Technical Information

Hard Dot Soft Dot

Linotype-Hell

There has been a lot of confusion recently concerning hard and soft dots. What is the issue? This document will summarize the history of halftone dots and then see how it applies to modern laser technology.

Dots and spots

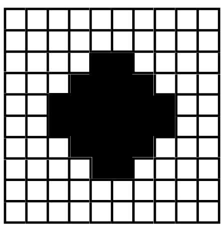

Figure 1 - Digital halftone dot made up of many individual laser spots.

Much of the confusion stems from the use of terms that are innately ambiguous: dots and spots. To clarify this, these terms should always be used with a qualifier: halftone dots and laser spots. A laser spot is the mark that an imagesetter makes on film. You can think of it as a building block for whatever the imagesetter ultimately creates (whether that is a halftone, a tint, line art or text). The size of a laser spot is usually measured in microns. The number of laser spots in an inch is often called the resolution but is more properly referred to as addressability. (See the Linotype-Hell technical information piece on Addressability and Spot Size, part number 3071.) But unfortunately, resolution is usually measured in dots per inch, and this makes it easy to confuse with halftone dots. The best way to keep these concepts straight is to understand that digital halftone dots are made up of one or more laser spots. (See Figure 1.) For a review, see the glossary on the back page.

A brief history of halftoning

Of course, halftones have not always been done digitally. Photographic halftones have a century-old history, as well as many characteristics which are unique. One distinguishing mark of a photographic halftone dot is its fuzzy or soft edge. Under a 100x magnifier a 10% photographic halftone dot has the appearance of a cotton ball. (A similar laser generated halftone dot has a regular shape and a hard edge).

The soft edge of photographic halftone dots results from their exposure through a halftone screen. Areas that get a lot of light grow big halftone dots, areas that get a little light grow little ones. The edges of the dots are soft because they receive some exposure, but the light is not focused or powerful enough to create a solid black. A photographic halftone dot becomes more solid towards the center because that is where it gets the most exposure.[1]

The soft edges of a photographic halftone dot become harder when a contact proof of the film is made. This contact proof is necessary to assure consistent platemaking. (It is difficult to predict the effect a soft photographic halftone dot will have on the printing plate material.) Laser-generated halftones don't need to be contacted because the fringing is minimal.

In the past, soft edges on halftone dots were useful. Acid could be applied to the film to actually shrink the size of the halftone dots. This process, called wet dot etching, was used to make tonal or color corrections in an image. Today, wet dot etching is a craft that is slowly dying. The reason for this is that tonal and color corrections can now be made more easily using either electronic front end systems or dry photographic methods.

When people first started seeing laser-generated halftone dots, they noticed that the edges were very sharp and uniform. Lasers, by definition, supply a very focused beam of light. When lasers expose film they create a very hard edge. This hard edge does not lend itself as easily to wet dot etching. Some output scanner manufacturers even developed attachments to soften the halftone dot edge, but the hard edge is now generally seen as an advantage.

[1] Theoretically, exposure above a certain threshold on a lith or rapid access film should create a black mark on the film, while areas below the threshold should remain clear. However in practice there is some ‘gray area’ between the edge of exposed and unexposed areas. This gray area is often referred to as a ghost or fringe. Dot fringe will appear to some extent in all halftone dots, but is much more accentuated in photographic ones. Fringe is particularly noticeable on low percentage halftone dots (i.e., the shadow areas of negatives or the highlight areas of positives.)

Digital Halftoning and Imagesetter Glossary

Imagesetter resolution is a measure of the ability of an imagesetter to render fine detail. Imagesetter resolution is a function of addressability, laser spot size, film transport, film and film processing. The common usage of the term is usually limited to just one portion of this: addressability.

Addressability is a measure of how many marks an imagesetter can make in an inch.

Dot per inch is a measure of resolution (addressability). It refers to the number of laser spots in an inch.

A **laser spot** is the smallest mark that an imagesetter can make on film.

Spot size is the width of the laser beam in microns, usually measured under a specific set of conditions.

Screen ruling is a measure of the fineness of a halftone screen. The higher the number, the finer the screen. A common screen ruling value is 150 lines per inch. This means that there are 150 lines of halftone dots in an inch. The distance from the center of one of these halftone dots to the next would be 1/150 of an inch.

Lines per inch refers to the number of lines of halftone dots in an inch.

Halftoning is the process used to convert a continuous tone image into a pattern of tiny dots of varying sizes. These halftone dots create the impression of many shades of gray, but can be reproduced using only one color of ink.

A **halftone dot** is used in halftoning to give the impression of gray. Halftone dots of different sizes are used to represent different shades of gray. A digital halftone dot is made up of many laser spots.

Dot percent refers to the size of a halftone dot (in relation to other halftone dots of the same screen ruling).

Hard and soft laser spots?

More recently the discussion about hard and soft dots has resurfaced, but in an up-to-date fashion. People are wondering if some lasers, when they expose a laser spot, make that spot softer or harder than other lasers. Some laser-generated halftone dots, therefore, might be ‘harder’ than others because of the underlying ‘harder’ laser spot. Usually this argument is accompanied by a discussion of the relative merits of infrared laser diode and helium neon lasers (two common imagesetter lasers.)

This argument is somewhat surprising. Under 100x magnification, the difference between a soft photographic halftone dot and a hard laser-generated halftone dot is very easy to see, however the difference between two laser-generated halftone dots is not. To really see the fringe of a laser-generated halftone dot you must view the films using so-called dark field illumination (where the light source is not directly behind the image as in a standard light table). Using this technique, it is difficult to see any difference between the edges of two laser-generated halftone dots. As far as halftone quality is concerned, imagesetter optics, film transport, film, film processing, calibration, and halftone dot generation are more important than the type of laser. (For more information on lasers, see the Linotype-Hell technical information piece on Lasers and Films, part number 3070.)

Conclusion

There are certainly quality differences between different laser imagesetters. The type of laser does play a role in this. But the significance of laser type must be balanced with the many other quality aspects of an imagesetter. Soft and hard halftone dots are of historical interest because of the differences between photographic and laser-generated halftones, but soft and hard halftone dots should not play an important role in the choice of an imagesetter.

Comments

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