STOCHASTIC SCREENING 507

Most of you have probably heard of stochastic screening by this time. But unless you attend publishing conventions and trade shows or regularly use a service bureau that's made the necessary RIP upgrade, you probably haven't seen many examples of stochastic screening at work. And if you've been satisfied with your current production techniques, you don't have much incentive to experiment with a new technology. What follows is a way to explore the process.

The Test

We selected four images for our test: a black-and-white photograph that includes smooth gradations in skin tone; a color photo with fine detail; an infrared photo that we treated as a duotone; and a watercolor illustration with subtle color variations We had them scanned at our service bureau, Lithographic Consultants of San Francisco, which also made conventional halftone separations on an Agfa SelectSet imagesetter with our standard settings— 2,400 dpi with a 150-line screen. We also sent the images to Digital Pre-Press International (DPI), also of San Francisco, which made stochastically screened separations on a SelectSet 5000 imagesetter, also at 2,400 dpi. We had proofs made, and members of our editorial and design staff reviewed them. At the same time, we notified our printer, Brown Printing, of our intentions.

What Is Stochastic Screening?

Any halftone is an illusion. In black-and-white offset printing-the simplest example- -the problem is how to represent the shades of gray in a photograph when you have only black ink to work with. The conventional solution is to print evenly spaced rows of black dots and let some of the paper show through, varying the size of the dots to attain different shades. The same approach is used to achieve halftones in four-color printing, but multiple halftones are printed on top of each other in different colors.

> ***The new halftones promise to end moiré and a host of other printing problems. Do they live up to the hype?***

Conventional halftones have just as many dots in light areas as in dark areas but the dots are smaller in light areas. Stochastic screening, on the other hand, uses dots that are all the same size but varies the distance between them: there are more dots in the darker areas. That's why stochastic screening is also called FM (for frequency modulation) screening .the dots vary in frequency.

The dots in a stochastic screen are randomly placed- it's the overall distribution that's important, not the placement of individual dots. For this reason, the term line screen, which describes the uniform distance between the dots in a conventional halftone, has no application in stochastic screening.

Most of the major imagesetter and RIP manufacturers have announced their own stochastic-screening software. Agfa offers CristalRaster Linotype-Hell has Diamond Screening, Scitex has FullTone, Tegra-Varityper has announced ESCOR-FM, and Adobe makes Brilliant Screens available to its licensees.

Supposed Advantages

Stochastic screening has attracted such attention because of several advantages it is supposed to offer.

No moiré. Foremost among the charms of FM screening is the promise of an end to the moiré problem. When four conventional halftones are printed on top of each other, as is the case in standard four- color printing, placement of the dots is crucial. If they don't fall at precisely the right angles, interference patterns among the four dot patterns can develop—these are called moiré patterns. In fact, it's very difficult for any digital imagesetter to reproduce the proper angles exactly, so some kind of pattern is very often visible. Because stochastic screening places the dots randomly, no interference patterns can develop.

Registration tolerance. Achieving correct color in an offset-printed version of a photograph is likewise dependent on the careful alignment of the printed dots. If the halftones are misregistered, you can get a severe color shift. Because it doesn't rely on dot placement, stochastic screening is more tolerant of poor registration.

Better results at the low end. Early reports indicate that stochastic screening is a better solution for printing at low imagesetter resolutions and on poor quality paper—the combination found in newspapers. That's because when an imagesetter clumps individual spots (the smallest marks it can make) to form large halftone dots, it needs an abundance of spots to work with. FM screens require fewer spots to achieve the same effect because they don't use large dots.

Lower scan resolutions. Some people working with stochastic screening have reported that they :use lower scan resolutions, resulting in smaller tile sizes and shorter imaging times. The common prescription to scan at a resolution that's close to twice your line screen is based on the fact that a :conventional RIP produces a halftone dot that's usually a compromise attempt to represent the scanned :color value. Oversampling during the scan enables the RIP to make a better guess at the true value. Theoretically, since FM screens have more flexibility in the placement of spots, they do a better job of approximating the scan without averaging extra samples. This means you should be able to scan at a lower resolution.

Harry L. Shaw, president of In Tandem Design of Towson, Maryland, and head of the Linotype- Hell Users Group Subcommittee on Diamond Screening, says this is basically bunk. Stochastic screening offers superior edge definition, and if your image contains sharp edges-a crisp shadow, say, or the stripe in a shirt—you need the higher resolution to ensure that these edges are rendered smoothly. A representative at DPI agreed that the company would still recommend scanning at 300 dpi for 2,400 dpi output (the imagesetter resolution that they'd use for a conventional 150-line screen).

Shorter makeready time. Supposedly, stochastic screening makes it easier for a printer to get a press up to speed and producing good color, Shaw's early tests indicate that FM screens give printers more latitude in the ink density that the: apply to a page. Teff Fette of Brown Printing concurs, saying that Brown's initial tests show the same potential.

Watch Out . . .

Dot Gain. Because FM dots are smaller, dot gain–the difference between actual printed density of a color and the specified density-is greater. That is, the smaller dots spread more, relative to their size. Most publishers work to the Specifications for Web-Offset Publications (SWOP) standard of 18 to 25 percent dot gain; Tegra-Varityper has found up to 45 or 50 percent dot gain in midtones in its tests of FM screens. The solution is to compensate for the gain at the film making stage; Shaw's advice is to make sure your service bureau can prove to you that its imagesetter is calibrated properly for FM output. DPI uses the compensation curve for CristalRaster supplied by Agfa.

Higher cost. FM-screened pages could cost you more, but probably not as much more as analysts predicted when the technology was announced. Agfa's CristalRaster requires an outlay by a service bureau of some $25,000, and it's reasonable to expect the bureau to try to recoup that cost. According to DPI, the subject is still under discussion—the only certainty is that the price will be higher for 3,600-dpi film. According to Shaw, many Linotype- Hell imagesetters can be upgraded to Diamond Screening with relatively inexpensive software. He plans to add a 10 percent surcharge for Diamond Screening but says he'll be able to run most jobs at 1 ,270 rather than 2,540 dpi, and the lower resolution carries a discount that will offset the surcharge.

Clean environment. The tiny dots in an FM screen are less forgiving of a dusty work environment than conventional screens can be. For instance, a piece of dust that's on the film when you make a contact exposure of a proof or a plate can cause a gap between the contacted materials, The gap can cause the dots in that area to spread. With a conventional halftone, the spread may represent only a 2 percent increase m dot size, but the same absolute spread on a smaller stochastic dot might be a 10 percent increase. Most experts seem to agree with Tegra-Varityper's assessment that any prepress house or printer that is already successfully working with the small halftone dots used in screens of 200 or more lines should have no trouble with stochastic dots.

Proofing difficulties. Tiny dots make some proofing systems difficult to use. Shaw says, for instance, that he doesn't expect his DuPont Chromacheck system to reproduce such a small dot, but that Agfa's proofing system should work. Another danger is that although most proofing systems show the effect of standard dot gain, they may not be able to show the added dot gain of stochastic screens. At DPI, Fuji technicians recalibrated the company's Fujichrome Match-print system to make it accurate for FM screens.

Know the Score

We found that working with an experienced prepress house and printer meant that stochastic screening demanded little more from us than conventional production does. Most publishers and prepress experts who are experimenting with stochastic screens agree that although these screens require a little extra care in handling and production, it's no more than the attention to detail that high-quality service providers are used to giving their work.

As far as reproduction quality goes, the results were mixed. Some things looked better stochastically screened, others better in conventional halftones. Judgments varied from observer to observer and also were affected by the fact that one proof was glossy and the other matte (the two prepress houses use different proofing systems), by a difference in the color saturation of the proofs, and even by what the observer expected a halftone to look like. Ultimately, such relatively small variables as these made as much difference as the screening method used.