



The Benefits of Grayscale: The DPI Battle Ends

As grayscale print head technology evolves and becomes a viable solution for true production-level superwide/grand format inkjet printers, it's important to address the impact variable drop grayscale printing has on how the industry measures print quality.

The spatial measure of resolution in dots per inch (dpi) is only relevant when measuring single/binary droplets. In this paper, we will discuss how apparent resolution, or the way an eye perceives an image as having greater detail than it does in physical reality, should be used as the new standard for judging final print quality.

Improved Print Quality with the Introduction of Light Colors

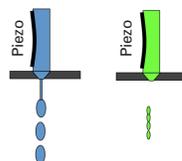
Light colors are used as a means to trick the user's eye into perceiving the print as having a higher resolution than the native resolution. In other words, light colors offer a second, lighter level of detail to an image to reduce the grainy appearance of skin tones and quartertones, in particular. Light colors are typically 40% of the optical density of the dark colors. So, if you are printing a light blue of 40% density, for example, the printer will use nearly 100% of light cyan instead of the usual 40% coverage of dark cyan. Although more ink is used, the light color gives the print a nice, smooth fill, resulting in an apparent increase in resolution of 1.5. So, an image printed at 600 x 360 dpi, an average resolution of 464 dpi, appears closer to 700 dpi with the use of light inks. Similarly, a 1000 x 720 dpi print with light inks has an apparent resolution of 1200 dpi.

Superior Quality Using Variable Drop Grayscale Technology

The use of variable dot sizes within the same print (variable drop grayscale printing) can be a marked improvement in the imaging technology. As the dot size gets smaller, the eye perceives the dots to disappear, becoming continuous tone, like a photograph – all while using less ink than the light colors method.

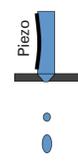
True variable drop grayscale print heads can produce droplets of varying volume on demand. Through the RIP, you can specify the appropriate droplet size for specific image features. For example, use small drop sizes when producing prints with small text and fine line detail. Medium drops are ideal for skin tones and when smooth tonal transitions are required. For high ink density areas or large fields of solid colors, select a larger drop size. Grayscale delivers flawless skin tones, smoother shadows and gradients, crisp, clear small and knock out text, and intricate detail. The more levels of grayscale available, the smoother color transitions and fine detail can appear.

Although the levels of grayscale (the number of variable droplet sizes available) differ by manufacturer, the overall result of variable drop grayscale printing is near photographic image quality that exceeds the image quality when printing with light colors. You also get the added benefit of improved image quality consistency throughout the print and from job to job since you are able to vary the drop volume based on the specific features in the print.



BINARY VARIABLE DROP

Can produce different size drops, but only one size per image. These heads are not capable of dynamic drop volume changes. Can simulate grayscale with multiple passes.



VARIABLE DROP GRAYSCALE

Print head capable of ejecting different size drops dynamically within the same image.

Cost Savings

As stated earlier, light colors are used to image smoother tones and increase the apparent resolution of a print, but at the expense of using substantially more ink. Variable drop grayscale printing, on the other hand, saves ink by using small dots to fill light areas, rather than flooding an area with lighter inks. Four-color printing with variable drop grayscale technology will save ink versus four-color binary drop printers and six color printers using light colors.

The savings will vary depending on the droplet size capabilities of the printer, but on the six-color EFI™ VUTEk® QS2 Pro printer with grayscale technology, conservatively, ink savings ranges from 15-25%. EFI's four and eight-color VUTEk GS Pro Series hybrid printers use 20-30% less ink when used in the grayscale mode versus the comparable binary modes.

When Image Quality is Critical: Grayscale and Light Colors

For those times when image quality is the absolute critical factor for customer satisfaction, variable drop grayscale printing with two light colors (six color printing with CMYK, LC, LM), a capability of the VUTEk QS2 Pro printer, gives the appearance of more levels of grayscale, for additional smoothness and continuous tones. Take it a step further and print variable drop with four light colors on the eight-color VUTEk GS Pro Series printers and image quality will further improve.

In these cases, you will not benefit as much from lower ink consumption, but the final print will live up to your customer's quality requirements.

The New Standard

Side by side comparisons of inkjet technology surely will continue to list true resolution in dots per inch for some time. Changing the way an entire industry measures final print quality will not be easy. However, it is important for us to begin talking about apparent resolution versus dpi as new measure of final image with print buyers. After all, beauty is in the eye of the beholder.



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