A COMPARISON OF ELECTRONIC PREPRESS TECHNIQUES:

WATER BASE VS UV INK
ROUND VS ELLIPTICAL DOT SHAPES
THREE PRESS SPEEDS

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FOREWORD

The purpose of this experiment was to test electronic prepress techniques as they interact with the flexographic printing process. Adobe Photoshop and Aldus FreeHand were used to create graduated and radial fills. Aldus FreeHand was also used to create a screen tint chart. This chart was used to measure dot gain and print sharpness. Images created in Photoshop were imported into Freehand to create a master target. The target was output at 133 lpi at both round and elliptical dot shapes. The press test was conducted using water-base and UV inks at three different press speeds.

HYPOTHESIS

Based on the concept of the blur filters contained in Photoshop's toolbox, it may be possible to reduce the effects of banding and produce smoother gradations. The results should also favor the elliptical dot over round dots. No assumptions will be made on the performance of water-base vs UV ink. There should not be a significant difference between the two inks.

PROBLEM STATEMENT

Electronic prepress is gaining popularity in flexography; however, there are additional technical factors that need to be addressed. There have been problems printing graduated and radial fills. This target will be used to evaluate this problem. Water-base and UV inks will be used in this experiment to see what affect ink has on graduated and radial fills.

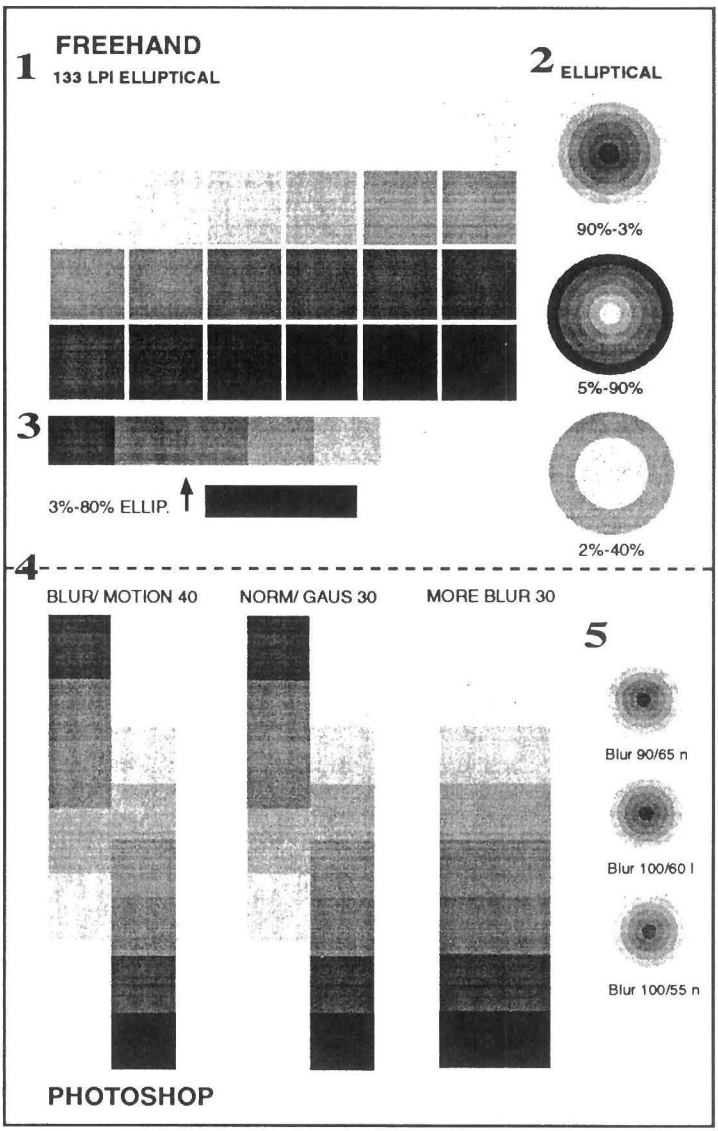
TEST PARAMETERS

CONSTANTS:

Plate: PQS .067" thickness/ floor .040"
Cushion Stickyback: 3M .020"
Base Cylinder: .160" Demountable
Substrate: Coated White Paper
Anilox: 600/23 Laser Engraved Cermaic
Imagesetter: AGFA Proset 9800
Screen Ruling: 133 lpi
Press: Comco Captain 10"
Test Target: Created using Aldus FreeHand and Adobe Photoshop

VARIABLES

Ink: Environmental Water base Ink, Black
Sun Chemical UV Ink, Black
Press Speeds: 100, 200, and 300fpm
Electronic Imaging: round and elliptical dots



The Test Target

Above is an example of the target that was output. This target was output twice at 133 lpi to obtain both the round and elliptical dot shapes. (The actual printed sheet looks slightly different because it was conventionally stripped.)

Explanation of target

1. A tint chart was created in FreeHand to measure dot gain and solid ink density. The tints ranged from 2% to 95%.
2. These are the radial fills that were created in FreeHand. The initial center dot percentage and the outer radius dot percentages varied for each fill. The numbers for the center and outer

radius are listed below each fill. This was done to show the effects of dot gain on possible visible graphic effects.

3. Only one FreeHand fill was produced with a 3% to and 80% graduation.

4. These fills were created with the graduated tool in Photoshop at 266 dpi and then imported as tiff files into FreeHand. The purpose of using a Photoshop blur is to soften an image. Four blur filters were used to see if they would decrease the possibility of banding, and they are as follows: Blur, Blur More, Gaussian Blur, and Motion Blur. A normal gradation was also produced. The Gaussian Blur has the ability to set a specific value from 0.1 to 100.0 to determine the amount of blurring that will be applied to the section. A value of 30 was set for this value. The Motion Blur can produce a blur effect in a given direction and can also regulate the degree to which the blurring takes place. A value of 40 was set for this press test.

5. These are the radial fills created in Photoshop. The end points and center were able to be controlled and the values that were entered are listed below each fill. The *l* and the *n* at the end of these values stand for normal and lighten only. These are two options that can be selected under the Blend Tool Options dialog box. A limitation to the design of the target was that these fills were not created to match those created in FreeHand. Also, this was the first time the user had experienced radial fills and this could have caused less than standard results. Because of these two limitations, conclusions could not be made in comparing Photoshop to FreeHand radial fills.

PREPRESS TECHNIQUES

The test target was output through FreeHand to AGFA's Proset 9800. The imagesetter was previously calibrated for round and elliptical dots at 133 lpi. The targets were output twice and then conventionally stripped together to get the two dot shapes on one film and plate. The final films were duped using Du Pont BLDM film. The density of each tint on the final film was compared to the originals and there was only a slight difference in the density, +/- .03. Plates were made using Cyrel PQS. The face exposure was 17 minutes and the back exposure was 20 seconds. After three washout sessions, the plate dried for ten minutes in the dryer. It was taken out and dried overnight. The plate was .067" thick, with a floor depth of .040". The plate was mounted using .020" 3M cushion stickyback on a 12" repeat cylinder undercut for a .160" using .067" plates.

PRESS PROCEDURES

The press was webbed with white coated paper .003" thick. The normal press set-up procedures were performed. The first trials were done using water-based inks. The starting viscosity was measured to be 45 seconds using a # 3 zahn cup. The impression was set and a sample was taken at a speed less than 100 fpm. The solid ink density was measured. One ounce of reducer was added. Another sample was taken, and one more ounce of reducer was added. After adjustments, a sample was pulled and the solid ink density was recorded to be 1.56. The target was evaluated for sharpness and cleanness of print. The plate was next cleaned and the press speed increased to 100 fpm. The press ran for approximately 30 seconds and the web was marked. The same procedure was performed for 200 and 300 fpm. After the water-base test trials, the printing station was cleaned.

The same procedure was carried out for UV ink. The difference was that UV ink had no additives. A problem occurred when the press speed increased to 300 fpm. The ink became thick and started to sling throughout the printing station. The UV ink performed without problems at lower speeds.

TESTING METHODS

The press sheets were read using an X-Rite 418 densitometer. Each % block was recorded on the actual press sheet. Three samples from each ink and different press speed were measured. A total of 18 samples were read. This test was analyzed on a comparison of solid ink density, dot gain, and a subjective poll. The original films were read using an X-Rite 412.

The FreeHand and Photoshop graduated fills were evaluated subjectively by several different people. Both professional graphic artists and printers were used for this evaluation. The samples were taken off of the press sheet and placed on a separate piece of paper. The 300 fpm samples were used for this comparison. The results and conclusions are outlined on the following pages.

FINDINGS

DOT GAIN

To evaluate overall dot gain, three graphs were produced. Each graph represents a different press speed and contains both water-base and UV inks with both dot shapes. Figure 1.1 illustrates the results at 300 fpm. Overall the UV elliptical dot produced the least amount of gain, except at the 40% mark and the 20% and 30% where the gain was slightly more than the UV round dot. Both UV dot shapes produced less gain than the water-base ink. The water-base elliptical dot performed better in the highlights than to the water-base round dot.

Figure 1.2 graphs the results for the 200 fpm press samples. UV elliptical and round dots significantly outperformed the water-base ink in the highlights and up through the quartertones (2%-30%). At the 10% and 20% marks, the water-base gained about 10% more than the UV ink. The dot shapes at this speed did not produce enough evidence to prove that one shape was superior. The gain for dot shape is illustrated in a random pattern.

Figure 1.3 graphs the results for the press samples at 100 fpm. The UV elliptical and round dots produced the least amount of gain overall. The elliptical dot for both UV and water-base ink produced a smaller amount of gain in the highlights. The gain from the midtones to the shadows

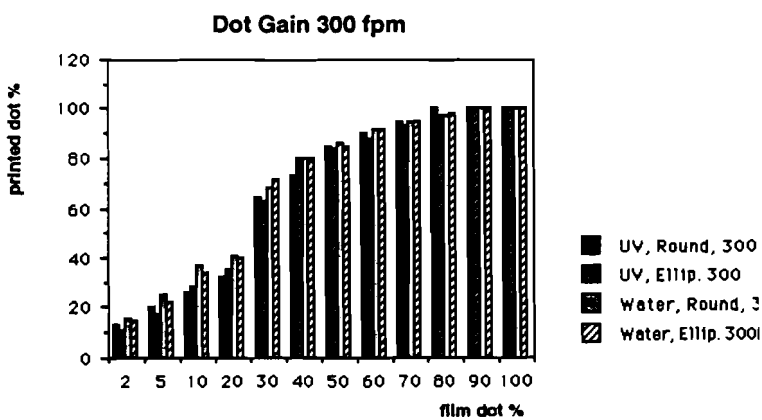


FIGURE 1.1

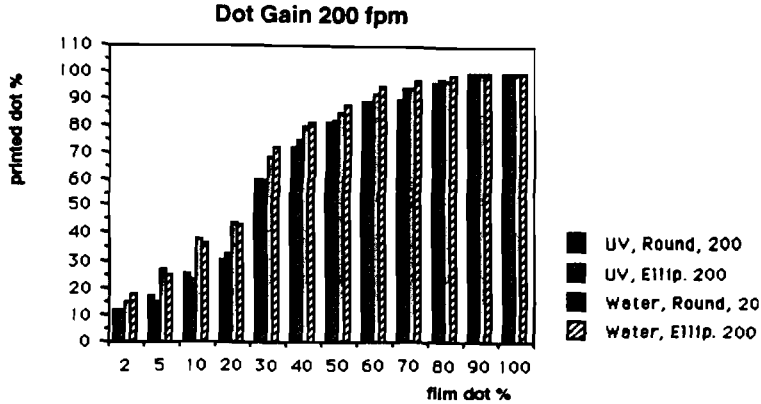


FIGURE 1.2

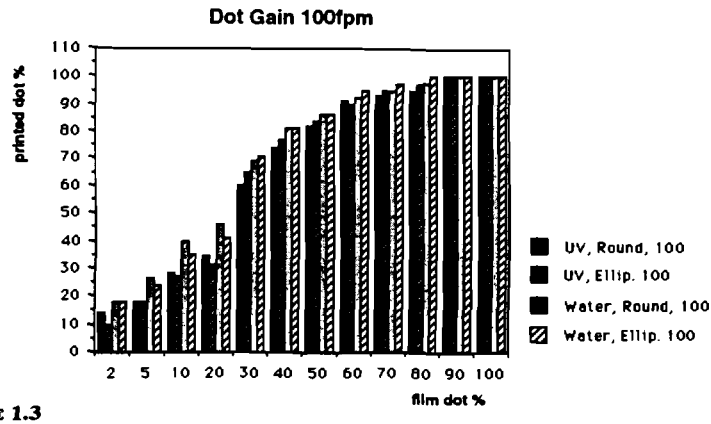


FIGURE 1.3

SOLID INK DENSITY

The solid ink densities performed approximately the same for both water-base and UV inks at different press speeds. That is, when the press speed increased from 100 fpm to 200 fpm, the density increased and when the press speed increased to 300 fpm, it then dropped off. The highest density recorded was 1.61 for water-base inks at 200 fpm. The highest density for UV was 1.58 at 200 fpm. A visual comparison of the two inks showed that UV solid ink densities were contaminated with dust. The water-base ink printed the cleanest and sharpest solid ink density at each speed.

ELECTRONIC PREPRESS TECHNIQUES

An evaluation page for the electronic graduated and radial fills was produced. Five graphic artists and several graphic communications students evaluated the sheet, choosing only one graduated and one radial fill. The Photoshop graduated fills had the most votes and two different blur filters were chosen. The Photoshop radial fills did not receive any votes. The tables below outline the results of the evaluation.

RADIAL FILLS

# votes	ink	dot	Program
14	water-base	e	FreeHand
7	UV	r	FreeHand
6	water-base	r	FreeHand
4	UV	e	FreeHand

GRADUATED FILLS

# votes	ink	dot	Program
4	water-base	e	FreeHand
10	water-base	e	Photoshop/ Gaussian blur
8	water-base	e	Photoshop / Normal blur
4	water-base	r	Photoshop/ Normal blur
4	UV	e	FreeHand
4	water-base	e	Photoshop/ More blur
1	UV	e	Photoshop/ Normal blur

To summarize, the water-base inks were favored over UV by a score of 50 to 16 on both the graduated and radial fills combined. The UV scored poorly because dust particles were extremely relevant in all of the fills. The graduated fills created in Photoshop scored higher than those created in FreeHand. The Blur filters scored higher than the normal graduated fill. Those polled for this test stated that the Photoshop fills had a smoother transition for the graduated fills. As explained earlier, the reason why the FreeHand radial fills were selected hands down over the Photoshop radial fills in the radial section could have resulted from an operator error. The fills created in Photoshop were done by a novice computer artist who had never produced a radial fill before. However, the radial fills produced in FreeHand still produced acceptable and above expected results.

CONCLUSIONS

DOT SHAPE

- There was not a true pattern to the behavior of round and ellipitical dot.
- It was expected that the elliptical dots would perform with the best results. The elliptical dot had the least amount of gain in the highlights for both water-base and UV.
- The elliptical dot was also favored in the electronic prepress comparison.

DOT GAIN

- The UV ink produced the least amount of gain in the highlights for all three press speeds.
- Both inks and dot shapes produced about the same amount of gain from the midtones to the shadows.
- UV elliptical dot had the best performance at all three press speeds.

SOLID INK DENSITY

- The solid ink density for both water-based and UV increased from speeds 100 fpm to 200 fpm.
- The density dropped off when the speed was increased to 300 fpm.
- The UV ink was contaminated by severe dust particles.
- The highest solid ink density, 1.61, was water-base ink at 200 fpm.

ELECTRONIC PREPRESS

- The water-base inks were favored over UV by a score of 50 to 16. The UV scored poorly because dust particles were extremely relevant in all of the fills.
- The graduated fills created in Photoshop scored higher than those created in FreeHand.
- The Blur filters scored higher than the normal graduated fill. Those polled for this test stated that the Photoshop fills had a smoother transition for the graduated fills.
- The elliptical dot was favored over the round dot.