BRADEN SUTPHIN INK COMPANY

THE COLOR OF LEADERSHIP

SHEETFED | HEATSET | FLEXO

Stochastic screening – What is it and why is it a hot issue... today….and tomorrow.

Some basic definitions:

From Webster's New World Dictionary:

Stochastic - (stō kas´tik) 1. of, pertaining to, or arising from chance; involving probability; random. 2. *Math*. Designating a process having an infinite progression of jointly distributed random variables.

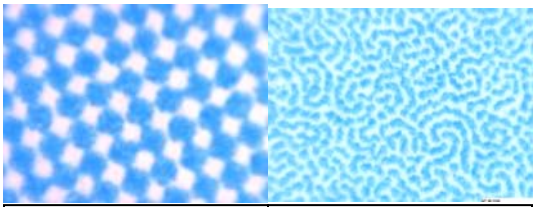
AM screening – Amplitude Modulated screening – modulates the screen area by changing the size of halftone dots that are in an ordered pattern in a given area. This has been the typical method for creating halftones and process screens for the last 100 years or more.

FM screening – Frequency Modulated screening – modulates the screen area by changing the number of "randomly distributed" dots of the same size that appear in a given area. This is the method used in the various stochastically driven methods for creating screens and "halftones".

Stoccato® - Registered trademark of Creo Corporation for their product offering stochastic screen separations. This term should not be used as a generic description of the screening techniques.

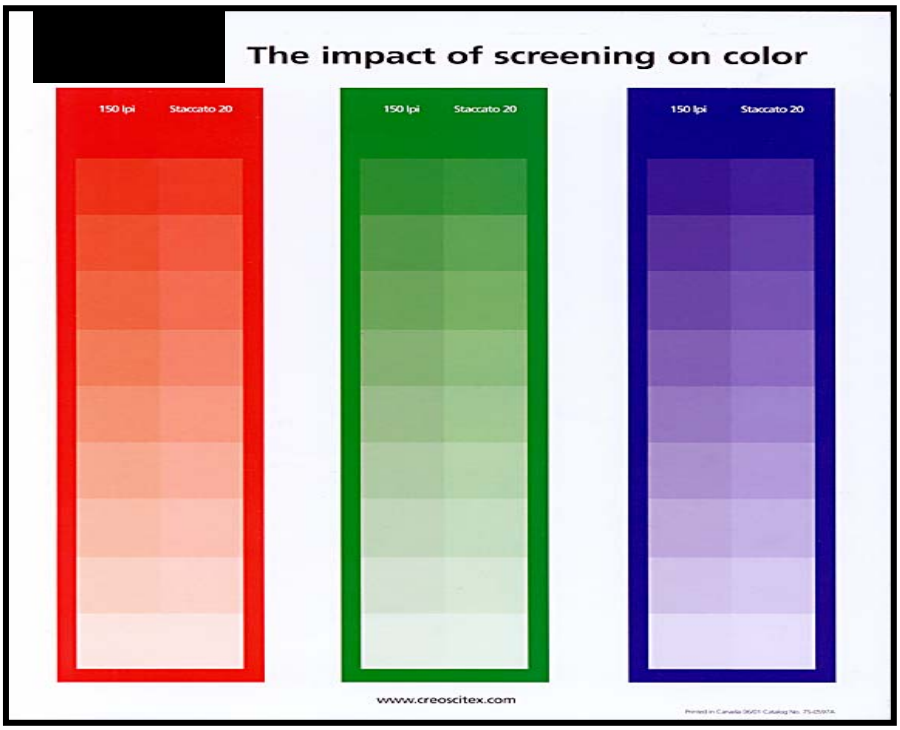
Practical issues relating to stochastic screen techniques and offset reproduction.

The relative dot size of stochastic methods of screening versus conventional screening drives the press behavior. Below is a comparison of the 50% tonal value patches from actual printed sheets. These were taken at 200X.



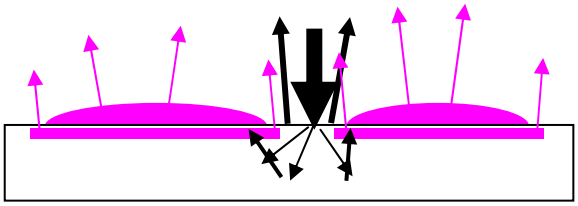
50% dot area AM Screen	50% dot area Stoccato® 10

The dot size and distribution pattern of stochastic screens create optical effects as well as mechanical effects that impact on the printing process. Below is a comparison of color screens in both conventional and stochastic screens. The inks and screen values used are identical; the only difference is the screening technique. Stochastic screens yield cleaner (higher chroma) color.

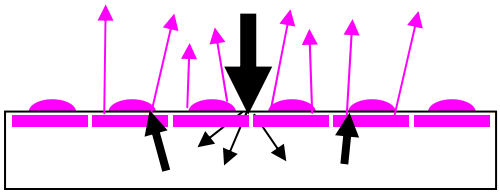


Why does this occur? The many, many small dots create much more "edge" interface where the edge of the dot and paper each contribute to the visual effect. Each dot has a fixed area of "optical dot gain" due to the refraction of light through the ink film. The distance from the true edge of the dot and the "apparent" edge of the dot remains the same regardless of dot size. Where there are many small dots instead of a few large dots, the area of "optical dot gain" is much larger, thus reducing the direct reflection of paper. This produces higher apparent chroma (cleanliness) and more color overall.

Less paper effect



Conventional screen mid-tones allow paper reflection – paper color directly affects printed color

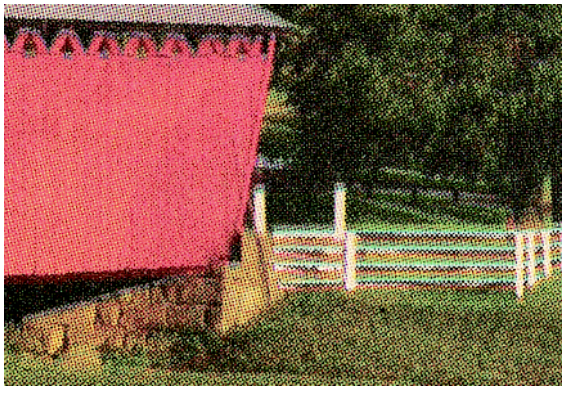


Stochastic mid-tones minimize the direct reflection of paper because of the refraction of light – minimizes the affect of paper on printed color

This set of circumstances leads to one other beneficial aspect; the overall ink volume consumed is reduced. Unfortunately, this results in an undesirable side affect – blanket piling, which will be addressed later.

A second positive benefit that this phenomenon generates is that variations in printed film thickness are less visible; therefore if ink density changes slightly during the press run, the visible results are more consistent. Note that in the reproductions below the difference in color between the top row and the bottom row in the 150-lpi conventional screens versus the two stochastic screened images. So in addition to printing “cleaner” in a coloristic sense, there is less waste due to the inherent variation of ink film thickness.

A third benefit is related to print register. Due to the "ordered" distribution of dots in a conventional screen, if one color is not "registered" with the others it shows up very clearly. The random patterns in stochastic screens do not show misregister as clearly; again leading to reduced waste. See example below.



Out of Register
Conventional Screens

Out of Register
Stochastic Screens

Finally, the lack of ordered dot patterns eliminates screen moiré patterns (similar to looking through two screen doors with the screens at different angles) as well as other ordered dot effects and patterns. This provides a much smoother looking print.

The one negative that has to be addressed is that of blanket piling due to paper picking and other tack related issues. As mentioned earlier, work separated into stochastic screens requires less ink because of the optical effects of the smaller dots. A thinner ink film prints with a much higher tack (see Sefan's Equation below).

$$F = \frac{\eta V A}{h^3}$$

Where: F = force required to split the plates (i.e., tack)
η = fluid viscosity
V = separation velocity (i.e., press speed)
A = area of the plates (i.e., ink coverage and blanket bead)
h = the distance between the plates (i.e., ink film thickness)

The fact that the film thickness is an inverse cubed variable makes it the most influential variable in the "tack" equation. A quick and easy solution to this is to run inks that are weaker and make adjustments in the separations to compensate for the slightly higher dot gains you get when running thicker films.

While this seems easy, it does take substantial presswork to arrive at optimized ink and press combination.

As the systems for this develop more fully there is a certainty that printers will begin to take advantage of the positives and will begin to use process inks to "build" spot colors. The one detriment to doing this with conventional techniques is the inability to hold color within a close tolerance because of the variation in ink films on press. If that is reduced significantly then Spotless® printing becomes more of a reality and mixed colors become a thing of the past for many jobs. By not having to wash up press units when changing spot colors there is considerable savings for the printer. By not having to manage delivery and/or inventories of multiple spot colors the printer saves time and money and had more flexibility in their schedule. There are currently beta test programs for Spotless® printing under way.

The "Pay Offs" for the printer are:

- Use less ink
- Use weaker inks (less cost)
- Less waste due to misregister and /or color variance
- Higher productivity
- More flexibility in scheduling
- Reduced inventory costs.

And THAT is why Stochastic screens are a **"hot"** issue today... and tomorrow. For more information, please contact us at 1-800-289-6872.