

# DEFINING PARAMETERS OF OFFSET PAPERS SUITABLE FOR INK-JET PRINTING

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## Abstract

In this article the researches on parameters of offset papers suitable for ink-jet printing were presented. There were used five types of paper in two grammages. After defining parameters, new papers were chosen and printed with aqueous-based and UV curable inks. There were gamut volumes of new prints estimated. The results shown that the biggest gamut volumes characterized offset prints made in UV machines – they were similar to the ones of prints made on papers dedicated to digital technique. To sum up, thanks to the researches it was proved that for ink-jet printing can be used also papers suitable for offset, especially in UV technique.

**Keywords:** *ink-jet printing, aqueous-based inks, UV-curable inks, paper suitable for offset, gamut*

## Introduction

Digital printing is more and more popular nowadays. It is connected with shorter runlengths, even in books and packaging branch.

The aim of researches conducted at Warsaw University of Technology was to check the possibility of using offset papers in ink-jet printing and to make order in paper classification.

Offset papers are cheaper then the ones suitable for digital printing – this is the reason why the owners of digital machines buy them more often then in the past. However using them can be risky because of quality of prints. Researching of possibility using offset papers in digital technique is practical and makes sense.

## Experimental

First there were done the researches connected with gamut volume measuring because it was assumed that the biggest volume is the criterium of choosing papers for ink-jet printing.

Papers suitable for digital printing have either the widest (the case of a device with aqueous-based inks) or one of the widest gamut volumes (as it happens in case of a device with UV-curable inks). However, especially in the case of printing with UV-curable inks, uncoated and coated papers in their maximum available grammage, have comparable volumes of gamut. As far as the CIELAB colorimetric space and CIECAM color appearance model space are concerned, they have even greatest values than papers suitable for ink-jet, whereas the uncoated and uncoated bulky papers in their minimum grammage possess the lowest gamut volume. [1]

After gamut volumes defining there were done the micro- and macro-structure researches. What is more, there were checked physicochemical properties, mechanical properties and fiber components.

## Results

According to the references [2÷4], paper grammage suitable for ink-jet should be bigger than 100 gsm. In case of using aqueous-based inks – its value should exceed even 135 gsm. This is the reason why for verifying research were taken coated and uncoated woodfree papers in 170 gsm. Other parameters:

### Uncoated paper

Grammage – about 170 gsm,

PPS roughness –  $4,0 \pm 0,5 \mu\text{m}$ ,

Water absorption according to Cobb60 –  $38 \pm 3 \text{ gsm}$

PDA parameters:

W –  $0,170 \pm 0,05$

Tmax –  $0,3 \pm 0,05 \text{ s}$

A30 –  $16,8 \pm 0,3 \text{ gsm}$

A60 –  $22,10 \pm 0,20 \text{ gsm}$

T95 –  $1,08 \pm 0,05\text{s}$ .

### Coated paper

Grammage – about 170 gsm,

PPS roughness –  $2,5 \pm 0,5 \mu\text{m}$ ,

Water absorption according to Cobb60 –  $25 \pm 3 \text{ gsm}$

PDA parameters:

W –  $0,025 \pm 0,05$

Tmax –  $0,10 \pm 0,05 \text{ s}$ ,

A30 –  $17,6 \pm 0,3 \text{ gsm}$

A60 –  $25,0 \pm 1,0 \text{ gsm}$

T95 –  $2,00 \pm 0,10\text{s}$ .

## Discussion

Papers chosen for new research were printed with aqueous-based and UV curable inks. As in previous experiment, on papers was printed special test: ANSI IT8/7.3 color chart with 928 control patches. The spectral reflectance of all patches was measured using SpectroScan (Gretag Macbeth) and colorimetric properties: illuminant D50 and standard color observer, angle 2°. Gamut volume values are presented in table 1.

Table 1. Gamut volume values

Type of paper and ink	Gamut volume in the space:		
	CIEXYZ	CIELAB	CIECAM02
1. UV curable ink, suitable paper	60 516,00	401 191,46	405 723,62
2. UV curable ink, uncoated paper 170 gsm	47 527,11	226 629,02	256 751,51
3. UV curable ink, uncoated paper 185 gsm	60 603,62	321 418,18	345 923,50
7. UV curable ink, coated paper 170 gsm	57 562,52	379 517,37	389 579,87
1. Aqueous-based ink, suitable paper	72 873,65	657 233,31	630 897,16
2. Aqueous-based ink, uncoated paper 170 gsm	48 405,18	164 257,22	192 871,91
3. Aqueous-based ink, uncoated paper 185 gsm	50 148,42	159 769,63	190 001,82

Prints made with UV-based inks on chosen papers had very good gamut volumes – almost as good as the ones characterizing suitable paper. The visualization of CIELAB is presented on figures 1 to 3. On every figure, the first space is the one characterizing prints made on suitable paper, the second space is the one characterizing prints made on offset paper and the third space is the combination of two previous spaces. Thanks to such combination it is easier to notice the differences in gamut volumes.

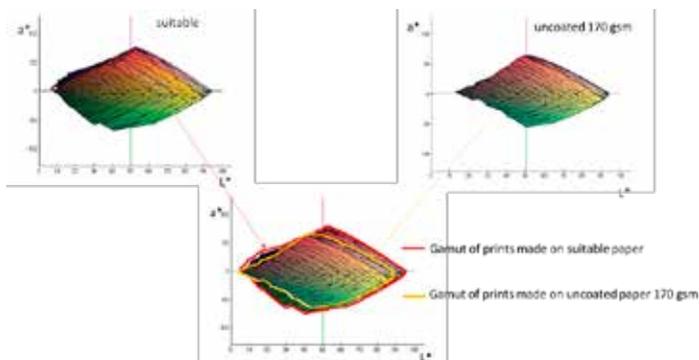


Fig. 1. Color gamut in CIELAB colorimetric space – prints made with UV inks, comparison of the ones made on suitable and uncoated paper (170 gsm)

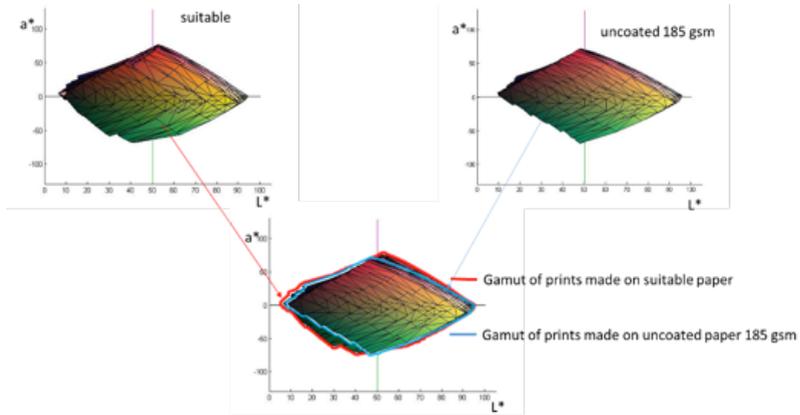


Fig. 2. Color gamut in CIELAB colorimetric space – prints made with UV inks, comparison of the ones made on suitable and uncoated paper (185 gsm)

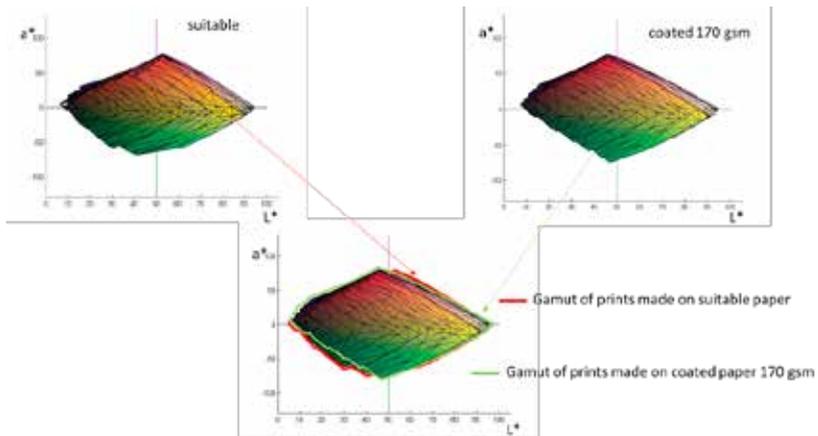


Fig. 3. Color gamut in CIELAB colorimetric space – prints made with UV inks, comparison of the ones made on suitable and coated paper (170 gsm)

On the one hand, prints made with aqueous-based inks on offset uncoated papers have lower gamut volume than the ones made on suitable paper. On the other hand, their volume is wider than volume of prints made on offset paper used in previous research. What is more, those new papers have lower grammage than the ones used in previous experiment. However, their gamut volumes are wider.

Unfortunately, there were problems with making prints on coated paper. Because of wrong type of coating, ink wasn't able to absorb. Prints were very wet and they didn't dry at all.

The visualization of CIELAB is presented on figures 4–5. It is made similar to the visualization of prints with UV inks.

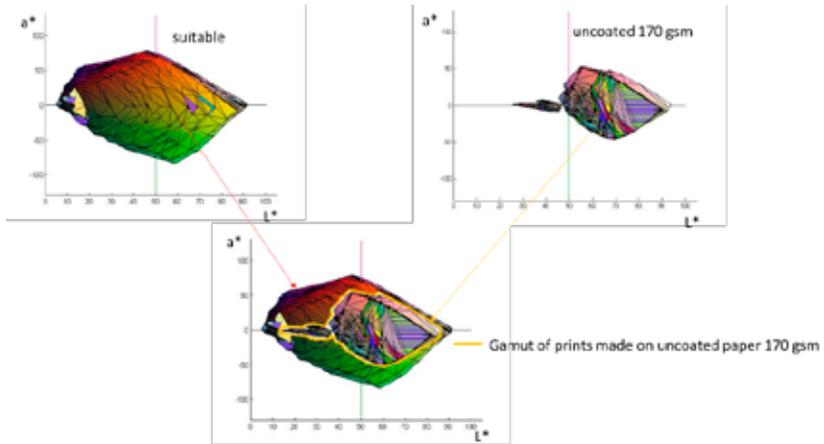


Fig. 4. Color gamut in CIELAB colorimetric space – prints made with aqueous-based inks, comparison of the ones made on suitable and uncoated paper (170 gsm)

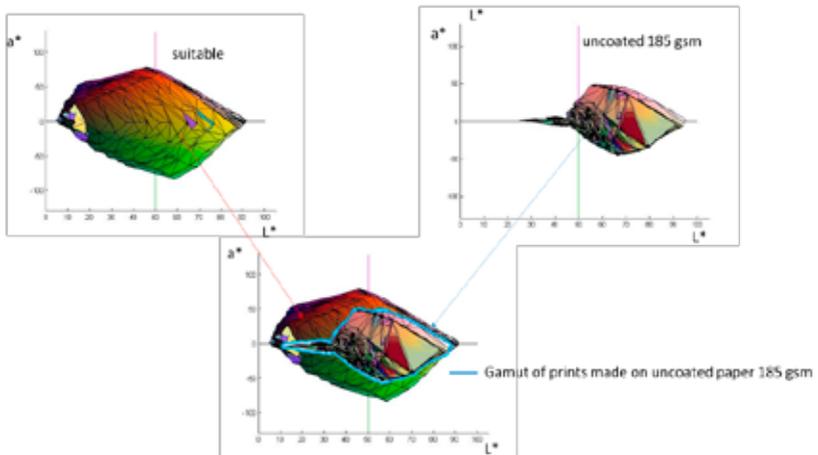


Fig. 5. Color gamut in CIELAB colorimetric space – prints made with aqueous-based inks, comparison of the ones made on suitable and uncoated paper (185 gsm)

## Conclusion

The research confirmed the thesis that in ink-jet printing (especially with UV-cured inks) it is possible to use not only papers suitable for this technique but also papers traditionally apply in offset printing. The exception is printing multicolour photography.

To sum up, it isn't necessary to choose paper for ink-jet printing, because of producer or name – the choice can be made by knowing only parameters defined in this article.

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