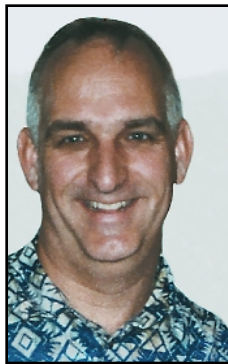
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There you have it. Top Ten Quick Start Secrets To Printing Better Halftones. These ten items will absolutely do the most, in the least time, to get you greatly improved halftone printing.

If you enjoyed these tips and you would like to continue to get better and better at printing halftones, consider taking my 30 Days To Professional Halftones Course. You can get much more detailed information at <http://www.halftonesecrets.com/>.

Once you have attained the Black Belt of Halftone Printing, there is a world of new opportunities waiting for you. Make the jump that will set you apart from 90% of all the printers in the industry.

Sign-Up Today at <http://www.halftonesecrets.com/>.



With 30 years in the business, Mark Coudray owns two companies: Coudray Graphic Technologies, a digital color-separation, software, and e-business firm specializing in electronic prepress for the screen printing industry, and Coudray Serigraphics, a screen printing operation. He has served as Chairman of the Screen Printing and Graphic Imaging Association (SGIA) and the Academy of Screen Printing Technology. He is the recipient of the SGIA Parmele Award, 2 Swornstedt Awards, and the Magnus Award. He is a frequent contributor to the industry trade press and is a sought after speaker and consultant. Contact him at 825 Capitolio Way, San Luis Obispo, Calif. 93401; (805) 541-1521; or e-mail coudray@coudray.com.