Tribological Examinations of Digital Packaging Prints

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Abstract

The influence of the voltage change in digital printing (Ingido E-Print and Xerox) on the possibility of the objective reproduction in printing and the rub-resistance of the dry prints are presented in the paper.

Introduction

In general, tribological properties of the material refer to the changes registered on the tested materials caused during its usage, i.e. by friction and wear. Rub resistance is a tribological important consideration of packaging prints.[2] This term refer to a printing ink`s ability to be subjected to abrasive forces.[3]

Experiment

The printing machines Indigo E-Print 1000+ and Xerox DocuColor 2045 were used in printing. In digital offset printing technique Indigo the voltage level on the photoreceptor drum was -600 V and -300 V respectively. Prints were made on the digital machine Xerox with the indirect transfer of ink on the printing substrate with corotrone voltage level on the back side of the paper of 212 V and 136 V respectively, with the adjusted toner fusing on the printing substrate. The unique test form was used in printing containing wedges of tonal values from 0 – 100% coverage in steps of 10% for CMYK.
Printing substrates were the mat fine art papers of 200, 250 and 280 g/m^2. The caliper was 0,185 mm, 0,235 mm and 0,260 mm.

The spectrophotometric measurements performed by X-Rite Spectrophotometer, were supported by ColorShop 2.0 software. Ink rub test (T830 sp-99) was used for testing the abrasion wear of dry prints.

Results and Discussion

Figure 1 shows the colour densities of Indigo and Xerox prints, at different voltage levels on three grammages of papers in dependence on the screen tonal value.

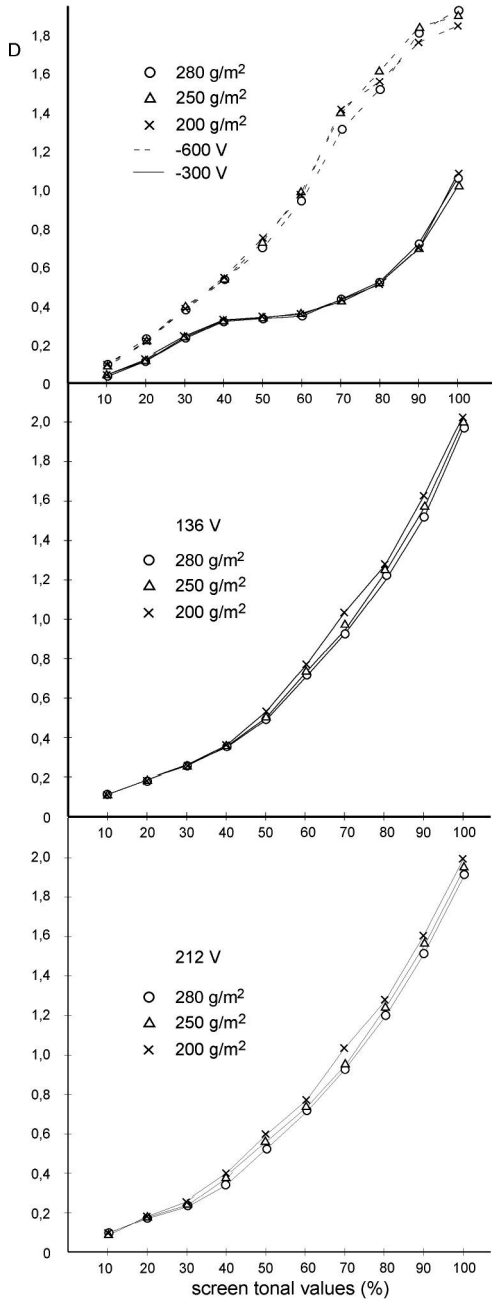

Figure 1. Inking density versus screen tonal value.

As shown in figure 1, the increase of grammages causes minor changes in colour density on prints obtained by either printing techgniques. More significant change in colour density of the print is visible in dependence on the voltage level of the photoreceptor drum in printing on Indigo machine.

Figure 2 illustrates CIE colour space diagram for the above systems in experimental conditions

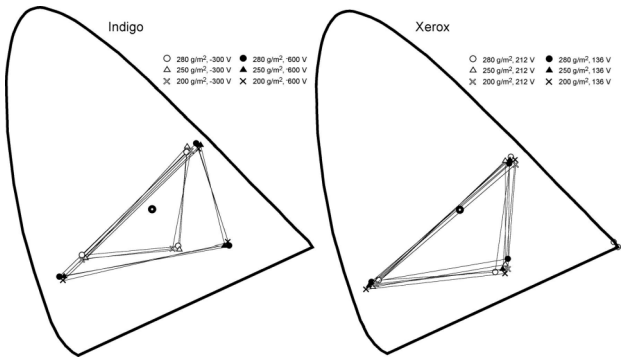

Figure 2. CIE colour space diagram for solid patches.

The measuring results are presented in figure 2 and have the same trend as those presented earlier. The gamut in CIE diagram is less dependent on paper grammage in both printing techniques and much more on the changes in voltage level in Indigo printing. This means that the colour reproduction of real inks increases by the increase of voltage in printing on Indigo machine, which increases the possibility of objective reproduction.

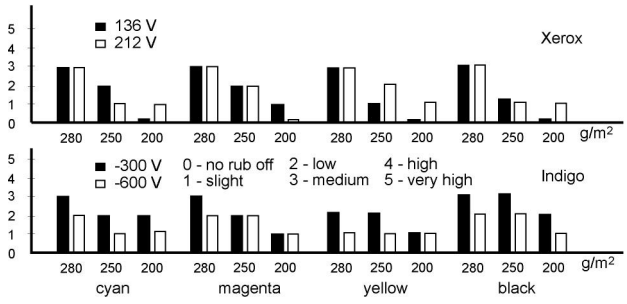

Figure 4. The results of ink rub of Xerox and Indigo prints

Results of Xerox prints show that on higher grammage papers, in spite of somewhat thinner ink layer (smaller D, Figure 1), the rub off is greater than on paper of smaller grammage. Such results can be influenced by the system of ink fixation onto paper, the temperature characteristics of ink and the substrate caliper.

In the case of te Indigo prints results differ considerably in regard to the Xerox ones. The Indigo prints made with a higher voltage on the photoreceptor drum have significantly considerably thicker layer of elektroink. It hardens by polymer crosslinking under the influence of the heated offset cylinder and quickly hardens on contact with paper.[1] The drying process for electroink consists of the fact that the ink is laminated into an ink-plastic film, and then both ink and film are peeled off the blanket and applied to the paper with the help of the transfer oil. The thicker, compact ink layer is somewhat more resistant to destruction of the print by abrasion, which has the consequence of greater rub resistance in regard to the print produced with lower voltage.

Conclusion

Printing on packaging on digital machines Xerox and Indigo are done in a different way than the printing on packaging on conventional offset or flexoprinting. In printing on Xerox, the rub resistance of prints, which is an important parameter of the quality of the packaging, is very difficult to control by changing the voltage during the printing process. More positive effect in this case is achieved by using thinner papers. On the contrary, in printing on Indigo machines, the thickness of paper plays a lesser role, but the voltage level on the photoreceptor drum is the important factor in the context of increasing the rub resistance of prints.

The results of the investigation will contribute to better knowledge of the influence of digital printing mechanisms on packaging prints quality.

References

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Biographies

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