

Now that the effect of film thickness on color has been demonstrated, there arises the question of the film thickness or ink quantity at which a color pair should be compared. The "milage curve" is used to determine the ink quantities commonly applied in practice.

The "milage" is understood to be the area (in m^2) that can be printed with a given quantity of ink (in m^2/g). In practice, however, it has become more usual to indicate the ink quantity (in g/m^2) at a particular density value as the milage indicator; in other words, the lower the ink quantity, the greater the milage.

Milage is determined by producing proofs with increasing inking, and determining the density value with a densitometer. Plotting the density value against the ink quantity produces the "milage curve."

In Figure 13 two offset inks, A and B, are compared to one another. The density value of the original is 1.75. The milage curve then indicates ink consumption in each case for a density value of 1.75 – in this example it is $1.08 \text{ g}/\text{m}^2$ for ink A, and $1.3 \text{ g}/\text{m}^2$ for ink B. Ink A thus offers approximately 20% better milage.

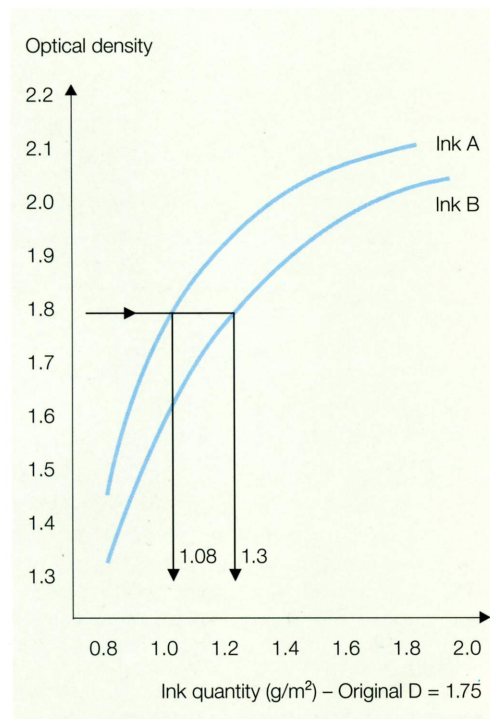


Figure 13. Milage curves for printing inks

The disadvantage of this method is that the density value is influenced by color and gloss. Incorrect results can therefore be obtained with different pigment and vehicle compositions.

The method developed by K. H. Schirmer and W. Renzer [1] is based on colorimetric principles; some of its advantages include:

- Milage values for inks with different pigment and vehicle compositions can be compared.
- Unequivocal indication of the film thickness or ink distribution, on the print, at which the optimum color match to a given original is achieved.
- Utilization of colorimetric color difference formulas allows quantitative determination of the degree of optimally achieved color match between an ink and a given original.
- Separate consideration can be given to deviation and change in DIN 6164 hue, saturation, and blackness value, and comparison using a different color system.
- Objective determination of the degree of visual change, therefore sensitivity of the ink to color fluctuations.

The film thickness range in which a color match to the original is achieved (within a permitted tolerance) can be accurately determined. Despite the measurement complexity, the Schirmer and Renzer method will be described briefly below.

Standard chromaticities X, Y, and Z are determined with a spectrophotometer. This simultaneously defines the chromaticity coordinates x and y, as well as the lightness reference value Y. From the chromaticities, the color differences DE_{ab} defined by DIN 6174 can be converted to an ideal color.

The calculated color differences DE_{ab} from an ideal color are plotted against the ink quantity (Figure 14). The position of the minimum indicates the optimum approximation to the ideal color.

The following results can be inferred from this:

Ink 1 achieves its optimum color approximation to the ideal value at $1.1 \text{ g}/\text{m}^2$, ink 2 at $1.4 \text{ g}/\text{m}^2$, and ink 3 at $1.2 \text{ g}/\text{m}^2$.