

The Digital Dots Wild Format Digital Printing Technology Guides are about providing you with all you need to know about investing in wide format digital printing technology. The Wild Format goal is to create and share objective and independent explanations of key digital production technologies. The Wild Format articles are relevant for all parts of the graphic arts supply chain, especially print buyers and designers. They're for anyone with great ideas who wants to get them into print cost effectively and conveniently.

The Wild Format guides are intended to expand awareness and understanding of the craziness that can be created on wide format digital printing devices, from floors to lampshades and everything in between.

These guides are made possible by a group of manufacturers working together with Digital Dots. Together we hope you enjoy the articles (yes, there will be more) and that you put into practise what you learn. If you want to talk about it, go to our LinkedIn group at

<http://linkd.in/1pkeLH1>

Enjoy and Go Wild!

This is the second article in this part of the Wild Format Series. It is supported by . . .



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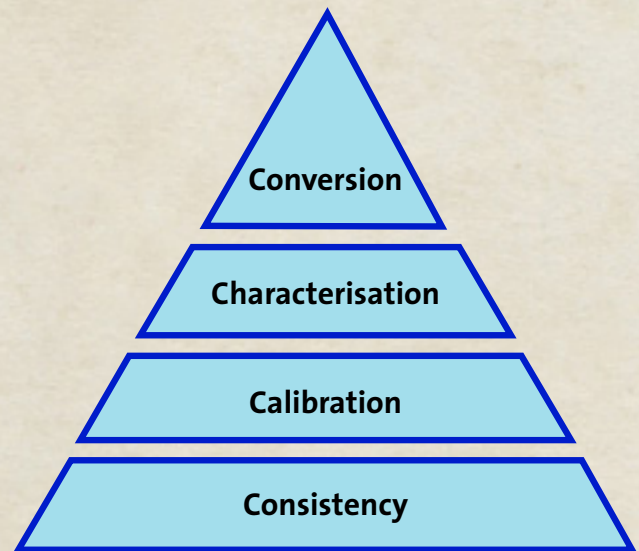
Calibration and colour profiles

At the heart of printing is the capability to reproduce colours, not only producing colours as such, but doing so in a predictable and consistent way. Obviously this includes being able to print a specific colour, be it a corporate logo colour, or a colour that's dominant in a particular photo. But for most print buyers this sort of colour matching is actually not always the

main priority. Over many years experienced print buyers have learned that not all the special colours can be produced using the normal process colours, which are CMYK (Cyan, Magenta, Yellow and Black). This is why they prefer to rely on special inks. It is generally understood and accepted that a particular orange brand colour may not come out exactly the same when printed in CMYK. If the colour has to match exactly, it has to be printed with a special spot colour ink, not just using the four process inks (CMYK). Getting predictable colour results is the priority, trusting for example that proofs, when signed off, will be a close match to the final printed product. Or it might mean that a brochure printed one month and reprinted the next, will look the same. This is consistency and printers who want to offer their clients a predictable result need to establish consistency in the whole print process. But how do they do that? And how do print buyers make sure that processes get the production results they want?

The 4 Cs

A good way to understand how to establish predictability and consistency in print production, is to go through the 4 Cs. The first time we came across this term was in the book "The GATF Practical Guide to Color Management" by authors Adams and Weisberg, published in 2000. They actually



Quality assurance in printing starts with creating a consistent environment for the printing device. Then calibration and characterisation can begin, creating the basis for predictable and correct colour conversion.

at first only focused on the last three steps, which are Calibration, Characterisation and (colour) Conversion. But since it's almost futile to try and calibrate a device, be it an offset press or a large format flatbed printer, without first having established a stable and consistent environment, they later introduced the first C, which is – Consistency.

Consistency

Establishing consistency in wide format digital printing includes some obvious requirements like well maintained ink heads for an even and constant flow of ink. But there are other perhaps less obvious needs. Before installing a wide format digital press we need to ensure that the very foundation of the press is stable and strong enough. Remembering that the two most

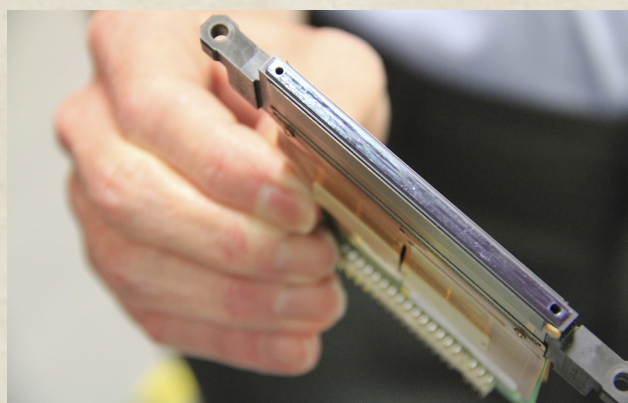
problematic factors which will prevent a machine behaving consistently are vibration and heat, we need to ensure that the floor itself is both solid and extremely even. To achieve accuracy across the whole print area of a wide format press, the floor it stands on must be perfectly even to start with.

This may not always be the case in general industrial buildings. As for temperature it is a good idea to install temperature control, and this goes for humidity as well. To keep temperature and humidity stable and within the ideal range is key for the predictable behaviour of print substrates. A general rule of thumb says that a temperature of around 20° C and a humidity not below 50% is good for humans, printing machines and most substrates.

Calibration

When it's certain that the print engine can operate in a consistent environment we can move to the second step: calibration. Depending on the technology used in the printer, this can include alignment of the print heads, testing out the optimal amount of ink laid down on a certain substrate, suitable shuttle speed for a certain print mode and so on. When this is done, a final linearisation check needs to be done, to ensure that for example 50% cyan really comes out as 50%, give or take 1%. This is to be certain that the whole scale of tinted colours comes out

right, like mid-, quarter and three quarter tones. When performing calibration it's necessary to use the correct tool. In many cases this is a spectrophotometer, which can also act as a densitometer, but not all spectrophotometers are suitable for all types of substrates. For example when calibrating



One key factor in achieving colour consistency is to properly maintain the printheads, to make sure that the nozzles are clean and fully operational.

the printer to print on glass or transparent plastic, you will need a special type of spectrophotometer suitable for this, for example the Barbieri Spectro LFP.

Characterisation

When the printer is correctly and carefully calibrated it's time to create ICC profiles using a technology developed by the International Color Consortium. This process is called characterisation. Normally this is done by printing a number of colour patches, and then measuring them with a spectrophotometer, one that is suitable for the type of substrate. The numeric equivalents of the colours are described in



Characterisation of the printing engine means that you optimise the printer's settings for a certain substrate, and describe the colour characteristics for this printing condition in an ICC profile.

the ICC profile and we can then use the ICC profile to simulate the final printed colour results on a high end, colour accurate monitor, for instance to proof them.

Alternatively we can simulate a very similar printed result on another press or printer, if we use an equivalent substrate. ICC profiles also convey the characteristics of a certain printing condition, so it's important to save the metadata that describes all the parameters that applied when a particular ICC profile was created. This includes substrate, print mode, resolution, ink black generation used (UCR or GCR), Total Ink Coverage or Total Area Coverage (TIC or TAC). It's only possible to achieve colour consistency over time if we keep track of

the key parameters and settings required to reproduce the very same colour appearance later, using a particular ICC profile.

Conversion

Most of today's artwork is a mix of text, photos, illustrations and logos with different colour encoding. Some photos might still be in RGB, as captured by a digital camera, or converted to some variation of CMYK, but very seldom is it the blend we will need for our particular printer. Corporate logos are often colour coded with the special spot colour they ideally should be printed with, but this colour is normally converted to a CMYK mix using the inks in our printer, which will produce as close

as possible a match. This means that the incoming artwork's colour encoding needs to be converted to the closest match when using the inks in our wide format printer. This conversion can be done beforehand by the designer or client when they create a PDF that is ready to print, as long as they have the correct settings. Conversion can also be done later in the process, if it isn't yet clear exactly which substrate or print engine will be used. A modern Raster Image Processing (RIP) system will have a colour management module to take care of this step, and if properly managed, we will have an end result that matches expectations. It can be a big if, but the beauty of using ICC profiles in this way is that we can decide on a reference standard. With a reference standard we can reproduce the same results on many different devices, getting a predictable and consistent output. This is one take on the term Cross Media! Or we can optimise the colour conversion to use the full gamut of the device (as described by the ICC profile) and create a stunning photorealistic reproduction.

In the last few years the concept of colour profiles has expanded beyond ICC profiles as such. Nowadays it includes the combination of an ICC profile and its associated metadata, describing all the parameters needed to set up the RIP that drives the printer. In this way we provide

reliable colour consistency, which is what brand owners and print buyers want to achieve. It's really not that complicated and comes down to good housekeeping for print media production workflows.

– **Paul Lindström**

The Digital Dots team specialises in consulting and editorial for digital prepress, printing and publishing technologies. This includes research, testing, evaluation and content services for publishers, printers and print buyers.

Our Wild Format Series is the latest in a long line of educational projects for graphic arts professionals, including designers and content originators. We also publish Spindrift, a subscriber supported, monthly journal with readers all over the world and a sharp focus on technology.

We work on various ISO committees developing standards for print production and the environment, and we are accredited auditors for ISO 12647-2 and ISO 9001 in the UK and Sweden. You can find out more about us at digitaldots.org.