‘Running to Delta E (dE)’
Objectively Quantify Pressroom Color

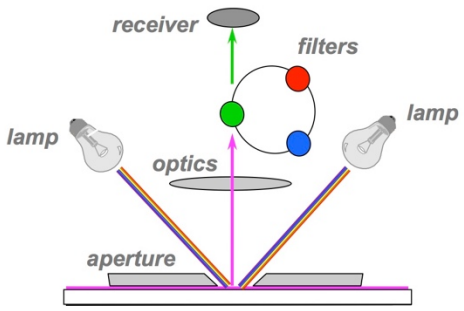
Executive Summary

For years pressroom color approvals were based on subjective criteria - opinion. This approval was done by a customer, quality control personnel or pressroom management, but was rarely based on factual data. The reason being, the technology to provide an objective opinion either wasn’t available or was cost prohibitive. Until recently, the main measurement equipment in the pressroom was a densitometer. A densitometer measures densitometric values such as lightness or darkness and tone value increase but cannot measure color.

Handheld spectrophotometers are now available, at a similar cost to a densitometer, which can measure both densitometric and colorimetric values such as Spectral Curves, CIELAB, CIELcH, xyZ, and calculate color differences known as Delta E (dE). New software products designed specifically for the pressroom have entered the market that work in conjunction with spectrophotometers to provide information that can objectively quantify and report color. This new pressroom metric is called ‘Running to Delta E’.

Using Densitometric Values Press Side

In Graphic Arts, densitometric values have a long history in the press room. Measurement values such as Solid Ink Density (SID), Tone Value Increase (TVI formerly known as dot gain), and Trap have been commonplace. These measurements values are still useful when used properly but none of these values can be used to measure the difference between two colors, such as the color you want (Reference color) and the color you are printing (Measured color). This is because a densitometer does not measure color, it measures lightness and darkness (density) using a series of predetermined filters.



In the press room, a densitometer can monitor the ink film thickness being applied to the substrate or media. An increase in density results in a darker color and decrease in density results in a lighter color.

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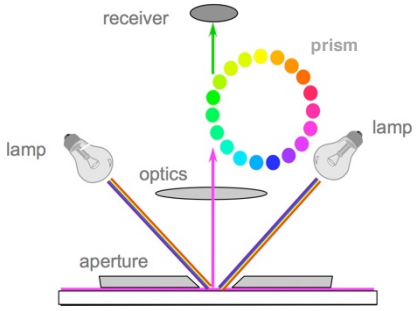
Using Colorimetric Values Press Side

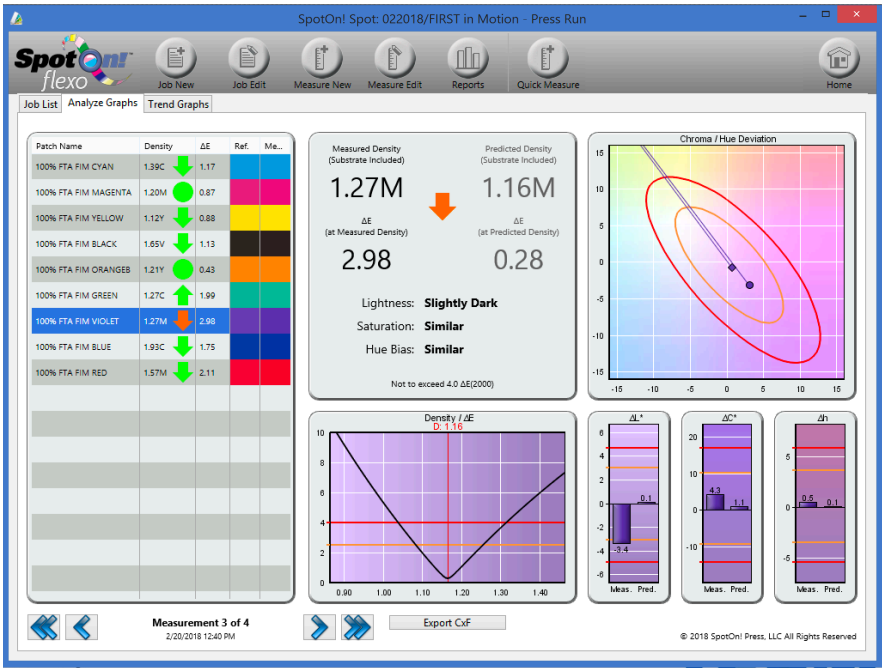
It is now commonplace to see spectrophotometers used in the pressroom. Manufacturers have combined densitometric and colorimetric values into a single instrument nicknamed 'spectrodensitometer'.



These devices can measure the visual spectrum of a color using a prism type device and report back three-dimensional colorimetric data such as CIELAB, also known as L*a*b* or CIELcH. These instruments can also report densitometric data. With the ability to measure and report colorimetric data you can also have the instrument calculate a color difference called Delta E (dE). dE represents a known mathematical difference between two colors. Through the years there have been several dE calculations, dE76 also known as dEab, dE94, dECMC and dE00. In recent years the Graphic Arts/Print industry has defaulted to using dE00.

Software for the Press Room

The availability of spectrophotometers (spectros) in the press room has led to the development of new software products designed specifically for the pressroom. Sophisticated mathematical algorithms can be used to offer new information, such as predictive ink density for optimal color reproduction based on dE. Software can also show a range of ink density that will produce an acceptable color match to the desired reference color. Using this new information to maintain color on press is called 'Running to Delta E (dE)'



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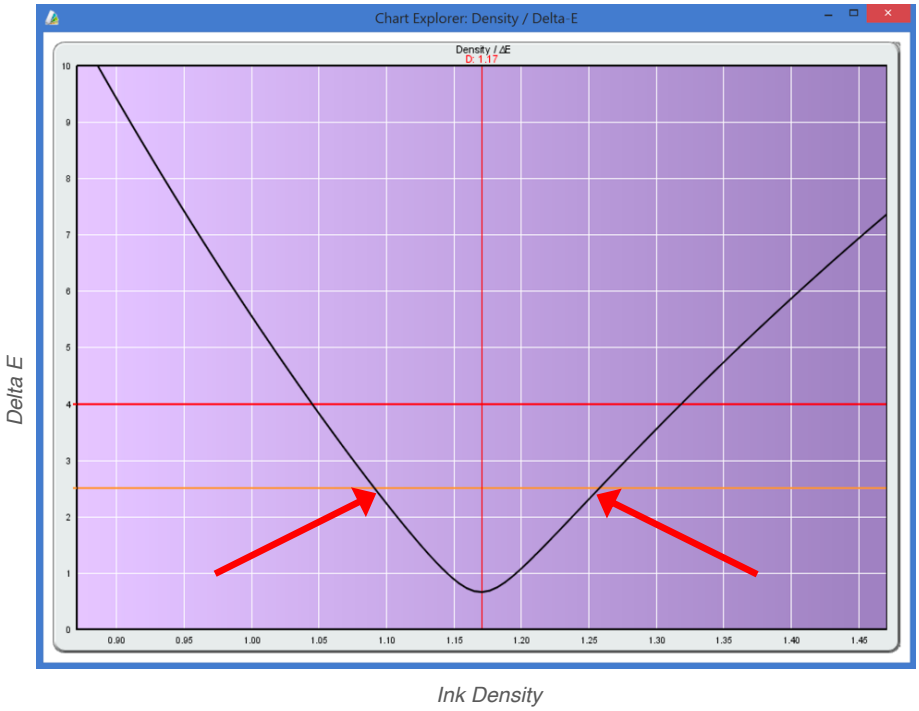
This chart provides the press operator the range of ink density that can be run (1.08 – 1.26) and still maintain an acceptable color match of under 2.5 dE00. This is new information for the press operator and changes the way we look at the color approval process. With this data, the press operator or quality control manager can objectively approve color on press based on colorimetric data.



Prior to the new pressroom metric of 'Running to Delta E', a press operator would try to visually match the color. In the case above, what if the visually approved Violet color was going to run at an ink density of 1.05, that would have resulted in a color match to the reference color of just under 4 dE00 and may have visually looked OK. We can see from the chart, if the density decreases during the run, the color match (dE) becomes unacceptable. This would be the same case if the visually approved color match was run at an ink density of 1.33 which would also create a color match of under 4 dE00. However, in this case, if the ink density were to increase the color match would be unacceptable.

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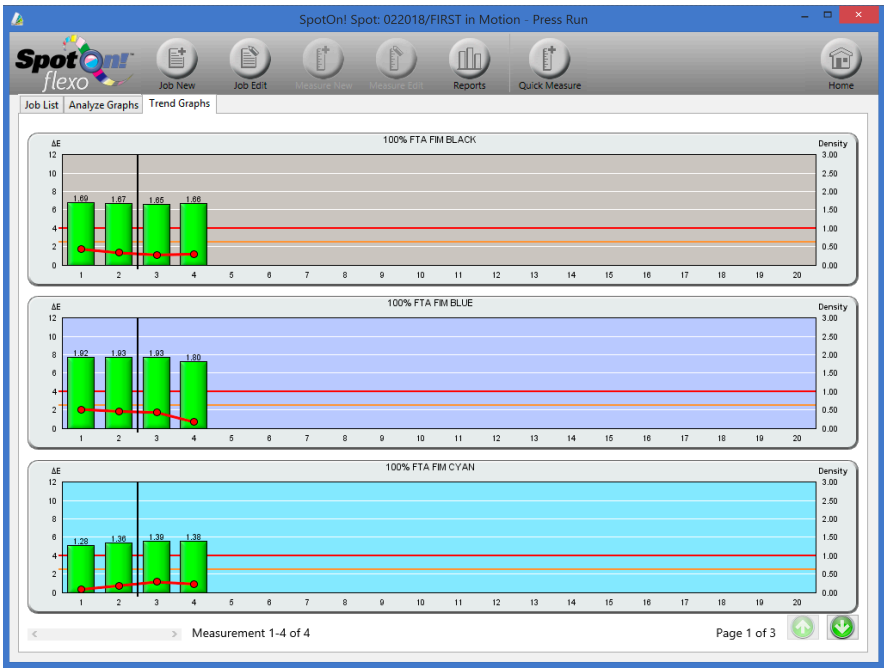
Software can also provide the press operator immediate feedback if the ink cannot match the desired target and requires ink formulation, saving valuable time, material, and money. In this example the color that cannot be matched and requires ink formulation is displayed with a Red icon. Color densities that display an arrow indicate that the color match can be improved with a density adjustment in the indicated direction.

Some pressroom software products can also track and trend measurement data. This data can provide information to changes that are occurring and could impact color reproduction before it is visually noticeable.

Additionally, individual jobs can be created and stored that contain metadata.



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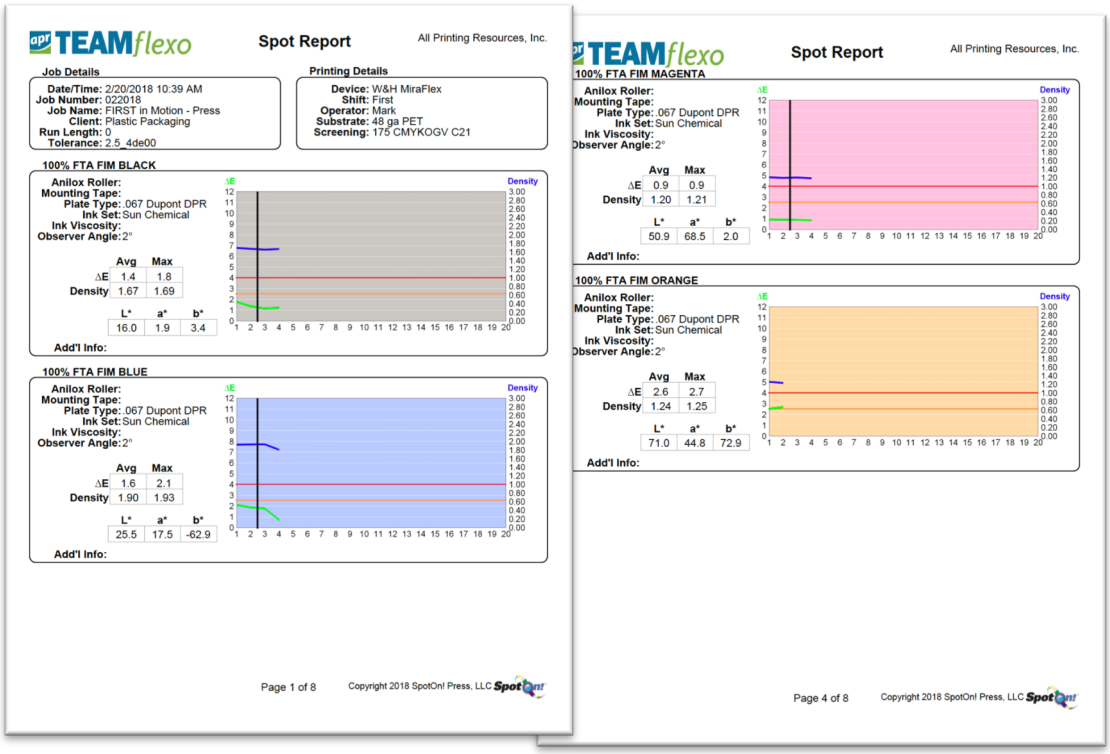
This job-related metadata can contain items such as the type of ink, plates, mounting tape, substrate, and anilox rolls being used. This data can then be used to create Reports of the press runs.



Summary

The use of hardware and software in the pressroom will continue to grow especially as customers and brands require documentation of their press runs. The days of visual color approval will continually be replaced with objective quantitative data.

The new pressroom metric of Running to Delta E (dE) will continue to grow and replace running to Solid Ink Density (SID). New print standards such as ISO 15339 Characterized Reference Print Conditions (CRPC's) do not even have any ink density information only colorimetric L*a*b* values to target.

So, the next time you are press side and you see the CMYK solid ink targets posted by the viewing booth ask yourself, why are we running Magenta to a 1.20 ink density and Cyan to a 1.30 ink density? Is it because we have always done it this way or is that the optimal ink density to create the best colorimetric match (lowest dE) to our target colors?

For more information about the software described in this document please visit www.spotonflexo.com

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