Linotype-Hell

Technical Information

Automatic Calibration

Calibrating an imagesetter can be a long process, particularly in a service bureau environment where many imagesetter addressabilities[1] and halftone screen rulings may be used on any given day. For imagesetters in general, the process requires two steps:

- Selecting the density setting (i.e., laser intensity) that will produce the desired dmax (maximum density) on film.
- Using a calibration utility to assure that the dot percentage that is requested, is the dot percentage that appears on film.

The second step involves taking many dot percentage measurements from a test strip, and re-entering these values into a calibration program. Since you must repeat this process for each addressability setting (and for greater accuracy, each screen ruling), this can involve numerous measurements.

The calibration process adjusts for the difference between the dot percentage value that you requested versus the tint value that you measure with a densitometer once the film has been processed. And while calibration gives you some insight into the effect that the laser is having on the paper or film material, it is possible to go to an even deeper level. Using two simple test targets as a basis, Linotype-Hell has developed an innovative software technique that characterizes the interaction between laser and film, and uses these results to predict how halftone dot sizes will be affected. This automatic calibration process is called AutoCalibration and is part of the Linotype-Hell Production Tools 1.0.

[1]Addressability and resolution are sometimes described as synonyms, but there is a difference. Resolution is the ability of a device to resolve detail. Addressability refers to the number of marks that a device can make in a given distance. For accuracy, the term addressability will be used here instead of resolution.

For background information on the topic of calibration, please refer to the Linotype-Hell technical information pieces: Density and Dot Percent, Calibration, and Calibrating on Imagesetter Paper. See also these related topics: Addressability and Spot Size, Digital Halftone Dots, and Lasers and Films.

Laser exposure of film

What happens when a laser light source exposes film? A latent image is formed that becomes visible only after the film has been processed. If you consider a single mark formed by the laser on film, it might look something like the illustration in Figure 1. A number of factors can change the size of this mark: the laser intensity setting of the imagesetter, the amount of time that the laser stays marking this spot, the film material itself, and the film processing. Change any of these factors, and the size of the individual mark may shrink or grow. Digital halftone dots, since they are made up of many laser spots, are very sensitive to any changes that take place in the exposure of the film. And because halftone dots are so small, an increase or decrease in size around the edges can significantly change the size of the halftone dot (and of course the resulting dot percentage value).

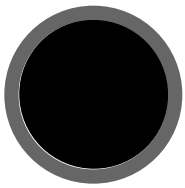

Figure 1 - The mark made by a single laser spot. The gray area around the laser spot signifies the variation in size that may occur due to changes in exposure or processing conditions. (Note: Individual laser spots may not be perfectly round as shown here.)

Calibration

Depending on the size of the mark made by laser spot, the halftone dot size that you request may not be the halftone dot size that you measure. Calibration programs adjust for this discrepancy via a transfer curve. A trans-

fer curve takes the requested value and alters it so that the measured value will come out correctly on film. Transfer curves are created by calibration programs using a technique involving measurement and feedback. Often ten or more tint values are measured, and the resulting measurements are then compared with the requested values. These test results are then used to create the transfer curve.

Automating the process

It is possible, however, to streamline the process of creating a transfer curve by analyzing the interaction between film and laser at a stage below the halftone dot, i.e., the laser spot. Engineers at Linotype-Hell Company have developed a process that looks at the growth in density along the edge of an area that is exposed by a laser. This is done by measuring the density of a series of very narrow (one to three pixel width) horizontal and vertical parallel lines. (See Figure 2.) These measurements give clues to how the film and laser are interacting.

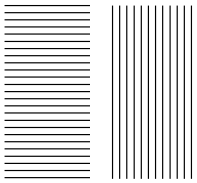

Figure 2 - Extremely narrow horizontal and vertical lines are used as a test target for automatic calibration.

Two sets of lines are required because the interaction between the laser and the film is slightly different in the horizontal and vertical directions. By analyzing the difference, the AutoCalibration software in the Linotype-Hell Production Tools 1.0 can predict the transfer curve that would normally be attained through a lengthy calibration process. There are many factors that can affect the accuracy that may be achieved through AutoCalibration, including dmax, densitometer calibration and the number of gray levels (as based on screen ruling and addressability setting). However, in a properly maintained work environment, measured values should fall within one or two percentage points of the requested value.

[2]AutoCalibration is only one feature of the Production Tools 1.0. Also included are: Automatic Page Positioning (which maximizes film use); crop mark, register mark, and slug line control; and the ability to swap screen angles assigned to color separations.

Automatic calibration means that only one calibration is required for each film material and addressability setting. By entering the data from the test target, the calibration for all halftone screen rulings, screen angles, and dot shapes will be performed automatically. Automatic calibration works with all Linotype-Hell recorder models except the Linotronic* 70 and the Linotronic 90. For those who are interested in continuing to use the existing calibration technique from earlier versions of the Linotype-Hell Utility, that facility still exists in the Linotype-Hell Utility 6.0. In the U.S. and Canada, the Linotype-Hell Utility 6.0 and the Production Tools 1.0[2] are available through the type sales department (1-800-633-1900).

Conclusion

While automatic calibration speeds the calibration process, it is important to remember that the laser intensity settings must be adjusted for each addressability setting and film material. In addition, the process still requires that a test target be output and measured for each addressability setting that is used for halftones and tints. Finally, the role of the film processor should never be underestimated. If the film processor is not maintained carefully, any calibration done earlier will not produce the desired results. Keeping an eye on the dmax of films throughout the production day is one way of assuring that no unexpected changes have taken place.

Comments

Please direct any questions or comments to:

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