Results-Orientated COLOR MANAGEMENT

For corrugated plants that want to excel in the area of graphics, a color management system is crucial. Oftentimes, plants overlook the importance of such a system or they fail to incorporate all of the tools necessary to monitor color.

By Chris Heusch
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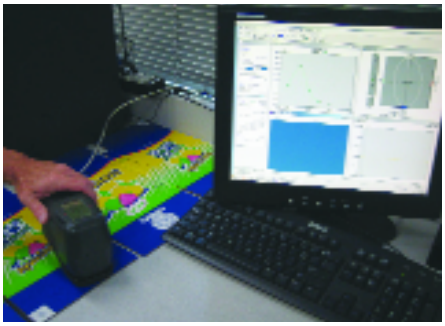
The corrugated packaging industry has seen long-term growth in graphics applications. Demand for colorful packaging and displays is not diminishing. On the contrary, it continues to be an ever-gaining share of the market. This article addresses three key elements of color management: communication with the customer, ink blending and quality control press side.

Inspection Tools

A tri-stimulus colorimeter (also spectro-densitometer) can be used for color verification; a spectrophotometer is the preferred tool. The flexographic printing packaging industry agrees on a tolerance standard of 4.0 Delta of E in a CieLab color space. For display work, color should be held to 2.0 Delta of E in a CieLab.

A densitometer cannot verify hue or color. It can, however, assist visual color examination.



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When examining color by visual means, it is necessary to standardize the light source as best as possible. If no standardized light booth or table (at 5000 deg Calvin) is available, a window with northern exposure may be best. When in doubt, operators should simply step outside to see color.

I recommend visiting the web site www.xrite.com for additional information.

The visual examination of color should be done on similar size samples and standards held at the same plain (not on top of each other) and at the same angle.

Communicate color distinctions in shade or hue differences, not as "weaker" or "stronger".

Finally, don't forget to test all operators for color vision.

Color Specification

Ideally, color should be specified as a standard color (Pantone, GCMI, RAL, HKS, etc.) on a specific substrate. For example, green GCMI (edition IX) 20 on IP Sunliner brown kraft or red PMS 485c on Rieger LC with overprint varnish.

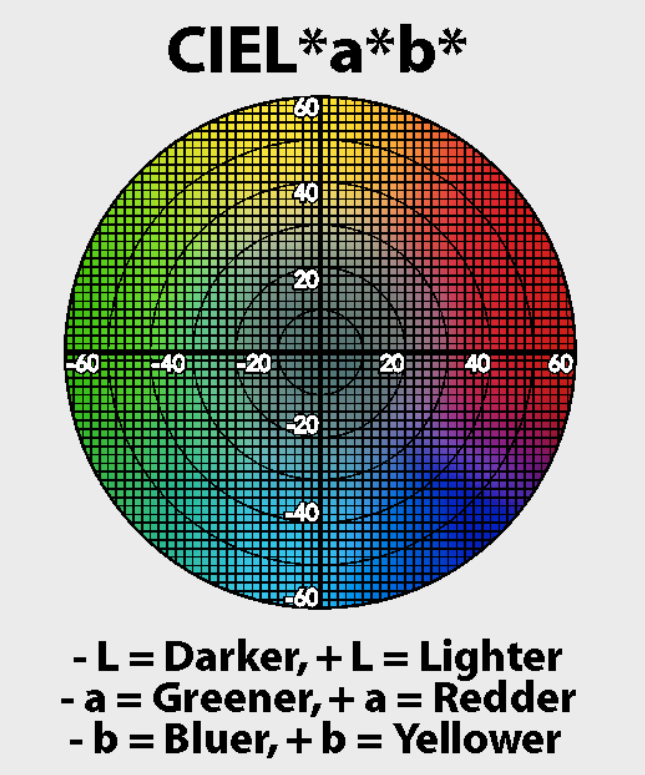
It is important that all parties involved understand the impact of liner/substrate quality on color. Not only do changes in mottle or liner color change the hue of color, but they also impact the level of gloss and brightness.

When in doubt about the exact expectations, ask your ink maker providing the actual printing ink to furnish color swatches on various substrates. Please beware that even the best "draw downs" do not match a flexo printing press perfectly. Color draw down swatches should not replace the standard; they can help in the determination of pass/fail.

Every production run must aim to match the original standard.

House colors are communicated in ink swatches, which should be signed off by the customer as proof. For the most professional generation of ink swatches, use a small anilox press, such as what can be found on the web site www.saueressig.de under Products & Services, Printing and color proofer.

The best distribution of base colors is easily explained using the CIELAB color chart.



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Many colors in Pantone PMS and RAL standards are extremely "clean" colors and cannot be reproduced well on brown or mottled liner grades. They were developed with superior pigment quality on high-end substrates for the lithographic offset industry. For more information about this, visit www.pantone.com

While the GCMI color swatch book was originally designed for letterpress printing on corrugated, it still provides a more realistic standard for flexographic printing on corrugated board. The pigments used are not as refined and the substrates more closely reflect actual industry use.

Please visit www.gpi.org for edition IX books, which do offer new colors and do not perfectly match previous editions.

All color standard books should be kept very clean, in dark (black) envelopes or cartons to avoid contamination and fading.

Color Communication

Artwork file and printing plate proofs are not designed to represent correct color. They only show layout and graphic design features.

Only digital proofs from a fully color-managed workflow will match process color off a flexo press. This is available from fine color artwork houses and high-end printing plate makers.

For line color, an ink swatch should be used as proof. However, plotter proofs and similar can be used to demonstrate the general impact of a layout. Do learn how to use brown paper on the HP Design Jet and how to fake a dirty background color.

Ink Chemistry

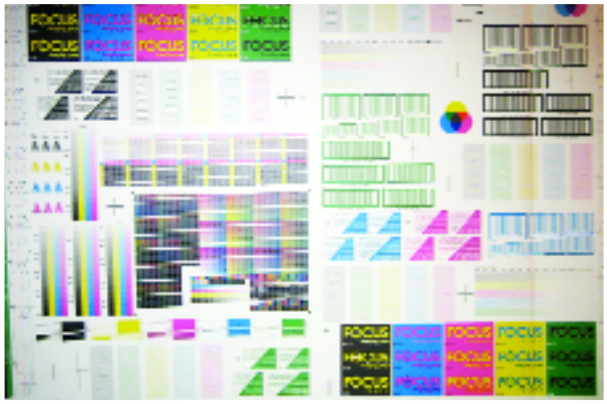
The base components of any ink blending system must be selected for best reproduction of the widest range of colors, allowing complete miscibility/compatibility, and good printability in all current applications.

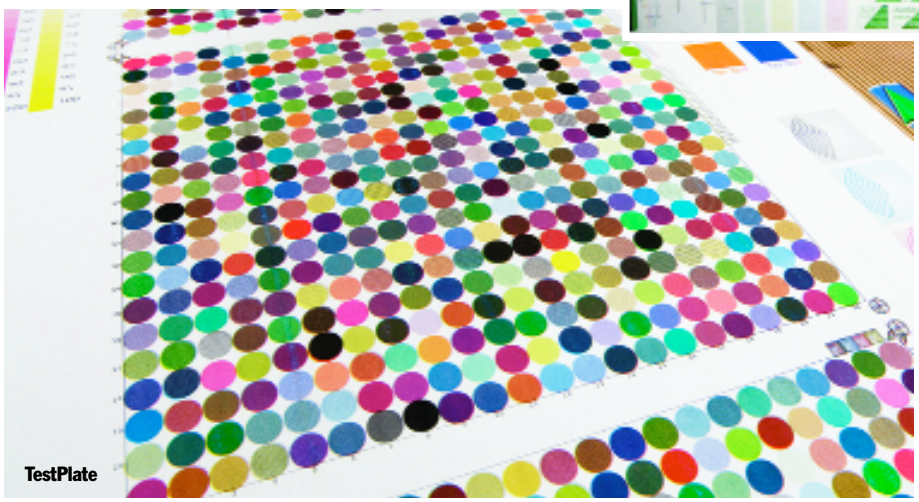
Base Colors

The best distribution of base colors is easily explained using the CIELAB color chart. Since we do not have an infinite selection of bases available, colors are being matched from two or three components. Whenever two components are mixed, the resulting tone lies somewhere along the straight line between the two components. Hence, two components farther apart make for a "muddy," less clean match. For example, draw a line from orange to green and the midway result is black. Yes indeed, orange and green make black.

So our goal in selecting base colors must be to find clean bases, positioned as far outside on the circle as possible. Since combinations of two colors always yield some "dirt," Mono-Pigment-Bases is a must.

Furthermore, color bases should be spaced as evenly around the circle as possible. However, the selection can reflect the particulars of the end-user's business. In corrugated, green is an often-neglected color, since only few clean greens are needed. All other greens can be matched from greenish blue (cyan) and greenish yellow. Another consideration is the mandatory inclusion of the process colors, cyan, magenta, and yellow.





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An exemplary color selection could be as follows: **Process yellow, red shade yellow, warm red, magenta, red shade blue (Reflex), process cyan blue and green (phthalocyanine).**

The more demanding graphics have to be reproduced, the more colors are added in between. Another consideration is cost. True rhodamine magenta is rather expensive, and rubine red is added for blended colors.

Rubine red or orange or violet.

Also we require the two extremes of the L-axis: **White/opaque and black.**

Regarding opacity, all organic pigments are transparent — the finer ground, the more transparent. White, in addition to pastel coloring, is used to increase opacity for coverage on brown kraft or trap.

Chemical Engineering

The base colorants, in my opinion, should be printable, resinated ink bases. What this means is that pigment is fully encapsulated in resin particles, ensuring good maintenance of grind and suspension. The resination also ensures full compatibility and negates the need for intense mixing of bases after blending.

Color bases must be very strong, allowing for the addition of extender varnishes. These extenders, essentially inks without pigment, tweak the printability of the ink toward the final application.

Colored ink bases are of the highest strength, on the high end of the viscosity range, on the medium to low end of the pH-range. Strength is cut with an extender, viscosity is reduced with extender and/or water, pH is raised, where necessary, with the extender or ammonia (a non-sudsy, household grade is fine).

The minimum requirement for extenders is two bases at the extreme end of the range each. One "commercial" extender imparts high pH, low viscosity, high tack, and low cost. The second "high finish" extender imparts low pH (7.9 - 8.1), higher viscosity, low tack, and high gloss. Both extenders give excellent rub resistance. In non-graphics plants the commercial extender may also impart some opacity and contain white pigment. **Extender, commercial.**

Extender, high finish.

The simplest inks are based on the commercial extender for low cost only. Fast dry or high gloss, as well as fine screen print applications, are covered with the high finish extender.

For multicolor trap and overprint, combinations can be printed:

1st down	2nd down	3rd down
100% CE	50%/50%	100% HFE
low visco	medium visco	high visco
high pH	medium pH	low pH

high tack attracts overprint

Last but not least, there is one more component that we just seem to be unable to do without: **Water.**

In closing, ink and color management go hand in hand with strong prepress activities. Advances in prepress are swift and this consultant recommends box plants establish strong team relations with an experienced prepress house.

It is becoming increasingly difficult to justify the investment in rapidly changing hardware and software on a single plant level. An innovative pre-press supplier can leverage the investment and knowledge by helping multiple players around the globe.

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