

# So you want to set up a colour managed workflow ...

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How often have we heard the cry “*It printed fine on my office printer why can’t you get it right on the Press!*”. If only it were as simple as correcting the press output.

Traditionally, that is exactly where colour correction was done. A skilled press operator manipulated the inks to obtain the best possible image. Inevitably this was a compromise between getting the best possible image for the target illustration and retaining an acceptable image for the other illustrations. It was never possible to get all images correct.

Colour correction started at the beginning of the workflow. A good scanner operator knew that if they applied **this** and **that** and a little bit of the **other**, then the image would come out right on the press. Change the press and it was back to the scanner for a rescan and start the job again.

Colour output was an art form. No two operators used the same settings and neither could be said to be right or wrong.

In recent years desktop publishing has changed the customers perception of what can be done. The customer is now able to print acceptable looking proofs on their own cheap colour printers. Indeed, technology has advanced so quickly that properly managed these cheap printers can give excellent results. The key is “*properly managed*”.

## How to establish a colour managed workflow?

The starting point of all colour management is the output device – in most cases in the printing industry this is the Press. The objective of colour management is to be able to produce consistent colours on this Press, and to have a proofing device that matches the output of the Press, *digital proofing*.

Remember this objective, as we will be returning to this concept later...

It is appropriate to pause and define a few terms before we continue the discussion. What is colour management? How is it defined? And, how do we know when we have achieved the desired result?

## What is colour management?

### **Colour Profiles**

The International Color Consortium (ICC) who established precise definitions of how to observe and measure colours, defined colour management. The resulting colour maps define how a particular device handles colour, are called ICC Colour Profiles. The details of what is inside an ICC profile would occupy a book. It is sufficient for the present discussion to understand that inside a profile are a number of related tables defining how colours change when moved from one colour space to another, e.g. RGB to CMYK, or CMYK to LAB. When producing high quality colour profiles each of these tables must be edited separately.

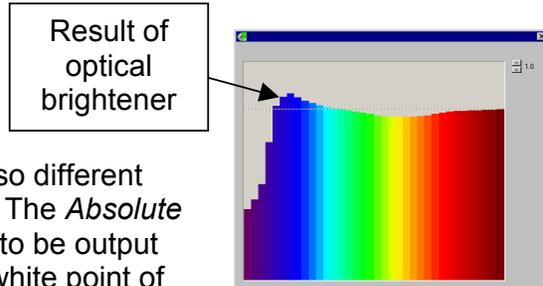
Also included inside the ICC profile is a description of how colours should be treated that cannot be printed by a particular device. This is called the rendering intent. Each ICC profile has a default intent, which will be applied by the application software unless changed by the user.

There are four rendering intents defined by the ICC specification.

1. Perceptual (or photographic)
2. Absolute Colorimetric
3. Relative Colorimetric
4. Saturation

The purpose of the *perceptual* rendering is to retain the overall look of an image. The difference between colours is more important than printing any particular colour correctly. Different software manufacturers can interpret the perceptual rendering in different ways, so profiles built by different manufacturers often differ in the way they treat certain colours. An example of this is how profile manufacturers compensate for the growing trend to use optical brighteners in printing papers. Optical brighteners enhance the UV part of the spectrum and thus produce a false peak in the blue region.

If allowance is not made for this false peak, then the profile tends to give poor shadow detail in the black areas.



The *Colorimetric* rendering intents are specified precisely by the ICC profile definition so different manufacturers should produce similar profiles. The *Absolute* rendering intent is used where the colours are to be output with the smallest colour error. In addition, the white point of the original is transferred to the output. For example, to proof a page reproduced for newspaper printing on a laser printer using white offset paper, the white point of the source system must be used. [Remember the concept define earlier... that the output device was the starting point for colour management. The press output is the *source* of the digital proof.]

The *Relative* rendering intent is similar to the Absolute intent, with the exception that the paper white of the source is not used. Thus a newspaper proofed to a laser would not simulate the newsprint paper grey. Relative rendering is used mainly where the proofing is on to the same paper stock as the final output. E.g. proofing to an inkjet printer, which is using newspaper as its paper stock.

The final rendering, *Saturation*, is seldom used, except for business graphics. The colour space is expanded to make full use of all available colours. The original colours are not preserved.

### **Linearisation**

Before we return to the procedures for profiling a press, there is one more concept to define – the difference between linearisation (or calibration) and profiling.

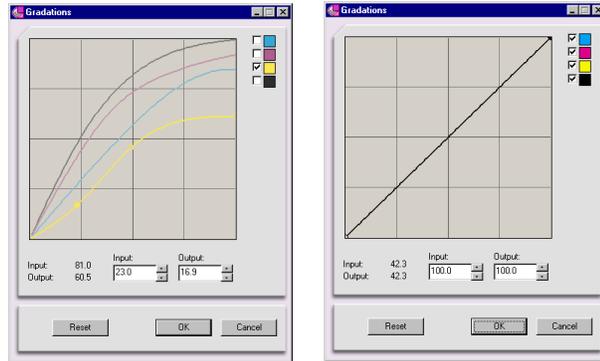
Linearisation is the process of setting up the physical characteristics of a device so that it can be returned to a known state. It usually also includes measuring and altering the physical characteristics such as the dot gain so that a measured input produces the equivalent output. In the case of a printer or press, this means that an input 10% screen will be measured on the output paper as 10%, 20% as 20% etc.

For example a typical press might have the following dot gain curves...

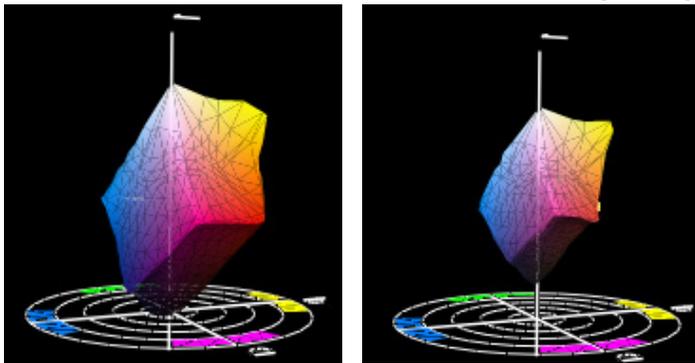
Each of the inks has a different dot gain when measured from file input to printed output.

The objective of the linearisation process is to set up the workflow so that each of the curves is linear.

It is then comparatively easy to remeasure the behaviour of the press after major overall, or mechanical replacements. Linearisation is achieved by first measuring this behaviour and then compensating for it in the Rip (raster image processor).



By comparison, profiling is the process of measuring how a device behaves when processing colour. Some devices will output a large range of colours whilst others are very limited. This range is called the colour gamut of the device. It is important when choosing a digital proofer to choose a device that has a colour gamut larger than that of the press. Otherwise it is impossible for the proof to match the press. However, having a large colour gamut is not sufficient. When



Gloss

Matte

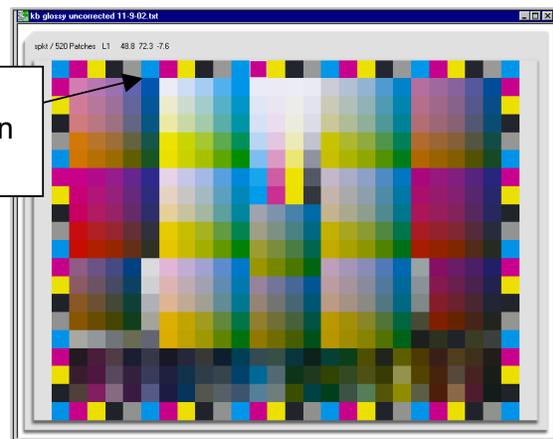
outputting a particular colour, defined say in cmyk co-ordinates, different devices will produce different colours. The type of inks used and the paper stock will have a major affect on the colour produced. Therefore to obtain the same output colour on two different devices it is necessary to input different mixes of cmyk. The colour maps within the ICC profile handle the calculation of these different mixes.

A profile is created by first linearising the device and then outputting a known set of colours. The colours in the test chart are carefully chosen to represent the colours normally output. E.g. the test chart used to profile a press is different from the test chart used to profile a digital camera.

In the case of a press it is usual to output a set of colour swatches around the test chart, as shown below. These are used to check and compensate for variations in the ink ducts across the press.

Let us now return to the process of establishing a colour-managed workflow.

Ink duct compensation swatches



### A Colour- Managed workflow

In a Colour managed workflow a number of different devices have to be colour profiled.

A typical environment consists of input devices such as Cameras, Scanners and Monitors; output devices such as the Printing Press, and proofing devices such as a monitor and proofer.

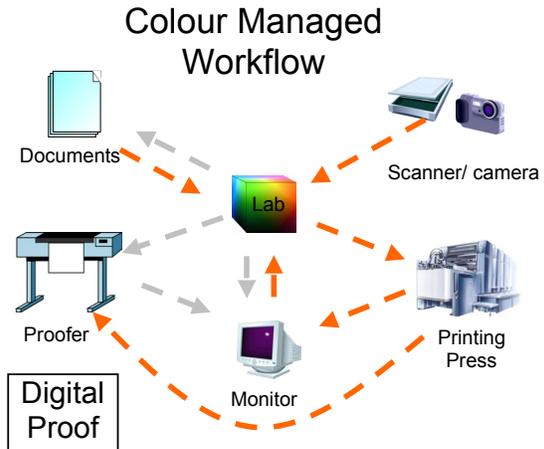
The diagram below shows the various components and the flow of colour data during the creation, proofing and output of an image; these flows will be considered in detail later.

A number of devices can have dual roles; the most obvious one is the monitor. If a monitor is used to create an image, then the monitor is an input device. However, if the same monitor is used to examine an image created by a scanner, then the monitor is an output device.

The device that causes most confusion is the Printing Press. This is the device that is the target for all finished printing. It is therefore an output device. However, in the diagram below, there are also arrows from the printing press back to the digital proofing devices – the monitor and the proofer. For the purpose of proofing the Printing Press is an input device!

In summary, each device in a colour-managed workflow has to be first linearised, where this is possible, then profiled by outputting the colours of a known test chart.

The final stage is to test the colours being printed on the Press and on the Proofing device for accuracy, and then to make minor modifications to tune the profiles to obtain the best possible results.






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