

New Opportunities and Challenges with Fifth Color Units

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Abstract

In this session new opportunities for high quality printing with a fifth color unit will be shown. The difference between "Spot Color Printing" and "Gamut Expansion Printing" with extension colors as well as the coating will give a new dimension to digital print. The presentation will focus on technical aspects in the workflow:

- How to use 5-Color ICC profiles in workflow
- Impact on simulation of brand colors
- How to run test prints
- Handling of different color definition (color-spaces) and data types inside the workflow and PDF/ PS interpreter.

Introduction

A fifth color unit can be used in general for two different applications:

- Use of Spot Color Ink to better match brand colors e.g. according to Pantone or use of clear ink for special effects like protection, watermarks or gloss
- Additional Process Color to expand the color space and show more e.g. saturated colors or match different spot colors which are in a special area outside of the standard color space reached with 4 colors

Use of Spot Color Ink

Spot color ink usually matches one special color exactly. It is usually not used as process color (separated in the RIP, mixed with other colors). The ink manufacturer produces Spot color ink according to special customer requests, or standard Pantone, HKS etc. color definitions. Problems in this area are:

- No exact definition of the spot color in Lab is available, but only e.g. the Color number which does not take care of the individual printing conditions like dot gain etc.
- Unknown gloss conditions: The saturation of the color depends on the gloss of the substrate – e.g. the saturation on a glossy coated paper is much higher than on a uncoated paper. To match the customer's expectations this must be taken into account.
- Gradations of Spot Colors are even more critical to print conditions, because shades can look different on each printing press. Repeatability on different printing systems is not guaranteed.
- A lot of effort is required to match exactly the right color, which is too expensive for most applications.

Varnishing: Spot Color Ink "Without" Color

With clear ink (without pigments) it is possible to create a varnishing effect. This can be done on the entire print area or as a spot effect e.g. to create "watermarks" etc.. Some printing systems offer as well high gloss for this "Varnish" (e.g. NexPress).

For spot application a special color channel must be applied in the file.

Varnish or clear ink may change the color appearance. Therefore it is recommended to use special ICC profiles created for the exact printing conditions with clear ink to avoid drift.

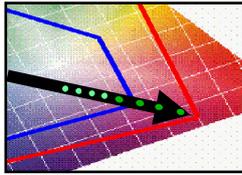
Higher Abrasion-Resistance by Intelligent Masking With Clear Ink:

The electro photographic process creates a relief on the printed result, depending on the amount of ink in each area, because the ink is not merging into the paper. This relief makes the prints sensible to abrasion. To avoid this effect it is possible to compensate the thickness differences by applying clear dry ink to the areas where none or few ink is printed. The intelligent masks can be created in a workflow system automatically by processing color values in the file. The result is a flat surface that is very resistant against abrasion.

Expanded Color Space Due to Additional Process Color

The use of additional colors like special Red, Green or Blue can expand the color space. More colors - mainly brand colors, but as well colors in an image – can be matched. The supplier defines the additional process colors. This depends on the required saturation and brightness of the colors used in the printing system. These inks shall not show any secondary color densities. Darker shades can be reached by parallel colors, for example for Red by Magenta and Yellow. With 3 additional colors it is possible to extend the color space by approx. 33 %. The printer has to select in which area he needs the improvement, because he can use only one additional color at the time.

Special color management algorithms help to reach the exact colors. To achieve this, the brand colors must be defined in Lab. The translation can happen in the workflow system. For pictures the use of Lab or RGB values is recommend to stay closest to the original color. CMYK is possible when the ICC profile with inverse gamut mapping for the calculation back to Lab is available.



5-Color ICC Profile Creation

In order to allow Color management for 5-Color separations special ICC profiles with 5 colors are necessary. To generate such profiles different vendors offer corresponding tools.

NexPress offers a very convenient service, which creates ICC profiles for 4 and 5 colors according to the individual requirements of a customer.

Workflow for Jobs with an Expanded Color Space

To come closest to the original colors an image should be defined in the largest color space, which is either Lab or "RGB". CMYK is not recommendable. Separation to 5 colors (CMYK+spot) is not possible in most software applications. As well it would not be recommendable in regards to device independence.

Vector-graphic and text elements should be defined as Lab / Lch or as "Named Color" in the swatches supplied by the application. It's important that the swatches are defined as spot color not CMYK, so that the workflow system can change it to 5 colors.

The NexPress Solution with Color Management on PDF

The NexPress workflow is based on PDF. Therefore color management must be applied to PDF.

In NexStation ICC profiles for all different inks for the 5th imaging unit are available. These are assigned to substrates and represent the special features of the substrate and the inks.

- **Lab** elements are converted directly to CMYK&5th color.
- **RGB** elements are converted according to the embedded profile or to the settings in the job ticket to Lab.
- **CMYK** elements are converted according to the embedded profile or to the settings in the job ticket to Lab. For this purpose it is necessary that the profile contains inverse gamut mapping to allow the use of the larger Lab and CMYK&5 color spaces.
- **CMYK&5** elements are already separated and will not be changed; this is possible in NexStation through naming conventions. For example test elements or test forms for the profile preparation without further

variation must be printed. Therefore it is necessary to create image files as 5 color Photoshop native "PSD", "EPS DCS2", or "TIFF" and to place them in InDesign., Vector and text elements can be defined with 5 colors. The resulting InDesign file will be transformed to PDF during export.

Nexstation uses the following color definitions without modification: NexPress DryInk clear / NexPress DryInk red / NexPress DryInk green / NexPress DryInk blue

Named Color

If an element is defined as "Named-Color" in the PDF, the name and one alternate color is assigned to the element. The alternate color is necessary for the representation on the screen and will be used on devices without corresponding color management. In NexStation a Spot color list is included which contains the name and Lab value for each spot color. This Lab value will be transferred to CMYK&5 by the ICC profile.

Rendering Intent

For transformation of pictures from Lab to CMYK+5 the rendering intend "Perceptual" is recommended to reach an optimal grading in saturated areas. If the rendering intent "Absolute Colorimetric" is used, the impression of higher print density is created, however, details are lost. The same is valid for brand colors.

The grading is not so important for brand colors, but the rendering intend "Absolute Colorimetric" is necessary to reach the exact color.

Conclusion

A 5th color unit for an additional color offers great new applications, but is a challenge for the workflow to reach the desired results.

Biography

Norbert Limburg is in the graphic arts industry since 1968. After an apprenticeship in pre-press and master examination he worked as an instructor and in sales support for different companies worldwide. He participated in the development of Hell-Scanners and Linotype color management systems. Norbert was a member of the NexPress image quality group in Kiel. Since 2004 he is in Customer Development responsible for workflow and color management for digital print.