



**FUTUREPRINT & PACK**

11 NOV: CAMBRIDGE LIVE // 18 NOV: DIGITAL STREAM

# GIS

GLOBAL  
INKJET  
SYSTEMS

**FUTUREPRINT & PACK**

# Perfecting Print Quality Through Software

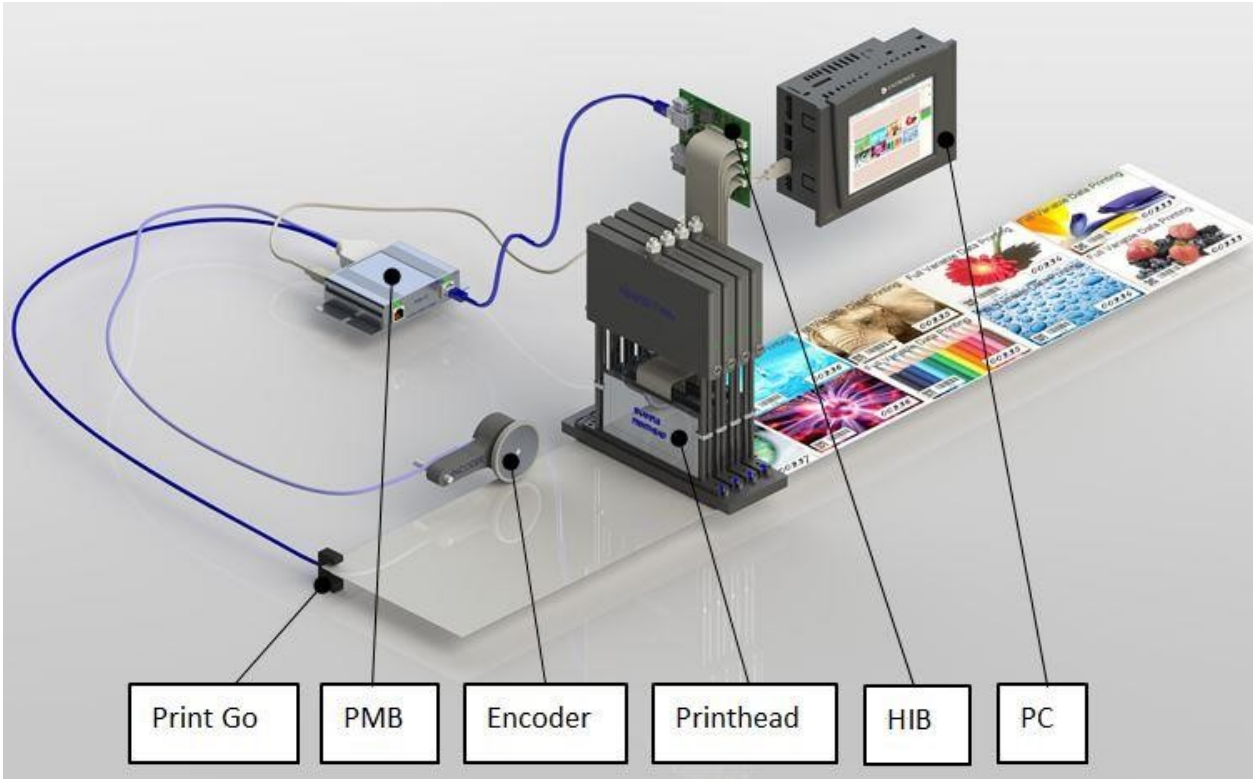
**Simon Edwards**

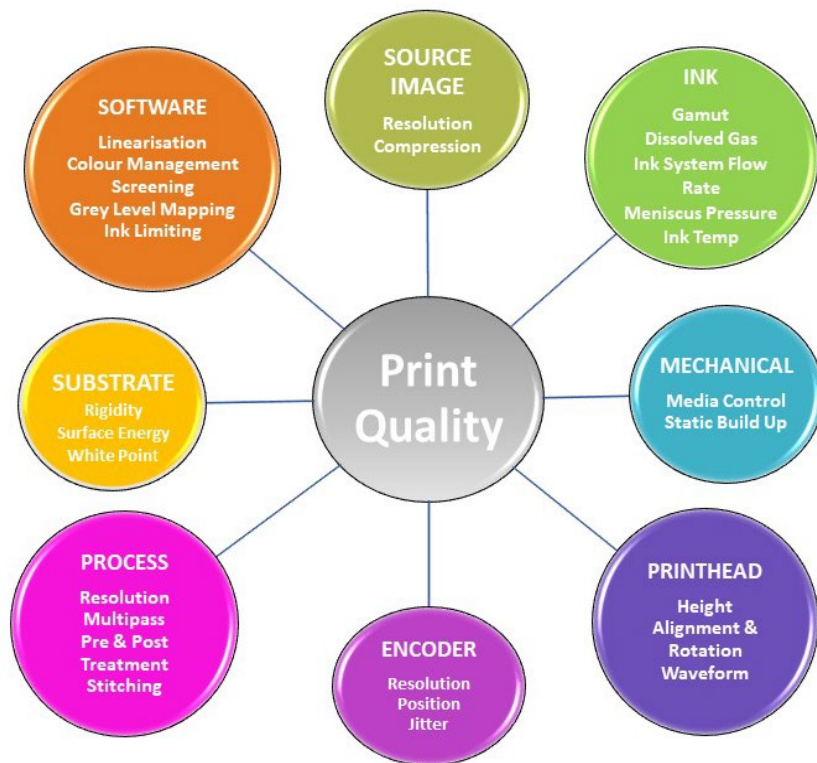
Software Business and Product Manager

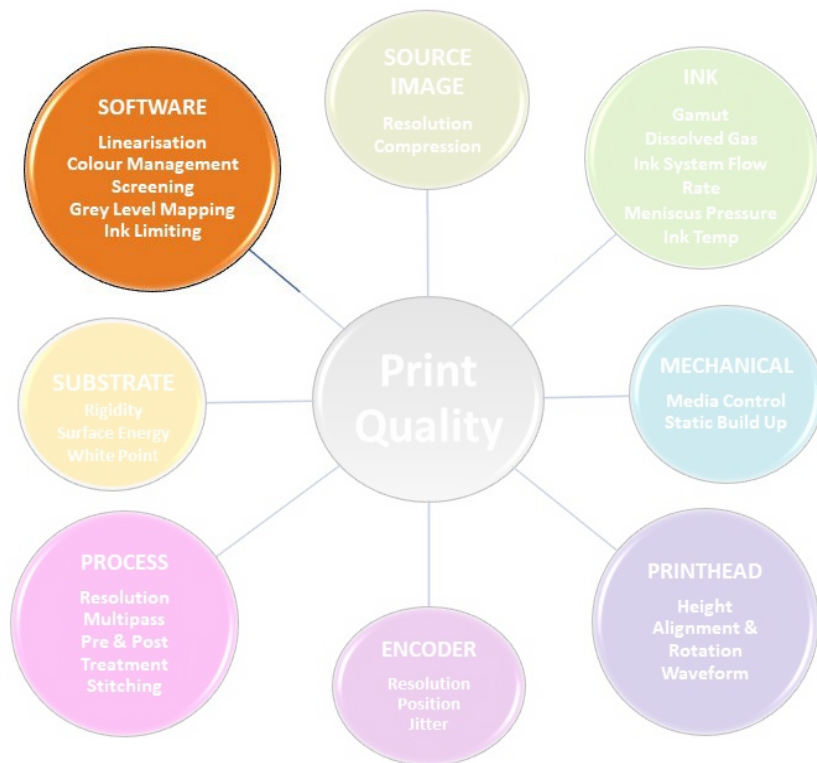
FUTUREPRINT & PACK

CAMBRIDGE, 11 NOVEMBER 2021

# How Hard Can It Be?

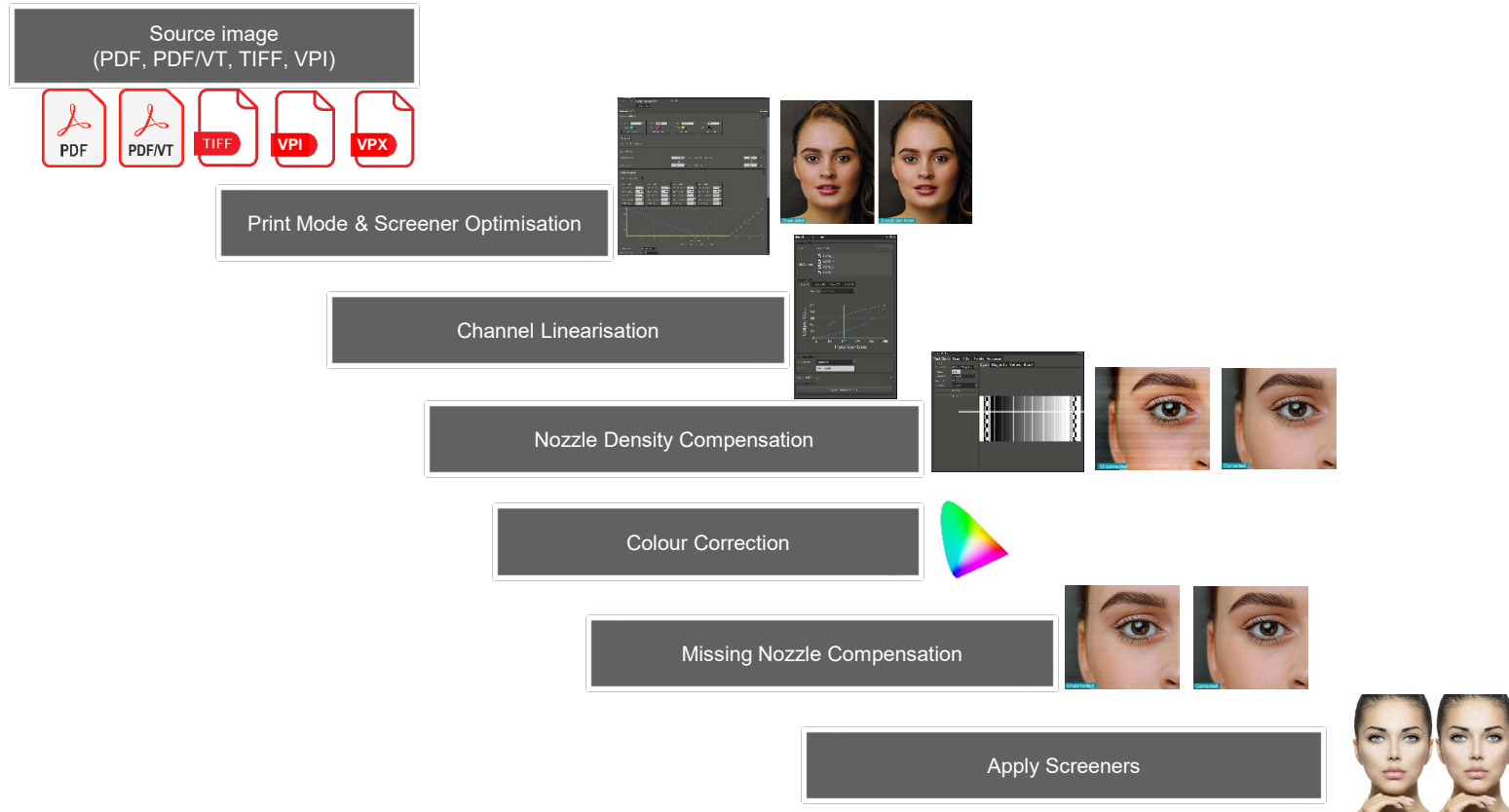






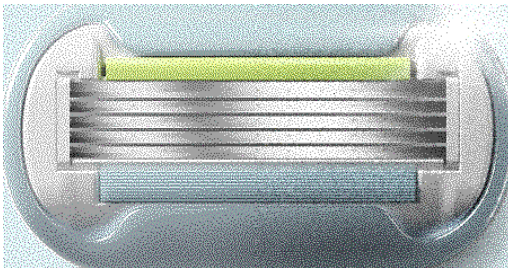
**System  
stability  
is critical**

# What Can Be Achieved With Software Alone?



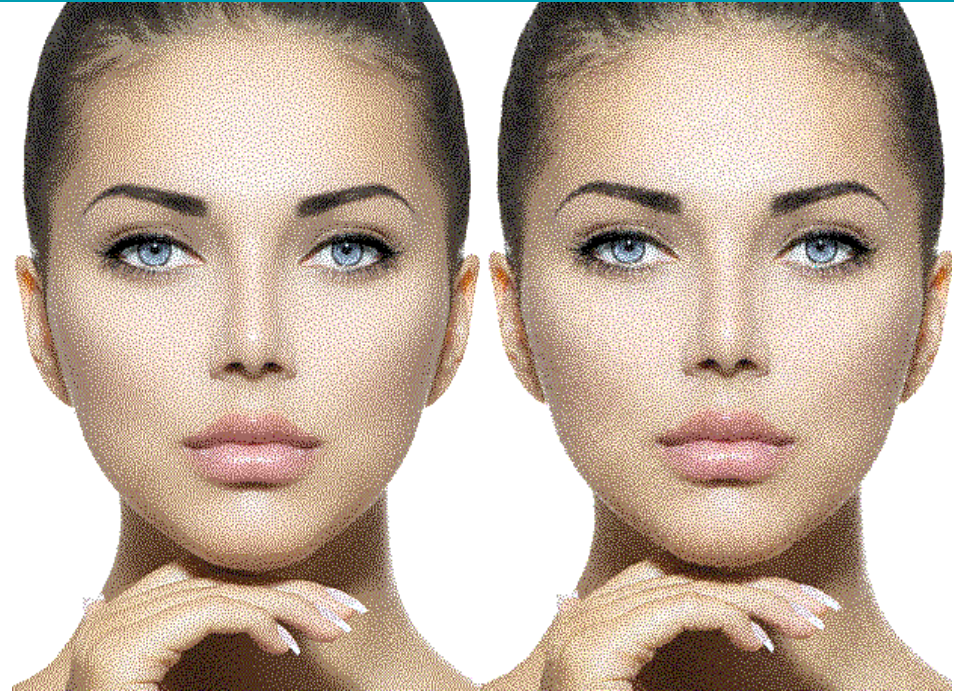


- Error Diffusion (ED) and Ordered Dither (OD) Screeners
- Comparison is difficult without controlled viewing conditions
- But side-by-side ED shows slightly less grain in skin tones and better fine detail
- Differences become smaller at higher resolution
- OD significantly faster to compute than ED



Error Diffusion

Ordered Dither



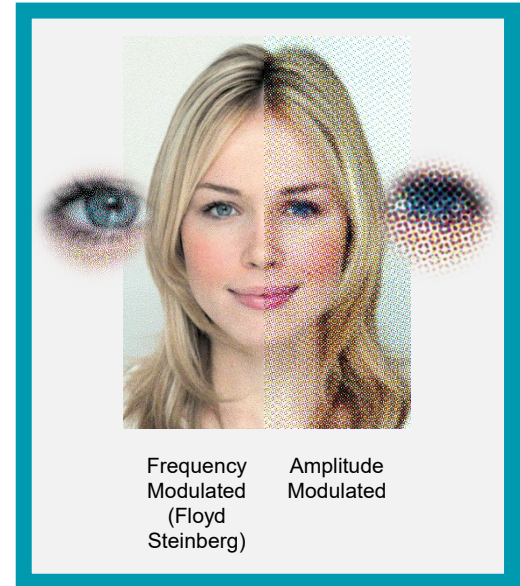
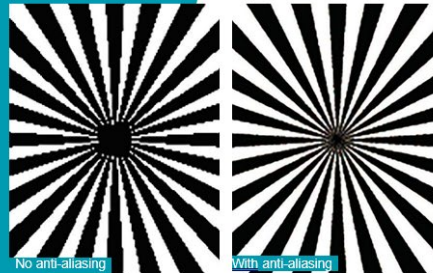
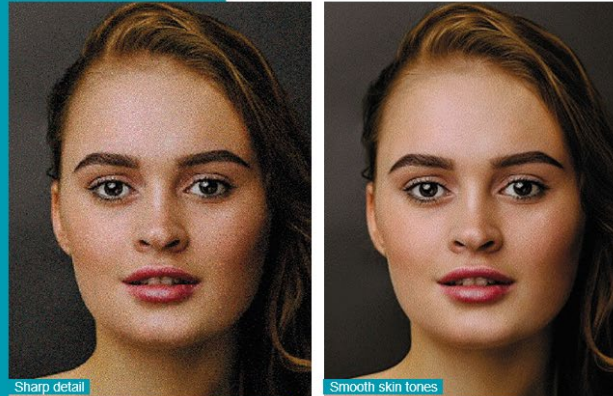
Error Diffusion

Ordered Dither

## Screeners Optimisation

Ultra-fast binary and greyscale screeners are crucial to achieving the best image reproduction for the type of image being printed, allowing the best image quality conversion of contone images to produce smooth grey-level transitions while maintaining sharp line detail when working with a limited number of printhead grey levels.

GIS Screeners are the most optimised screeners on the market, allowing for inline RIP-on-the-fly to maximise press usage and profitability for the press operator. Once the screener type has been selected, the screener is optimised to achieve a smooth contone to grey-level mapping, full greyscale dynamic range and ink limiting.



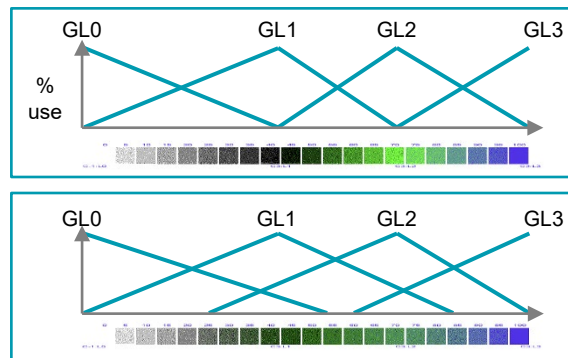


## Another inherent issue is greyscale texture



### Avoid areas of single drop sizes in greyscale

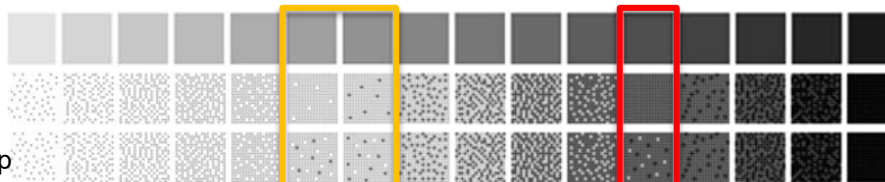
- Human visual cortex is also sensitive to texture
- Greyscale screeners should avoid areas with single drop sizes because they create a change of texture
- This is achieved by mixing in other drop sizes, known as grey level overlap



Source Contone

Output No Overlap

Output With Overlap

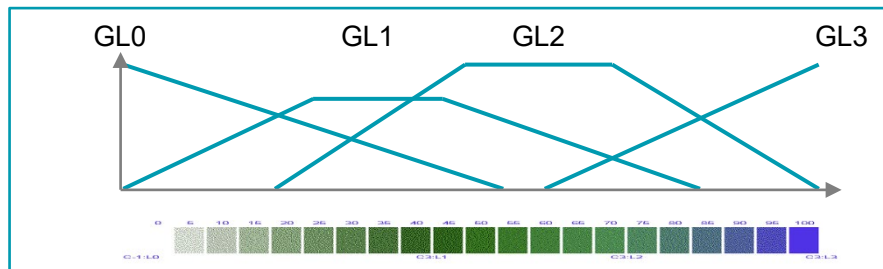
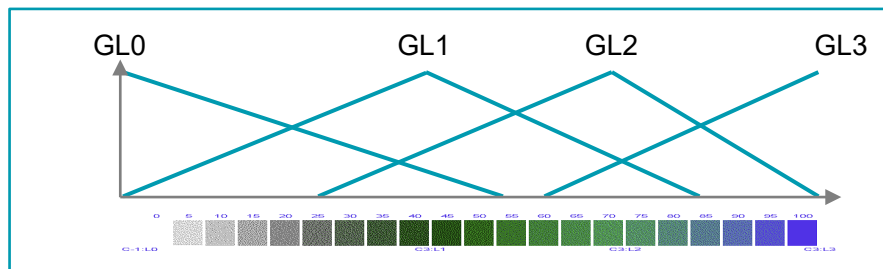
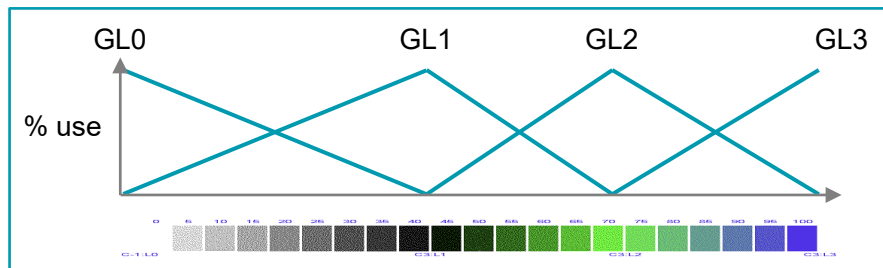


GL1

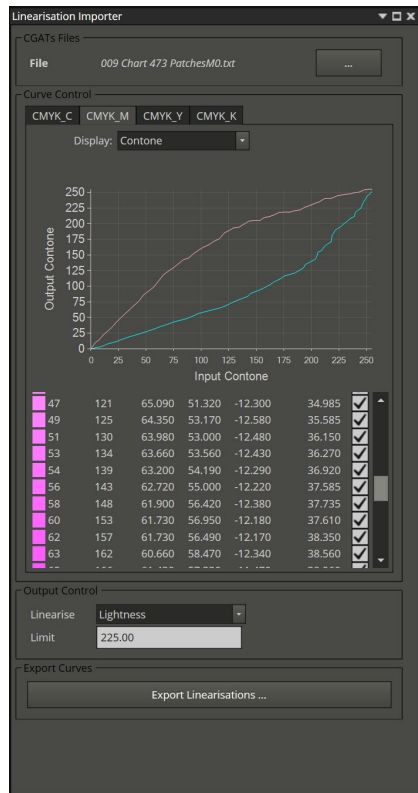
GL2

# Blending Grey Levels

- RIP technologies often allow the user to specify the locations where grey levels overlap and how they overlap
- This can improve image quality, especially on systems where the ink can have a gloss finish, as it avoids areas of density where only a single drop size is used
- This technique is only applicable to systems printing with multiple grey levels



- 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
- Each print mode will need its own linearisation and colour profile

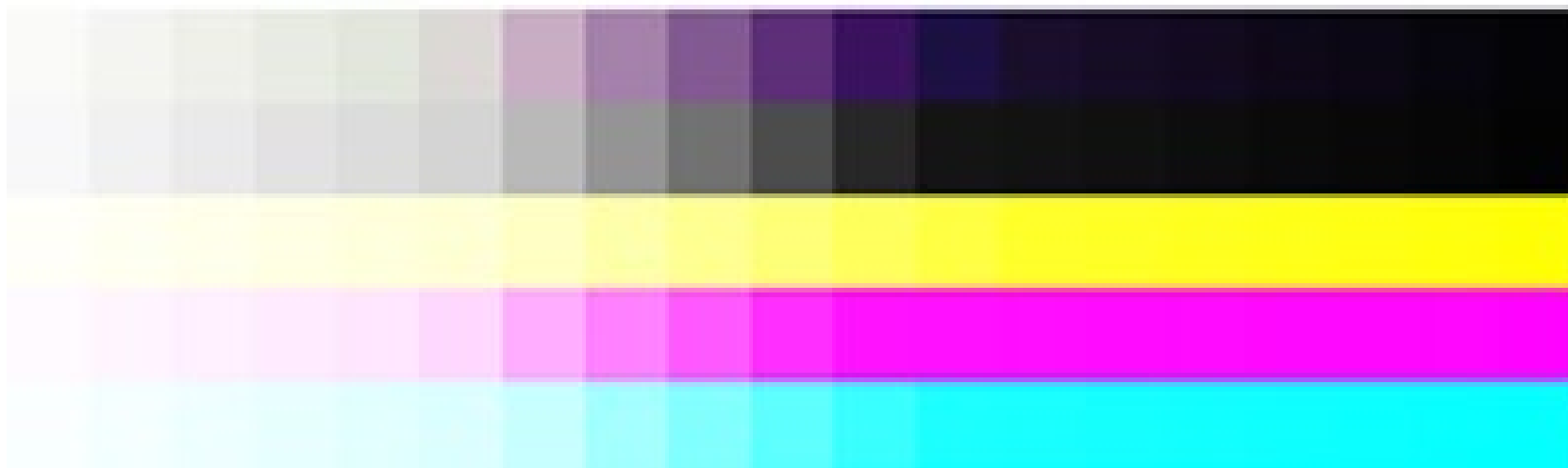


## Linear Colour Channel Density

Incorrect colour channel density linearisation means the input colour value for a single colour does not match the output colour value comparatively to other colours

Results in non-linear response and incorrect colour

Process black (=C+Y+M+K) shows colour shift



## What is it?

- Linearisation ensures the printer maps contone values evenly throughout the scale, from 0-100%

## Why do it?

- It makes multiple printers behave in a similarpredictable way
- It makes colour management easier

## Method of control?

- Generate a linearisation test chart
- Print it
- Measure the output data
- Import the measurement data into the RIP to apply

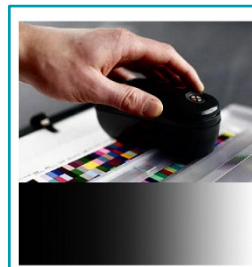


Figure 1: Not linearised

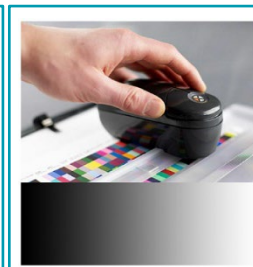


Figure 2: Linearised

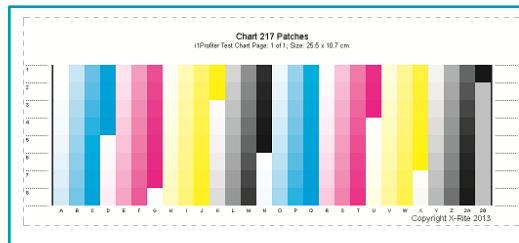
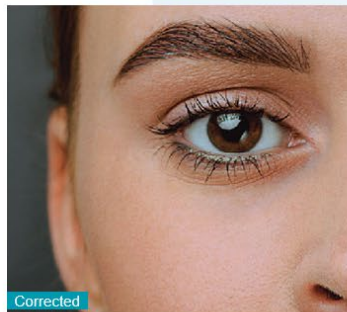
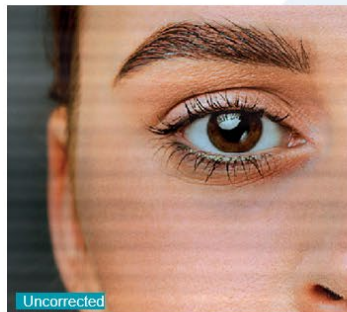
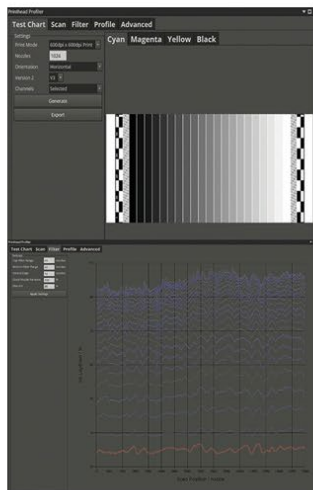


Figure 3: A Linearisation Test Chart





## Nozzle Density Compensation

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 the GIS Printhead Profiler image correction software can be 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.

# Nozzle Density Compensation

## Correcting for print density can be done through software



### Print Density Analysis

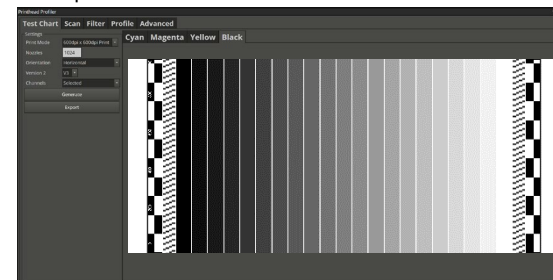
- GIS has a suite of tools for creating a density pattern
- Once a test pattern has been printed and scanned users can import scanned images, analyze them and generate a correction file
- For in-line correction, a line scanner and fully automated workflow is also supported



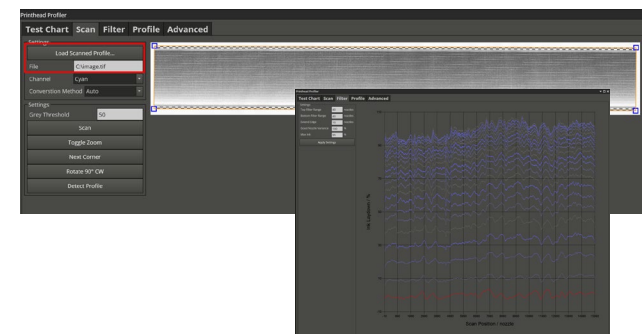
### Correcting Density

- Using a correction file, GIS software can compensate all print data on the fly to minimize the density variations
- Users can specify correction methods, linearization curves and more
- Correction is normally done during screening to maximize print quality although it is also possible to density correct screened data
- Density correction is available **Fully Integrated** or **Standalone** for use with 3<sup>rd</sup> party software

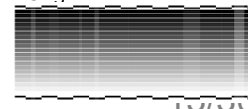
Test pattern



Scan Results Window




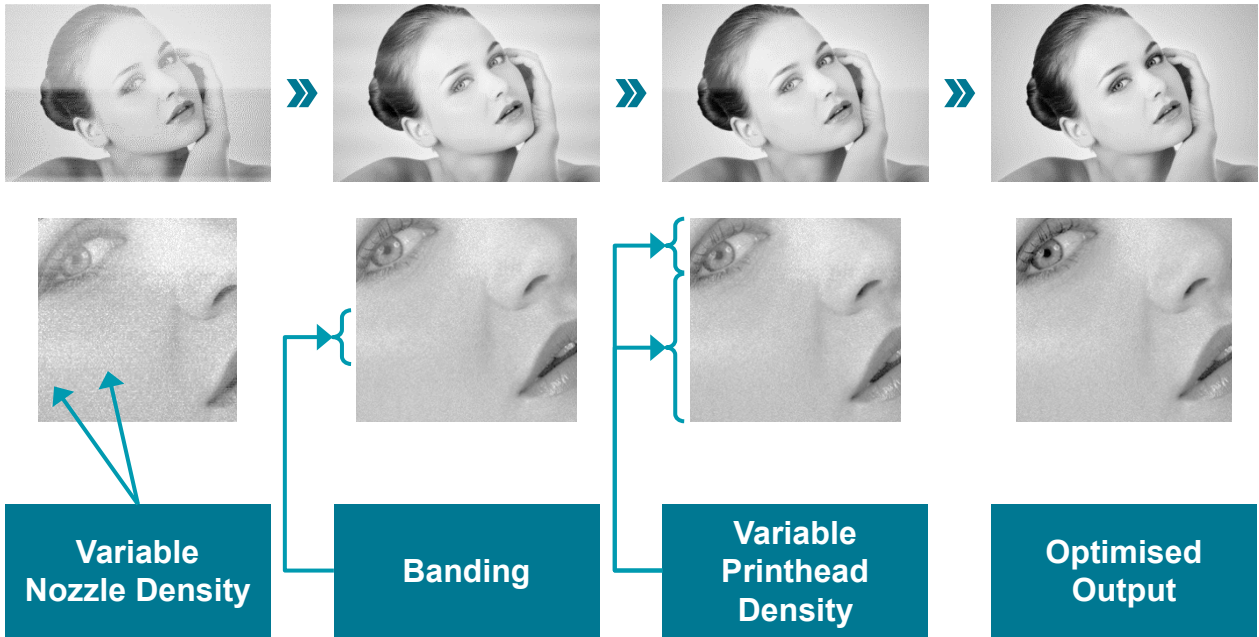
Original Data



Corrected Data



 GIS Atlas Server is then able to correct density mismatches **per printhead**, **per bank of nozzles** and **per nozzle**

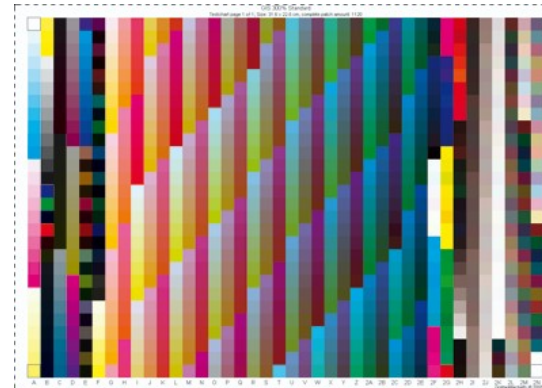
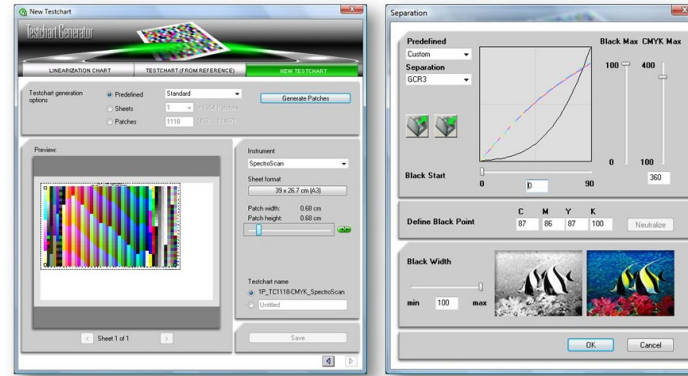
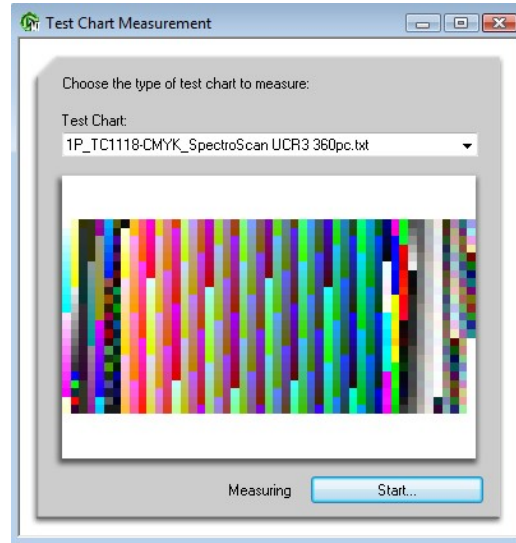


- Poor colour management results in the printed colour output not matching the desired colours of the original image
- This is the result of poor mapping of continuous colour tones into process colours and poor colour “mixing”
- Resolve by implementing a colour mapping process to produce a colour mapping profile (ICC)



## Colour Management / ICC Profile

- Generate test charts
- Print and measure charts
- Generate ICC profile
- Iterate

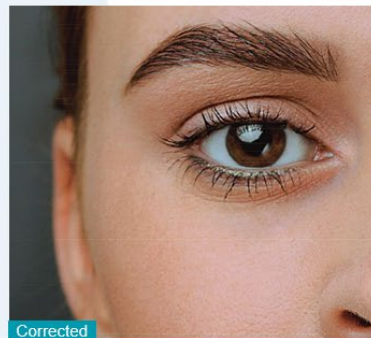
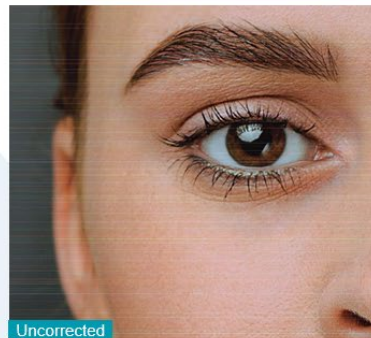




## Missing Nozzle Compensation

Missing Nozzle Compensation reduces the visibility of missing nozzles. It is tightly integrated with the screeners to maintain optimal performance. In an ideal world all printhead nozzles would be perfect; however, due the size and number within a printhead this is often not the case. Misalignment of or even blocked or damaged nozzles can be masked by software, thereby removing the tell-tale faint lines or missing lines in the final printed image.

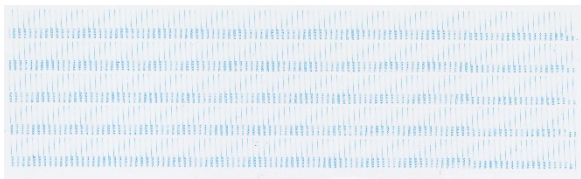
Missing Nozzle Compensation allows for neighbouring nozzles to be adjusted to compensate for those issues, thus significantly reducing the visibility of these artifacts and giving the impression that all nozzles are active.

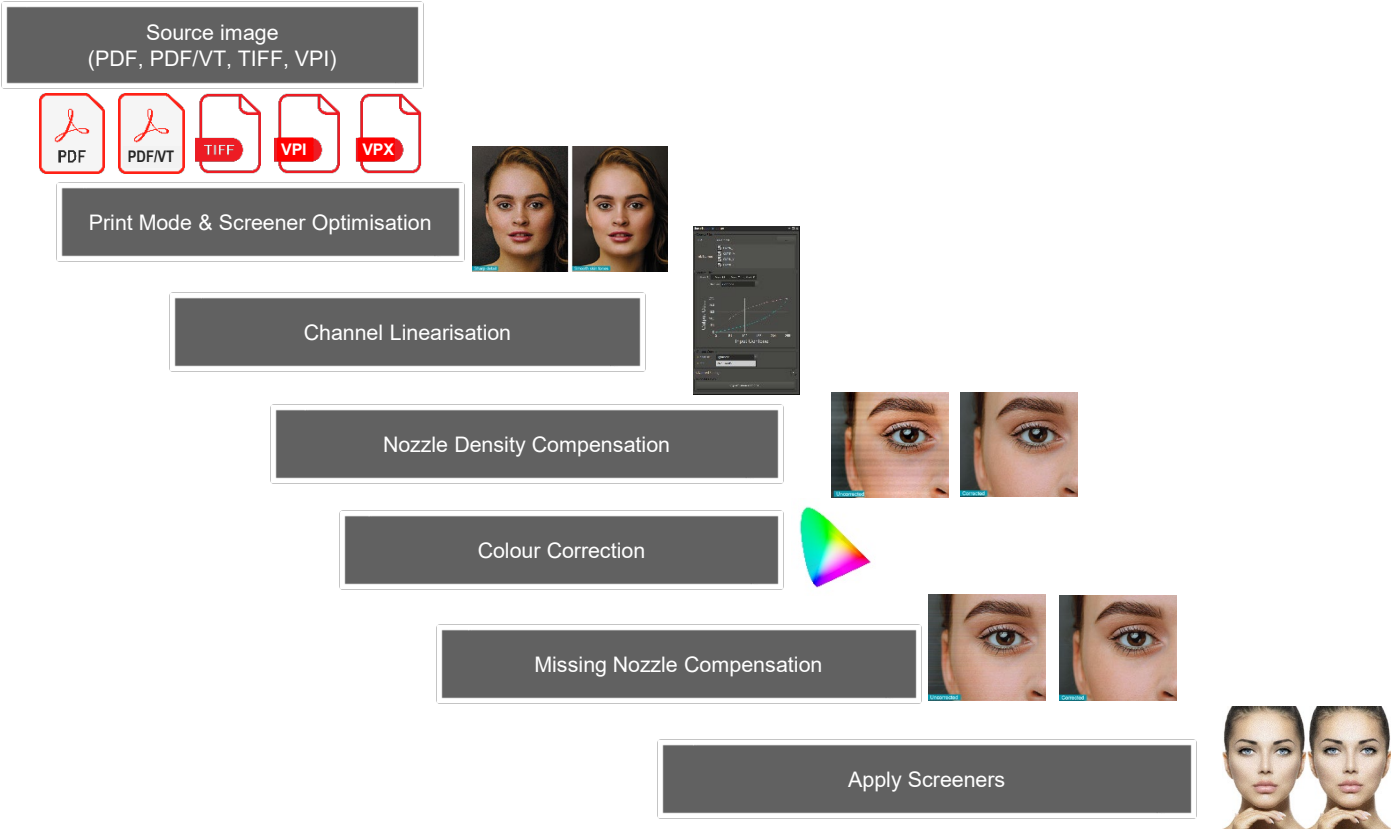


Uncorrected



Corrected







## GIS Atlas IQ® Tools



### Image optimisation for your digital printing:

- Ultra-fast binary and greyscale screeners
- Nozzle density and missing nozzle compensation
- Colour management, linearisation and ink limiting
- Dynamic registration; alignment, rotation and skew
- Print output simulation

### GIS Atlas IQ Tools can be used for a variety of applications:

- Inline RIP-on-the-fly and offline RIP-to-file
- Tools available as bundled software, standalone or SDKs

GIS Atlas IQ Tools are compatible with GIS and 3rd party RIP solutions, user interfaces and datapath drive electronics.



Find out how GIS can help you supply a fully integrated image processing solution for label and packaging printing:

+44 (0) 1223 733 733   [info@globalinkjetsystems.com](mailto:info@globalinkjetsystems.com)   [www.globalinkjetsystems.com](http://www.globalinkjetsystems.com)

### Contact

**Simon Edwards**

Business Manager Software

[simon.edwards@globalinkjetsystems.com](mailto:simon.edwards@globalinkjetsystems.com)