HARDWARE-AWARE SOFTWARE

Software that is highly optimised for data rate performance can help to ensure better print quality for industrial digital printing. Simon Edwards introduces a new range of tools designed to provide enhanced image management and compensation for variation caused by inkjet printheads.

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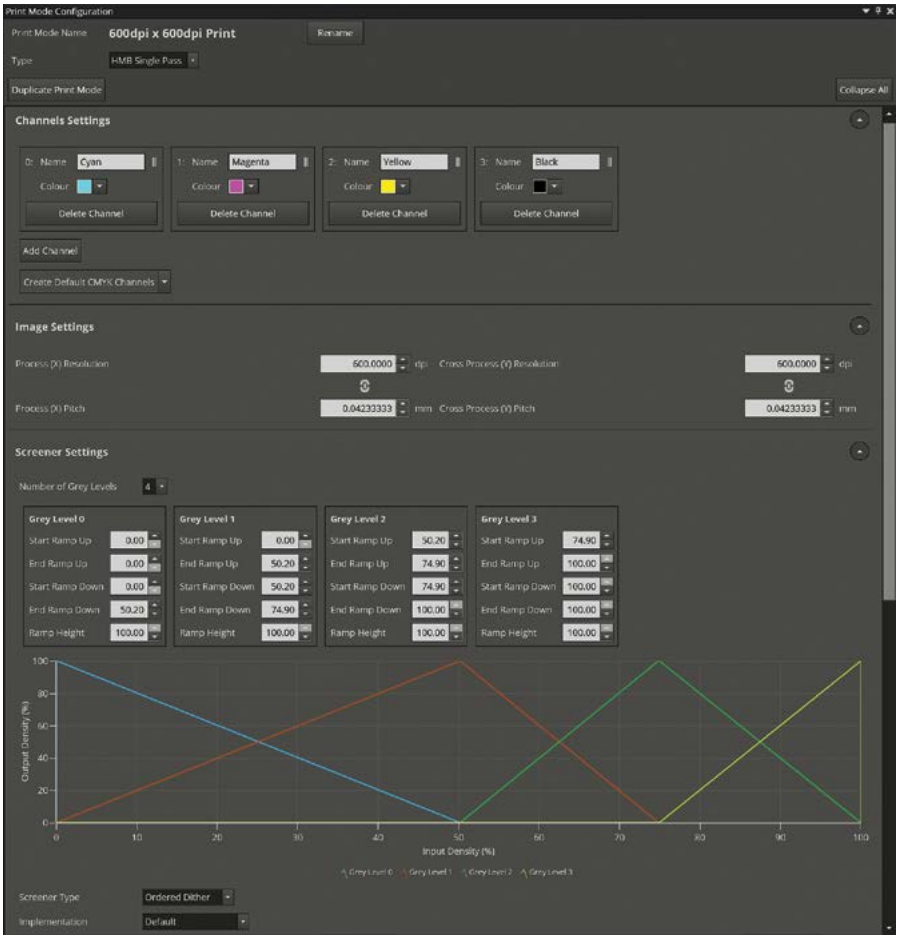

GIS' Atlas IQ toolset includes screener type selection and optimisation for smooth continuous tone to grey-level mapping

The industry is now moving into a new era of industrial digital inkjet printing with increased printhead capability and high data rate drive electronics, resulting in faster print speeds and higher resolution. When combined with state-of-the-art software, high image quality and productivity can be achieved, opening new markets and product opportunities.

The application of intelligent software systems is becoming one of the most significant differentiators between average print and superior print performance – in particular, software that is highly optimised for data rate performance, 'hardware aware' and able to compensate for some of the shortcomings of printing systems.

MONITORING VARIATION

Industrial digital printing presses often include large arrays of high resolution printheads. Despite the tight manufacturing tolerances, there is still variation in the performance of each nozzle within a printhead, as well as from printhead-to-printhead, which often leads to image defects in the final print. As a result, it is highly likely that there will be printheads with missing nozzles, as well as variation in the nozzle performance within a printhead and from one printhead to the next. For many digital printing applications, it is critical to use software compensation to adjust for these variations and hence reduce the visibility of these nozzle-to-nozzle and printhead-to-printhead variations in the printed output.

Many industries have similar issues; for instance, the automotive industry relies heavily on software within vehicle computers to monitor many aspects of the vehicle's performance and correct for a range of metrics to maximise fuel consumption, while at the same time maintain high overall performance. As is the case with many other industries, the process of compensating for hardware variations is not solved by a single tool but requires a combination of components that when used together provide the highest possible quality and performance outcome.

ENSURING CONSISTENT DELIVERY

Printhead drive electronics and print fluid control systems also have a direct impact on quality of print. An important aspect of GIS drive electronics is stable and accurate replication of the waveforms to the printhead. The use of drive electronics that can drive the printheads at their maximum specification is also an imperative to ensure that maximum print speed and drop placement accuracy are achieved. Ink control is also as essential as the drive electronics in maximising the

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performance of inkjet printheads. GIS Ink Delivery Systems provide a high level of electronic monitoring to ensure they work together with drive electronics to achieve the highest possible level of performance. For this reason, a key element of the GIS Atlas software is the control and monitoring of both the drive electronics and the ink delivery platform, ensuring consistent delivery of the ink or fluid.

GIS ATLAS IQ

With software taking an ever-important role in print quality, GIS has introduced its Atlas IQ toolset, a range of image quality tools to provide a superior level of image management and compensation for inkjet printheads. Without these tools, print defects such as grainy images, discontinuities between printheads and density variation can become evident in the printed image to such an extent that the print result is un-saleable. The process of achieving maximum image quality and performance starts with screener selection and screener optimisation. This is followed by calculating nozzle density compensation, channel linearisation and colour profiling, and lastly applying these along with missing nozzle compensation and dynamic image registration to the printed output.

THE PROCESS

It all starts with the screener, and importantly **ultra-fast binary and greyscale screeners**. Screeners are crucial to achieving the best image reproduction for the type of image being printed, allowing the best image quality conversion of continuous tone (contone) images to produce smooth grey-level transitions while maintaining sharp line detail when working with a limited number of printhead grey levels. Once the screener type has been selected, it is optimised to achieve a smooth contone to grey-level mapping, full greyscale dynamic range and ink limiting.

Nozzle-to-nozzle balancing, known as **Nozzle Density Compensation**, adjusts every pixel in the original image with the aim of producing the same output print density for the same input density of the original image for every nozzle. The application of these corrections is tightly integrated with the screener software to achieve the fastest correction possible and maintain the highest possible performance of the datapath from original image file to printed output.

To ensure that each process ink colour channel accurately represents the desired output density, **Channel Linearisation** needs to be performed on each process colour channel. This is achieved by printing individual channel linearisation test charts, measuring the printed charts with a densitometer resulting in the linearisation correction such as CGATS. This is then followed by Colour Profiling to ensure that when process colour channels are used together, they accurately represent the intended output colour, as the combination of the process colours and laydown order can significantly affect the resulting printed output colour.

To reduce the visibility of missing nozzles, **Missing Nozzle Compensation** is required. As with **Nozzle Density Compensation**, this compensation is tightly integrated with the screeners to maintain optimal performance. GIS Missing Nozzle Compensation allows for neighbouring nozzles to be adjusted to compensate for those issues, thus significantly reducing the visibility of these artifacts and giving the impression that all nozzles are active.

Finally, **Dynamic Registration** is applied to the printed image for applications where aligned with pre-printed substrate or where substrate alignment is required. This is typically used for applications such as hybrid printing presses, where digital print is being applied to pre-printed analogue print, or varnishing applications where the varnish layer needs to be applied to pre-printed substrate.

The GIS Atlas IQ tools are now available within the GIS Atlas Software Suite, enabling customers to fully optimise their print quality and achieve superior print performance. These are available as bundled software, standalone or SDKs, and are compatible with GIS and third party RIP solutions, user interfaces and datapath drive electronics. ■

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