◊ **Ink Color Sequence Choice** In those cases where inks are dried between colors (e.g. gravure), a ***YMCK sequence*** will produce the largest color gamut. When inks are printed wet-on-wet (e.g. offset lithography) a ***CMYK sequence*** will produce the largest color gamut.

◊ **Ink Film Thickness** Increasing the ink feed will result in higher densities, but also will produce greater dot gain and ink-trap distortion. Thicker ink films take longer to dry or set and may result in setoff (to the subsequent sheet) problems. Attempt to "make the job" on press via ink-feed manipulation are usually doomed to failure.

◊ **Gray Balance** Images should not have unwanted ***color casts***. Such problems are indicative of unbalanced color separations or improperly balanced ink feed rates. A calibrated 3-color gray control image is used to evaluate the press condition. If a yellowish cast is detected in a dark tonal area it is likely due to yellow being run last in the sequence of colors. Switch to a tack-graded set of inks where black is the last-down ink.

◊ **Picture Colors** Red, green and blue are the most prominent colors in most images. They are formed by the paired overlaps of the yellow, magenta and cyan primaries. The appearance of these overlaps is influenced by the ***transparency/opacity*** of the inks and ***ink trap*** performance. Press color control strips must have 2-color patches in order to evaluate the initial and ongoing red, green and blue overprints.

◊ **Sharpness** ***Register*** variations will influence the ***sharpness*** of process color images. Misty landscapes without sharp defining edges can tolerate greater misregister, but a useful target is to keep register to within a half row of dots in either direction.

◊ **4-color Maximum Density** Higher Dmax values mean ***better tone reproduction*** and ***sharper images***. The maximum is dependent upon the initial substrate and ink choice, but the proper ink sequence and ink film thickness will maximize this important process capability factor.

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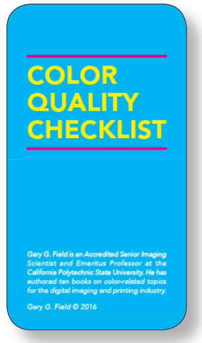
Need more detail?

Supplementary materials relative to color quality excellence are available from the Graphic Communication Institute at Cal Poly.

Color Quality
A Judgment Skill

A 44-page booklet of essays which describe all facets of color excellence, the color decision-making process, and a strategy for enhancing color quality judgment skills. ($8.95 each)



Color Quality Checklist

A phone-size reminder to use during the color planning and OK processes. Incorporates a useful black Dmax and neutrality bar. Linked via QR code to greater detail. ($1.95 each)

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COLOR REPRODUCTION EXCELLENCE

One best way? ... Sorry, no.

There is no single pathway that always produces excellent color reproduction. This is so because aesthetic, commercial and technical factors or preferences will vary from image to image and job to job. The guidelines that follow touch upon many "It depends" factors that need to be considered before effective color quality decisions can be made.

Preliminary Production Choices: *Suitability Selection*

◊ **A Choice?** When producing such products as magazines, production specifications (e.g. SWOP) are fixed, but under other circumstances, production conditions often may be chosen to enhance the quality of the reproduction.

◊ **The Printing Process** In most cases, the type of product being produced, together with economic factors, will establish the printing process. Their color capabilities do differ: gravure, largely because the inks are dried between colors, has a color gamut about 25% larger than offset lithography.

◊ **The Substrate** Water color or pastel artwork reproduces better on ***uncoated substrates***, whereas photographic images tend to be more appealing when printed on ***coated substrates***. Reproductions of textiles are sometimes enhanced when printed on ***textured substrates***, whereas automobile brochures preferentially utilize ***smooth high gloss substrates***.

Image detail is best reproduced on ***smooth substrates***, but ***uncoated*** substrates reproduce light halftone tints with greater ***purity***. Ideally, substrates should have good ***whiteness*** (neutrality) and high ***brightness***.

In order to avoid "show through" problems, substrates should have high ***opacity***, and to minimize color degradation of the printed ink film, use substrates with low ***absorptivity*** and high ***gloss***.

◊ **The Inks** For the greatest ***color gamut***, process color inks with the best ***color purity*** are required. Note that the ISO 12647 standard uses Lithol Rubine pigment for the magenta. This relatively inexpensive pigment is deficient in the blue portion of the spectrum, thus causing degradation of blue, violet, purple and magenta colors. For an improved color gamut in this region use ink made with the (more expensive) Rhodamine Y pigment.

Inks are not perfectly ***transparent*** — another gamut-limiting condition. Cyan is the best, followed by magenta and yellow, the worst. If the inks are dried before overprinting with the next, use a YMC sequence; if wet-on-wet printing is used, a CMY sequence is best.

In the case of wet-on-wet printing, ***ink tack*** ("stickiness") should be graded such that the first ink in the sequence has the highest tack and the last has the lowest tack.

Extra colors may be used (coupled with an appropriate prepress strategy) to enhance the reproduction of images when the normal conditions are not capable of producing a sufficiently high-fidelity reproduction.

◊ **Coating** gloss vs. matte depending upon the image or the nature of the product.

Prepress Image Manipulation: *Proof OK*

◊ **The Objective of the Reproduction** Some reproductions should be ***exact***, such as reproductions of fine art, catalog images of fabric samples or skin color in medical textbooks. In most cases, however, ***preferred*** color is the objective. "Clean and bright is always (often) right," means that natural colors (e.g. a blue sky) are deliberately distorted to make them more appealing. Skin tones are often "preferred" (for people with European heritage) tanner than reality.

◊ **Tone and Color Factors** Usually, the original image's ***tone scale*** must be compressed to fit the ***limiting value*** established by the ink-paper-press system in use. This compression of the ***lightness scale*** should be done to favor the ***interest area*** of the image. If the subject of interest is, for example, a bridal gown, the highlight (lighter) ***tonal differences*** should be emphasized at the expense (for that image) of the darker (shadow) tones.

If the color gamut of an original image, such as a rose, is not reproducible, the image should undergo a somewhat equal compression in order to retain ***saturation*** distinctions. If a critical color lies within the printing system's gamut, it should be reproduced accurately, while allowing out-of-gamut colors with a similar hue to be "clipped".

Hue should be reproduced accurately, except in those cases where prior lightness and saturation compression may dictate a hue shift to produce a preferred reproduction.

◊ **Image Definition** Fine detail may be discerned more readily when ***resolution*** is maximized through the use of the finest practical halftone screen (regular or random structure).

Detail may be enhanced through the use of ***sharpening techniques*** that emphasize the differences between adjacent image elements. Such enhancements must be used with care: emphasizing facial blemishes is not desirable. ***Excessive sharpening*** also will emphasize image graininess.

◊ **Interference Patterns** Improperly angled halftone screens may cause objectionable ***moiré*** patterns. In other cases, a screen's structure may interact with detail in the image to create ***subject moiré*** patterns. Stochastic, or random, screen structures avoid these problems, but some may cause ***graininess*** in smooth even tonal areas.

Press Optimization And Control: *Press OK*

◊ **Standards and Specifications** If printing to a standard (e.g. ISO 12647) or a specification (e.g. SWOP) the ***proof*** must match those conditions. Otherwsie, the proof should be made to match the specific printing conditions. Either way, compare identical ***color bar*** or ***test strip*** images: check solid primary color printed densities, overprint color ink trap, halftone dot percentages, 4-color solid density and neutrality, 3-color tint gray balance, ink color and substrate matches.