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STUDY OF SURFACTANTS IN THE DEINKING OF OFFSET PRINTED PAPER

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SUMMARY & INTRODUCTION

This work presents the results of the recycling using two ionic surfactants of offset printed papers with two different inks: one using a conventional mineral oil based ink and other using a vegetable oil based ink . The recycling of the material followed a standardized method for evaluating recyclability of printed papers (INGEDE - Method 11). For comparison purposes, two recycling procedures were performed: a standard procedure with oleic acid (OA) as a surfactant and another using sodium dodecylbenzenesulfonate (LAB) as surfactant instead. The goal was to evaluate the use of a more accessible surfactant as the standard surfactant in the recyclability evaluation of printed papers. The pulp produced from both deinking processes have low recyclability index, but the pulp obtained in deinking with LAB presented better results than the pulp deinked with oleic acid, for both types of inks.

MATERIALS & METHODS

A 75 g/m² paper was printed by an offset process using an mineral oil ink and the same pattern was printed with an vegetable oil ink. The paper was characterized and the ink printing quality was tested using an IGT equipment in five different levels of applied ink.

Table 1. Samples identification

Sample code	Description
MO_REF	Printed with Mineral Oil, not deinked and used as reference
VO_REF	Printed with Vegetal Oil, not deinked and used as reference
MO_OA	Printed with Mineral Oil and deinked with Oleic Acid as surfactant
MO_LAB	Printed with Mineral Oil and deinked with LAB as surfactant
VO_OA	Printed with Vegetable Oil and deinked with Oleic Acid as surfactant
VO_LAB	Printed with Vegetable Oil and deinked with LAB as surfactant

The recyclability of the printed papers were evaluated based in the Method 11 of the INGEDE (International Association of the Deinking Industry). The procedure for the determination of the deinkability score is described in the Assessment of Printed Product Recyclability of the European Recovered Paper Council. The calculation of the score is based in the following parameters of the deinked handsheets :

Table 2. Parameters for deinkability score calculation

Symbol	Description
Y	Luminosity
a*	Colour a* (green – red) of the CIELAB system
A50	Dirt particle area for particles larger than 50 µm
A250	Dirt particle area for particles larger than 250 µm
IE	Ink elimination (difference between observed ERICs – Effective Residual Ink Concentration)
ΔY	Filtrate darkening

RESULTS & DISCUSSION

1. Paper properties

The 75 g/m² paper was tested for basic, strength and optical properties, but for the aim of this work, only the grammage, ash content and optical properties are presented.

Table 3. Main paper properties

Property	Result
Grammage (g/m²)	74.6 ± 0.7
Ash content at 525ºC (%)	23.17 ± 0.05
Brightness – without UV filter (%)	95.41 ± 0.76
Brightness – with UV filter (%)	85.11 ± 0.81
CIE Lab Color	
L*	91.88 ± 0.75
a*	4.84 ± 0.75
b*	-11.37 ± 0.76
Fiber composition	Bleached sulphate hardwood pulp

Note: The grammage and its uncertainty are based on an average of 20 results. Ash content, brightness and their uncertainties are based on an average of 5 results.

2. Optical density of the applied ink

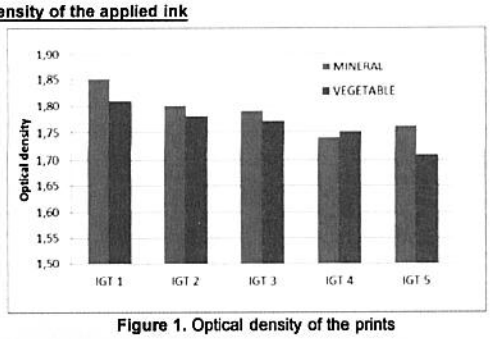

Figure 1. Optical density of the prints

3. Optical characteristics of the handsheets and filtrates

Table 4. Optical properties

Sample code	Y	a*	A50 (mm²/m²)	A250 (mm²/m²)	ERIC (ppm)	IE (%)	ΔY
MO_REF	68.5 (0.1)	2.8 (0.1)	11,930	6,923	329 (7)	-	-
VO_REF	68.2 (0.3)	2.7 (0.1)	18,257	13,053	343 (8)	-	-
MO_OA	67.1 (0.2)	2.7 (0.1)	1,528	227	329 (5)	0	23.2
MO_LAB	67.6 (0.6)	3.1 (0.1)	1,167	192	250 (34)	24	28.4
VO_OA	66.6 (0.1)	2.7 (0.1)	1,929	252	345 (6)	1	29.7
VO_LAB	67.1 (0.1)	3.2 (0.1)	1,191	219	272 (12)	26	28.9

Note: The numbers in parentheses correspond to the standard deviation of five determinations.

For all the samples the recyclability score was -3 (not suitable for deinking).

CONCLUSION

One of the purposes of this work is to compare the recyclability of the new vegetable oil based offset inks with the conventional mineral oil based inks. Considering the optical density as an indication of the quality of the prints, the d.o. of the mineral oil based ink prints is better when printed in a standard commercial offset 75 g/m² paper.

The recyclability of the paper printed with mineral oil is slightly better than the one printed with vegetable oil. The values of the optical parameters of the references samples (MO_REF and VO_REF), that were not deinked and were only desagregated, suggest that the vegetable oil might have a greater penetration in the fibers, resulting in a print with lower optical density and in a recycled paper with greater values of dirt area and ERIC.

The other purpose of this work was to compare the use of oleic acid and LAB as surfactants. Despite the low recyclability score of all the deinking processes and inks used in this work, the utilization of sodium dodecylbenzenesulfonate (LAB) in the deinking of offset printed papers had a better efficiency, considering the results of the dirt area (A50 and A250), IE and ΔY.

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