SGIA
Screenprinting & Graphic Imaging Association International

The Influence of Solvent Based Inks When Using UCR/UCA

Hans Georg Koch
Marabuwerke Erwin Martz GmbH & Co.
Tamm, Germany

To acheive an optimal printing result when using the UCR/UCA system, the printing ink should hvae optimal characteristics too. In principle, it should fulfill the same demands as in conventional printing: each ink has to be adjusted to each printing color with regard to printing substrate, the necessary resistancy and the equipment of the screen printer.

We now want to examine which influence the ink has on the printing result, in conventional systems and in comparison to the use of UCR/UCA systems.

Influence of Individual Characteristics of the Halftone Ink

The shade, the density, the printability and the printing substrate require special attention.

The Shade

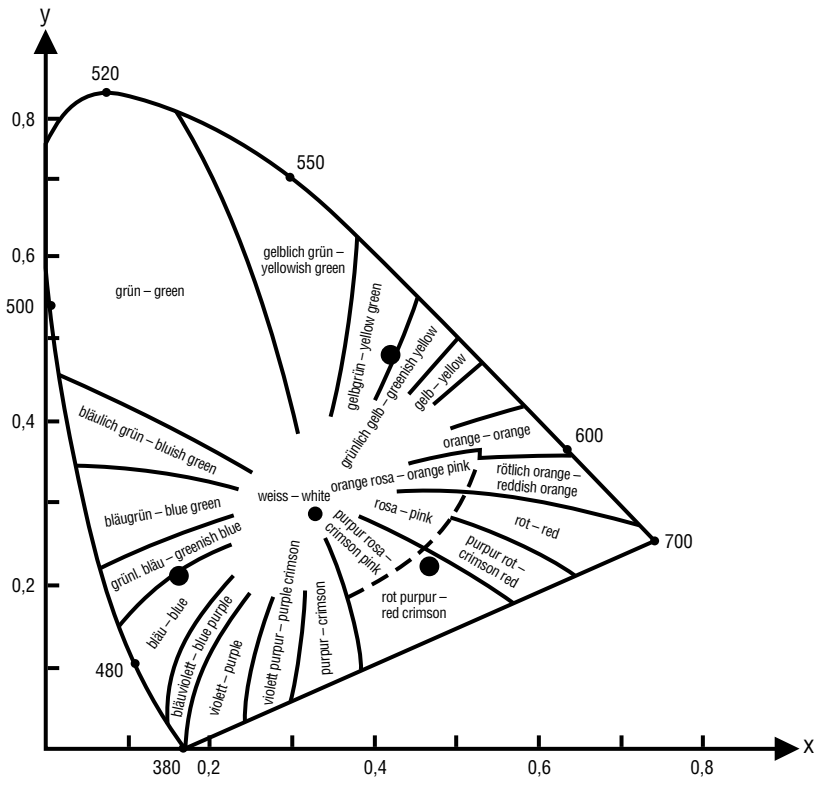
The basic colors: yellow, magenta, and cyan are determined for halftone printing by the "Euro-Scale," which was developed in the 1950's for offset printing by a group of European ink manufacturers, and which has meanwhile largely replaced the previously used DIN and KODAK scales. The values agreed on in the 1950's formed the basis of the German standard DIN 16539 - "European color scale for offset printing" which shows the basic colors, the mixed colors and the colors obtained when printing halftone screens on top of each other.

There is no special standard for screen prinitng and the offset Euro-Scale is used in the whole of Europe instead. The color values for these standard shades are expressed in x - and y - values according to "Standard Color Range DIN 5033".

These standard tones provide a clear and exact basis for making color separations as well as for ink formalization for the ink maker. Only the most exact adherence to these values makes an exact reproduction possible. We now have modern color measuring instruments available which enable us to maintain these values at all times. A test protocol shows the values measured and compares them graphically to

Figure 1

The two-dimensional graph shows the color points of yellow, magenta and cyan.



the values given. The smaller the shade divergence, the more exact the reproduction of the original in screen printing.

Density

Density is a measuring unit for the richness of a color shade, which is measured with a densitometer. It is influenced by the following factors: a) the amount of pigmentation determined by the ink manufacturers; b) the thickness of the ink layer, which is dependent on the mesh thickness, the stencil, the squeegee material, the squeegee pressure, etc.

Because of the different production methods used in various reproduction houses and the different printing conditions in screen printing plants, it is common practice today that ink manufacturers make EURO-shades with relatively high densities. The printer then has the possiblity of adding more or less transparent material to influence the density and to achieve a close match between print and original. This process requires a lot of time and experience and it is understandable that printers demand the standardization of all factors influencing printing ink. We will return to this point later.

Printability

The rheological properties of the printing ink influence the thickness of the ink film printed and consequently, the density of the print. In solvent based inks the print viscosity of the ink can change during the print run due to partly evaporating solvents in the ink.

Substrate

The ink can soak into the open pores of an offset paper much easier than into the surface of a coated chromo paper or self adhesive foil. This too can influence the density of a standard shade. In our test series we printed the shade EURO blue under the same printing conditions onto coated offset paper, chromo carton, and self adhesive foil. The values read by the densitometer are different.

- Coated offset paper: density 1.0
- Chromo carton: density 1.14
- Self adhesive foil: density 1.20

Degree of Influence When Using UCR/UCA System

So far we have examined how the most important factors can influence the printing result and lead to deviations from the original. Even in a single print run, such color deviations are more or less inevitable. They are, however, much more serious in four color halftone printing. Great differences can occur when printing the colors on top of each other, and the resulting mixed tones can lead to an entirely wrong color impression.

Here the UCR/UCA system gives us a great advantage, because a large part of conventional overprinting of colors, especially in the gray range, is replaced by black. The color deviation of the basic tones, regardless of how they have been caused, become much less visible.

During the preparation for this paper, we tested a color shade change which produced a greenish tone in the gray scale in one instance, and a reddish tone in another. With the resulting different color scales, we printed a test picture with the UCR/UCA system and we found no serious color shade difference, especially in the neutral zones, or at least much less of a difference than we would have found in conventional printing.

Possibilities of Standardization and Control When Using Solvent-Based Halftone Inks for UCR/UCA Systems

It would be ideal if in halftone screen printing—like in offset printing—the most important factors of influence mentioned could be largely standardized. This would mean that all repro houses could make color separations according to a common system and the screen printer would be able to use the same kinds of mesh, stencils, ink settings, and machines.

Because of the great variety of screen printing jobs, and sizes and equipment of plants, this is hardly possible. One should therefore try to standardize the influencing factors within one plant to control the print-run precisely.

Preparation of Color Separations (films)

It is a precondition for use of the UCR/UCA that color separations are made by a scanner and with the use of corresponding software. From here it is a great deal further to the second step: the inclusion of the specific printing conditions of the plant in question through the use of printing coordinates. This way the result of the various factors — mesh, stencil, ink type and ink density — can be measured and taken into account when making the films. It is, of course, important that the conditions which were determined during the definition of the printing parameters are rigorously maintained during the print run, as only then will the color shades printed correspond with the original. The screen printer can test this by measuring the various color shades with a densitometer and comparing the values with the original.

The densitometer can, however, only measure the color density; any deviations in color tone are not measured, which call sfor an additional visual check. We can demonstrate this by printing two density measurements, but which have a different color position and lead to a different color impression.

Preparation of Halftone Screen Printing Inks

If the called-for standarization in the area of production of film separations and of printing parameters could be achieved, the ink manufacturer could also prepare his ink to be print-ready. It would then also be possible to use color pigment with even higher transparency than today and with equally good light

and weather resistance. The question of which order the colors have to be printed in would consequently loose much of its urgency. With standards of that kind, viscosity and rheological qualities of the ink could be adjusted optimally to the standarized printing conditions.

The UCR/UCA system gives us an additional advantage with respect to drying of solvent-based inks; because of the much thinner ink films, drying of the second, third, and fourth ink layers is much faster. If faster drying is not required, the mesh can be kept open by slowly adding evaporating solvents, which would also maintain the viscosity of the ink during the print run at a much more constant level, and very fine details can be printed much better.

Advantages of UCR/UCA Systems in Combination with Solvent-Based Screen Printing Inks

The considerations mentioned here show some concrete advantages, and some other positive aspects can be added, which may lead to the following results:

- Four-color halftone printing becomes easier

  Through close cooperation between screen printer and color separation houses, many difficulties can be avoided beforehand. Especially by establishing the aforementioned printing coordinates for the demands of the printer. The long and difficult way of reaching a good result by trial and error can be avoided and preparation times are much reduced.

- The printing result becomes better and more consistent

  Small diviations in the color shade which may occur nevertheless, will influence the final result much less than before. Deviations in the print run also become less noticeable.

- Halftone printing cost can be reduced

  Because of faster drying of the various colors, the printing spread can be increased and the consumption fo energy is reduced. One aspect not mentioned so far is the much lower ink consumption which, especially in lare jobs with large ink areas, leads to a noticeable reduction in cost.

- Further conversion of prints becomes easier

  In some instances, the thick ink film in conventional screen printing is a disadvantage, i.e., in vacuum forming when high demands are made onthe elasticity of the ink film. In these instances, the UCR/UCA system also offers advantages.

If we look at all the advantages and possiblities for further standardization in halftone screen printing, we can only hope that the UCR/UCA system will be used most widely in screen printing plants.

Reprinted with permission from a presentation given at FESPA Seminar '86, Santa Margherita Ligure, Italy.