The Influence of the Digital Printing of the Packing Materials on the Characteristics of the Recycled Fibres Prints

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Abstract

This paper presents some optical properties and distribution of particle sizes of handsheet before and after flotation of Indigo and Xerox prints made by using different voltage levels during the printing process.

Introduction

In general, the successfulness of recycled process depends among other things, on the technique and printing conditions, kind of ink and printing substrate.[1,2]

The digital prints usually provide ink particle size distribution after disintegration with larger dimensions than the conventional ones. Large particles give an insufficient removal by the flotation process.[3,4]

This paper presents only that part of our extensive investigations which comprise the recycling of Indigo and Xerox prints made by using different voltage levels during the printing process. The efficiency of the recycling process as well as some optical properties of the recycled fibres in regard to the printing conditions and the usage of the printing substrates are discussed in this paper.

Experimental

The printing machines Indigo E-Print1000+ and Xerox DocuColor 2045 were used in printing. In digital offset printing technique the charge on the photoreceptor drum was -600 V and -300 V. The prints were made on the digital machine Xerox with the indirect transfer of ink on the printing form with the corotrone voltage on the back side of the paper of 212 V and 136 V, with the corresponding toner fusing on the printing substrate. The unique test form was used in printing which contained wedges of tonal values from 0 – 100% coverage in steps of 10%. Printing substrates were the fine art papers of 200, 250 and 280 grammages.

The process of chemical deinking flotation was described in previous work.[2] Handsheets were made after disintegration and flotation. The optical properties of handsheets were determined by ISO standard methods. The particle size distribution was examined microscopically and by image analysis.

Results and Discussion

Figure 1 presents the brightness of handsheet before and after the flotation of digital offset prints Indigo and the digital prints Xerox on three paper grammages.

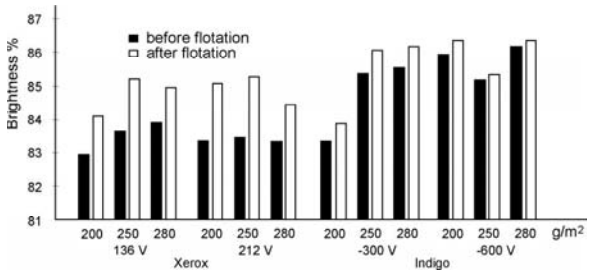

Figure 1 The effect of deinking on brightness

The measuring results show somewhat greater brightness of handsheet obtained by recycling of Indigo prints in relation to those on Xerox. The brightness increase of handsheet of Xerox are greater than those of Indigo. Greater dependence of the increase of handsheet brightness on the thickness of the printing substrate at higher voltage was noticed in Indigo prints.

Interesting parameter from the aspect of the usage possibility of the recycled fibres for the production of graphic papers is the definition of the white and very near white paper in, according to TAPPI standard T 525 ($L^*>84$ and $(a^{*2}+b^{*2})^{1/2}<10$). All the handsheets obtained in the described experimental conditions satisfy the presented relation, as shown in figure 2.

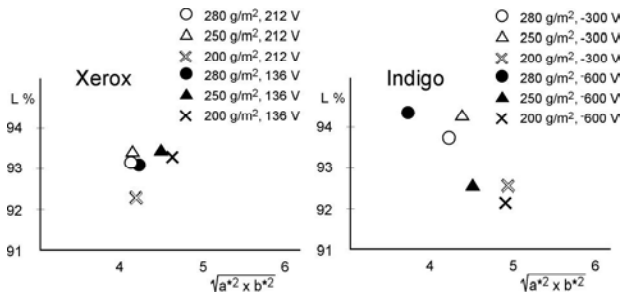

Figure 2. Lightness versus Chroma

The particle size distribution before flotation of the Xerox and Indigo prints printed at different voltages on the printing substrate 0.185 mm thick are presented in figure 3.

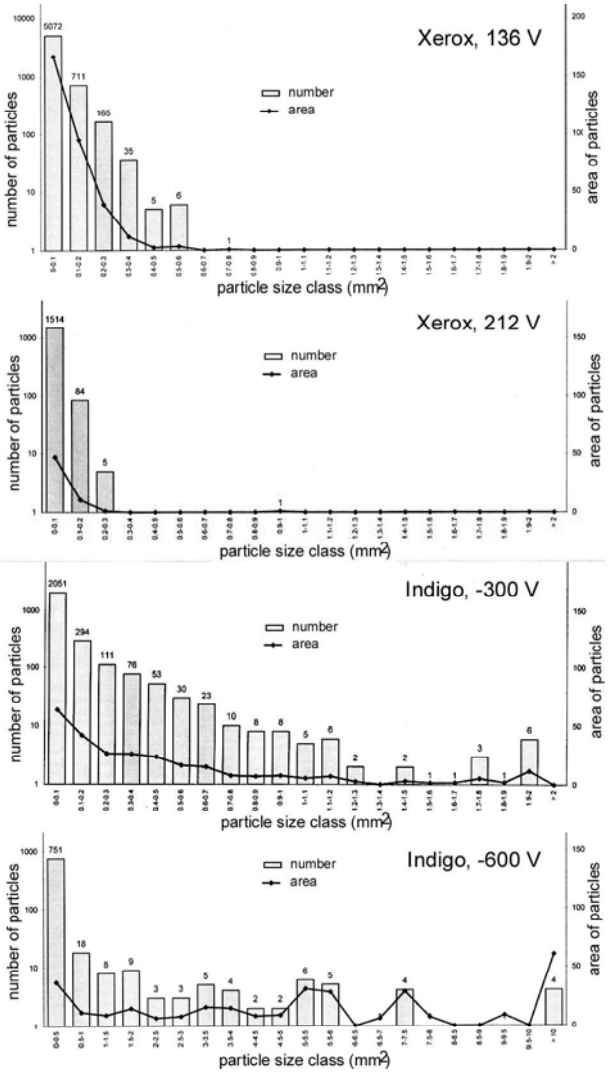

Figure 3. The particle size distribution.

As it is visible from the presentation, the handsheets obtained by the Xerox prints recycling contain greater number of smaller particles (which has the influence on handsheet brightness, figure 1) in relation to the handsheet of Indigo. Somewhat greater influence of the voltage change on the particle size was noticed in Indigo. The particles have such sizes in this case, that they influence the flotation efficacy which explains smaller increase of handsheet brightness. The results can be explained by the principle of the indigo printing technique. The electroink hardness through a polymer cross linking process and is laminated into an ink-plastic film which dries before it reaches the paper.

Conclusion

On the basis of the obtained measurements, it could be concluded that the influence of the digital printing techniques is recognizable on the efficacy of the print recycling, brightness and particle size. Increasing the voltage level in Indigo printing in experimental conditions the particle size increases as well as the flotation efficacy. The printing substrate thickness influences less the investigated characteristics of the recycled fibres.

The results of the investigation will contribute to better knowledge of the influence of mechanisms and conditions of printing process on characterictics of recycled fibres.

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Biographies

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