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PRINTING POLYOLEFIN SUBSTRATES ON UV INKJET PRINTER

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Abstract:

Large format printing (LFP) opened new successful markets for printing, penetrate into segments where offset and screen printing used to be the only technologies. The main field of their application is indoor and outdoor posters. For outdoor applications plastic substrates are less sensitive to weather conditions than paper substrates.

Our research work focused on evaluating prints produced by UV inkjet printing on polyolefin substrates. Polyolefin substrates were chosen with different thickness, structural, and surface properties. A test chart was designed to obtain the most possible information on print quality in visual evaluation and measurements. Visual assessment was used to determine the number of tones and to evaluate photographic image reproduction, while measurements provided data on density and reproducible colour gamut.

Keywords:

polyolefin substrates, UV inkjet, colour gamut

1 INTRODUCTION

Most of the prints on plastic substrates are used in advertising or as decoration. Large posters are one of the oldest means of advertising, on which the idea is to be presented by an image or with a few words. Posters are in fact one of the oldest forms of advertisements, became widespread in the second half of the 19th century, when printing technologies became capable of producing large amount of large format prints (1).

Professionals of advertisement and media studies have long recognized that colour prints, documents attract more attention from the recipients, and tend to have prolonged impacts on their memories. The application of colors enhances the effects of prints. Therefore, in the recent years of the development of digital printing, a priority focus has been on digital equipment making color printed media products. Nowadays, outdoor advertisements have an increasing role, and just recently the so-called giant posters have become broadly popular. Prints made on plastic printing media are more resistant to weather impacts than paper printing media, and therefore they are more suitable for outdoor use. The emergence of large-format inkjet printers (LFP) has opened up new, successful market segments in printing industry. The main field of their application is indoor and outdoor posters (2) (3).

2 STATEMENT

In printing industry, meaningful communication about colors and quality control are allowed by quantified color definition, objective color measurement and the availability of appropriate accessories. At the present, problems associated with computerized color management and the color rendering of digital devices can be handled only with the use of color measurement.

There are a number of software applications and instruments available for the color measurement of the input (scanner, digital camera) and output (printer, proofing equipment) devices of pre-printing

procedures. When used by experts, the color measurement spectrophotometer is a device that simulates human vision, and quantifies color characteristics appropriately.
It means that this device gives way to objective comparisons, quality control, documentation and archiving, as well as communication among the participants of the work processes, as irrespective of their being customers or designers, ink suppliers or printers. With reliance on spectrophotometers, visual control can be supported by objective means. On the basis of the measured data, the color profiles of the digital devices can be established. In this way, the actual color rendering characteristics of the given digital devices of color management are revealed, and thereby the desired results can be taken into account in the work processes towards the appropriate reproduction of colors. The standards pertaining to the visual control of colors require standard lighting conditions in all industries. With color measurement, color fidelity can be controlled, and a number of phenomena associated with colors can be measured in advance and anticipated. During the preparative phase, the customer can even measure the desired color with the use of an appropriate measuring device. With reliance on the support offered by digital color management, the ordered materials can be forwarded to the manufacturer or printer in color-correct forms – where production can again be controlled with objective color measurement – making communication and production free of problems (4).
The objective of this research work is the description of the quality of prints made with inkjet printing and the comparison of their printability characteristics. We have performed visual assessments, and on the basis of color measurement results the colour reproduction capabilities of a HP FB6100 large-format inkjet printer have been examined on prints made on plastic printing media (5).

3 METOLOGY

For the purpose of the tests, we have selected such printing media of poliolefin materials featuring various thicknesses and surface characteristics that are generally used for advertising and decoration (Table 1).

Table 1 Characteristics of the printing media

Names of media	Grammage g/m^2	Thickness, µm	Producer company
3D polyolefin film	130*	90*	Avery
F400 Gloss White polyolefin film	130*	95*	Avery
3021 Matt polyolefin film	110*	95*	Avery
Transparent polyolefin film	120*	100*	Hexis

Remark: data with * are without back plate

The test images were printed in A3 size, on four plastic printing media of different characteristics. Each test print was made in one copy with the use of a HP FB6100 type inkjet printer, under identical circumstances and conditions.
Test printing was performed under normal operating conditions as follows:
- venue: OSG HUNGARY Kft. digital workshop, Budapest
- printer: HP FB100 type, large-format UV inkjet printer,
  t=21 ºC, RH 39–44%

To perform color measurements on the test prints, an X-Rite SpectroEye spectrophotometer was used, the measurements were made one days after printing. The conditions of measurements were as follows: D50/2°/Abs/ black underlay (Figure 1).

Figure 1: Structure of the test image

4 RESULTS

4.1 Visual testing of the prints

In the course of the visual testing of prints, we concentrated on the printing errors occurring in certain elements of the test image, distortions, deviations caused by the surface properties of the printing media. The tests were carried out with the unaided eye, on an inspection board.
The number of color tones was examined with the use of a 20-step scale of tones. The largest number of color tones could be distinguished in the black and cyan colors, 19 steps could be observed in all the cases. For all the prints, the smallest value was given by yellow colors, and no or just a very little yellow ink could be seen under the 5% tone value field. It was the glossy, matt and 3D polyolefin printing media that proved to be the richest in tines.
Nice and detailed images were found on all of the polyolefin substrates, the contour lines and tones of these images were very close to reality. Realistic colors could be seen in the printed images of these printing media.

4.2 Densitometric examination of the prints

Density measurements were performed in the 100% tone value field of the CMYK tone stripe, on four various printing media. The measurement results are provided in Table 2.

Table 2: Density values printed with a HP FB6100 inkjet printer on the tested printing media

Names of medias	**Density, D**			
	K	**C**	**M**	**Y**
3D polyolefin film	1,92	0,72	1,70	1,63
F400 Gloss White polyolefin film	1,92	0,64	1,62	1,53
3021 Matt polyolefin film	1,91	0,79	1,66	1,71
Transparent polyolefin film	1,91	0,85	1,49	1,71

4.3 Reproducible colour gamut

On the basis of the measurements performed on the color fields of the primary and secondary colors, the color stimulus points were presented in an a^*b^* coordinate system where the top view section of the color solid of the reproducible color range formed the basis of comparison for the tests. Differing in the tested printing media, the reproducible color ranges were considered separately for the individual types of the printing media (Figure 2).

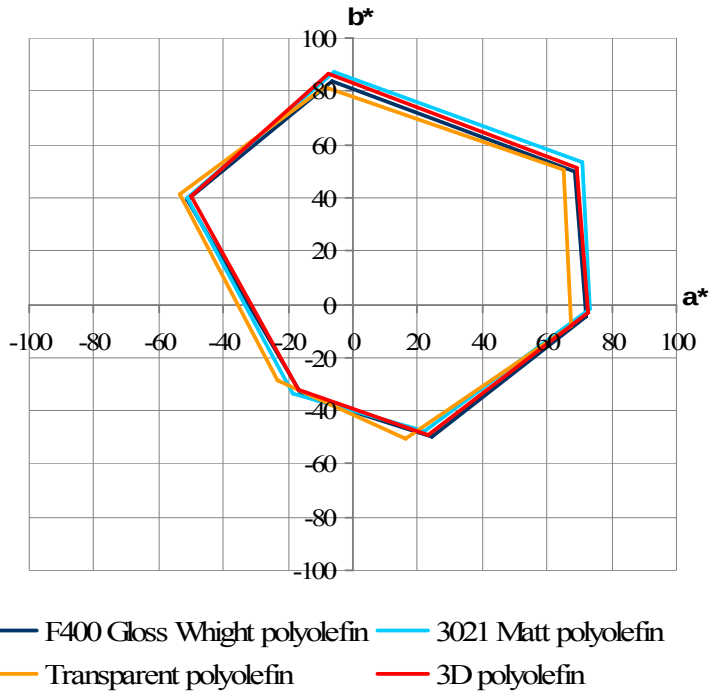

Figure 2: Colour gamut contours in CIELAB color space of polyolefin prints

5 CONCLUSION AND DISCUSSION

In the light of the visual testing of the images, generally it can be claimed in connection with the prints made with the HP FB6100 inkjet printer that the printer renders colors to all the printing media to a good extent of fidelity, yet lighter tones tend to be slightly blurred.

The obtained density values were evaluated for each type of the printing media. The density values of the polyolefin printing media were similar. The largest ink density was found on the 3D polyolefin film, while the smallest on the F400 Gloss White polyolefin film.

Our tests showed that from among the prints made on polyolefin plastic media with the use of a HP FB6100 large-format UV inkjet printer the largest color space could be achieved on the 3021 matt polyolefin film, and it was approximately identical to the reproducible color gamut of the other polyolefin films.

References

[1] BROCHAND, B.; LENDREVIE, J.: *A REKLÁM ALAPKÖNYVE*, AKADÉMIA KIADÓ, ISBN: 9789632247939, BUDAPEST, 2004

[2] ESLER, B.: TOP SIX TRENDS SEEN AT DRUPA, *GRAPHIC ARTS MONTHLY*, JULY 01. 2008.

[3] ROMANO, R. (2008): *INKJET PRINTING PRIMER – A WHATTHEYTHINK OVERWIEW OF INKJET PRINTING IN THE COMMERCIAL PRINTING INDUSTRY* [ONLINE], WHATTHEYTHINK E-STORE, AVAILABLE ONLINE: HTTP://STORE.WHATTHEYTHINK.COM, ACCESSED: 2010. 09. 12.

[4] DAVID, B.: NYOMDAI MEGRENDELŐK KÉZIKÖNYVE, SCOLAR KIADÓ, BUDAPEST, 2007.
[5] SZENTGYÖRGYVÖLGYI, R.: PRINTING PLASTIC SUBSTRATES ON THE HP FB 100 INKJET PRINTER, *PROCEEDINGS OF INTERNATIONAL CONFERENCE ON PRINTING, DESIGN AND GRAPHIC COMMUNICATIONS*, MIKOTA, M. (ED.), PP 411-418., ISBN 978-953-7644-05-5, SENJ, 6-9. OKTOBER 2010, UNIVERSITY OF ZAGRAB, FACULTY OF GRAPHIC ARTS, SENJ, (2010.)

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