Limits of overprinting. Which print methods can be used to overprint areas of different height?

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Abstract

Research was conducted to identify the limits to the overprinting of different materials by means of different print methods and in the presence of a thickness step. The thickness step was produced by applying different film, paper or EAS labels as well as a varnish layer. Label paper, art paper and polypropylene film were used as substrates, and overprinted by means of offset, flexography, screen and inkjet processes. Aim of the overprinting study was to determine which layer thicknesses can be overprinted at what print quality level, focusing on the surface quality of printed layers as well as on the edge or transition zone between overprint layers.

Using the method of statistical experimental design, 330 different parameter settings were implemented to produce samples on an industrial rotary press, using around 600 kg printing ink and varnish as well as around 210,000 labels. All samples were documented in a sample folder, and characterised by measuring their gloss, colour density and CIElab values at different positions. Moreover, visual match-offs were performed in two test series: The first one included 30 male and 20 female test persons doing 51 paired comparisons and rankings. In the second series, 3 male test persons established print quality profiles over all 330 parameter settings. All measurement and test results were entered in a data base.

Correlations were established in the data base by means of statistical methods: variance analysis and effect analysis. The variance analysis showed a very great influence of print methods and the secondary layer. Primary substrate, screen printing fluid and screen print layers were found to have a great influence, whereas the printing speed influence was comparably small. The effect analysis produced very useful detailed findings. However, the limited quality and amount of data available for the study became visible in both methods.

The results were documented in a sample folder and in test records. All data were entered in an EXCEL data base from which they can easily be extracted. Yet another option was implemented based on the KNN (k nearest neighbour) method: using the parameters entered, the algorithm shows the next most likely sample including characteristics and sample photograph.