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GREYSCALE TECHNOLOGY

Why greyscale?

Traditionally the large-format print head has used a fixed drop size, and there was always a trade off between high performance and image quality for production speed. When printing quartertones, particularly when printing skin tones, there is an issue with grainy appearance of the image. This was resolved by using additional light versions of CMYK. The downside with this method is that you use more ink.

The Dimatix Q-class and Ricoh Gen5 print heads, that Novus uses in its printers, when combined with dynamic variable drop greyscale jetting technology, deliver highly accurate, variable-drop jetting with just CMYK ink without affecting the print productivity. These drop-on-demand print heads with drop sizes ranging from 7 to 21 picoliter for the Ricoh Gen5 and 10 to 30 picoliter for the Dimatix, combine precise, high-speed, multi-pulse binary jetting and versatile greyscale operation. Dynamic variable drop greyscale technology utilizes the high frequency response of the print heads. It does this by activating the piezoelectric element with waveform pulses of varying amplitude to produce measured amounts of ink which is pumped into a single drop before the droplet leaves the nozzle. This capability is used to form variable size drops with no compromise in jetting productivity.

THREE TYPES OF PIEZO INKJET PRINT HEADS

BINARY DROP: A single drop size is ejected from the print head. These heads can simulate greyscale with multiple passes, but consume more ink in doing so.

VARIABLE DROP: Some piezo heads produce different size drops, but only one size per image. These print heads are not capable of dynamic drop volume changes.

VARIABLE DROP GREYSCALE: These print heads are capable of ejecting different size drops dynamically within the same image.

Variable drop size, image quality and productivity

Variable-drop printing delivers near-photographic image quality. For printers with a wider range of variable drop sizes, the image quality will reveal a sharpness that only previously has been seen at higher resolutions. The highest image quality in fine text and color gradients is accomplished using a small drop size. For any given drop size, to achieve full ink coverage and optimal color density, the printing device must match resolution with drop size. Once the resolution and drop size are established, the resolution and carriage speed determine print head (printing) frequency.

To summarize the key relationship – improving image quality drives toward the use of small drop sizes, but small drops/ high resolution need higher frequency, which limits overall printer productivity. Unlike other variable drop solutions, dynamic variable drop greyscale technology decouples these two fundamental constraints to achieve high image quality AND productivity within a single printing system.

Uniquely, dynamic variable drop greyscale technology produces variable drop sizes from a single print head in two ways. First, variable binary mode can be used to create all drops within a single image with one drop size, but it allows the drop size to be changed for different print jobs based on desired image quality or substrate attributes. This allows the printing system to run in high-quality mode using small drop sizes, and then switch to high-productivity mode with a higher speed and lower resolution using larger drop sizes. This capability makes a more versatile printing system and does so without altering the linkage between image quality and productivity.

Second, in greyscale operating mode, dynamic variable drop technology can produce drops of varying sizes within a single image file to derive image quality consistent with small drop high resolution imaging combined with the productivity associated with large drop printing.

Improved drop formation and increased ink latitude

Waveforms can be tuned for optimum drop formation. Unlike other greyscale implementations, dynamic variable drop waveforms have the unique capability of forming the drop at the nozzle for every drop size. The waveforms can quickly be modified to accommodate a speed of sound variation in a given ink or optimized for the velocities of the different drop sizes. As the Novus Imaging product line expands, the dynamic variable drop waveforms can be adapted with unrivaled flexibility to suit the nature of the ink.

Cost savings

The greyscale technology of the Dimatix and Gen5 print heads that Novus Imaging uses in its printers not only delivers high quality images and pin sharp text, but also has the benefit of delivering ink savings as the smaller drops are placed around and between the larger drops. These ink savings are typically between 30%-35% purely on image production, however there is also minimal ink purging due to the perfect collaboration between the Dimatix or Gen5 print heads, dynamic variable drop jetting technology and Novus Imaging's UV LED and UV28 ink. This only adds to the cost saving versus traditional grand format solutions and can reduce the amount of ink used by up to 50%!

In summary, by using dynamic variable drop greyscale technology, Novus Imaging has the flexibility to design waveforms specifically tuned to the ink and application, giving a superior image quality and print performance coupled with ink cost savings for the customer.