Proceedings

Novi Sad, Serbia

11-12. November 2008.

p.d.p. convention

Универзитет у Новом Саду
Факултет техничких наука
Графичко инжењерство и дизајн

Први међународни студентски конгрес из области графичких технологија

p.d.p. convention

Нови Сад
11. и 12. новембар 2008.

Зборник радова Првог међународног студентског конгреса из области графичких технологија ‘‘PDP convention’’

Издавач:
ФАКУЛТЕТ ТЕХНИЧКИХ НАУКА
ГРАФИЧКО ИНЖЕЊЕРСТВО И ДИЗАЈН
21000 Нови Сад, Трг Доситеја Обрадовића 6

Редакциони одбор:
Борис Петровић
Ђорђе Радонић

Секретар уређивачког одбора:
Андреа Вујиновић

Уредник:
Никола Брадоњић

Зборник технички уредили:
Владимир Аћамовић
Никола Брадонић

Насловна страна и дизајн:
Владимир Југовић

Припрема и прелом:
Владимир Аћамовић

Лектор:
Јелена Кукољ

Штампа:
ФТН - Графички центар ГРИД
www.grid.ns.ac.yu

Тираж:
150 примерака

Универзитет у Новом Саду
Факултет техничких наука
Графичко инжењерство и дизајн

Први међународни студентски конгрес из области графичких технологија

Зборник радова
Proceedings

Нови Сад
11. и 12. новембар 2008.

Први међународни студентски конгрес из области графичких технологија ‘‘PDP convention’’

Програмски одбор:

Председник:

- Проф. др Драгољуб Новаковић, ФТН, Нови Сад

Чланови:

- Проф. др Илија Ћосић, ФТН, Нови Сад, Декан Факултета техничких наука
- Проф. др Ливија Цветићанин, ФТН, Нови Сад
- Проф. Бошко Шево, Академија уметности, Нови Сад
- Проф. мр Слободан Недељковић, Академија уметности, Нови Сад
- Асст. мр Игор Карловић, ФТН, Нови Сад
- Асст. мр Живко Павловић, ФТН, Нови Сад
- Асст. мс Сандра Дедијер, ФТН, Нови Сад
- Асст. мр Урош Недељковић, ФТН, Нови Сад
- Карло Бинголд, ФТН, Нови Сад
- Проф. др Мирослав Гојо, Графички факултет, Загреб
- Проф. др Горазд Голоб, Природно-технички факултет, Љубљана

Организациони одбор:

- Борис Петровић, координатор пројекта
- Ђорђе Радонић, асистент координатора
- Андреа Вујиновић, односи са јавношћу
- Проф. др Драгољуб Новаковић, стручни консултант
- Карло Бинголд, стручни консултант
- Асистенти департмана ГРИД-а

Чланови ‘‘PDP convention’’ тима:

- Борис Петровић
- Ђорђе Радонић
- Андреа Вујиновић
- Владимир Аћамовић
- Никола Брадоњић
- Стеван Петров
- Дајана Марјановић
- Иван Радумило
- Владимир Југовић
- Ана Келер
- Мирко Шовран
- Никола Радаковић

CONTENTS:

PRINTING

DESIGN

PHOTOGRAPHY

PRINT
.ING

p.d.p. convention

METHODS OF COLOR CORRECTION FOR MINIMIZATION OF COLOR SHIFTS

Gubnytska Iuliia, Gurieva Natalia
Department of the Engineering and Computer Graphics , KhNURE, Ukraine

Резиме

У савременој графичкој индустрији се повећавају захтеви у погледу квалитета репродукције оригинала. Корекција боја је саставни део тог процеса репродукције. У том погледу је неопходно детаљније истражити процес репродукције боја као целине у оквиру процеса обраде оригинала. Један од највећих проблема у процесу репродукције је узимање у обзир чињеницу да је динамички тонски опсег излазног уређаја или супстрата мањи од оригинала. У циљу избегавања потешкоћа при репродукцији потребно је избећи проблеме који доводе до померања у репродукцији боја.

Кључне речи: управљање бојом, корекција

Summary

For today in graphic arts industry increased requirements to reproduction of graphic originals. Color correction is an integral part the process of the reproduction. In this connection, it is necessary to examine process of color reproduction as a whole. The major problem of the color reproduction process is to account the fact that the dynamic range of an output device or medium usually is substantially less than that of an original scene. It is necessary to avoid difficulties connected to distortion of colors.

Key words: color management correction

1. INTRODUCTION

There is a concept about kinds of conformity of the image to the original which match with physiological, psychological, colorimetric accuracy of reproduction [1]. For the decision of problems of accuracy in color reproduction it is necessary to allocate group of colors of the natural objects representing vital importance to reproduction. We investigate reproduction some memorable colors such as skin color, color of vegetative greens and the sky blue. And depending on that what task we solve, when printing of firm colors or color photos develop

various strategy of color correction. All successful color imaging systems employ some form of color management. Further in work some methods of prepress preparations for minimization of color shifts and achievement of necessary accuracy of color reproduction is investigated.

Color management of digital imaging provides communication of the associated data required for unambiguous interpretation of color content data, and application of color data conversions, as required, to produce the intended reproductions.

2. GAMUT MAPPING AND RENDERING INTENTS IN COLOR MANAGEMENT

Color management is a useful method of controlling and standardizing the reproduction of colors from the original input (a scan or digital capture) to the eventual output (a printed page or website), via the intermediate devices (designers monitors, and proof prints). In an ideal world that purple car in your photo would look the same shade of purple on all these devices, and those lime green boots would appear the same all the way from photography to page. Color management is meant to make it easier for this ideal world to be a reality.

The measured scene color is known as Scene-Referred. Since we need to view this image on something like a display and then to print it. It's usually necessary to make the image appear more pleasing on the output device and to produce the desired color appearance the image creator wishes to express and reproduce. These image colors are known as Output-Referred. The need to fit the color gamut and dynamic range of the scene-referred data to output referred data is called rendering.

The gamut mapping intents for various kinds of original images are considered below:

- Perceptual. All out-of-gamut colors are compressed to fill the printer gamut. Gray balance should be preserved but colorimetric accuracy might not be preserved. It is useful for general reproduction of pictorial images, typically includes tone scale adjustments to map the dynamic range of one medium to that of another, and gamut warping to deal with gamut mismatches. Commonly used for natural images such as portraits and scenery.
- Saturation. The saturation of the pixels in the image is preserved. Accuracy in tone and lightness might be lowered. It is useful for images which contain objects such as charts or diagrams, usually involves compromises such as trading off preservation of hue in order to preserve the vividness of pure colors. It is used for business graphics.
- Colorimetric (absolute and relative). In-gamut colors are not moved, and out-of gamut colors are mapped to the closest color. Colorimetric intent is used for company logos (because the correct color is important) and for contract digital proof.

So, we chose aim of reproduction process and scheme of color transformation (gamut mapping intent) and we choose method of color correction.

3. COLOR CORRECTION ACCORDING TO ACCURACY OF COLOR REPRODUCTION

Despite of sufficient validity to research the questions of psychological accuracy of color reproduction now quality of color reproduction estimate on degree of physiological matching of the reproduction image to the original image. Owing to uncertainty of concept psychological accuracy and the conditions necessary for its achievement, in practice use physiological accuracy at an estimation of quality of color reproduction. To receive physiologically exact reproductions in certain cases it is possible, applying technologies with number of paints of synthesis more than four. But, despite development and expansion of sphere of application Hi Fi of the technologies using from 6 to 8 paints of synthesis, all of them still are at a stage of working out and are accessible not to all printeries.

Colorimetrical accuracy of color reproduction creates the numerical model, allowing to predict effect of metamerism. Successful colorimetrical model should carry out the following: Colorimetrical model should designate both samples identical numerical values, when the typical person-observer sees coincidence of two samples of color. And when the typical person-observer sees differences in two samples of color, colorimetrical model should not only designate these samples different numerical values, but also provide calculation of numerical value of the color distinction, allowing to predict, how much different the given samples will appear for the observer. Modern colorimetrical models are imperfect, but thanks to the advanced researches of CIE, they have appeared reliable enough to form the basis for creation of the majority of modern color control systems. Without going into details colorimetrical CIE models, it is necessary to notice that they allow to present color which perceives the majority of people with normal color sight in a numerical kind. In comparison with it all the rest — details without which, it is impossible to understand an action principle, and sometimes and inactivity of management by color.

Physical and physiological accuracy, provide coincidence on color in each point of the original and its image which it is possible to be set only in cases when the reproduction is reproduced the same paints and in the same conditions, as the original image (for example, reproduction of scales of color coverage). In all other cases as there are big or smaller distortions of the color information, it is expedient to approach to an estimation of quality of reproductions from positions of psychological accuracy color reproduction.

In certain cases physiologically exact reproduction can seem excessively contrast on color. By visual consideration of a reproduction with the lowered saturation of all colors reproductions with the separate colors reproduced too bright and sated are perceived more satisfactory, rather than. Concept of physical and physiological accuracy usually apply to the characteristic of images in the assumption that they are looked through under the same conditions, as the original. The concept of psychological accuracy can be applied both for identical, and to various conditions of illumination and survey. Such image which in each small enough site has the radiation visually identical to corresponding site of the original is called as physically exact. Such image which in each small enough site has the same spectral distribution of energy, as in a corresponding site of the original is called as physiologically exact. As visual identity understand the established conformity which consists in equality of their coordinates of color.

Physical accuracy is simultaneously and physiological. In cases when conditions of illumination and original and print survey are identical, physiologically exact reproduction can be considered as ideal reproduction of the original. For an estimation of that, really received reproduction to physiologically exact is how much close, apply essentially excellent two methods.

The first of them is based on an estimation of accuracy of reproduction of each separate color of a reproduction by certain color with the further addition of colors which answer the major color elements of object. In the second method this estimation is carried out on parameters which characterize all set of colors of object without the characteristic of accuracy of reproduction of each separate color of a reproduction. This technique is based on an establishment of conformity of the given reproduction to one of psychologically exact images which are placed as gradual approach to physiological to the exact image of the original.

Both methods follow from the laws of visual perception of color distinction established in practice. The first method is based on definition of sizes of admissible distortions in reproduction of color tone, a saturation and lightness for each taken color. The second - on construction of formulas which define admissible transformations of colors of the original to colors of a reproduction which at a visual estimation is satisfactory images of the original.

4. CONCLUSION

In this paper, the color image workflow is investigated. The role of gamut mapping in color management is considered. It was also proposed some methods for color correction. Our methods implements color transformation according for aim of reproduction process to predict colors with given accuracy. Accurate is in quotes since nearly every user has a different definition of what they mean or want when they say accurate but in our work we clearly define strategy of correction according to aim of reproduction.

LITERATURE

1. Hunt R.W.G., The Reproduction of Color in Photography. Printing & Television, Fountain Press, Tolworth, England, 1987, page 534.
2. Mark D. Fairchild, Color Appearance Models. Second Edition, Addison-Wesley, Reading, Massachusetts, 2004.
3. ICC (International Color Consortium), Specification ICC.1:2004-10 (Profile version 4.2.0.0) “Image technology color management — Architecture, profile format, and data structure” (2004)
4. Professional Photoshop: A Classic Guide to Color Correction. by Dan Margulis. John Wiley & Sons, 2007
5. Photoshop Color Correction by Michael Kiernan Peachpit Press, 2003

Contact address:
Gubnytska Iuliia, Gurieva Natalia
Department of the Engineering and Computer Graphics
KhNURE
Lenin av., 14,
61166 Kharkov, Ukraine
E-mail: julgub@ukr.net

CORRESPONDING COLOR IN ICC-BASED COLOR MANAGEMENT

PhD student Gurieva Natalia,
Department of the Engineering and Computer Graphics , KhNURE, Ukraine

Резиме

Циљ овог рада је истраживање радног тока репродукције боје ради постизања одговарајуће репродукције боја у форми "репродукције боја независних од услова посматрања". Након претварања боје зависне од уређаја у боје независне од уређаја помоћу профила уређаја, боје независне од уређаја ће бити претворене у "боје независне од услова посматрања" коришћењем модела осећаја боја (CAMова) са параметрима посматрања под којим се изворна слика посматра. Након тога коришћењем корекције боја са параметрима посматрања репродуковане слике ће се извршити претварање у боје независне од излазног уређаја и у боје зависне од излазног уређаја.

Кључне речи: ICC управљање бојом

Summary

In the work, the color reproduction workflow which allows to achieve corresponding color reproduction as "viewing condition independent color reproduction" is investigated. After conversion the device dependent colors to device independent colors using device profile, device independent colors will be converted to "viewing condition independent color" using color appearance models (CAMs) with the viewing condition parameters under which the original image are viewed. Then, after color correction using viewing condition parameters of the reproduction image it will be transformed into device independent colors of output device and then to device dependent colors of the output device.

Key words: ICC color management

1. INTRODUCTION

Color reproduction is a complex process. Hunt [1] has defined following six types of color reproduction: spectral color reproduction, colorimetric color reproduction, exact color reproduction, equivalent color reproduction, corresponding color reproduction, preferred color reproduction. Depending on what task is solved during the prepress whether to print some firm colors or to match the input image as closely as possible, or print some photos with memorable colors, some ways of colors transformation during the prepress are developed.

To realize “corresponding color reproduction” we have to obtain color appearance match across different media and devices. First, color device must accurately be characterized so its color could be clearly defined. Second, gamut difference between the input device and the output device should be compensated so the reproduced image looked similar to the original image. Third, human visual system’s chromatic adaptation to the various viewing conditions should be compensated. All these phenomenas should be considered together to achieve “corresponding color reproduction.”

2. COLOR TRANSFORMATION

Corresponding device independent color reproduction allows to capture, display, and print color images which look the same across different devices. Mathematically, color transformation was previously introduced to ICC-based color management scheme in color management systems (CMS’s). These CMS’s consist of: intermediate (connection) color space; transformation method between color spaces, and transformation tables (transformation tables for each device are often called “device profiles”) from device-dependent color to device-independent color for each device.

However, present CMS’s hold some technical problems. We discussed two of them: color reproduction accuracy through the image transformation and color appearance under different viewing conditions.

Digital image data is transformed to hard-copy image data as follows (fig.1): device dependent signals (RGB) are transformed into device-independent color space (XYZ) through the source profile; tristimulus values (XYZ) are transformed to cone signals (LMS); and then, the simple von Kries adaptation model is used to get the corresponding cone signals for the output image using viewing condition parameters.

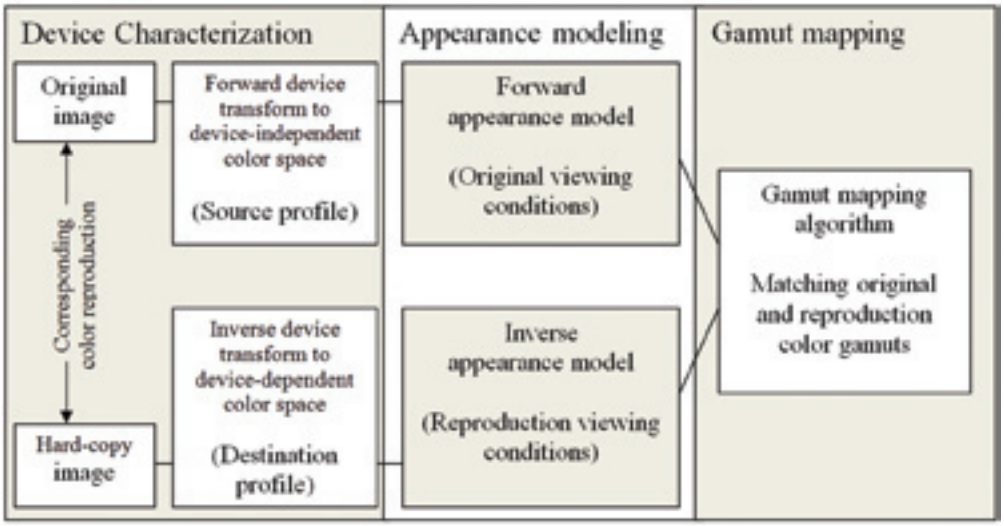


Fig. 1 The scheme of image transformation

In general, actual device color gamuts will fail to match each other. Because of this mismatch, and because of the needs of different applications, four rendering intents of profiles (color rendering styles) are defined in specification [2,3]. Each one represents a different color reproduction compromise. The colorimetric rendering intents operate directly on measured colorimetric values, though possibly with correction for chromatic adaptation when the measured values were not calculated for the D50 PCS illuminant. The other rendering intents (perceptual and saturation) operate on colorimetric values which are corrected to account for any differences between devices.

In our experiment, original digital images are reproduced to the hard-copy by the printer. For the output device, ink jet printer (RGB-output) Epson Stilys Pro 4880 was used. The printer was characterized by composing multidimensional Look-up-table (LUT) by mathematical transformation from 1728 color patches measurement.

Under fixed viewing conditions, a color can be described by three numbers. The CIE system of colorimetry provides a mechanism for the standardized measurement and description of color. Given the spectral reflectance of an object and the spectral radiance of the illuminant it is viewed under, CIE colorimetry allows the color of the object to be specified as a set of tristimulus values.

The colorimetry of a document region can be expressed in terms of its spectral reflectance and the power spectral distribution of the illuminant it is viewed under []:

$$t_i = \int_{\lambda_{\min}}^{\lambda_{\max}} a_i(\lambda) \cdot l(\lambda) \cdot r(\lambda)\, d\lambda, \qquad i = 1, 2, 3 \tag{1}$$

where λ is a wavelength, a1(λ), a2(λ), a3(λ) are the CIE XYZ color matching functions (CMFs), r(λ) represents the spectral reflectance of the original, l(λ) represents the spectral power distribution for the viewing illuminant (we used real viewing conditions for modeling), and [λmin, λmax], represents the interval of wavelengths with non-zero CMFs. Three values [t1, t2, t3] represent the colorimetry of the document region in consideration and are referred to as the CIE XYZ tristimulus values. The reflectance spectrum produced by the color output system in a response to a specific set of three dimensional color control values can be converted to colorimetry using (1).

The result of colorimetric measurements was analyzed to make a colorimetric LUT for direct transformation. It was generated by the following method:

- Produce 12x12x12 color chart sampled in input color space (RGB).
- Measure the tristimulus values (XYZ) of the color chart under illuminant D50.
- Interpolate inside the 12x12x12 color mesh to make 33x33x33x3 RGB-to-Lab CLUT by standard software (GretagMacbeth ProfileMaker 5.0.7) and using the radial basis neural network.

3. USING NEURAL NETWORK FOR COMPOSING LUT

To compose a colorimetric LUT for direct transformation RGB-to-Lab we used radial basis neural network with two hidden layers. The parameters of the neural network are following:

- The input layer uses one neuron for each color value, in other words, 3 neurons are used. The output layer also uses 3 layers as each of these will give a different color value for: (L^,a^,b^).
- In order to choose the optimum number of neurons for the hidden layers, training starts with 5 neurons and goes increasing. The best performance, without overtraining, is achieved with 30 neurons.
- During the training of the neural network, Early Stopping of Neural Network toolbox of Matlab was used in order to be able to exhaustively examine the behavior of error in the training, and stop it optimally.

For evaluation CLUT's creating by standard software (GretagMacbeth ProfileMaker 5.0.7) – LUT1 and by using radial basis neural network – LUT2 we used testchart with primary CMYK and RGB colors and some memorable colors (table 1). This testchart is Fogra Mediawedge V3.0 – uses for checking digital contract proof.

№ patch	Lab coordinates printed colors	Lab coordinates predicted by LUT1			ΔE1	Lab coordinates predicted by LUT2			ΔE2
A1	54.1, -38.5, -51.1	56,7	-37,5	-49,2	3,37	55,5	-37,9	-49,1	2,51
A4	47.5, 74.4, -2.7	47,9	72,4	-4,1	2,47	48,6	73,1	-3,9	2,08
A7	89.6, -4.9, 94.9	88,1	-7,1	94,3	2,73	89	-6,9	95,5	2,17
B1	24.3 ,20.1, -47.1	23	23,5	-47,5	3,66	24,7	22,7	-47,9	2,75
B4	47.3, 70.2, 45.1	45,4	71,2	43,1	2,93	47,3	72,2	42,1	3,61
B7	48.5, -67.7, 26.4	51,9	-64,9	23,1	5,50	48,9	-65,1	24,4	3,30
A9	93.9, -3.5, 32.2	90,9	-6,9	30,8	4,75	92,2	-4,1	31,1	2,11
A16	36.4, -30.9, -20.4	34,4	-32,6	-23,8	4,30	35,1	-32,9	-22,4	3,11
B12	47.4, 72.3, 16.3	46,6	70,9	20,9	4,87	46,1	70,1	18,3	3,24
B16	45.5 -20.5, -48.9	47,5	-17,5	-50,7	4,03	46,5	-19,7	-52,9	4,20
Mean ΔE					3,86				2,91

*Table 1: Errors in calculating L^, a^, b^*

Table 1 presents the errors for LUTs. We calculating Euclidian distance between predicted Lab coordinates by CLUT's and Lab coordinates real printed patches. As you can see, CLUT formed with our algorithm gives lower error then by standard software so we can accurately predict memorable and scene-important colors.

4. CONCLUSION

In this paper, the color image workflow is examined in details. The role of ICC color management in color imaging is considered. It was also proposed improvement to standard ICC-based color management scheme by using neural network to create look-up tables of ICC profiles. Mean errors was reduced by 18% as compared to standard software. Our algorithm implements corresponding color reproduction to accurately predict memorable and scene-important colors of hard-copy color images under various real world illuminants.

LITERATURE

1. Hunt R.W.G., The Reproduction of Colour in Photography. Printing & Television, Fountain Press, Tolworth, England, 1987, page 534.
2. ICC (International Color Consortium), "Spec ICC.1: 1998-09, File Format for Color Profiles," (1998).
3. ICC (International Color Consortium), Specification ICC.1:2004-10 (Profile version 4.2.0.0) "Image technology colour management — Architecture, profile format, and data structure" (2004)
4. Mark D. Fairchild, Color Appearance Models. Second Edition, Addison-Wesley, Reading, Massachusetts, 2004.
5. P.D. Wasserman, Advanced Methods in Neural Computing, New York: Van Nostrand Reinhold, 1993.

Contact address:
Natalia Gurieva
Department of the Engineering and Computer Graphics
KhNURE
Lenin av., 14,
61166 Kharkov, Ukraine
E-mail: natali.guryeva@gmail.com

INFULENCE OF HARSH ENVIROMENT ON UHF RFID ANTENNAS

Dorotea Agošton, M.Sc.Vladimir Bišćan
Faculty of Technical Sciences , Novi Sad
Graphical engineering and design

Резиме

Овај рад испитује површинску отпорност штампаних UHF RFID антена, постављањем у различита окружења која симулирају реалне услове у којима RFID етикета би требала да ради. Резултати показују повећање у перформансама антена.

Кључне речи: RFID, антене, површинска отпорност

Summary

This paper examines surface resistivity of the printed UHF RFID antennas, by exposing it to different environments, thus simulating real conditions in which a RFID tag should work. Results showed an increase in performance of the antenna.

Keywords: RFID, antennas, surface resistivity.

1. INTRODUCTION TO RFID

The object of any RFID system is to carry data in suitable transponders, generally known as tags, and to retrieve data, by machine-readable means, at a suitable time and place to satisfy particular application needs.

Data within a tag may provide identification for an item in manufacture, goods in transit, a location, or the identity of a vehicle, an animal, or an individual. By including additional data, the prospect is provided for supporting applications through item-specific information or instructions immediately available on reading the tag. For example, the color of paint for a car body entering a paint spray area on the production line, the setup instructions for a flexible manufacturing cell, or the manifest to accompany a shipment of goods. A system

requires, in addition to tags, a means of reading or interrogating the tags and some means of communicating the data to a host computer or information management system. A system will also include a facility for entering or programming data into the tags, if this is not undertaken at the source by the manufacturer.(1)

Quite often an antenna is distinguished as if it were a separate part of an RFID system. Although its importance justifies the attention, it must be seen as a feature that is present in both readers and tags, essential for the communication between the two. (1)

In a nutshell, RFID involves detecting and identifying a tagged object through the data it transmits. This requires a tag (a.k.a. transponder), a reader (a.k.a. interrogator) and antennae (a.k.a. coupling devices) located at each end of the system. The reader is typically connected to a host computer or other device that has the necessary intelligence to further process the tag data and take action. The host computer is often a part of a larger network of computers in a business enterprise and, in some cases, is connected to the Internet.(3)

The coupling in most RFID systems is either electromagnetic (backscatter) or magnetic (inductive). The method used in a particular implementation depends on the application requirements, such as the cost, size, speed, and read range and accuracy. For example, inductively coupled RFID systems typically have a short range, measured in inches. These types of systems are used mostly in applications, such as access control, where short range is advantageous. In this case a tag only unlocks an RFID-enabled door lock when it is moved within close range of the reader, not when people who may be carrying a tag in their wallet or purse are walking past the reader in a hallway in front of the door.(3)

2. RFID ANTENNAS

The element that enables the tag and reader communication is the antenna. The tag and the reader each has its own antenna.There are three main methods of manufacturing a passive tag antenna: etching, stamping, and printing.

The etching process starts with a sheet made of three layers: a substrate, metal film (usually copper), and a photopolymer layer. A special mask “burns” an image of a future antenna into the photopolymer layer. The sheet is then washed by a chemical solution that dissolves all metal around the burned image. The burned photopolymer is removed from the image by another chemical solution to expose the etched metal antenna. The antenna then goes through a special process to prevent oxidation of the metal.(4)

This method produces high-quality metal antennas with great conductivity. However, it has a main disadvantage: producing chemical waste. Etching uses chemical solutions for dissolving the remaining metal as well as the photopolymer layer, and these require special handling.

The stamping method uses a metal foil (usually aluminum) and a “cookie cutter” in the shape of an antenna, which is attached to a roller. When the roller stamps out the antenna in the foil, the unused foil is removed and potentially reused. This method produces high-quality antennas that are also relatively cheap (because of the reused aluminum), and also eliminates the need for any chemicals and reduces waste.(4)

Antennas also can be printed using conductive inks. This is a very fast method and does not require sheet metal. Conductive inks are made of liquid containing solvents, binders, and very fine metal

particles. Ink is applied through a mesh screen with a cut-out opening in the shape of an antenna. The rest of the mesh is sealed off. This method produces an antenna of comparable conductivity to pure metal antennas via a high-speed manufacturing process. (4)

3. SURFACE RESISTANCE AND SURFACE RESISTIVITY

Concepts of surface resistance and surface resistivity can be sometimes confusing. Definitions of both terms can be found in many books and standards. Surface resistance, Rs, is defined in all of the aforementioned literature sources as the ratio of a DC voltage U to the current, Is flowing between two electrodes of specified configuration that are in contact with the same side of a material under test (Figure 1).

$$Rs = U/Is \qquad (1)$$

Surface resistivity ρs, on the other hand, is determined by the ratio of DC voltage U drop per unit length L to the surface current Is per unit width D.

$$\rho s = (U/L)/(Is/D) \qquad (2)$$

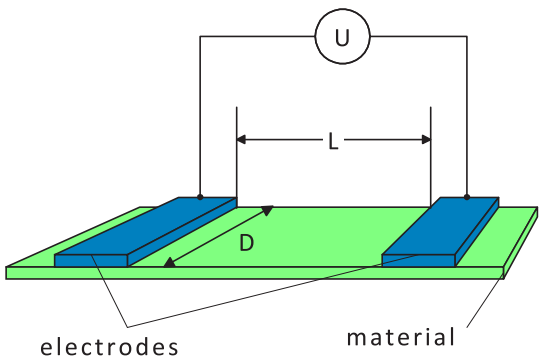


Figure 1: Basic setup for surface resistance and surface resistivity measurement.

Surface resistivity is a property of a material. Theoretically it should remain constant regardless of the method and configuration of the electrodes used for the surface resistivity measurement. A result of the surface resistance measurement depends on both the material and the geometry of the electrodes used in the measurement. The physical unit of surface resistivity is Ohm (Ω). The legitimate unit of the surface resistance is also Ohm. Because of that surface resistivity and the surface resistance are often mixed up. In order to differentiate between the two, surface resistivity is often expressed also in Ohm/square (Ω/ sq.) which is not a valid unit from the dimensional analysis point of view. (2)

4. THE COURSE OF THE EXPERIMENT

The aim of this experiment was to examine behavior of the surface resistivity of UHF RFID antenna when they are exposed to the possible real temperatures during normal exploitation of the tag. The UHF dipole antenna model was used in the experiment, as a standard design the use between 860 and 960 MHz. Antennas were obtained by the courtesy of the "Állami Nyomda Plc. " Budapest, as a sample boxes. Screen printing technique was used to manufacture the antennas, using a conductive ink, shown on figure 2.

Figure 2. Antenna design for UHF RFID

A smaller free space between two parts of the antenna is a place for the chip.

One approximation was needed, as the measurement of the surface resistivity derives from the two dimensions, with and length. With the same area, but with the mean value of the height, two rectangular (Figure 3.) were used in calculations.

Figure 3. An approximation of the antennas

Resistance measuring was conducted using "American Reliance AR-160H" multi-meter. A resistance of the probe was also considered. Probes were positioned as far as possible at the ends of the one part antenna. Every part of the antenna was considered as a separate test piece. Initial measurement showed a slight variations in values, which were expected. This is explained by common variations in screen printing, in which isn't possible to precisely control the thickness of the printed ink. These variations are acceptable.

The experiment continued by exposing the antennas to the temperature of -20°C with the humidity of approximately 80% for 11 hours. Samples were left to settle down on room temperature of 21°C for 5 hours. After conditioning, samples were exposed to the temperature of 55°C in oven for 1 hour.

The surface resistivity was measured after the exposure to the possible low and high temperature, simulating the environment in which the whole RFID tag can be in.

5. RESULTS AND CONCLUSION

Results were an opposite of what was expected. Resistance and surface resistivity decreased after the tests for 6.94% as shown on figure 4. . This directly leads to increase in conductivity of the antenna and better performance of whole RFID tag.

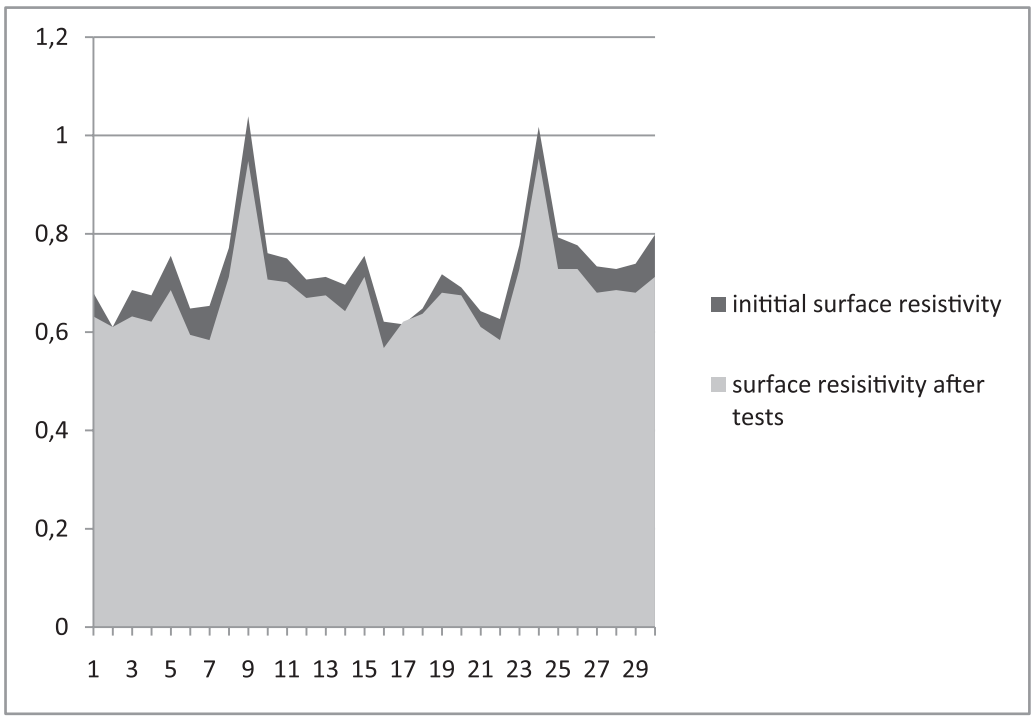


Figure 4. Comparison of resistivity before and after tests

Expected increase in resistance and surface resistivity was due the expectation of oxidation by exposing antennas to the high humidity and afterwards to the high temperature, which didn't occurred.

Some explanation of the unexpected results may be found the similar research by Rudie Oldenzijl from "Acheson Colloids" (5), in which in more detail a UV ink is examined and the results showed an increase in conductivity after a heat treatment.

Authors wish to express a gratitude to Mrs. Erzsébet Novotny and Mr. László Rácz form "Állami Nyomda Plc." Budapest for the help and advices and provided materials for this research.

LITERATURE

1. Dowla, Farid U. Handbook Of Rf And Wireless Technologies, Elsevier, Inc.2004.
2. William A. Maryniak, Toshio Uehara, Maciej A. Noras, Surface Resistivity and Surface Resistance Measurements - Using a Concentric Ring Probe Technique, Trek Inc. 2003.
3. Bhuptani Manish, Moradpour Shahram, RFID Field Guide: Deploying Radio Frequency Identification Systems, Prentice Hall PTR, 2005.
4. Patrick J. Sweeney IIandEva Zeisel, CompTIA RFID+ Study Guide (Exam RF0-101), Sybex 2007.
5. Rudie Oldenzijl: Seeking a good reception, European Coatings Journal July-August 2008.

Contact adress:
Dorotea Agošton
M.Sc. Vladimir Bišćan
Grafičko inženjerstvo i dizajn
Fakultet tehničkih nauka
Trg Dositeja Obradovića 6
21000 Novi Sad
e-mail: doroteaa@gmail.com
biscanv@gmail.com

DESIGN, PREPRESS AND PRINTING OF THE LENTICULAR PRODUCTS

Radatović Gabriel,
Faculty of Technical Sciences , Novi Sad
Graphical engineering and design

Резиме

Овај рад описује лентикуларну штампу и процедуре дизајна . Лентикуларна штампа је врста уметничког приказивања тродимензионалних слика на отиску као носиоцу дводимензионалне слике. Лентикуларне слике се најбоље могу описати као илузиона уметност. Од једноставних решења са две слике на окретање до комплексних 3Д слика лентикуларни дизајн користи комбинацију одабир слике И боја, дизајна сочива, техника преплитања И штампарских технологија за стварање одређене илузије. Сви ови елементи требају бити уклопљени ради постизања успешног лентикуларног производа.

Кључне речи: лентикуларно, 3D дизајн, штампа, припрема

Summary

This work is based on the lenticular printing and design. Lenticular print is a kind of art or a way to show / represent a 3D image on a sheet what is actually the carrier for a 2D image.
Lenticular images can best be described as illusionary art. From simple two-image flips to complex 3D images, lenticular designs utilize a combination of image/color selection, lens design, interlacing techniques, and printing technologies to create the desired illusion. All these elements need to work together to achieve a successful piece.

Key words: lenticular, 3D, design, print, prepress

1. INTRODUCTION

Lenticular print is the print of future. It is an interesting way of printing, especialy for some comercials, logos and reproduction of the originals. It can represent the third dimension on a paper (actually plastic / PVC material). It is an expensive way of printing, but it’s becoming

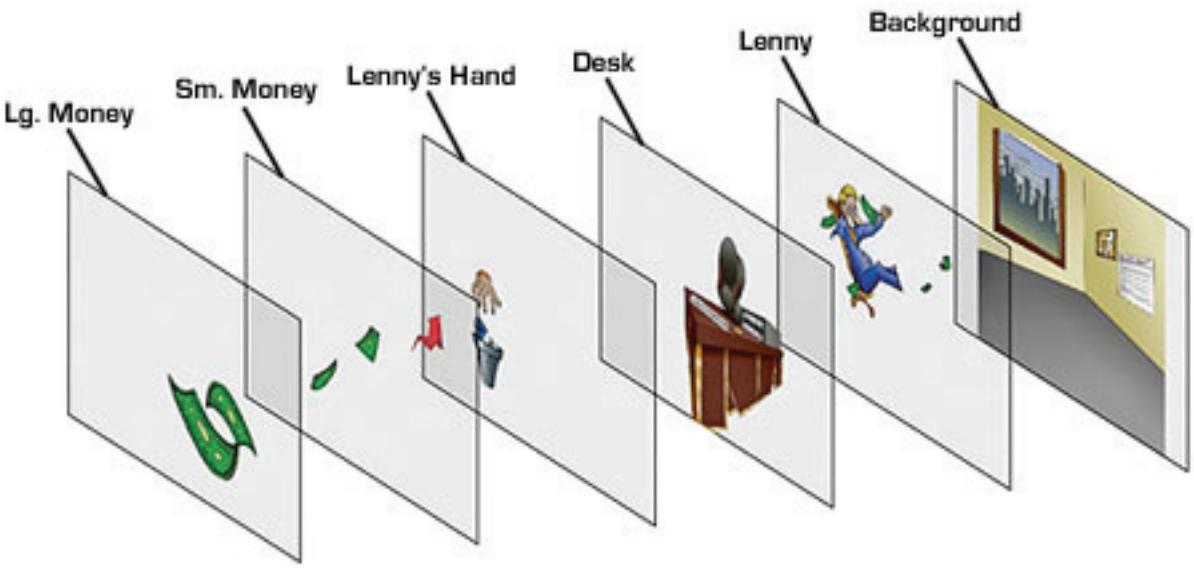
more popular. The procedure of the prepress is not so complicated, it can be done easily with some softwares. The printing procedure can be carried out with UV colors, or colors that dries really fast because of the ink repeling base. The details of preprees, printing and explanations are written in the paragraphs below.

2. LENTICULAR DESIGN

One of the most important aspects of designing lenticular is the concept. If we have a strong concept, lenticular designing becomes a much easier task. A variety of effects can be used — and some even combined — yet, many times the best ideas use the least amount of effects. It might be a good idea to consult with the printer when selecting the optimal lenticular effect for the desired job. We should consult about 3D depth, typography, flip, etc.

3D Depth

As far as achieving the optimum "3D Lenticular " effect is concerned, color choice and placement play a large role. The most successful effect will often be achieved by usage of bright and light imagery. More precisely neutral colors in the background and brighter colors in the foreground work best. Moreover, it is best to use soft, less-detailed imagery for the extreme foreground and background layers, while logos and typography should be near, or on, the middle keyplane where they will appear the sharpest and most readable.



Type and Fonts

As for typography, we should stay away from “serif” and “italic” type styles. The font point-size will vary according to the lens LPI. For example, the larger LPI (fewer lines-per-inch) will require a larger font point-size, and smaller LPIs (more lines-per-inch) will allow a smaller font point-size. Also, we should avoid very fine type as the lenticular screen will reduce readability.

A simple test to determine font readability is to print out a proof of the planned font size at 100% and place the planned lens over it to see how it will appear. In this process it’s important to remember to make sure the lens is going in the correct direction. To enhance font readability, we should try outlining the type and applying various stroke sizes. Color is also a huge factor, so it would be best to change the color until we find a satisfying result.

If there would be trouble placing the type at, or near, the keyplane during interlacing, we should try layering the text on the interlaced art. In doing this, we should take care that the type is the same resolution as the interlaced art. By doing this, the copy will become static and there will be no parallax shifting. However, this might cause the type to appear as though it’s pushing into some of the 3D objects — depending on the depth and layout. Logos may also benefit from this technique.

Flip (2-3 Images)

In “Flip” animation, less is definitely more. The most dramatic visual presentation will result with fewer frames. Color usage plays a large role in a successful lenticular effect. Bright and light imagery will often work best. Areas of extreme contrast should be avoided in the main subject, logo, and/or product. Elements that are not similar enough can cause one image to appear faintly over the other (known as “ghosting”) when only one image should be seen. Overlapping typography that flips to other typography should be also avoided.

We sholud stay away from very fine type as the lenticular screen will reduce readability.

To maintain sharp contrast between the elements, the flip should be limited to only two images. As for type and font information the samo cautions apply as mentioned under 3D depth.

Morph

Elements similar in shape and color density work best for a clean “Morph” effect.

Two images will need to be created and those are the beginning and ending frames of the morph, which can be easily carried out with a good morphing software. Elements that are not similar enough can cause one image to appear faintly over the other (unwanted effect known as “ghosting”) when only one image should be seen. Very fine type should be avoided as the lenticular screen will reduce readability.

Zoom

As with other lenticular effects, color choice and placement are very important when creating the best "Zoom" effect. Cool, darker colors in the background and warmer, lighter tones for the element in motion tends to produce the best lenticular zoom effect. Also, bright and light imagery will often be the most successful. If a specific section of the image, for example logo, product, or type, is intended to be a separate zoom area, it should be included as a separate layer or file.

3. LENTICULAR PRINTING

Lenticular printing is a technology in which a lenticular lens is used to produce images with an illusion of depth, or the ability to change or move as the image is viewed from different angles. Examples of lenticular printing include prizes given in Cracker Jack snack boxes that showed flip and animation effects such as winking eyes, and modern airport advertising graphics that change their message depending on the viewing angle. This technology was created in the 1940s but has evolved in recent years to show more motion and increased depth. Originally used mostly in novelty items, lenticular prints are now being used as a marketing tool to show products in motion. Recent advances in large - format presses have allowed for oversized lenses to be used in lithographic lenticular printing.

Creation of lenticular images in volume requires printing presses that are adapted to print on sensitive thermoplastic materials. Lithographic offset printing is typically used, to ensure the images are good quality. Printing presses for lenticulars must be capable of adjusting image placement in 10 μm steps, to allow good alignment of the image to the lens array.

Typically, ultraviolet-cured inks are used. These dry very quickly by direct conversion of the liquid ink to a solid form, rather than by evaporation of liquid solvents from a mixture. Powerful (400W per sq. in) ultraviolet (UV) lamps are used to rapidly cure the ink. This allows lenticular images to be printed at high speed.

In some cases, electron beam lithography is used instead. The curing of the ink is then initiated directly by an electron beam scanned across the surface.Typically three different types of lenticular prints are used: ***transforming prints***, ***motion - capturing prints*** and ***stereoscopic effects***.

In ***transforming prints***, two or more very different pictures are used, and the lenses are designed to require a relatively large change in angle of view to switch from one image to another. This allows viewers to easily see the original images, since small movements cause no change. Larger movement of the viewers or the print causes the image to flip from one image to another.

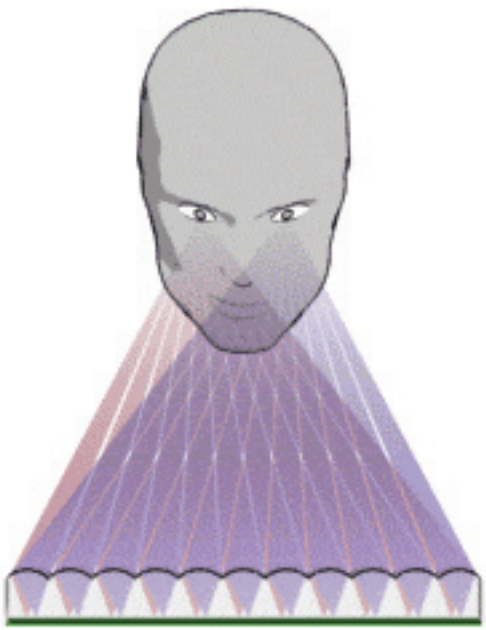
In ***motion-capturing prints***, the distance between different angles of view is "medium", so that while both eyes usually see the same picture, moving a little bit switches to the next picture in the series, creating a motion effect. Usually many sequential images would be used, with only small differences between each image and the next.

In ***stereoscopic effects***, the change in viewing angle that is needed to change images is small: 6–7 centimeters (2–2.5 inches). This causes each eye to see a slightly different view, creating a 3D effect without the use of special glasses.

Lenticular print in all three types works the same way. Each image is sliced into strips, which are then interlaced with one or more other images. These are printed on the back of a piece of plastic, with a series of long, thin lenses molded into the other side. The lenses are lined up with each image interlace, so that light reflected off each strip is refracted in a slightly different direction, but the light from all strips of a given image are sent in the same direction (parallel).

The end result is that a single eye or camera looking at the print sees a single whole image, but an eye or camera with a different angle of view will see a different image.

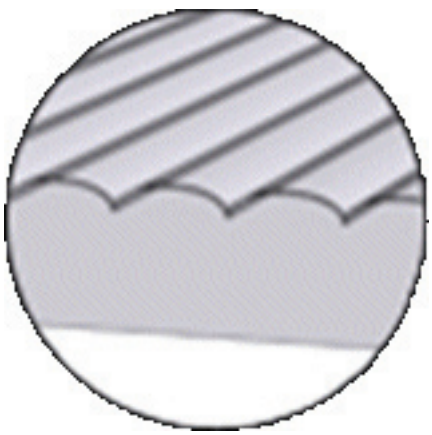
So, to create a lenticular image, we need a lenticular lens and at least two different frames.



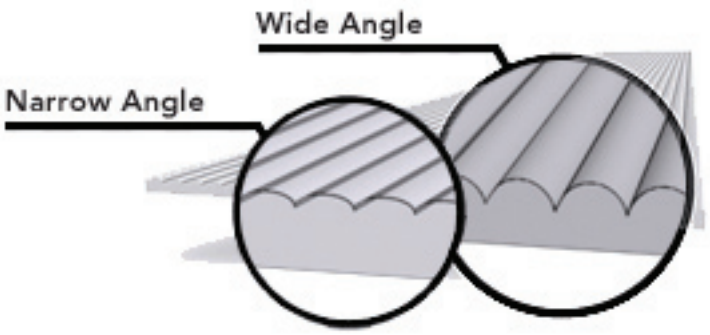
The lenticular plastic sheet has one side that is smooth (this side is printed) while the other side is made of the “lenticules”, optical devices that will allow to visualize the effects.

Each lenticule acts as a magnifying glass to enlarge and display the portion of the image below, depending of the viewing angle.

There are different lens designs. The thickness and viewing angle of the lenticule are different.



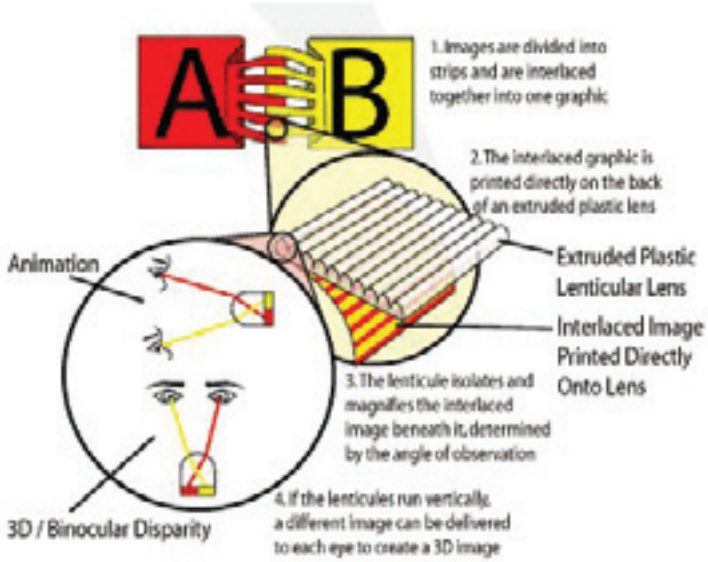
A narrow angle will give an optimal 3D effect, and a wide angle will work best for an animation effect. The lenticules for animation effects may run vertically or horizontally. However, results are better, meaning cleaner action and far less chances of ghosting, when the lenticules are in the horizontal direction.



For larger, more stationary pieces such as a poster, the vertical direction should be used since it requires the viewer to move rather than the piece.

The process of creating a lenticular image

Interlacing images that are divided into strips together into one graphic. This can be made using Photoshop or a specific lenticular sofwtare. The interlaced graphic is printed directly on the back of an extruded plastic lens. The lenticule isolates and magnifies the interlaced image beneath it which is determined by the angle of observation. If the lenticules run vertically, a diffrent image can be delevered to each eye to create a 3D image.



After printing the lenticular image looks like the picture bellow. It can be seen that each lenticule contains information from both images A and B isolated in function of the viewing angle of the printed lenticular picture:

4. PREPRESS PROCESS

A prepress process inculdes determination of the exact pitch of the lenticular sheet before interlacing. Two pitches can be distinguished - the visual and the mechanical (or absolute) pitch.

To determine the visual pitch of the lenticular sheet, it is necessary to carry out a pitch test.

It is possible to determine the pitch by placing a lenticular clear sheet on the plate (or the film) and look at the viewing distance of the final image. One line will be totally black or invisible, it will be the visual pitch. The result will be more precise if the pitch test is printed on the lenticular sheets. The mechanical pitch will be determined using a magnifying glass.

In order to create a lenticular image we need a computer and a CTP or CTF.

Software that can be used to create lenticular images are: Adobe Photoshop, Quark, Adobe After Effects, Adobe InDesign, ArtPro, Lenticular Softwares, etc.

The CTP (or CTF) must have a resolution of at least 2400 DPI, a higher resolution will give a better result. The majority of the current CTP have a capacity between 2400 to 4000 DPI, some can achieve higher resolution, they are mainly designed for safety printing.

5. CONCLUSION

This work represents the processes of design, prepress and printing. Although the technique is relativly simple, the usage of lenticular materials can make printing more diverse and interesting. This way of printing is convenient for printing logos, posters, photos, commercials that tend to be different and noticeable. Before starting the prepress we should thoroughly inquire about the capability of the printing machines. As lenticular is a high resolution process, it would need to be printed on offset presses.

We should continue with the exploring of the lenticular materials to make more precise, smooth and cleaner and cheaper print.

It is the the technique of the future for the commercials, still expensive but attractive and more popular.

LITERATURE

1. http://en.wikipedia.org/wiki/Lenticular_printing , 30.09.2008
2. http://www.lenstar.org/design/designers.htm , 30.09.2008
3. http://www.celman.com/ , 28.09.2008
4. http://www.knt3d.com , 28.09.2008
5. http://www.dplenticular.com , 30.09.2008

Contact address:
Radatović Gabriel
Seljačkih Buna 81.
21000 Novi Sad
Serbia
mob: + 381 64 388 66 45
e-mail: radatovic.gabriel@gmail.com

PAPER DEFORMATION IN SHEET-FED OFFSET PRINTING

Zaloughny Alex (assistants: Halyna Zherebetska, Marta Ivantsiv), technology department, Ukraine academy of printing, Ukraine

Резиме

У овом раду се испитују фактори који утичу на деформацију папира током штампе. Ти фактори су најчешће: раствор, усмерени ваздушни ток, микроструктура папира. Главна идеја је да се успостави регулација степена деформације у уске интервал дозвољених вредности са описаним уређајима.

Кључне речи: деформација папира

Summary

In the article are explored factors which influence on the paper deformation during printing. There are: solution, directed air stream, microstructure of paper sheet. The main idea is desire to regulate the level of deformation in the narrow intervals of allowable values with use up the described device.

Key words: the paper deformation

1. INTRODUCTION

Setting the objective

During the last decades in Ukraine, there were a lot of changes in printing industry – a rapid increase of printing production, a boost in polychromatic printing, the palette of design decisions in polygraphic registration and advertising manufacturing diversified, geography of supplier's firms of the printing equipment and working material became wider. It became a logic reaction of the industry on consumer's requirements of the polygraphic production [1].

Flat offset printing with usage of a humidifying solution takes the main place among other ways of the press in our country. By statistical estimations 2/3 of the domestic book and journal productions and to the half of the volumes of paper and cardboard packing are made today by way of flat offset [4].

Especially for the offset-sheet press in comparison with the other ways there is a possibility of the press of wide production assortment, rather low cost at high quality and a wide spectrum

of circulations. Possibilities of colour (colour range) in offset printing is kept within an interval from one (including the quadricolour press) to twenty colours. Sheet offset is used for printing materials of different formats and density. Preparation for printing of the printing equipment occupies a very short period of time.

Today air cushion usage (Ventury effect) is a high technology in transportation, transmission, stopping, straightening and quire fixing in the system of printing machines (a flat sheet offset way of the press). The effect mentioned earlier is reached through the usage of the directed stream of air and it is used in the printing equipment of such manufacturers as Heidelberg, KBA, ManRoland, Komori etc [2].Use of a humidifying solution and pressure in a zone of printing contact are major problems for an offset printing in practical application. During air passage through the pores of the paper and action of a humidifying solution, the temperature and humidity of a paper changes, which directly influences deformation properties of a paper in a zone of printing contact. The printing sheet under the influence of deformation, changes the geometrical sizes that can negatively influence further post-printing processes (folding, cutting, die-cutting…) [3].

2. RESEARCH

The experiment description, object of research.

The paper is made of hydrophilic cellulose fibre, easily absorbs humidity from air. Also, the paper is capillary-porous body; therefore, mechanically keeps a moisture in its pores, which gets inside as a result of capillary condensation during the contact of a paper to water.

Properties of a paper to absorb humidity from air depends on structure, treaty, glue paste, maintenance of the filling . At humidifying the sizes of sheet change. One of the reasons for size change – fibre swelling. The moisture gets into fibres, moistens and expands cellulose macromolecules, as a result of this fibre thickens.

Since the sheet structure is not homogeneous and most parts of fibres are along the direction of a grid movement of paper-making machine, paper deformation will be different divergently. The greatest deformation of the paper during humidifying is observed in a cross-sectional direction, since at swelling each separate fibre widens in cross-sectional rather than in a longitudinal direction [5].

In practice deformation of a standard sheet as a result of humidifying, rapid change of temperature and blowing, can reach 0.5 %, and this number with the big formats can equal up to 5 mm of linear sizes, which is inadmissible [6].
The task of experimentation researches:

- elaboration of devices for creation and regulation of an air stream on standard sheets
- creation of a technique for definition of geometrical parametres of deformation at a bend of standard sheets
- realisation of research for wide assortment of papers which are used at offset printing

Technique of experimental researches:

- first of all the analysis of investigated papers has been carried out, kinds of papers were picked in order to display all set of a printing material which is used for the press by the sheet offset machine (in table 1 the short description of investigated papers);

- samples of papers which are investigated are cut in two directions (up and down), the size of a strip of a paper 20x100 mm;
- clips are fixed with different distances: 90,80,70,60,50 mm;
- in operation the offset way of the press is considered, therefore samples are humidified with different weight of humidifying solution 0,850 g, 0,500 g, та 0,250 g.;
- it is carried out having blown in each sample, taking turn, with observance of distances and taking into account directions of fibres (a corner of a stream of air and distance of the generator of a stream respectfully 45 degrees and 100 mm);
- measurements of the results of deformation are performed on the received photos;
- the obtained data is put in statistical tables and graphs are constructed.

Methods and materials of experimental researche.

In experiment fan made by CoolerMaster (DC 12V 0,21A) is used as well as universal power supply unit (DC 2-15V 1.2A). Objects of the researches, 9 samples of a printing material, display a wide spectrum of usage of the flat sheet offset equipment (table1). Fixation of the deformation of paper at a console bend is achieved by the digital camera (Olympus SP-500UZ).

Picture 1. Experimental device

Name of paper	Producer	Gramatura, g/m^2	Thickness, mkm	Descriptions of application
Simcastor Plus	UPM (Finland)	80	70	Classical label paper
Interflex	Intermills (Belgium)	80	58	Structural label paper
Sinarlux	APP (Indonesia)	80	78	Label cast-coated paper
Coated paper	M-real (Finland)	100	100	Coated paper
Bindakote	Favini group (Italy)	80	90	Special impregnating paper
Maximus	Favini group (Italy)	100	105	Paper with special structure
Alukett Spezial Fashion	B&B (Austria)	73	60	Paper with metalized relief
Amber Graphic 200	Amber Graphic (Poland)	200	287	Cardboard with one side coated
Amber Graphic Munken Polar 400	Amber Graphic (Poland)	400	450	Heavy cardboard

Table 1: Properties of papers

3. CONCLUSIONS

By analyzing graphs 1 and 2, it becomes apparent that with an increase of humidity and intensity of the directed air stream, it is possible to accomplish an increase of paper deformation. It is quite logical to admit that by using certain devices, for example at the outlet of the typewriter, it is achievable to regulate the level of deformation in narrow intervals of admissible sizes. The following device should be based on a system of movable and operated fans; besides, humidity level, temperature and intensity of fans should be supervised.

Therefore, there are a lot of characteristics influencing paper deformation, such as thickness, проклейка, density and architecture of the structure, temperature and humidity in the volume of the paper, etc. Characteristics, which have an influence on properties of the paper, include pressure of the printing stream, ingestion of the humidifying solution, directed air stream, indicators (temperature, humidity) of environment. Nowadays, when variety of colors of the production increases, and requirements for the denotation of the quality criteria indicators arises, accomplishment of the best printing result can be achieved only if all technological instructions are being severely followed.

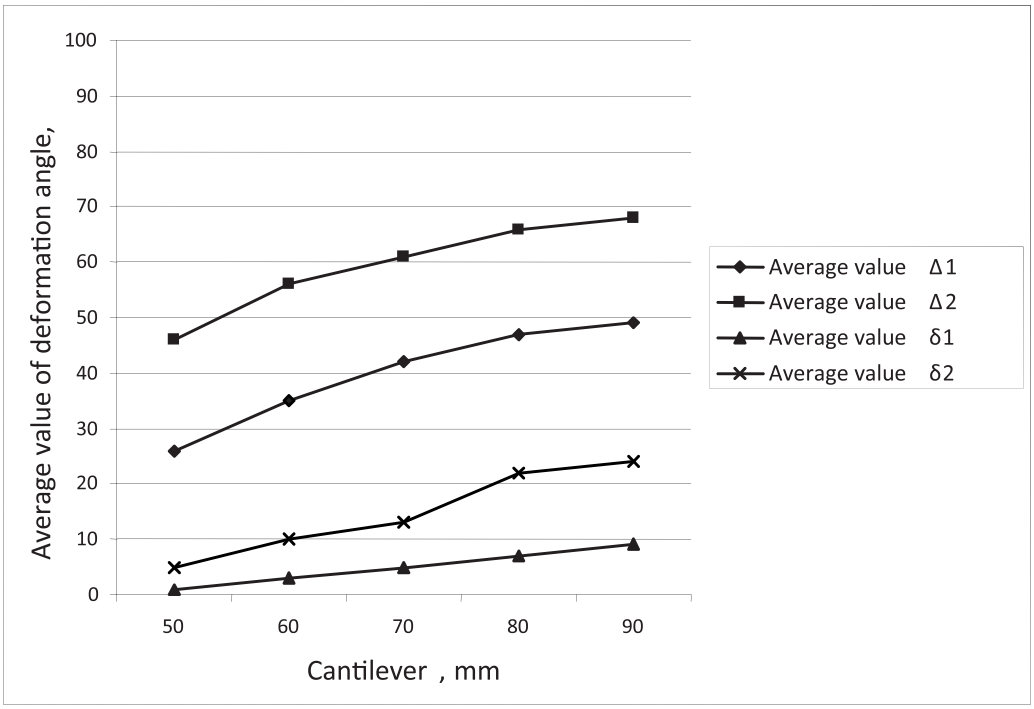


Fig. 1. Dependence of average value of paper deformation angle without moistening

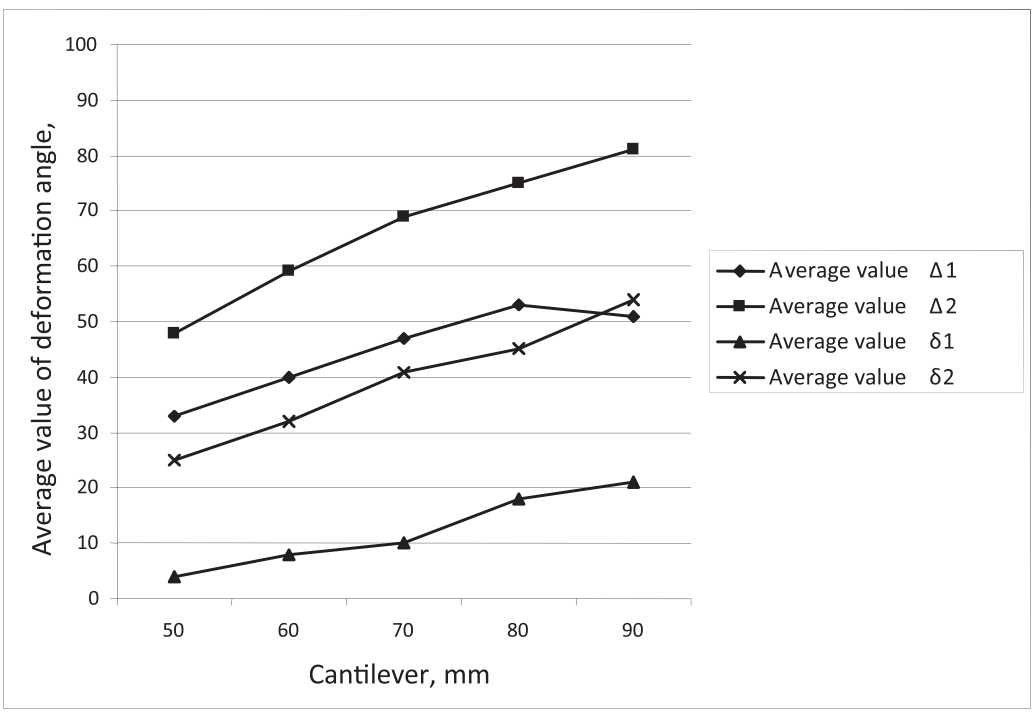


Fig. 2. Dependence of average value of paper deformation angle with moistening - 0,500g

LITERATURE

1. ШАБЛІЙ І.В.: Технологія друкарських процесів. – Львів: Оріана-Нова, 2003
2. КИППХАН Г.: Энциклопедия по печатным средствам информации. – М.: Московский государственный университет печати, 2003
3. ЧЕХМАН Я. І., СЕНКУСЬ В.Т., ДІДИЧ В.П., БОСАК В.О.: Друкарське устаткування. – Львів: УАД, 2005
4. МЕЛЬНИКОВ О.В.: Технологія плоского офсетного друку. – Львів: УАД, 2007
5. ЗАГАРИНСКАЯ Л. А., ШАХКЕЛЬДЯН Б.Н.: Полиграфические материалы. – М.: Книга, 1984
6. Процессы офсетной печати. Технологические инструкции. – М.: Книга, 1980

Contact address:
Zaloughny Alex
Ttechnology department, Ukraine academy of printing
Pidholosko str. 19
79020 Lviv
E-mail: ZalmanAlex@yandex.ru

THE INFLUENCE OF THE LACK OF THE DAMPENING SYSTEM ON THE QUALITY OF THE REPRODUCTION IN WATERLESS OFFSET

Bsc. Gabor Mokuš
Faculty of Technical Sciences , Novi Sad
Graphical engineering and design

Резиме

Техника безводног офсета омогућује нови начин квалитетне репродукције у офсетној технологији. Пошто у овој технологији нема потребе за уређајем за влажење, овај поступак има своје предности и недостатке. Без уређаја за влажење слика има велики контраст и не постоје проблем са емулгирањем између штампарске боје и средства за влажење- пошто папир (субстрат) је најчешће покривен са фином папирном прашином, која током штампе може да се залепи за штампарску форму. Пошто нема средства за влажење да их сперe са штампарске форме доћи ће до смањивања квалитета репродукције. Прегревање целог система је још један од проблема који је делимично присутан због недостатка средства за влажење.

Кључне речи: систем за влажење, безводни оффсет, растер ваљак

Summary

The technique of the waterless offset gives a new way of making quality reproductions in the offset technology. Since there is no need for a dampening system, it brings benefits and down sides as well. Without the dampening solution, the printed picture has great contrast and there is no problem with the emulgation between the ink and the dampening (fountain) solution. Since the paper (substrate) is mostly covered with fine paper dust, during the printing proces they can stick to the printing form. Since there is no dampening solution to clean them off the plate, the quality of the reproduction will decrease. The over-heating of the entire system is also a problem, partially due to the lack of the fountain solution.

Key-words: dampening system, waterless offset, anilox roller

1. INTRODUCTION

The technology of waterless offset has several differences in comparison with the conventional offset technology. This makes this printing technique a unique one, since there is no need for the use of a dampening solution, whereas the printing and non-printing elements are at the same plane. The dividing of the printing and non-printing elements is based upon the physical intollerance between the silicone layer (on the surface of the printing plate) and the silicone oil, that can be found in the special ink for waterless offset. Thanks to this there is no need for a dampening solution, which results in the simplicity of these units and the posibility of a printing with theoratically no makulature. This is possible with the use of an anilox roller instead of a duktor blade and a set of rollers (this construction can be found on the most of the conventional printing units) and with the use of a single inking roller. Using this method there can be no problem with the adjustion of the inking unit, because the thickness of the ink is 100% equal in every single point at the printing plate.

However, this system has several disadvantages, which can negatively influence the quality of the reproduction. The first disadvantage is the inability of making a correction in the inking unit by zones. This urges for a perfect prepress in order to achieve a perfect reproduction.

The second problem is the thicknes of the ink on the printed surface. Small corrections can be made by altering the temperature of the system, thus changing the viscosity of the ink. These changes result in a different optical density of the printed picture.

The lack of a dampening unit also represents a disadvantage. This unit, in conventional printing units, cleans the printing plate, and thus removes any dirt or residue from the surface of the plate. The dampening unit (the dampening solution, actually) is also lowering the temperature of the entire system in a conventional printing unit.

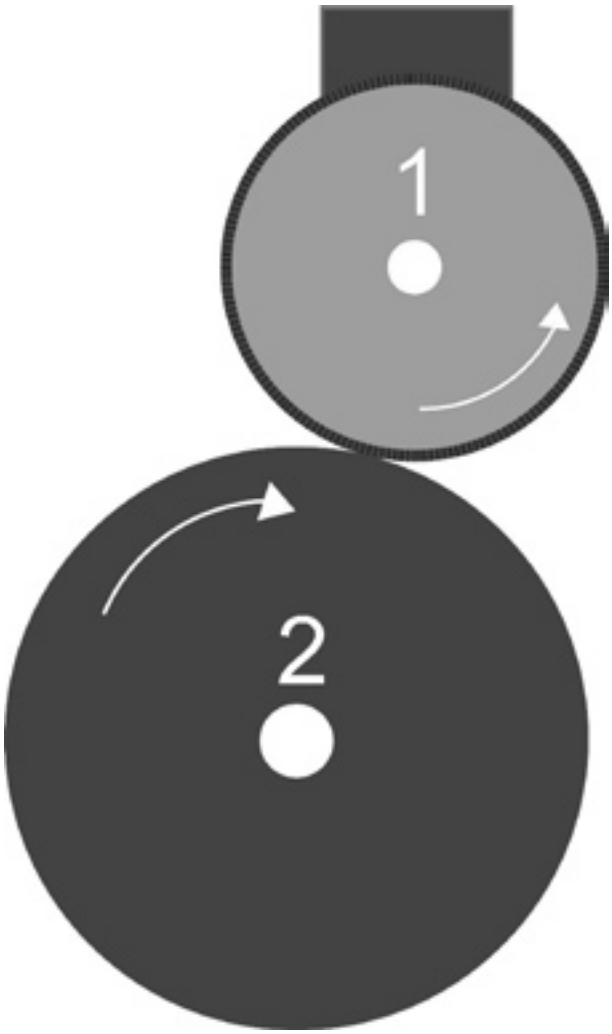
2. THE FUNCTIONING OF THE GRAVUFLOW™ ROLLER

In this work, the functioning of the anilox roller is going to be presented through the functioning of the Gravuflow™ roller. The Gravuflow™ roller is constructed by KBA, and it is used on waterless presses. The reason for choosing this unit for the presentation of this technique is not just because of the amount of information that is avaliable from KBA, but the fact that this company is the pioneer in modern waterless printing with an anilox roller.

The silikone ink is pumped into a separate unit, the inking unit, which has two duktor blades. The fluent ink is constantly circulated during the printing proces, so the viscosity of the ink is always at the same level. The Gravuflow™ roller is made from ceramic. It has microscopic dents on it’s surface, which alows the transportation of the ink.

By rotating the anilox roller, the dents come into contact with the inking unit. Since the ink is under pressure in the unit, it penetrates into the small dents. By further rotation of the anilox roller, the second duktor blade vipes-off the extra ink on the surface of the roller, thus the ink remains only in the dents of the roller.

The colored anilox roller then comes into contact with the inking roller, which has the same



Picture 1: The Gravuflow™ (anilox) roller (1) with the inking roller (2) and the inking unit with two duktor blades, above the anilox roller (1).

perimeter as the printing cylinder. The color is transported to the inking roller with vacuum efect. This principle is taken frome the gravure printing technology. After this, the inking roller transports the ink to the printing plate. A plate, colored using this technique, has 100% the same amount of ink on every single point of it's surface, on the priniting elements.

This characteristic can be very useful, if the prepress is done perfectly. Since there are no simple ways to alter the quantity of the ink aplied, and it is impossible to alter the quanitity of the ink aplied by zones, the quality of the reproduction is based upon the quality of the prepress process. In other words, if during the prepress process the color management is not made correctly, there is no way to correct the color during the printing process. [2]

3. THE TEMPERATURE OF THE SYSTEM

As mentioned before, the waterless systems have no dampening units, because the separation of the printing and the non-printing elements is based upon the physical intollerance between the silicone layer (on the surface of the printing plate) and the silicone oil, that can be found in the special ink for waterless offset.

The lack of dampening unit (where the dampening solution is usually tempered), causes the problem,

the temperature of the entire printing system begins to rise. The friction and pressure between the elements inside a printing machine, the heat from the electrical, hidraulical and pneumatical components, all release heat. This heat has a great influence on the quality of the reproduction. Because of the risen temperature inside the printing unit, the viscosity of the ink is changed and thus the optical density of the printed ink is changed.

In the conventional offset technology, the problem with the overheating of the system causes that the evaporation of the dampening unit from the surface of the printing plate becomes more intense. This results that the amount of dampening solution that is beening transported to the printing plate needs to be enhanced. This thus results in a greater emulgation of the ink and dampening solution, and with a low quality of reproduciton. With waterless offset this has no effect on the quality of the reproduction. However, with the evaporation of the dampening soultion from the surface of the printing plate, it's temperature has become lower. Since there is no dampening system in the waterless offset, there is no dampening solution to evaporate and thus lower the temperature of the system.

The inks that are used in waterless offset, using the anilox roller, are fluent. Even the smallest change in their viscosity causes extream changes in the optical density of the printed ink.

To eliminate this problem, these machines are always equiped with high-end temperature controlling system. These systems are monitoring the temperature of the entire system and by circulating cold fluids through the cylinders and rollers, effectively lowering the temperature of the system. Using these units, the temperature of the system is held between 28°C and 30°C. At the conventional offset technology, this margin is wider, between 20°C and 30°C, since the usage of stiffer inks. [1]

4. THE PROBLEM OF INPURITIES ON THE SURFACE OF THE PRINTING PLATE

The substrates that are used in printing industry often have small inpurities, eg. dust, fibres, etc. These small inpurities can cause big problems during the printing process and thus lowering the quality of the reproduction.

Since the non-printing element on the printing plate for waterless offset is a silicone layer, which rejects the special ink with silicone oil, every inpurity on this surface is a huge problem. If any other supstance is found on the silicone layer, it becomes a printing element. So if a small particle sticks onto the silicone layer, the particle will attract the ink. This brings to a printed image which has small dots or fibres printed where it should be white, withouth printed ink.

The dampening unit in the conventional offset removes these inpurities from the surface constantly. Since there is no dampening unit in the waterless technology, these small particles remain on the surface of the printing plate.

Eventually, the inpurities will stick onto printing elements as well. This brings to another problem, backing of the ink (the inpurities, actually). This results in contaminating the inking unit with inpurities from the printing plate. Since the usage of an anilox roller request the use of a closed inking unit, the inpurities can not be removed from the ink. If the contamination of the ink in the inking unit becomes too heavy, the entire inking system has to be cleaned, which is a time and money consuming action.

If this is not made, the contaminated ink will result in a low quality reproduction. This is one of the main problem of the waterless offset technology, and there are no simple and effective sollutions to this problem! [2]

5. THE CONTRAST OF THE REPRODUCTION

The quality of a reproduction can be determined based on several criteria. One of the most important is the contrast of the reproduction. It is greatly affected by the optical density and the sharpness of the printed dot. The optical density is determined by the viscosity and the thickness of the ink, that is printed on the substrate.

The dot sharpness, however, is greatly influenced by the amount of the dampening unit that can be found on the printing plate, and the emulgation of the ink and the dampening solution. Since there is no dampening unit nor solution in the waterless offset technology, it has a huge advantage compared to the conventional offset technology.

The contrast of the image is the highest possible, and the problem with the tone value increase can be also controlled, since there are no variables - the balance between the ink and the dampening unit, that has a negative effect on the image contrast in the conventional offset technology.

This system, withouth the dampening unit, also brings to a more constant quality of the reproduction, and brings to a great resetability of any job, since there are virtualy no variables which can influence on the quality of the reproduciton.

With no dampening unit, there is no time needed to achieve the balance between the ink and the dampening solution, which results shorter make-ready times, less (almost zero) waste and great productivity. [3]

Picture 2: Halfscreen dots, that are printed with conventionall offset technology. [4]

Picture 3: Halfscreen dots, that are printed with waterless offset technology. [4]

6. CONCLUSION

With the use of waterless offset, the quality of the reproduction can be high-end, if all the variables, parameters are according to the regulations. In that case, the waterless offset has an edge over the conventional offset in every point. The quality of the reproduction is greater, the amount of waste is significantly smaller and the productivity is greater.

However, this work represents that the system with an anilox roller and the technology of waterless offset is still far behind the conventional offset, in terms of mass production of printed materials. Certain time is needed for this technology to correct some of the problems, the biggest one of them, the inpurities on the printing plate.

The lack of the dampening unit represents, in the same time, an advantage and a disadvantage considering the quality of the reproduciton.

LITERATURE

1. Kipphan, H.: Handbook of Print Media, Springer-Verlag, 2001
2. Mokuš, G: Završni - Bachelor rad: Uticaj vrste štamparskog agregata na kvalitet otiska u tabačnoj ofset štampi, Fakultet Tehničkih Nauka, Novi Sad, 2008
3. Novaković D., Bingold K.: Materijal za pripremu ispita iz predmeta Tehnike Štampe, Fakultet Tehničkih Nauka, Novi Sad, 2005
4. http://ec-cards.com/waterlessprinting.htm, 2008.

Contact address:
Gabor Mokuš
21000 Novi Sad
Mornarska 15
+ 381 63 87 54 164
mokgab@gmail.com

THE EFFECT OF THE THERMODYNAMIC QUALITY OF SOLVENT ON THE KINETICS OF SCREEN PRINTING SQUEEGEES SWELLING

Akakiy Dzhvarsheishvili, Moscow state university of printing arts, Russia

Резиме

Последица термодинамичког квалитета растварача на кинетичком отоку у сито штампи са ракелом је експериментално проучаван уз помоћ математичких модела отока. Оток се сматра комбинацијом међусобно повезаних процеса дифузије и деформације материјала. Показано је да је квалитет растварача одредјен уз помоц вредности Флори-Хагинсових параметара значајно утиче на саму кинетику отока мреже. Коефицијет дифузије растварача је одређен кинетичком кривом отока и наравно термодинамичким квалитетом растварача.

Кључне речи: оток

Summary

The effect of thermodynamic quality of a solvent on the swelling kinetics of screen printing squeegees was experimentally studied applying the mathematical model of swelling. Swelling is considered as a combination of interrelated processes of diffusion and deformation of the material. It was shown that the solvent quality assessed by the value parameter Flory-Huggins essentially affects the kinetics of network swelling. Diffusion coefficient of a solvent is determined by the swelling kinetic curve taking into account the thermodynamic quality of a solvent.

Key words: swelling diffusion squeegees

1. INTRODUCTION

In one extent or another, practically all polymeric materials are permeable for gases, liquids, or their vapors. Permeability and capability to absorb low-molecular substances to a great extent determines field of application of polymeric materials. For example, low rate of permeability of certain kinds of polymers enables using them as packing materials and protective coatings, and the high degree of their permeability in respect of some substances of other polymeric materials enables using them in membranous technology in the capacity of separating diaphragms.

Mechanism of permeability of polymeric materials is based on phenomenon of molecular diffusion, which is of great significance in many processes, concerned with production, processing and exploitation of polymeric materials. For example, a lot of manufactured articles and materials produced on the basis of polymers are destined for exploitation in aggressive mediums. Absorption by polymeric material of such substances can result in considerable change of its physical-and-mechanical properties and destruction of the article of manufacture.

To realize successful exploitation of polymeric materials and manufactured articles under conditions when diffusion phenomena are of significant importance, it is necessary to comprehend the principal regularities of their passing, and to secure possibility of their prognostication. It is one of the reasons due to which diffusion investigations constitute one of the most important sections of physical chemistry of polymers .

Another reason of unrelenting interest to study diffusion phenomena relating to polymers consists in the fact that they have very close connection to thermodynamic properties of polymeric systems. Owing to this circumstance with the help of diffusion measurements it is possible to obtain information on supra-molecular and phase structure of polymers, on thermodynamic parameters of interaction of components of solutions and mixtures of polymers, on kinetic stability of polymeric systems, and so on [1-5].

In physics and chemistry of polymers swelling processes represent one of powerful “instruments” of studying physical and chemical properties and structure of polymeric grids. It is obvious that solution of problem with respect to particular liquids in which the polymer in question is swelling (or dissolving), and relative to which liquid it is resistant, is of actual importance for the present time, and not only in the field of printing art, but in other branches of industry as well.

Screen printing squeegees in the process of their exploitation are coming into contact with low-molecular liquids, such as: cleaning solutions, components of printing inks, and so on. As a result of such a contact, squeegees being swelled to one extent or another, that is, they are absorbing solvents.

Swelling changes elastic properties of squeegee blade, ink starts to non-uniformly forcing through the stencil, and as a result there are being originated such defects as streaking, dot gaining of screen point, star-lighting, and so on. In this connection it is of interest carrying out integrated study of the process of interaction of squeegees, having different hardness, with various low-molecular liquids.

2. MATHEMATICAL MODEL OF A SWELLING PROCESS

The swelling of a material in a liquid is a superposition of two simultaneous processes. These are, on the one hand, diffusion of the liquid and, on the other hand, deformation of the polymer matrix induced by absorption of the liquid. These processes are interrelated because a nonuniform distribution of the liquid arising in the course of diffusion induces heterogeneous strain and stress fields, which can affect the diffusion kinetics of the material swelling. This effect increases with increasing deformation of a material, being most pronounced in strongly swollen materials. The mathematical model constructed in [6] describes the nonequilibrium process of swelling that takes place with finite strains for a plane elastomer sample or a polymer gel. Let us use this model to analyze the kinetics of swelling for screen printing squeegee in solvents of various thermodynamic qualities.

3. RESULTS AND DISCUSSION

At first, let us introduce some definitions:

Φ_E is a volume fraction of polymer in an equilibrium swelling state;

χ is the Flory-Huggins parameter;

G is a compression modulus;

g (t) is a kinetic swelling curve;

D_i – diffusion coefficient at the initial stage of swelling;

D_f – diffusion coefficient at the final stage of swelling.

№	Solvent	65 shA				
		ϕ_E	$G\,(\frac{n}{cm^2})$	χ	$D_i \times 10^7\ (\frac{cm^2}{s})$	$D_f \times 10^7\ (\frac{cm^2}{s})$
1	Ethyl acetate	0,498	434,954	0,081	36,07	5,28
2	Butyl acetate	0,695	538,673	0,416	19,27	2,57
3	Ethyl cellosolve	0,629	400,011	0,514	20,54	2,05
4	Decane	0,881	866,786	0,716	30,1	0,91
5	Heptane	0,889	969,814	0,923	0,45	1,82
6	Butanol	0,845	709,941	1,057	30,33	1,4
7	Isopropanol	0,918	890,847	1,552	16,3	2,8
8	Water	0,965	1070,05	2,473	81,22	1,32
9	Ethanol	0,97	876,114	2,476	51,8	0,893
10	Hexane	0,981	717,366	2,713	45,4	0,866

Table 1: Parameters of kinetic curves of swelling of single-layered squeegee having hardness of 65 shA, in solvents of various thermodynamic quality.

Determination of diffusion coefficient and of Flory-Huggins parameter has been carried out according to methodology, offered in the study [7]. As the study object there served screen printing squeegees of different hardness – 65, 75 and 85 shA. There was studied kinetics of swelling of screen printing squeegees in solvents of different thermodynamic quality: ethyl acetate, butyl acetate, ethyl cellosolve, heptane, hexane, decane, butanol, ethanol, isopropanol and water. Results of the experiments are represented below.

№	Solvent	75 shA				
		ϕ_E	G $(\frac{n}{cm^2})$	χ	$D_i \times 10^7$ $(\frac{cm^2}{s})$	$D_f \times 10^7$ $(\frac{cm^2}{s})$
1	Ethyl acetate	0,593	499,88	0,313	10,77	1,01
2	Ethyl cellosolve	0,553	391,35	0,318	20,29	1,85
3	Butyl acetate	0,664	424,17	0,447	14,13	1,71
4	Hexane	0,938	1100,35	1,426	11,6	0,596
5	Butanol	0,908	432,71	1,596	14,16	0,506
6	Heptane	0,933	564,6	1,644	26,16	1,14
7	Decane	0,964	565,74	2,062	12,8	0,571
8	Ethanol	0,972	473,63	2,642	26	0,734
9	Isopropanol	0,982	421,75	3,026	21,49	1,39
10	Water	0,988	873,38	3,455	51,53	1,3

Table 2: Parameters of kinetic curves of swelling of single-layered squeegee having hardness of 75 shA, in solvents of various thermodynamic quality.

On the basis of experimental data on kinetics of swelling of screen printing squeegees of different hardness there were calculated Flory-Huggins parameters χ of interaction of polymers with solvents having various thermodynamic quality and coefficients of molecular diffusion D of studied solvents on the polymer-phase. Tables 1-3 demonstrate that the order of value of diffusion coefficients of all studied substances in squeegees comes to 10-7 cm2/s. This result fits to similar measurements carried out for flexographic plates [7] and to results of studies [8-9]. At the same time it is not difficult to notice that increasing of results in increasing of Flory-Huggins parameter χ. Indeed, from theoretic point of view, the regularity in question is justified, and this fact once more confirms trustworthiness of the obtained results. From tables 1-3 it is also possible to reveal the following regularity: in the process of increasing of hardness of squeegee there is observed deterioration of thermodynamic quality of solvent, and this fact is expressed by increase of Flory-Huggins parameter. Probably, increase of Flory-Huggins parameter takes place owing to increasing of grid frequency, preventing from penetration of solvent deep into phase, and in that way reducing interaction of molecules. In such a way it is possible to suppose that such values as hardness and Floury-Huggins parameter are proportional values (but not inversely proportional ones). The circumstance in question is visually demonstrated in figure 1.

№	Solvent	85 shA				
		ϕ_E	G $(\frac{n}{cm^2})$	χ	$D_i \times 10^7$ $(\frac{cm^2}{s})$	$D_f \times 10^7$ $(\frac{cm^2}{s})$
1	Ethyl acetate	0,752	894,38	0,516	18,5	1,42
2	Ethyl cellosolve	0,823	769,65	0,892	13,8	0,952
3	Butyl acetate	0,891	508,14	1,321	19,8	1,1
4	Ethanol	0,949	1050,3	1,969	12,3	1,36
5	Decane	0,971	889,88	1,975	12,9	0,358
6	Butanol	0,956	682,83	2,083	11	0,815
7	Heptane	0,978	702,61	2,512	31,4	1,08
8	Isopropanol	0,987	1286,4	3,048	26,6	1,11
9	Water	0,99	674,84	3,608	86,6	21,2
10	Hexane	0,994	1064,4	3,628	18,7	0,718

Table 3: Parameters of kinetic curves of swelling of single-layered squeegee having hardness of 85 shA, in solvents of various thermodynamic quality.

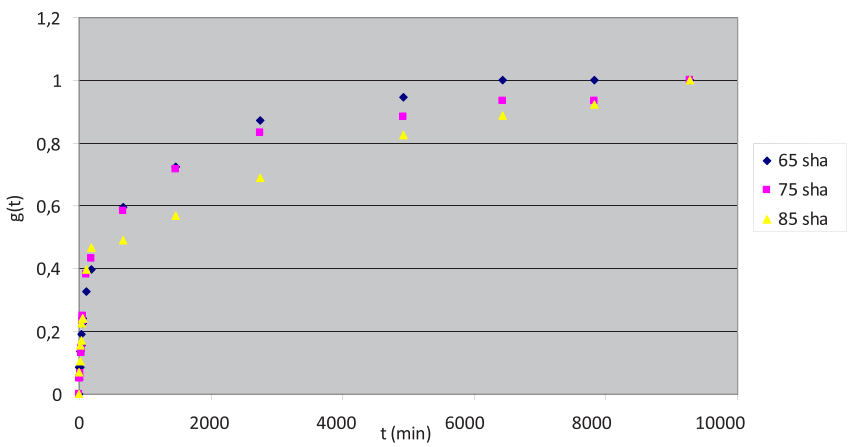


Figure 1: Kinetic curves of swelling of screen printing squeegees of various hardness in ethyl acetate

On the basis of experimental data it is possible to conclude that the following compounds have the most rate of affinity (at that, Flory-Huggins parameter takes the least values) with respect to squeegees: ethyl acetate, butyl acetate and ethyl cellosolve. At that, for all the three kinds of doctoring webs the most aggressive solvent is ethyl acetate. In the process of exploitation of screen printing squeegees it is necessary to avoid using these solvents. For the rest of solvents Flory-Huggins parameter considerably exceeded value equal to 0.5, and this fact testifies that

the rest of solvents (ethanol, heptane, isopropanol, hexane, decane, butanol and water) are "bad" ones for the squeegees in question from the point of view of thermodynamics, that is, even in case of absence of grid the material would not dissolved in them (swelling would be limited). However just they are the most suitable for use in the capacity of solvents of inks and cleaning solutions. The rate of interacting of water with all the three squeegees is the most weak. Consequently, wide-spread introduction of screen printing water inks into the Russian market during the recent years is grounded not only from ecological point of view, but also from the point of view of compatibility of water inks with screen printing squeegees. Just in such inks it is possible to expect the minimal rate of swelling of screen printing squeegees.

In the process of graphing kinetic curves of swelling there was observed so called anomaly of sorption kinetics. The phenomenon in question was expressed in S-shaped form of kinetic curves of swelling. The main reason for the anomalies is that solvent absorption causes a stress – strain state in the polymer matrix, thus, in turn, affecting the diffusion of the solvent. Therefore, the S-shaped pattern of kinetic curves is most pronounced for the swelling of rubbery polymer networks in good solvents where the material undergoes the highest strains. As the thermodynamic quality of a solvent becomes poorer, the degree of swelling of the material and its strain decrease and the S-like pattern of the kinetic curves becomes less marked.

The phenomenon in question is visually demonstrated in figure 2.

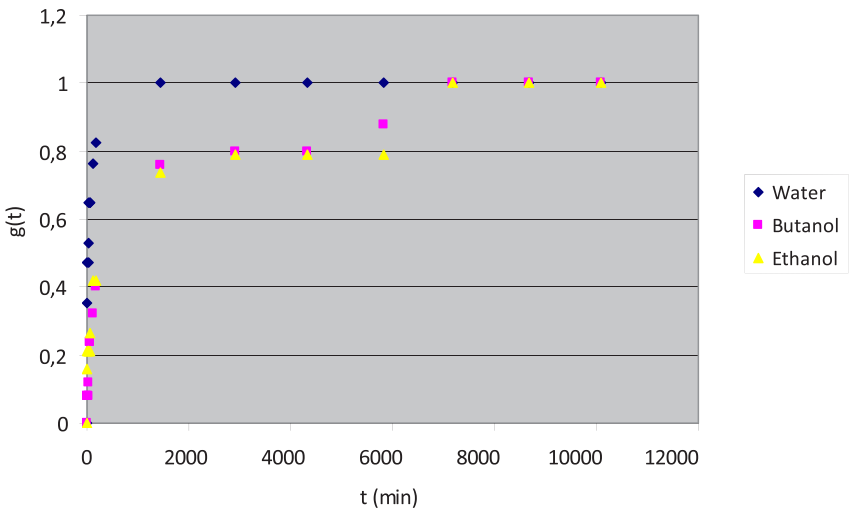


Figure 2: Experimental kinetic curves of swelling of screen printing squeegee, with hardness of 85 shA, in solvents of various thermodynamic qualities

Figure 2 clearly shows the way of changing of nature of diffusion process and of form of kinetic curves of swelling in proportion to deterioration of quality of solvent. In proportion to increasing of Flory-Huggins parameter S-shaped form of kinetic curve becomes less expressed.

In all the studied solvents at the diagram of dependence f(t) = -ln(1-g(t)) there was observed a break (there was observed quick absorption of solvent within the first moments of time, and then – gradual swelling in accordance with first order kinetics). It is possible to explain the phenomenon in question by 2 reasons (see figure 3):

a) Presence in polymer of micro-voids, which are being quickly filled with solvent within the initial moment of time;

b) Quick penetration of molecules of solvent along solvate shells of macromolecules with their subsequent slow-flowing diffusion into phase of polymer.

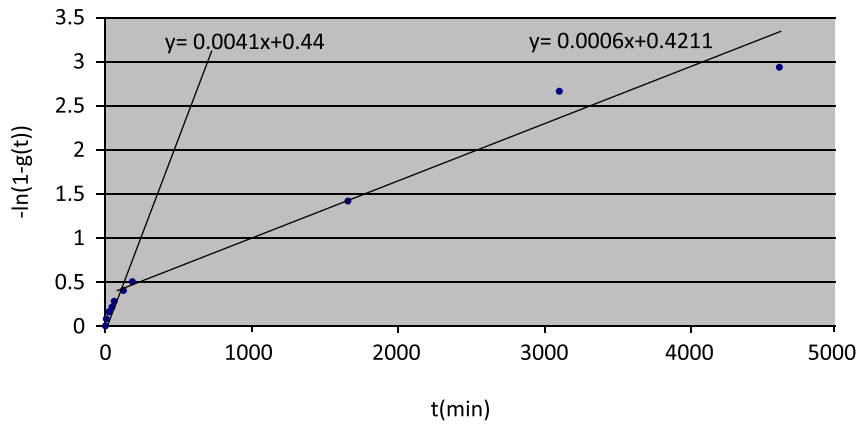


Figure 3: Experimental kinetic curve of swelling of screen printing squeegee, with hardness of 65 shA, in ethyl acetate

LITERATURE

1. ROGERS, K.: Solubility and diffusion, New York: physics and chemistry of the organic solid state, Fox, D., Labes, M., et al., Eds., New York: Wiley – Interscience,1965.
2. TAGER, A.: Physical chemistry of polymers, Moscow: Khimiya1968. 536 p (in Russian).
3. TENFORD, CH.: Physical chemistry of polymers, Moscow: Khimiya, 1965. 388 p (in Russian).
4. CRANK, J., PARK, G.: Diffusion in high polymers, London; New York: Trans. Faraday Soc. - 1951. V. 47. P. 489 - 496.
5. CRANK, J., PARK, G.: Diffusion in polymers, London; New York: Acad. Press, 1968.- 483 p.
6. DZHVARSHEISHVILI, A.I., SENCHEVA, E.A.: Some Physico-Chemical Studies of Polygraphic Material Tyvek® , Chemnitz : Proc. Printing Future Days 2007, pp.123-128 (2007).
7. DZHVARSHEISHVILI A., SHERSTNEVA M.: Thermodynamics and kinetics of flexographic-plate polymer interaction with solvents, Moscow: "Herald of the MSUPA", n.5. 2007.
8. DENISYUK, E.Ya. and TERESHATOV, V.V.: A nonlinear theory of the process of elastomer swelling in low-molecular-mass liquids, Moscow: Polymer Science, Ser. A, 2000, vol.42, no. 1, pp 56-67.
9. DENISYUK, E.Ya. and TERESHATOV, V.V.: The swelling kinetics of spherical elastomer samples in good solvents, Moscow: Polymer Science, Ser. A, 2000, vol.42, no. 12, pp. 1326-1331.

Contact address:
Akakiy Dzhvarsheishvili
Moscow, 117292, Profsouznay str. 20/9-8
Tel. (7 495) 1250904
Mob. (8 903) 1640916
E-mail. koks85@bk.ru

INFLUENCE OF COMPRESSIBLE LAYER ON PROOF QUALITY IN FLEXO PRINTING

Boris Obrenović
Faculty of Technical Sciences , Novi Sad
Graphical engineering and design

Резиме

Компресибилна трака има основну функцију да ублажава ударце клишеа (штампарске форме) о централни цилиндар који носи подлогу за штампу, приликом штампања и да преузима вибрације и деформације које се јављају током процеса штампе. Циљ спроведеног истраживања био је утврђивање утицаја компресибилног слоја на квалитет отиска у флехо штампи. На тонским пољима мерио се нанос боје који се постиже са различитим тврдоћама компресибилног слоја различитих произвођача. Мерења су показала да је однос наноса боје код свих произвиђача уједначен.

Summary

Compressible tape has its main function to reduce pressure between printing plate and impression cylinder during the printing and to amortize vibration. The aim of this research was to establish influence of compressible layer on proof quality in flexo printing. Comparing results in field of 40% and 5% halftones, of different producers, we have determined that exceptions can be excluded, which tells us about high and equal quality of all producers.

1. INTRODUCTION

Flexible printing is a printing technique that allows printing on various materials with imprint quality that is comparable and somewhat equivalent to the quality gained by using offset printing techniques. The fact that in the year 2000, flexible printing covered 65% of American market with respect to packaging materials, clearly shows how flexo printing is slowly but surely assuming leading roles in the printing business.[1]

The domain of these flexible techniques is today both followed and led by fast technological development especially in the sphere of printing plates. Thus, it is essential to understand the very process and the very control in relation to manufacturing of printing plates, its installation and its behaviour during the printing process, since it is one of the most important factors that influence the quality of final products, i.e. imprints.[2]

The control must be exterted in the earliest stage. Printing plates, colors, anilox cylinders, carried cylinders as well as adhesive compressible tapes, that play an important role in mounting of printing plates on a carried cylinder, have to be monitored. [2]

2. FUNCTION OF COMPRESSIBLE TAPERS IN PROCESS OF FLEXO PRINTING

Flexible photopolymer printing plates are mounted on carryed cilindar trough adhesive compresibile tapes. (figure 1).

Figure 1: Adhesive compressible tapes

However, different producers are offering wide range of prod¬ucts with diverse performance, which are differing as in hardness and also in difficulty of mounting, smell, color and structures of compressible layer. The most of this producers deliv¬ers compressible tapes so that inner layer is of the PE foam, while others are offering tapes with PU foam.

The tape or foam tape is of the elements of the “tolerances sendwich”. For tape thickness under 0.20 mm the small variations are not to be taken into consideration. For tape over 0.20 mm and foams it is not possible to neglect the tolerances. A study has shown that for 0.20 / 0.30 mm tapes the tolerances are about 0.020 mm and could reach 0.035 mm for 0.55 mm foam tapes. [2] The deviations to the nominal value are in most cases positive. For the foam tapes the dimensional stability to the temperature, the memory of the foam and its compressibility are the most important factors which condition its thickness during productions. The tape is sometimes considered as a secondary element but in reality its chois and good usage are very important: choose the right tape whit the right plate and ,motive to print, control its thickness and mount all the plates of a job with the same roll could avoid expensive problems. [2]

Compressible tape has its main function to reduce pressure between printing plate and impres¬sion cylinder during the printing and to amortize vibration. As it is known printing plates for flexo are made from flexible materials, such as polymers, which are not lasting, therefore the screen dots will be damaged. This automatically means that the printing plate will be damaged, and therefore the printing process would be more often interrupted. Thanks to the compress¬ible tape which is inserting bellow printing plate this disadvantages are avoided and printing of high circulation with good proof is possible. Printing of halftones and tones is demanding different types of compressible layers. Producers have sorted layers in three basic groups:

- soft
- medium
- hard

For printing of highlight tonal values, which are archived in printing with a different density, are used soft compressible tapes. Medium tapes as well as soft tapes are use for printing of highlight tonal values, however, regarding to tone value it is decided, according to recommendation of producers, for soft or medium hardness of compressible layer. Printing of tones and increased ink transfer requires for hard compresible tape.

2.1. Mounting process:

Flexographic plate mounting is a critical step in achieving optimum print quality. Using proper techniques in preparation, mounting and plate removal will allow the optimum performance of the mounting tape through the entire flexographic printing process.

Mounting process contains next steps:

- The adhesive tape is applied to the cylinder first, avoiding the problem of the edges of the plate lifting
- Remove the protective liner from the tape
- Mount the printing plate immediately after removing the liner from the tape
- Use a rubber roller to remove any air bubbles between the plate and the adhesive.
- To avoid plate edges lifting during longer runs or plate washing, the plate edges should be sealed.
- The printing plate should be removed at an angle of <60O This reduces the risk of adhesive / foam residue
- The adhesive tape should be removed from the printing cylinder accordingly [3]

3. MEASURING METHODS

Researching accomplished in this research paper includes testing compressible tape of different producers, trough suited proof and suited control wedge. Also complexity of mounting and demounting of printing plates was researched, appearance of trapped air as well as compatibility of compressible tapes with used printing plate.

Testing was accomplished in Comex printing house in Sabac, Serbia. Printing was done at Comexi FW2110 printing press, printing speed was 200 m/min. It was used DuPont DPI 45 photopolymer printing plate which was exposured pm CtP device CDI Spark 4835, ESKO. For test the finest anilox (340L/cm vol. 5.5cm3/m2) was picked, which could show even the smallest mistake.

White polyetilen was used as a substrate for printing, and it was printed with magenta of Torda-Zvezda producer, at viscosity 19sec Ford #4.

For testing was created control wedge which contains elements that provides adequate measuring of wanted values: field of full tone, halftone field 40%, 5%, control ruler and text in positive and negative.

At figure 2. is shown the look of control wedge which was used trough this research.

Research was made so that all factors, which may influence results, are avoid. All tapes were tested under the same conditions. Length of printing by the sample was 200 mm.

Printing was processed at the following way: nine the same compatible printing plates from the same polymer were made under the same conditions, so that every one of producers got one printing plate for every type of plate (soft, medium, hard). Pressure cylinder is set according to the softness tape of every producer, and then other hardness of a specific producer were printed. All hardness, of every producers were printed up to beginning, middle and from the end of printed material. Process of measuring was done at three different sample, and than was measured at three different points of sample. Summing results of goatherd measurements of those samples and aritmetical middle was taken. Experiment had been lasting for 3h, atmospheric conditions were constant and unchanged concentration of pigment in ink.

Control wedge is consisted of field with full tones and halftone field with a different density, roller with diameter and text in positive and negative (figure 2.)

To avoid influence of vibration, printing plate was designed so that it can handle pressure and deformation during printing. At tone field was measured density which is achieved with different hardness of compressible layer of different producers. Measurements had shown that ink transfer (and density) of all users were equal.

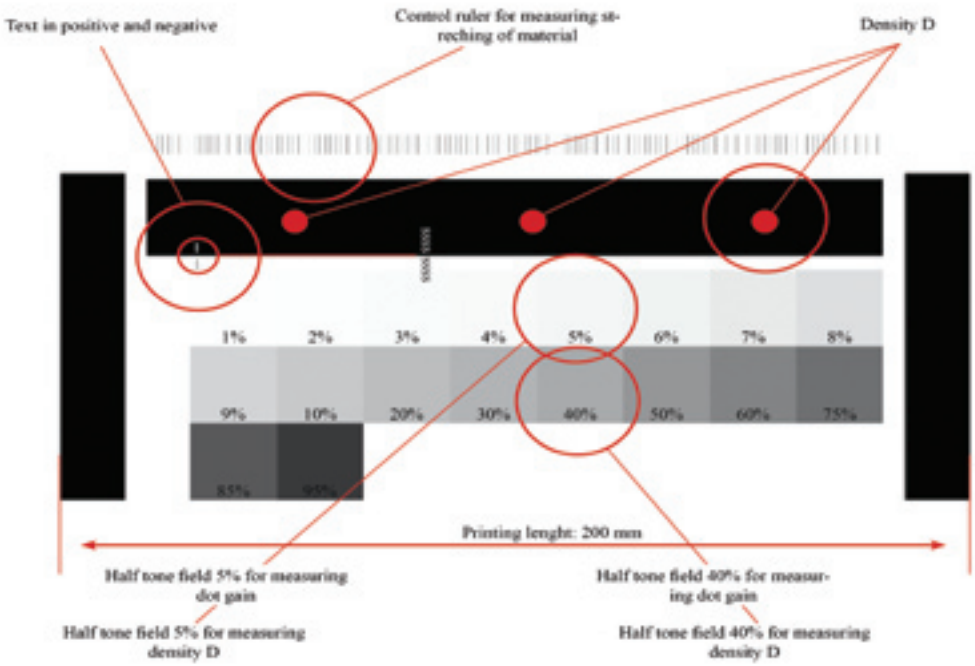


Figure 2: Control wedge

Halftone field were used for measuring dot gain at 40% as well as density at 40%. Text in positive and negative, 6pt, are there so that the we can visually mark possibility of reading letter characters, and with that we can established influence of compressible layer on transfer of letters.

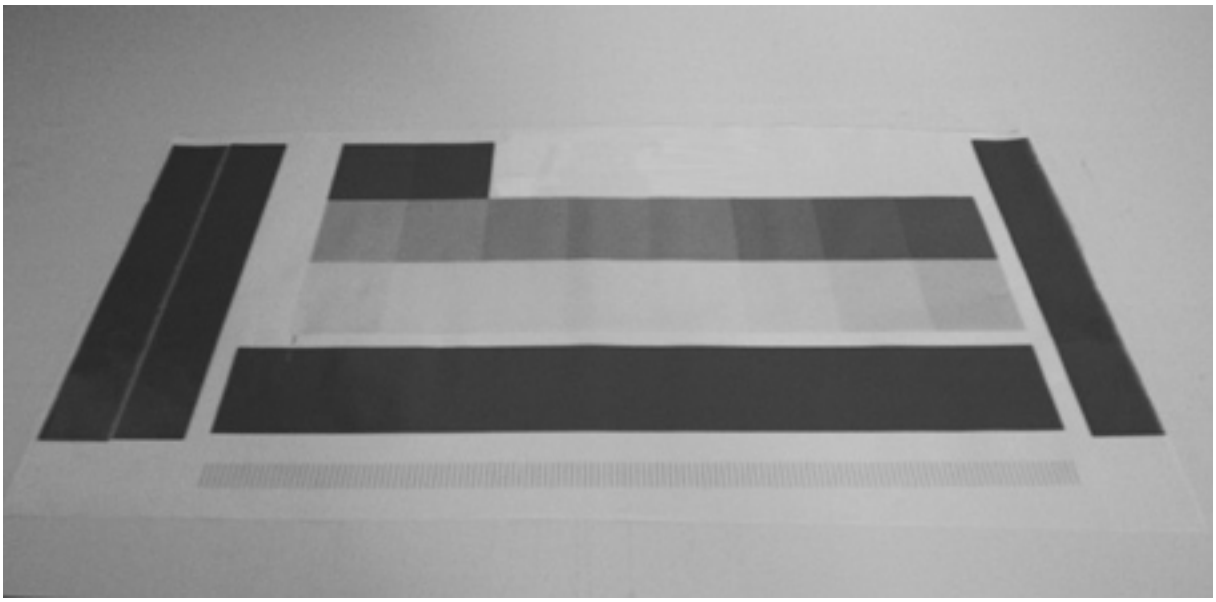


Figure 3: Printed reproduction control wedge

Research was made with intense to compare:

a) The same hardness compressible tape of different producers, via control points of compatible functionality

b) Mounting and demounting

c) Bubble effect

d) Compatibility between compressible tapes

e) Additional advantages that other producers offers

*Bubble effect is air between printing plate and adhesive compressible tape. Use a rubber roller to remove any air bubbles between the plate and the adhesive. Some producers have the liners orange skin structure in the adhesive surface, that helps avoiding air bubble entrapment between the adhesive tape and printing plate. A hard leading edge may cause vibration marks, and reduced printing speeds. This can be overcome by mounting the halftone part of a plate nearer the lead¬ing edge.

4. RESULTS OF RESEARCH AND ANALYSIS OF ARCHIVED RESULTS

Due to the way of testing, it cannot be said with the certainty that compressible layer is du¬rable within high circulation. However, due to the short time of research we cannot say that mounting and demounting can be done slightly. Others results could be taken into consideration.

In table 1 are shown results of measuring density D and dot gain at field 40%. D – density is quantity of ink transfer to substrate, higher values of D applies to higher ink transfer. Measured values according to

ISO 12647-1 standard, with status E referring to ISO 5-3 for values of dot gain at field of 40%, for magenta is 36, whit +/- 5% exceed.

Compeering measured values in this research paper with ISO 12647-1, it is concluded that measuring in the field of dot gain, according to hardness of compressible tapes, soft tapes which are the most suitable in given conditions of research, are tapes of producers B and D whit identical values, while tapes of A producer has shown as worst at given conditions. At medium hardness of compressible tapes producers were valued in following order: D, B, C, A from which is concluded that producer A gives weakest performance in given conditions of research. Higher values of dot gain, as it was expected, are measured at proofs archived using hard compressible tapes for which is characteristic higher color range. According to measured values which are in range of ISO standard, compressible tape of producer D gives proof whit highest quality. According to given conditions of testing of influence of compressible tape on proof in flexo printing as the most suitable producers has shown:

1. producer B and D for soft compressible tapes
2. producer D for medium compressible tapes
3. producer D for hard compressible tape

Producer	Type of tape	Hardness	Density D	Half tone field 40% for measuring dot gain
A	1	soft	1,19	26
A	2	medium	1,38	26
A	3	hard	1,44	28
B	1	soft	1,17	28
B	2	medium	1,37	27
B	3	hard	1,47	29
C	1	soft	1,22	27
C	2	medium	1,34	25
C	3	hard	1,36	26
D	1	soft	1,25	28
D	2	medium	1,35	29
D	3	hard	1,45	30

Table 1: Values of measured density

Names of producers wasn't given, whereas it is talked about renowned world class producers so that low is non broken.

Producer	Type of tape	Hardness	Equality of ink transfer	Equality of halftone transfer
A	1	soft	C	A
A	2	medium	A	B
A	3	hard	A	B
B	1	soft	C	A
B	2	medium	A	A
B	3	hard	A	B
C	1	soft	C	A
C	2	medium	B	A
C	3	hard	A	A
D	1	soft	C	A
D	2	medium	B	A
D	3	hard	A	B

Table 2: Subjectively grading proof quality

Ink transfer: A: best; B: good; C: bad

Equal transfer of halftones: A: satisfactory; B: unsatisfactory

Results accomplished from a subjectively grading of printed proofs are included in table 2 whereas connection between human as an observer and its subjectively grading of printing quality was maintained. In method of deciding if something is satisfying or not, very often is taken subjectively grading of printing quality.

At chart 1. are displayed measured results of density. Due to the measured values we can see that density, according to the hardness of compressible layer (soft, medium, hard), are even. Based on this facts we have made conclusion that different producers present product of evenly quality and performances.

During this research, quality of printing proof was on satisfactory level, which have also certify derived data as well as visual mark of printing proof.

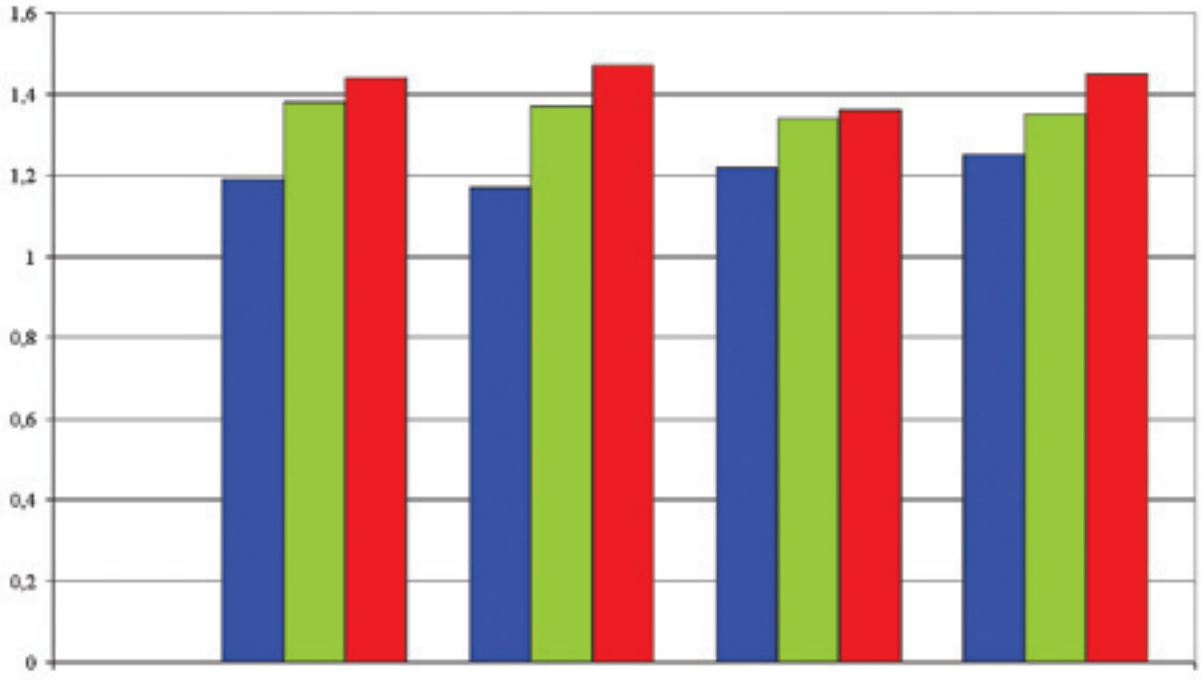


Chart 1: Density D

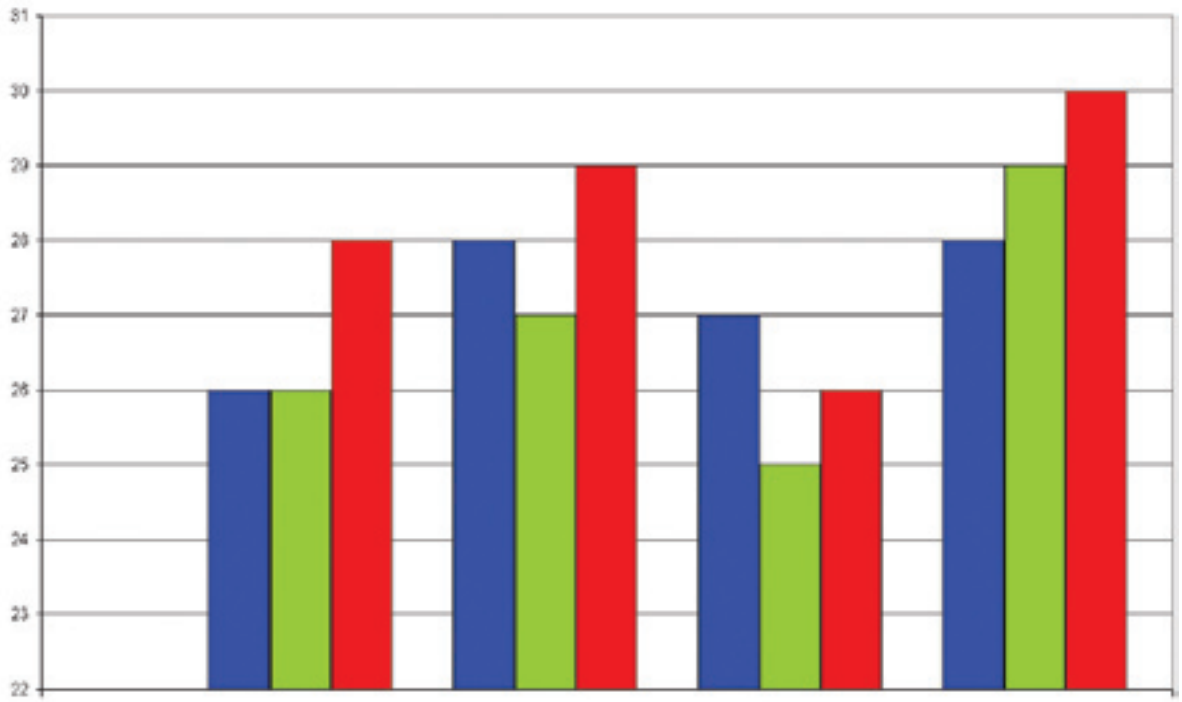


Chart 2: Dot gain at field of 40%

Dot gain at field of 40%, grows linearly whit change of hardness of compressible layer, from soft trough medium and up to hard. Measured values according to ISO 12647-1, whit status E referring to ISO 5-3 for values of dot gain at field of 40% for magenta is 36, with +/- 5% exceed. Following standard and exceeding from chart 2 it could be seen that measured values are up to given borders.

Producer	Type of tape	Hardness	Accordance of diameter of the same producers, different hardness	Accordance of diameter of the different producers
A	1	soft	0 - 0.02 mm	0 - 0.02 mm
A	2	medium		
A	3	hard		
B	1	soft	0 - 0.5 mm	0 - 0.5 mm
B	2	medium		
B	3	hard		
C	1	soft	0 - 0.02 mm	reference
C	2	medium		
C	3	hard		
D	1	soft	0.5 - 2 mm	1.5 mm
D	2	medium		
D	3	hard		

Table 3: Monitoring stretching of material during printing process

Polyetilen (PE) is consistent in group of elastic material which during the printing is stretching on occasionally at rolling and enrolling. Due to this factor, of a mayor influence is following streching of material, so that it could be avoided in earliest stage (prepress) unwanted effects of stretching of research it was randomly picked printing plate from which were made comparations. As reference for accomplishing thus research we have randomly picked printed sample (control wedge) with which have made comparations.

Producer	Type of tape	Hardness	Other advantages	Easily mounting / demounting
A	1	soft	smells, micro channels for despoing of trapped air	yes
A	2	medium		yes
A	3	hard		yes
B	1	soft	packaging easy for use	yes
B	2	medium		yes
B	3	hard		yes
C	1	soft	micro channels for despoing of trapped air	yes
C	2	medium		yes
C	3	hard		yes
D	1	soft	/	no
D	2	medium		no
D	3	hard		no

Table 4: Advantages that offers different producers

Additional advantage in mean of practical packaging, pleasant smell or micro channels for deposing of trapped air. Thus is just some of appreciated factors which producers offers and could be judgmental for choosing type of compressible tape. Linear channels for despoing of trapped air additionally makes easy putting away tape often usage and theirs main trance. Of course, it is important to highlight that these factors don't have influence on proof quality, however, regardless to that they are included in table.

5. CONCLUSION

Carried research of influence of compressible layer in quality of proof in flexography, has given results on base of which could be concluded following conclusions.

Density directly depends on hardness of compressible layer.

Comparing results in field of 40% and 5% halftones, of different producers, we have deter¬mined that exceptions can be excluded, which tells us about high and equal quality of all producers.

Due to the way of research, we cannot make un assumption on durability of compressible layer within high circulation. However, only partly could be retrieved the felling that demounting can be done slightly. Main advantage of producers “A“ and “C“ in relation to others is encom¬passed in fact that theirs compressible tapes in its structure maintain drains for disposing of trapped air, which additionally plate mounting process.

Pleasant smell of tickly compressible tape is neglected for reproduction, but is very important for workers who mount printing plate.

Gathered results of ink transfer, equal transfer of halftones and precise assembly within all producers are on the high level. Due to result the choice of producer is based on brand, habits, and price or on some of indicated bonuses.

REFERENCE

1. Foundation of Flexographic Technical Association, Inc.: Flexography: Principles and Practices 5th Edition, United States of America 1999
2. Laurent, G. L.: Measurement and Prediction Procedures for Printability in Flexography (MP3 Flexo), Stockholm 2002
3. http://www.gmspacific.com/product-pages/lohman.htm, 12.09.2008.
4. http://www.aaapress.com/plate-mounting-tape.html, 14.09.2008.
5. http://www.ausmeta.lt/index.php?lng=en&action=page&id=lohmann#flex, 12.09.2008.
6. www.3m.com, pdf: 3 Plate Mounting Techniques for Cushion-Mount™ Plus Tapes with Easy Mount Adhesive, 2004

Contact address:
Boris Obrenović
15000 Šabac
Žike Popović 29/13
boris.obrenovic@gmail.com

STANDARDISED CONCEPTS FOR SMALL AND MEDIUM SIZED NEWSPAPER PRINTING PLANT CONSTRUCTIONS IN EMERGING MARKETS

Paritosh Prayagi, Maik Müller, Alexander Mischke, Conny Schuhmann
Institute for Print & Media Technology
Chemnitz University of Technology, Germany

Резиме

Како се производно тржиште све више усмерава на нова тржишта као што су Индија, Кина, Бразил и Турска, расте потреба за стандардизацијум и одржавањем одређеног нивоа квалитета за производе који се праве на глобалном нивоу. Штампарски производи ће свакако имати значајно место у промоцији, комуникацији и пружању додатних информација у овим земљама. Битно оруђе у овим земљама, где се много ради на ширењу писмености су новине. Постоји много малих и средњих штампарија, које заједно чине већински део графичке индустрије. Конкуренција у новинској индустрији је поставила одређене стандарде у свим областима процеса: контрукцији машина, планирању објеката, логистичкој и матријалној контроли, штампарској опреми, припреми штампе и контроли квалитета, радној снази и контроли квалитета производа. Као додатак свему томе и потреби за високим квалитетом, сви ресурси и захтеви штампарске индустрије морају да буду у жељеној равнотежи. Нагли раст броја малих штампарија у овим земљама ствара доста проблема. Овај рад говори о могућности стандардизације нових штампарија. Базира се на истраживању спроведеном на индијском тржишту које се јако брзо развија. Рад истражује разне могућности и користи већ разрађена стандардизована поља успешних мањих и средњих штампарија како би се умањиле грешке у планирању и стварању нових штампарија у будућности.

Кључне речи: новинска индустрија, пораст тржишта, стандардизација

Summary

With the focus of the manufacturing market shifting towards emerging markets like India, China, Brazil and Turkey, there is a need for standardisation and quality definition for products manufactured on a mass scale. Print media will play an important role in promotion, communication and supplementary information in these countries. Especially newspapers are an important mass medium in emerging

markets with increasing literacy. There are a lot of small and medium sized newspaper printing plants, which form the major part of the printing industry in these emerging markets. The competition in the newspaper industry requires high quality levels in all areas while establishing a new printing plant, namely: construction, facility planning, logistics and material control, printing equipment, pre-press and quality control, manpower and product quality development. Additionally, the high quality requirements, all resources and demands of the printing industry have to be in balance. The high number of new printing plant establishments in emerging markets poses many problems. This paper deals with the possibility of standardisation while establishing new newspaper printing plants. It is based on a research conducted in the fast emerging market of India. The paper explores the possibilities and scope of standardised concepts for small and medium sized newspaper printing plants that may help to minimise mistakes in planning new establishments in the future.

Keywords: Newspaper Printing Plant, Emerging Markets, Standardisation

1. INTRODUCTION

Since 2005 the rise in newspaper titles and circulation has been significant. In the year 2006, the circulation of Indian newspapers led to attaining the second position worldwide with 180,738,611 copies per day, according to the Registrar for Newspapers in India. In the same year, about 2,075 new newspapers were registered in the Indian market [1]. The steady increase of the newspaper circulation in India led to a lot of new establishments of printing plants with production capacities of less than 100,000 copies per day. More and more representatives of the Indian newspaper industry demand a standardised procedure for new newspaper printing plant establishments to avoid mistakes that have been made in the past. Hence, a study was carried out focussing on the possibilities of implementation of existing standards. Another approach was developing new or modifying the existing standards to fit into the small and medium sized production scenario.

The application of standards and their development can be of different types. One option to adopt is the availability of global standards such as ISO. Good examples are the ISO 9000 series for quality standards and the ISO 14000, a global series of environmental standards. Another approach is to follow the industry trend and adopt standards set by other countries. Typically, the Indian printing industry follows European standards for this industry sector, set by research associations like IFRA (worldwide research and service organisation for the news publishing industry), the Graphic Technology Research Association (Fogra) or the Swiss Centre of Competence for Media and Printing Technology (Ugra) etc. The third possibility is to have own standards for certain areas in which global standards cannot be applied. As an example, standards for construction are based on many local influences like seismic behaviour in the region, availability of construction material and weather influences. Thus, the Bureau of Indian Standards has set up special standards for construction for the Indian scenario [2]. With the advent of new plants, individual standards were developed by companies but general standardised concepts were still missing. [3]

2. RESEARCH

2.1. Focus of the research

The aim of this research was to study the possibilities of standardisation within the spectrum of different areas of specialisation in the print production within the Indian newspaper market. The standards for graphic reproduction, print quality control, data formats etc. are defined by the newspaper industry e.g. in the form of IFRA Special Reports consisting of standards and recommendations. Hence, other areas such as construction of the building, logistic planning and energy consumption were studied with reference to other industries such as civil engineering and logistics technology.

The catalysers and influencing factors (compare Figure 1) were studied in detail to derive conclusions. Further, the factors affecting the construction of the building largely depend on the availability of space, workflow (mechanical, physical, data and manpower), type of climate, construction material availability, plan for further expansion and seismic precautionary constructions. In addition to this, special requirements such as moisture protection, ventilation, vibration-free floorings have to be considered [4][5]. According to the special requirements for the newspaper printing industry, interior planning remains a vital factor. The supply of water for dampening purpose on the machine as well as the requirement of air-pressure for pneumatic lifting of reels at unwind and rewind unit, need interior supply systems. Also, the material and product workflow (e.g. material infeed to the printing machine or transfer of printed newspaper for further processing) demands no floor hindrances. Hence, smooth flooring is an important part of interior designing.

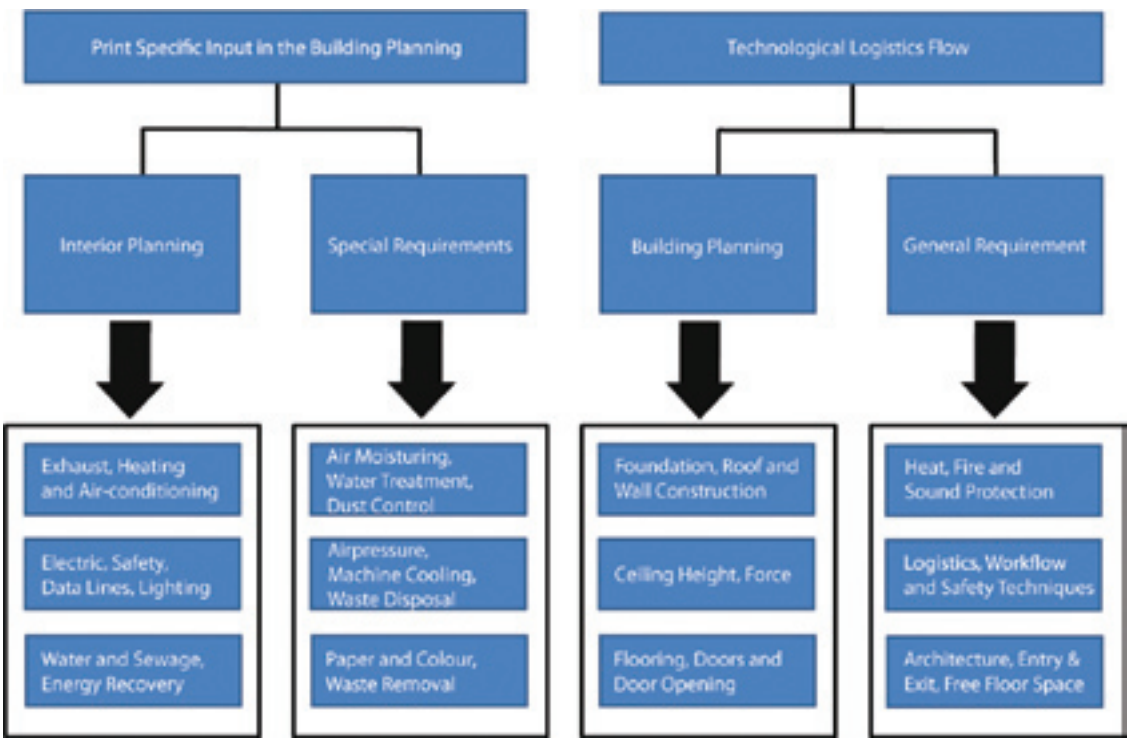


Fig.1: Overview – Building Construction for Printing Plants [6][7]

2.2. Small, medium and large printing plants

The circulation and type of newspapers are forming the basis to decide the process and material workflow, technical options, space and building plan for a new establishment. Within the Indian newspaper industry, with more than 1,000 titles, the scope ranges from daily newspapers, weeklys and fortnightlys to monthly published newspapers [8]. Figure 2 shows the distribution of the small, medium and large printing plants (based on 253 daily newspapers). One can easily see that the Indian newspaper industry is dominated by small and medium sized printing plants. The big plants, e.g. The Times of India (Mumbai), The Hindu (Chennai), produce newspapers and follow construction patterns as well as workflow designs at par when compared to any big international newspaper.

When talking about small and medium sized printing plants one has to set boarders between these two classifications. The classification of the size of newspaper printing plants is defined by the Indian Newspaper Society into small (up to 25,000 copies), medium (between 25,001 and 75,000 copies), and large (75,001 and more copies per day) [8]. However, during interviews with a consultant it appeared that a daily production of more than 100,000 newspapers describes the passage to large printing plants [9]. The passage between small and medium sized printing plants is fluent and can only be realised by a guideline, describing situations and technical options, and is not standardisable at all.

Based on our research, it does not make sense to state the exact definition of small and medium sized printing plants due to the dynamics involved in the productivity of the Indian market.

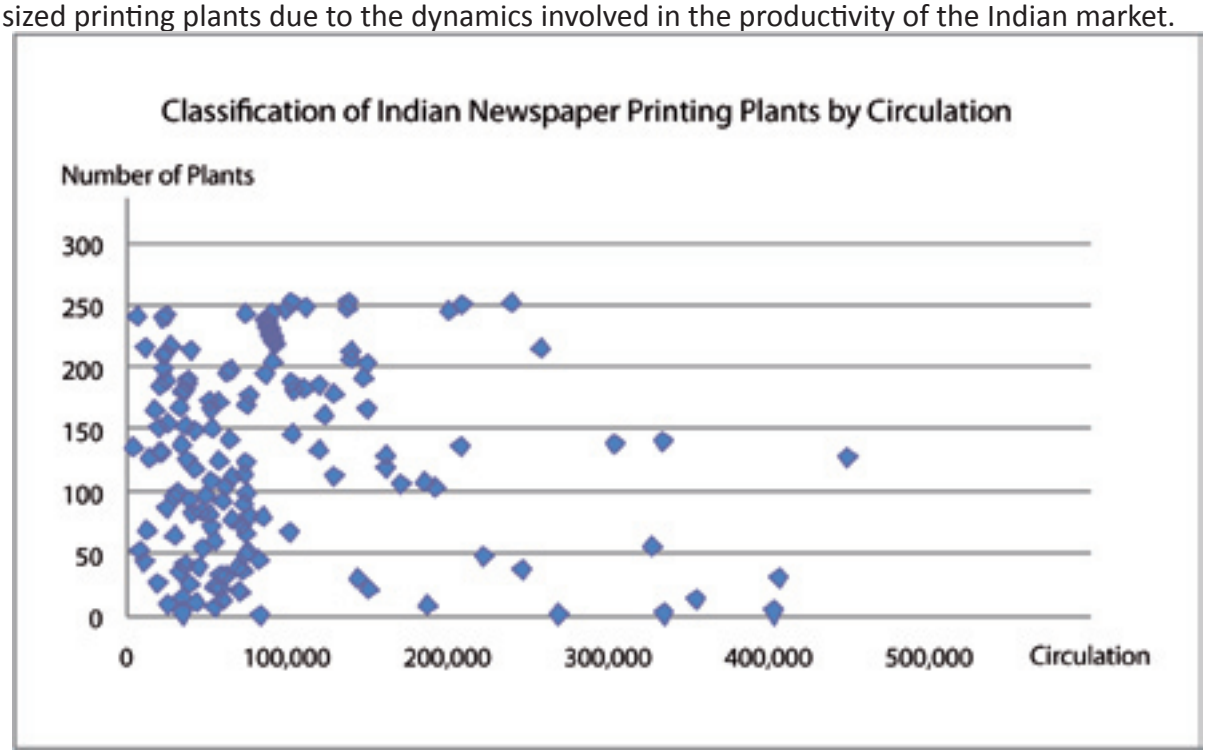


Fig.2: Small, medium and large newspaper printing plants in India [8]

2.3. Present situatuion

The distribution of space is largely dependent on technical and functional factors; the scalability of the printing plant forms an important constituent of the building construction. The present situation of scalability with output productivities below 100,000 copies is explained below, in Figure 3, where the present percentage denoted indicates the area coverage of a factor or facility in general and not plant by plant specific. The space provided for material and paper roll storage is very small (5-8%) and hence, material left-overs can be seen near the print facility. Similarly, field area is normally not observed in many printing plants. Considering, the futuristic decision making process, unplanned or reserved area scalability is also often negligible. In big cities, where space is limited, the scalability is compromised. A full-fledged automated mailroom system still consumes major area of the building (about 30-40%). With manpower as cheaper option and smaller productions, manual finishing and dispatching techniques still continue to prove a cheaper option within the printing plants having a circulation below 250,000 copies/day [10]. Further, the areas mentioned in Figure 3, are factors which should be considered as a checklist chart to establish an individual relationship with one's own building area, facility and design [6][7].

Besides space issues, other problematic situations have been observed. According to the quality standards, the paper handling has been an observed bottleneck too. Paper reels were stored in the press-room to save money spend for air-conditioning, but the reels were not protected from the ink dust produced by the press. The result was a thin ink film on the paper and finally also on the finished product - the newspaper. Furthermore, Indian newspaper publishers want to raise quality by using paper from Europe. Because of the long distance they need to store paper resources for 4 to 6 months in the printing plants, which leads to space and storage problems on the one hand, and a steady decrease in paper quality effected by the Indian climate (high humidity, air pollution) on the other hand. Regarding to the internal statistic of one printing plant the most process stops were effected by power interruptions [10]. The time lag between the interruption and the start of the backup-system (realised by diesel-engines) was unacceptable, caused by the long distance to the control console which had to be controlled manually. In addition to this more bottlenecks have been observed such as waste management, mailroom organisation as well as material handling. All of those build a long chain of small problems which let occur a large deficiency in quality and production.

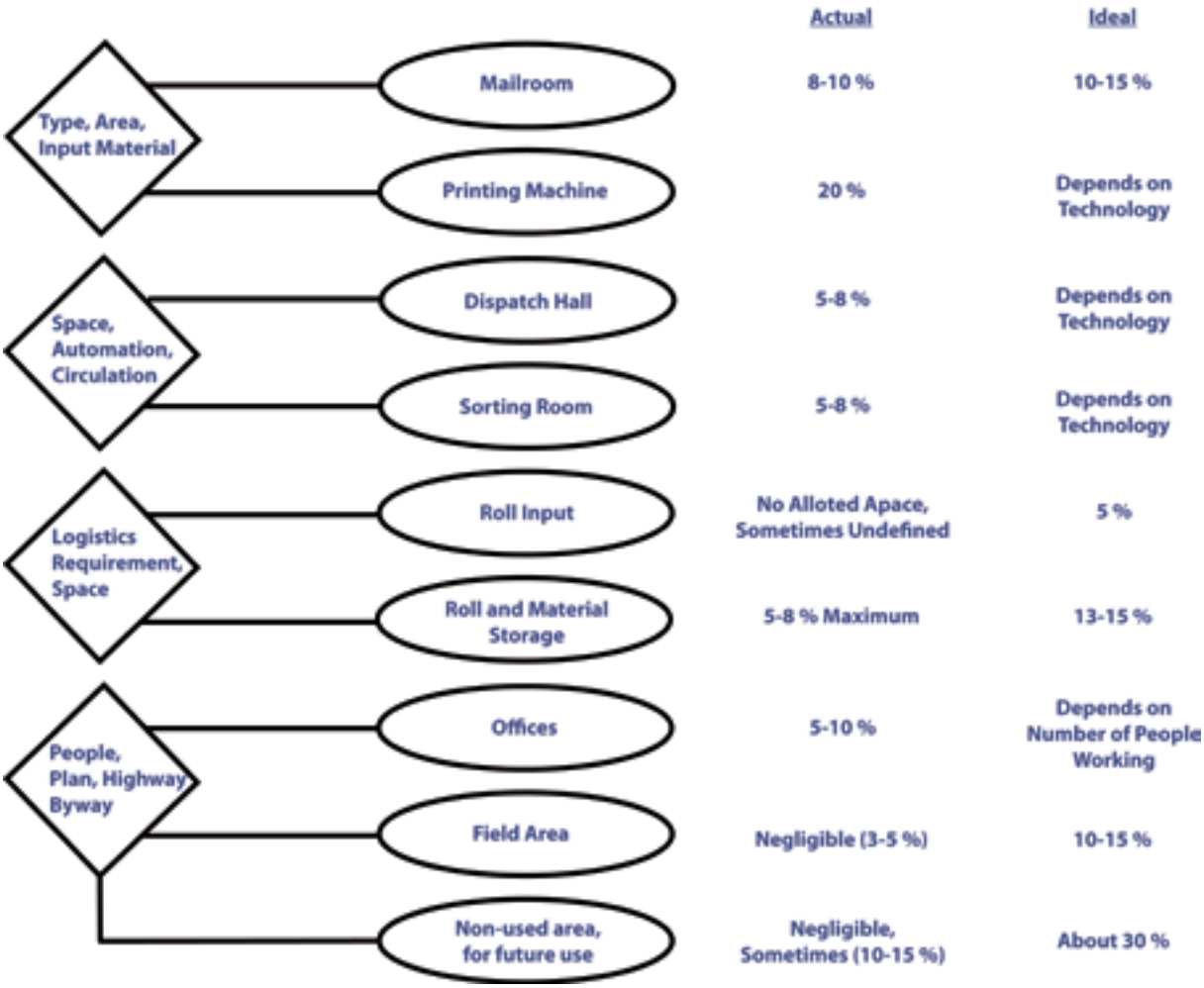


Fig. 3: Space Planning within small and medium sized plants [6][7]

2.4. Standards for construction

The Bureau of Indian Standards has set standards for different areas within the scope of construction covering industrial buildings, fire protection, electronic data protection, improvisation of earthquake resistance of earthen and masonry buildings and basic construction. Figure 4 exhibits that standards are appropriate within the Indian situations (IS – Indian Standard) with supplementary information on availability of construction materials in different regions [2]. The architecture and interior planning as described in Figure 1, can be primarily considered with these standards to form the first structure of the building. These standards are applicable for any type of industrial construction, here with respect to small, medium and large printing plants. But, the special requirements of a newspaper printing plant should be highlighted in the planning and realisation procedures.

IS 1893 : 1984 - Earthquake Resistant Structure of Building

IS 4326: 1993 - Construction of Buildings

IS 13827: 1993 - Improving Earthquake Resistance for Earthern Buildings

IS 13828: 1993 - Improving Resistance of Low Strenght Masonry Buildings

IS 13953 - Repair and Seismic Strenghtening of Buildings

IS 1641 : 1988, IS 1641: 1989 - Fire Safety of Buildings and Details of Fire Safety Construction (general)

IS 3079: 1990, IS 12456: 1988 - Fire protection of Industrial Buildings and Electronic Data Processing Installations

Fig. 4: Constructions standards set by the Bureau of Indian Standards [2]

3. CONCLUSION

The research analysis and study of the Indian market underlines that with increasing the number of newspaper printing plants, there is a need for systematic planning and construction. This need is often pulled back by negatives such as shortage of financial resources, rigid process workflow and negligence. However, all printing plants, independent from their size, have the same parts and sub-processes in common. The size of these have to be scaled related to the basic decisions on format, pages, colours and price of the final product. As mentioned before, a definite statement according to the size classification cannot be made.

According to the quality as well as quality control of the finished product and its intermediate stages during the production, standards as the existing ISO 9000 series can be introduced without too high investments regarding to the financial opportunities of the small and medium sized printing plants.

Standards for plant construction already exist. Solutions according to the general layout can be reached with modifications based on individual targets. Processes as pre-press, press and mailroom as well as their linking need better planning during the concept making phase and have to be optimised steadily during the future production. Especially organisation is the more important the less automation will be used. That means in detail all the needed employees, for example for the finishing, have to be organised and guided.

To guarantee and enable such an improvement of planning and production, well-educated employees and consultants, released by local schools and universities, are a fundamental factor. Those specialists have to be aware of the advantages of standards and able to communicate these to the newspaper printing companies. To lead the newspaper printing companies to agree upon a common standard to improve quality and productivity, a guideline converted by specialists, has to be developed. In case of the will to improve the existing workflow and organisation consultants should be hired to analyse the bottlenecks and give solutions to eliminate them.

All the mentioned solutions and bottlenecks as well as all other existing bottlenecks [11] will enable standardised concepts of newspaper printing plants. But the requirements have to be scaled to fit into the financial opportunities of small and medium sized companies. Standards can be established and realised step by step in the long run. However, at least each company wants to be unique and therefore it will be very hard to implement and realise common standards in each project stage of new establishments.

This paper is part of a newspaper project carried out at the Institute for Print and Media Technology at the Chemnitz University of Technology, Germany along with industrial partners.

LITERATURE

1. Registrar for Newspapers in India, URL: https://rni.nic.in (Last access: 16.09.2008)
2. Bureau of Indian Standards: Status Report on Standardization Efforts on the Area of Mitigation of Natural Hazards, Ministry of Home Affairs, Government of India
3. Kipphan, H. (Edit.): Handbook of Print Media. Heidelberg: Springer, 2001
4. Carmody, J.; Jeffrey, C.; Kenneth, L.: Builders Foundation Handbook, Oak Ridge National Laboratory, Martin Marietta Systems Inc, U.S. Department of Energy, 1991
5. Johnson, K.: Investments in Press and Mailroom, Preliminary IFRA Special Report 3.34, Second Edition, Darmstadt: IFRA, 2001
6. igb Industrie- und Gewerbebau GmbH: Bau-Info: Druck, Vol. 2, Weimar, Germany, http://www.igb-printfactory.de/fileadmin/user_upload/Bilder/Aktuelles/Bau-Info-Druck/Ausgabe2.pdf (Last access: 10.09.2008)
7. Interview with industry representative: Mr. Naveen Saldhana, Manipal Press Ltd., Manipal, India, 03.04.2008
8. Indian Newspaper Society (INS): Handbook, Vol. I & II, New Delhi: Allied Publishers Pvt. Ltd., 2005-2006
9. Interview with industry representative: Mr. Matthias Schmidt, manroland AG, Chemnitz, Germany, 04.09.2008
10. Interview with industry representative: Mr. Rajakumar, The Hindu, Mangalore, India, 04.04.2008
11. Müller, M; Mischke, A.: How to generate a standardised concept for a new newspaper plant? Chemnitz, Germany, 2008 – Seminar Paper

Contact address:
Chemnitz University of Technology,
Institute for Print & Media Technology
D – 09107 Chemnitz
Germany
Email: paritosh.prayagi@s2007.tu-chemnitz.de
maik.mueller@s2006.tu-chemnitz.de
alexander.mischke@s2006.tu-chemnitz.de
conny.schuhmann@mb.tu-chemnitz.de
Phone: 0049 371 531 23600

DESIGN

p.d.p. convention

BOAR

Dušan Zaklan - Academy of Arts, Novi Sad
zaklandusan@gmail.com

Резиме

Студијско решење из области обликовања књиге. Илустрације на тему: "Живот нераста".

Summary

Illustration & book cover solution study. Illustrations title: "Life of boar".

ZOO STATION, STREET MUSICAL

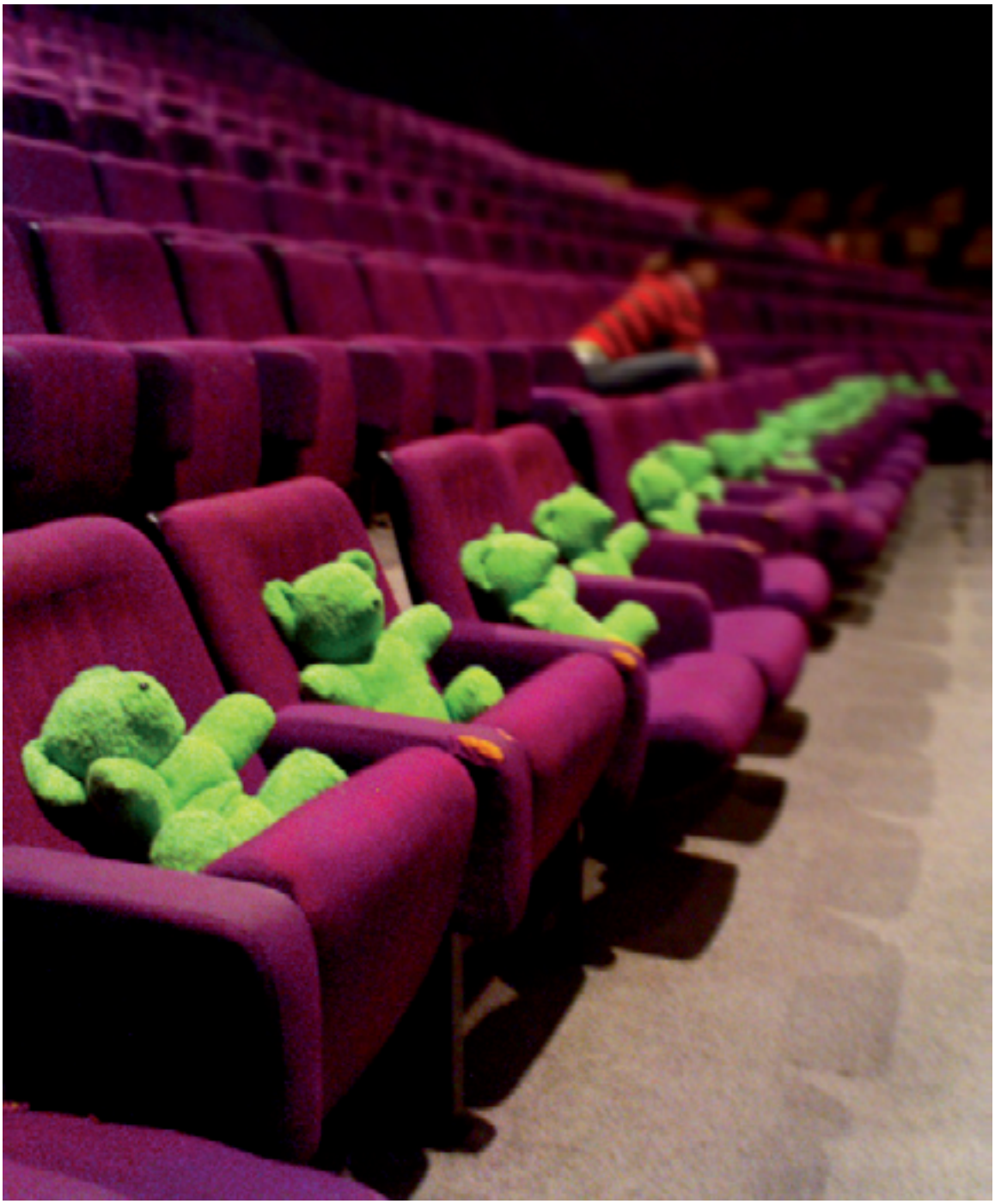
Natalija Ninkov - Academy of Arts, Novi Sad
natalija.ninkov@gmail.com
Ivana Radmanovac - Academy of Arts, Novi Sad
superivana21@gmail.com

Резиме

Као студенти академије добили смо могућност да радимо на пројекту осмишљавања сценографије и визуелног идентитета мјузикла "Станице ЗОО" који је играо на Стеријином позорју 2008.

Summary

As students of art academy we got the opportunity to work on the project of creating a scenography and whole visual identity of the musical "Station ZOO" which played at "Sterijino pozorje" , 2008.



POLISH POSTER

Ivana Radmanovac - Academy of Arts, Novi Sad
superivana21@gmail.com

Резиме

Упркос брзом развоју технологије за оглашавање и преношење информација, савремен начин изражавања се ипак ослања на своје корене и често ослања на раније епохе. Овај рад је пример пољског плаката, са модерним приступом.

Summary

Despite of fast development of advertising technology and data transfer, modern way of expression still relays on it's roots and often looks back at earlier epochs. These piece is example of Polish poster, with modern approach.

APPLIED POSTER - ANTI VIOLENCE

Srđa Đurović, VTŠ, Novi Sad
e-mail: srdjadjurovic@yahoo.com

Резиме

Све што бих рекао о овом раду, речено је на плакату!

Summary

Everything I want to say about this work is already said on the poster!

GRAPHIC DESIGN SOLUTION FOR THE NOVEL “LITTLE RED RIDING HOOD” BY CHARLES PERRAULT.

Vanja Todorić - Academy of Arts, Novi Sad
vanja3d@gmail.com

Резиме

Деца, поготово привлачне, лепо васпитане младе даме, никада не би требале да причају са странцима, јер ако би се за то одлучиле, могле би бити жртве једног од ових вукова. Кажем “Вук”, али постоје различите врсте вукова. Постоје и они који су шармантни, тихи, љубазни, ненаметљиви, пријатни и драги, који прогоне младе жене у кућама и на улицама. И нажалост, ови нежни вукови су управо они којих се треба највише клонити.

Summary

Children, especially attractive, well bred young ladies, should never talk to strangers, for if they should do so, they may well provide dinner for a wolf. I say "wolf," but there are various kinds of wolves. There are also those who are charming, quiet, polite, unassuming, complacent, and sweet, who pursue young women at home and in the streets. And unfortunately, it is these gentle wolves who are the most dangerous ones of all.

OLYMPIC POSTER, BEIJING 2008

Velimir Andrejević - Academy of Arts, Novi Sad
andrejevic.velimir@gmail.com

SUPERMARKET SRBIJA

Milena Veletić - FTN , Graphic engineering and design, Novi Sad
v.mixy@yahoo.com

Резиме

Да ли идете у шопинг? Шта је то модерно у Србији?....Стручњаци кажу да је тренутно јако популарно преживљавати... Ангажовани плакат инспирисан свакодневним проблемима са којима се сусрећу становници Србије: све већи број супермаркета,сталан раст цена и чувена „потрошачка корпа“...

Summary

Do you go shopping?What is modern in Serbia?...Experts say that surviving is very popular at the moment... This is involved poster inspired by everyday problems of serbian citizens: more and more supermarkets,continual increse of prices and famous „consumer cart“..

POSTERS FOR INFANT FESTIVAL AND IBUSAR PERFORMANCE

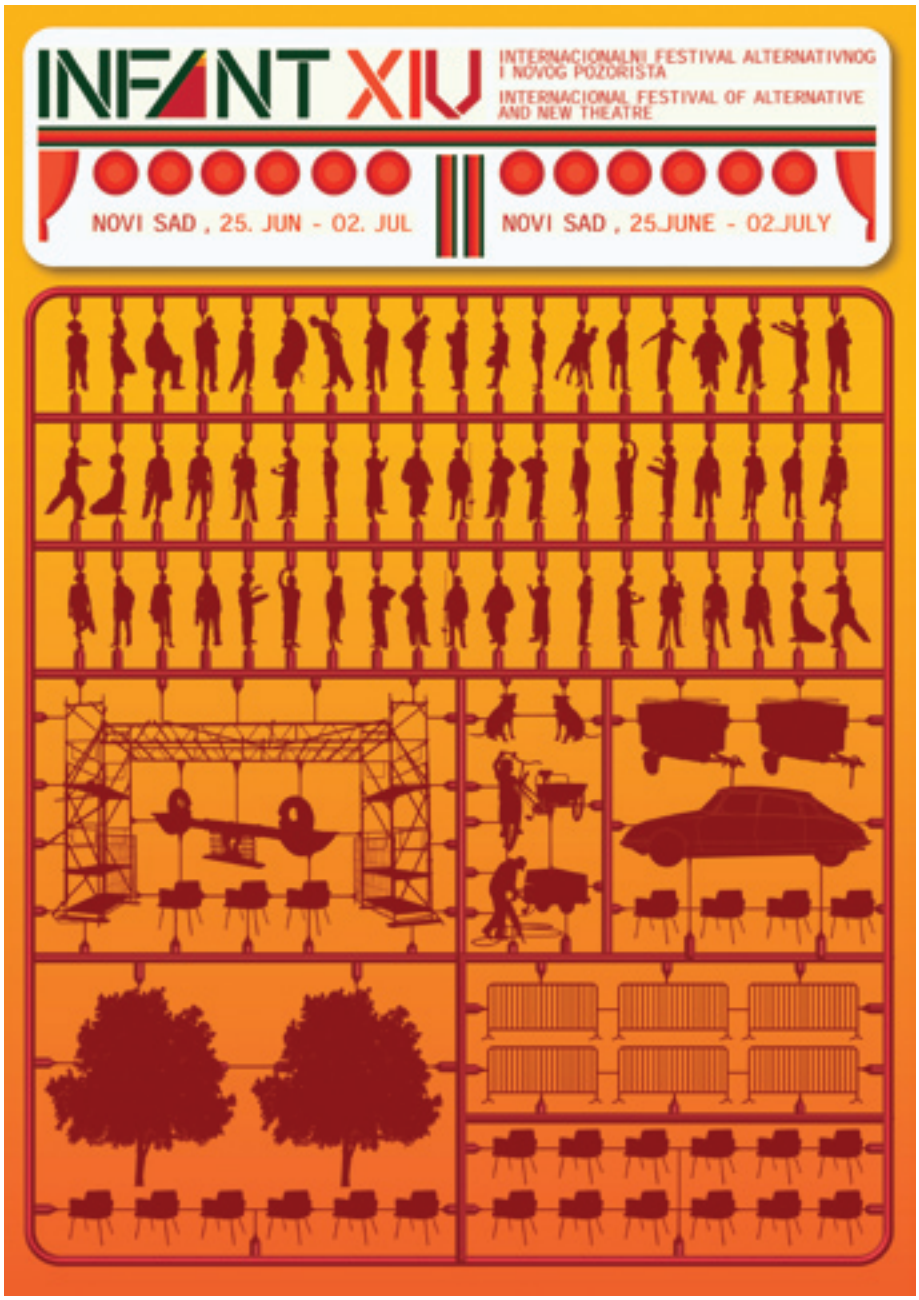
Marko Vuleta-Đukanov - Academy of Arts, Novi Sad
dizajnermarko@gmail.com

Резиме

Инфант је фестивал новог и алтернативног позоришта који се заснива на концепту да позориште више није везано само за класичну позорницу већ може бити било где, на улици , тргу у парку. Мој плакат сам базирао на приказу пластичне шеме за прављење макета (нпр. авиона) која се састоји од пуно малих делова , само што су то овде делови од којих се иначе састоји позорница и позориште уопште. Тако да се позорница може креирати по жељи.

Summary

Infant is Festival of Alternative and New Theatre with it's concept that theatre can be open or closed type, everywhere...street, park, stage .. at any possible place. My poster was based on plastic molded scheme for making small plane models (lots of small parts that you glue together to make plane toy) but here you have everything that is in connection with theatre, so you can make your own stage setup with actors, scenography, audience.



AT UNCLE'S HOUSE

Ana Šimon - Academy of Arts, Novi Sad
annasimo@gmail.com

Резиме

Илустрације су рађене на основу песме ''Код чичине куће'' од Бранка Ћопића намењене најмлађој популацији. Идеја је да се направи књига формата 18x36 која ће увести децу у живот на фарми,а успут их и потстаћи на читање и писање.

Summary

The illustrations are representing the poem of Branko Ćopić ,''Kod čičine kuće'', which is written for children.The idea is to create a book (format 18x36 cm) which will introduce the farm life to the kids, and help them learn how to read and write.


Za kobilom ždrebe skita,
rogama se zadrijm ----


ŽUĆA
U dvorištu čujem glas,
laje Žućo ljuti ---

DESIGN OF THE MAGAZINE “ARROWHEAD” THAT IS DEDICATED TO GRAPHIC DESIGN, AND STILL UNKNOWN ARTISTS

Vanja Bobić - VTŠ, Novi Sad
vanjabbc@yahoo.com
Božidar Ćalić - VTŠ, Novi Sad
bozidar_sner@yahoo.com

Резиме

Часопис који дизајнирамо носи име нашег тима који сачињавамо само нас двојица за сад. Покушали смо да кроз овај пример како би часопис требао да изгледа, представимо неке од наших радова и покажемо како размишљамо, и какав је наш поглед на свет око нас. Наравно у реалном часопису Ероухед који би излазио месечно, ми би се потрудили за сам дизајн часописа,а радови који би се нашли унутра припадали би онима који желе да још неко зна за њих, и на тај начин ако се некоме свиди њихов стил, изађе у сусрет давањем посла, унајмљивањем,итд…

Summary

The magazine we design carries the name of our team, wich create only the two of us, for now. Trough this example of how the magazine should look like, we present the some of our projects, to show the way we think, and our view on the world around us. Of course, we would take care for the design of real Arrowhead magazine, that would come out monthly. The projects we would present in it will belong to those that would like for someone out there to know about them, and maybe if they like their style could help them in any way, hiring them, or something else…

BOOK COVER SOLUTIONS

Dimitrije Pajtić - Academy of Arts, Novi Sad
pwkdima@gmail.com

Резиме

Приказана серија радова описује графичко решење корица лектире за ниже разреде основне школе. Ликовни концепт почива на комбинацији традиционалног решења главног мотива и модерног изгледа целине. Традиционална стилизација доминантног мотива прилагођена је узрасту, а модерни елементи целине стилски уједињују серију.

Summary

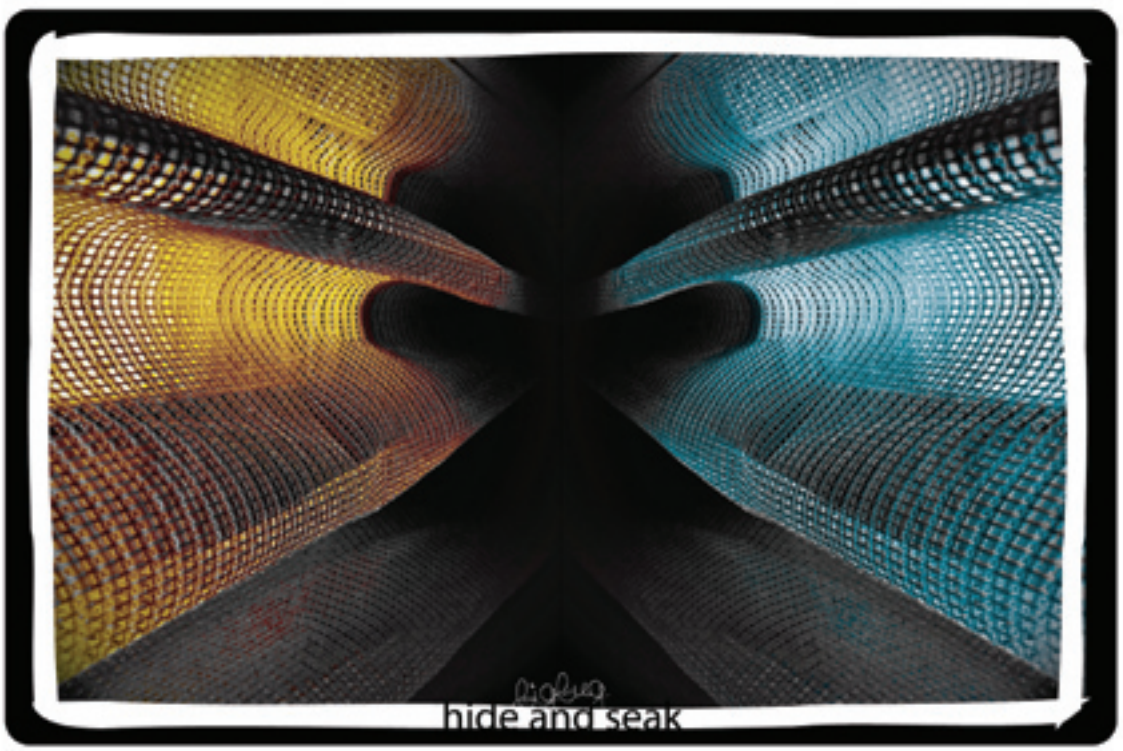
Featured presentation describes a graphic solution of book cover concerning the school reading suggested for lower grades. Visual concept rests on combination of traditional art solutions of the main theme and modern looks of the whole cover. Traditional styling of the dominant theme is made for the age of the readers, and modern elements are visually unifying the series.

FRAMES OF YOUR DREAMS

Marina Andrin - FTN , Graphic engineering and design, Novi Sad
andrin@ptt.yu
www.myspace.com/bubamarra

Резиме

Селекција радова одабрана је из гомиле фотографија, материјала који сам прикупљала последњих 5 година. И управо ти радови чувају у себи засебне тренутке, другачија осећања, који се опет могу склопити у једну причу, јединствену комбинацију различитог. Снови. Моји, твоји. Као нестварни, тешко ухватљиви, недокучиви, приказују суштину постојања, откривају твоје и моје тежње, осећања којих ни сами нисмо свесни. Надам се да ће те моји "исечци" спровести кроз један такав сан. Уживај.



Summary

This selection presents my work from last 5 years of photographing, seeing world through photo camera. These few photos are presenting special moments, different feelings, and, like puzzle, they are creating unique story, combination of different things. Dreams. Mine, yours. They are so unreal, unreachable, infinite, sense of existence, revealing yours and my desires, feelings that even ourselves are not aware of. I hope my "frames" will guide you through one of that dream. Enjoy.

SIMILARITIES AND DISTINCTIONS OF GRAPHIC AND WEB DESIGN

Vanja Srbin - FTN , Graphic engineering and design, Novi Sad
vanja.srbin@gmail.com

Резиме

Данашње глобализовано друштво, којег одликује неограниченост и брзина информација, као и потреба за лаким начинима долажења до сазнања, условило је проширење медиа од штампаног материјала на Интернет. На примеру графичког дизајна: стони календар за фирму "Греенфисх" и web дизајна: два web сајта, приказане су сличности и разлике у дизајну, лауоут-у, самом концепту и изведби ове две врсте дизајна. Код графичког дизајна постоје одређена ограничења која се морају поштовати, као што су формат, ЦМУК колорни простор, маргине и начини прелома текста. Код web дизајна се мора узети у обзир прилагођавање различитим резолуцијама екрана, колорни простор је РГБ што повећава опсег боја које се могу користити, дизајн треба да је прочишћен са наглашеним најбитнијим информацијама, и треба да омогући лако програмирање и оптимизацију. Колико год да су слични или различити, графички и web дизајн имају исту карактеристику: треба да су допадљиви, лепо обликовани, јасни и да преносе информацију.

Summary

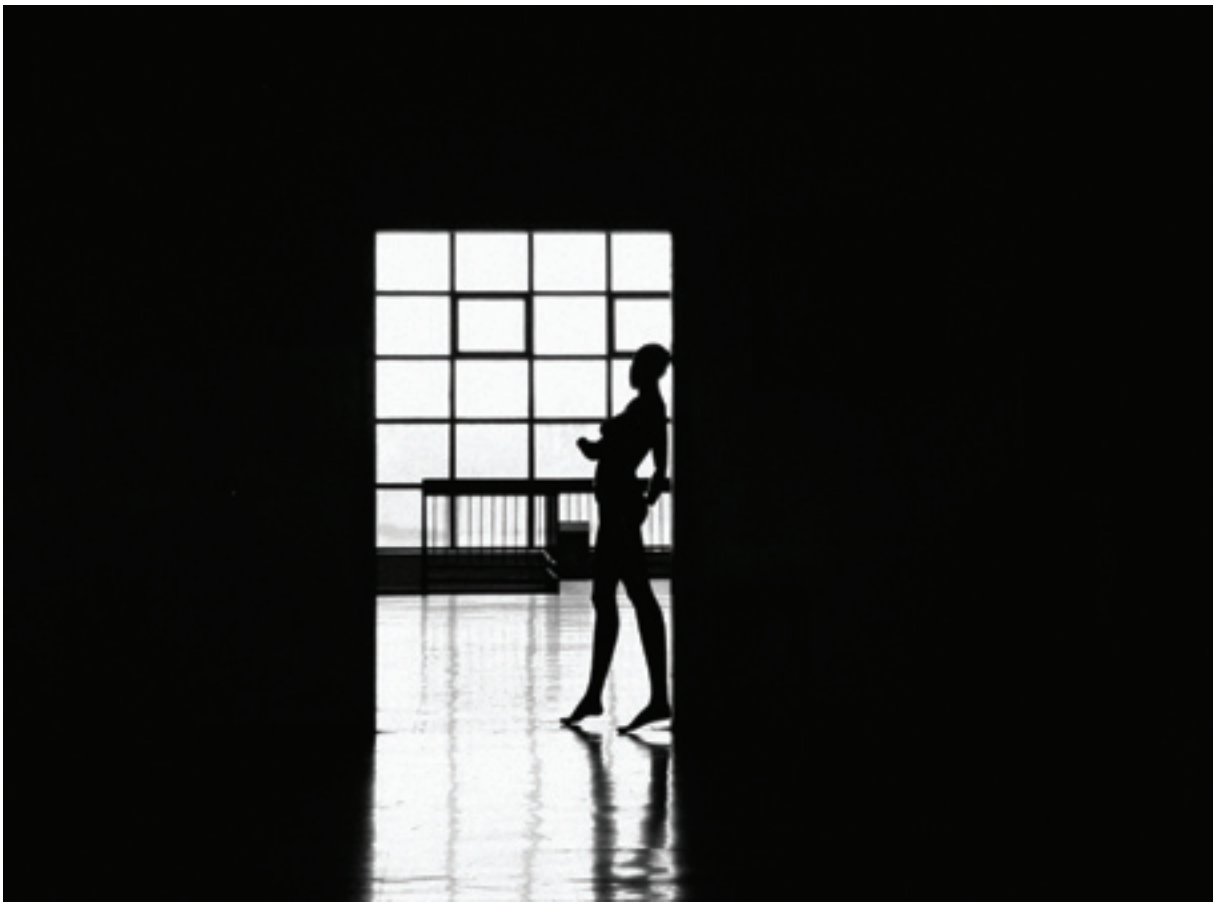
Today, world of globalization, which can be described in fastness and unlimitness of information, and need for easy way of knowing as well, has termned media expandation from printed material to Internet. In this work, graphic design: "Greenfish" calendar and web design: two web saits, it has been shown similarities and distinctions in design, layout and conceptions of this two design classes. Graphic design has some limitatitons that must be respected, such as format, CMYK color space, margins and text layout. Web design has to adapt to different monitor resolutions, color space is RGB, which approve more colors to be used, the most important informations has to be marked and accent, and programming and optimization of web design must'n be complicated. As much as similar or distinctive, this two web classes has the same characteristic: they need to be pleasant, with a nice form, simple and transfering the information.

PHOTO GRA PHY

p.d.p. convention

BLACK&WHITE PHOTOGRAPHY STUDY

Velimir Andrejević - Academy of Arts, Novi Sad
andrejevic.velimir@gmail.com



PEOPLE AROUND US

Predrag Novaković - FTN , Graphic engineering and design, Novi Sad

Резиме

Човек, иако важи за најсавршеније живо биће на Земљи, често не успева током свог кратког животног века да сагледа све лепоте, друге људе и ствари које га окружују. Фотографија, као средство којим успевамо да "замрзнемо" и ухватимо тренутак, помаже нам да људе око себе посматрамо из другог угла, да се не заврши све на само једном кратком погледу, већ да сачувамо лица, изразе, покрете, а нарочито осећања. Сваки човек у себи носи одређену емоцију, одређено осећање које веома често несвесно и показује. Овом серијом фотографија људи из целог света, желео сам да покажем, да су људи, ма колико били различити, у ствари веома слични и да су, ипак, само људи. Такође, на овим фотографијама могу се видети и младост и старост, безбрижност и сета, сјај и беда, све оно што живот јесте.

Кључне речи: фотографија, људи, човек

Summary

Although humans are most perfect living beings, very often, during their short life they do not get to see all the beauties, other people and things around us. Photography, as an instrument for capturing and freezing the moment, helps us to see people around us from another perspective. It should not end on just one short look, we should preserve faces, expressions, moves, and especially feelings. Every human carries inside himself a certain emotion, certain feeling which is usually being showed quite unknowingly. With these photographs of people from all around the globe, I wanted to show, that people, no matter how different they seem to be, are actually very same, and that they are, after all, just humans. Also, these photos present both youth and old-age, carelessness and melancholy, glory and misery, everything that life is.
Keywords: photography, people, human

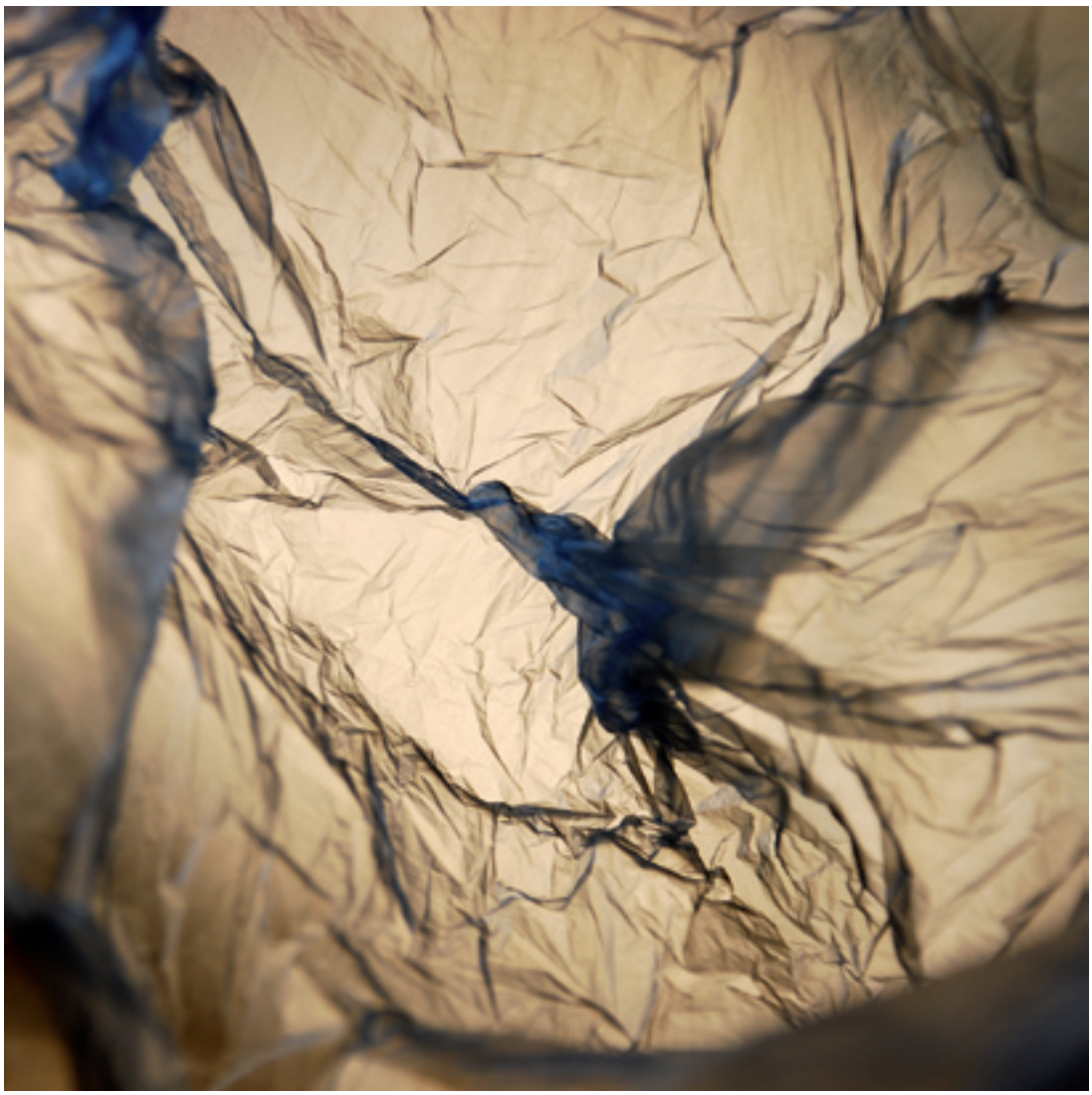
Predrag Novaković
Email: djapeman@gmail.com
www.djapeman.com

REAL-UNREAL, ORDINARY-DIFFERENT

Dragana Jokmanovic - Academy of Arts, Novi Sad
jokmanovicd@gmail.com

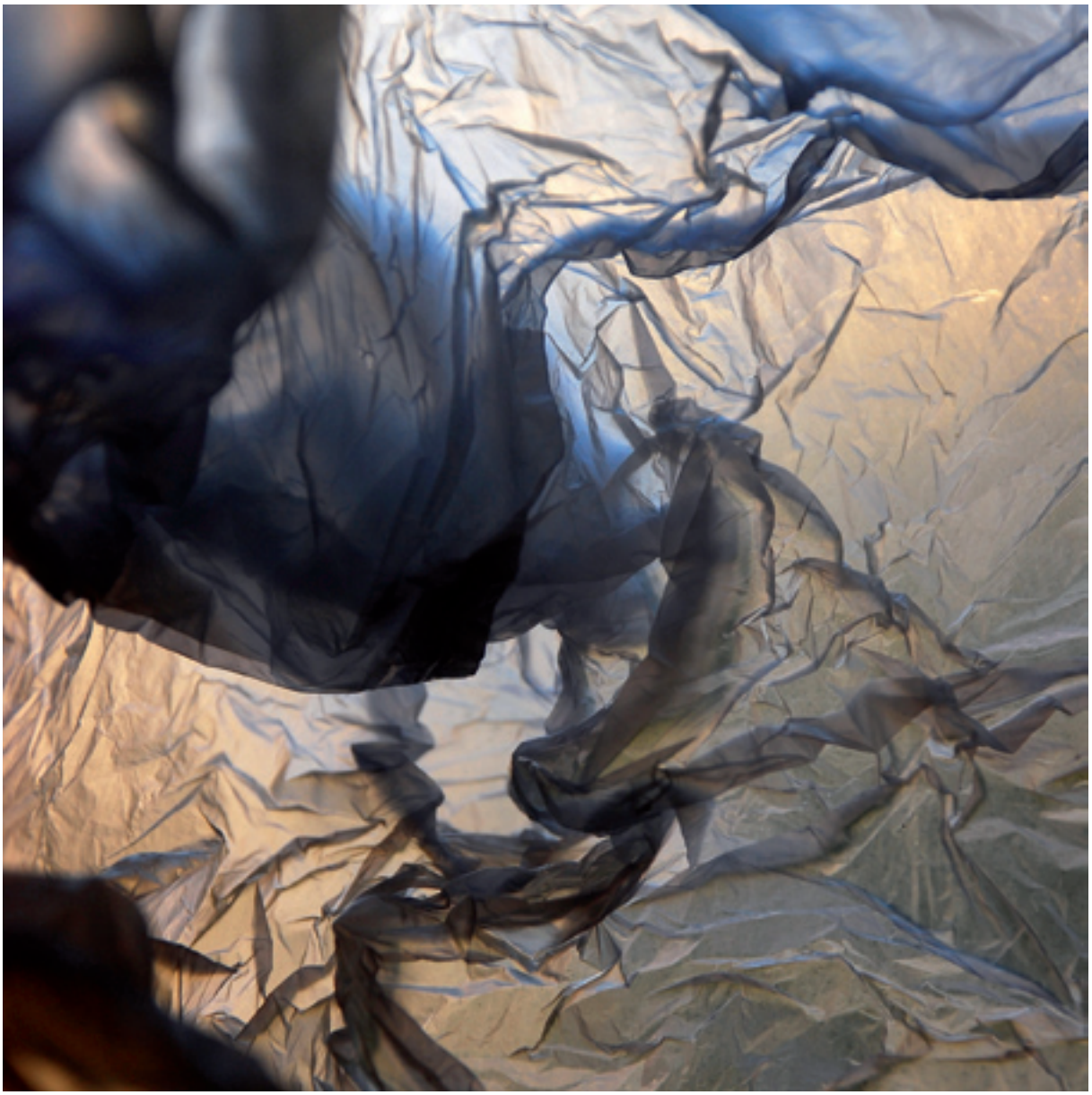
Summary

Transformation of an object by light-creating new "spaces".ORDINARY(plastic bag), gets new, personal dimension. Abstract.



Резиме

Трансформација објекта путем светла, стварање нових "простора".ОБИЧНО (пластична кеса), прелази у нов, субјективни контекст - нов "простор". Надреално.

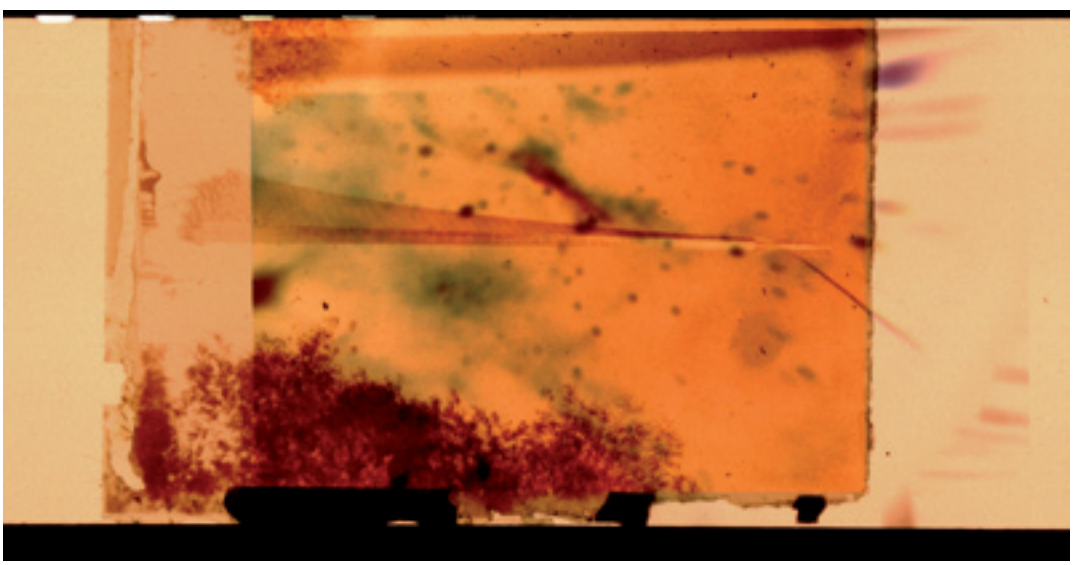


THE MICROCOSMOS OF THE DUST IN MY JEWELRY BOX

Dajana Marjanović - FTN , Graphic engineering and design, Novi Sad
marjanovicdajana@yahoo.com

Резиме

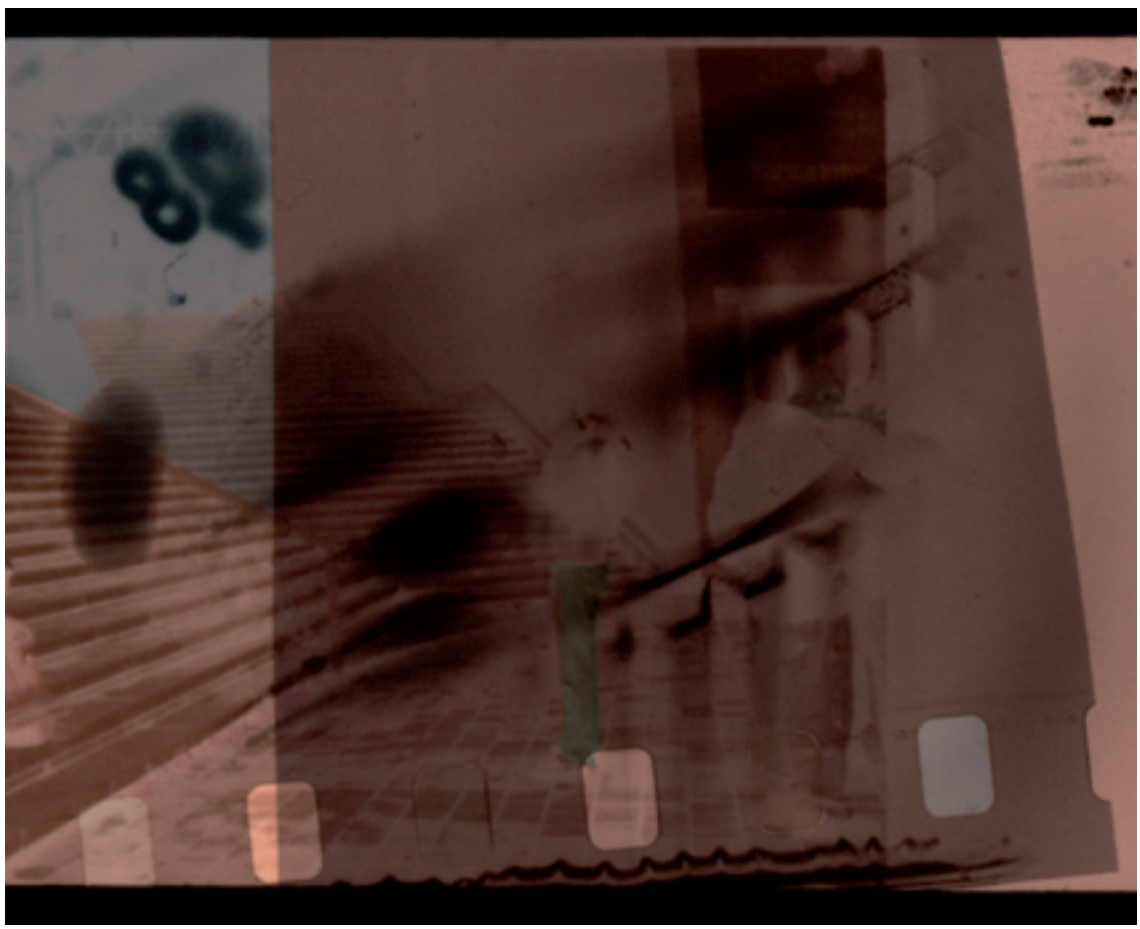
Игра бојама, сенкама, облицима, воде ме у неисцрпан свет маште у коме статично започиње кретање, неживо постаје разиграно, ирационално се чини као стварно. Тај неопипљиви свет ковитла се у мени, истовремено даје и црпи енергију, узбуђује ме и смирује. Када тај микро свет у једном бићу, прожет имагинарним и ирационалним, дотакне, макар за тренутак, машту другог бића, деси се необична, али стварна прича. Тренутак је довољан да се споји, да се употпуни и да се створи... У овом "микрокосмосу", како сам га назвала, као и у сваком космосу, постоје правила која ову игру чине хармоничном. Правила овог микрокосмоса су директно повезана са теоријом ликовних форми. Хармонија, као основни принцип компоновања, и моје виђење света, као машта комплементарни су и равноправни у овој игри. Та игра је алегорија бесконачног надопуњавања разума и маште. Ова серија се не бави дигиталном фотографијом, нити фотографијом на класичан начин, већ комбиновањем ове две врсте бележења светлосних информација. Комбиновањем и преклапањем негатив и диапозитив филмова постигла сам ефекат вишеструке експозиције. Тако преклопљене филмове сам скенирала и обрадила у програмима за обраду фотографија.
Опрема: Аналогни фото-апарат ЗЕНИТ 122, полу-аутоматик PENTAX ME SUPER, филм Agfa 200 ASA.



Summary

Play of colors,shadows and shapes, are taking me to the endless world of imagination. That immaterial world twirls in my being, it gives me and draws energy from me. It possessed me, it exicits me and makes me calm. If the microworld,which in some being is engrain with imagination and irrationality, touches even for a moment the imagination of another being, it's going to happen an unusual but real story. Only one moment is enough to blend everything together, to make everything complete and to make it happen... This "microcosmos", like any other cosmos, has it's rules which make this game harmonic. The rules of this microcosmos are directly connected with the theory of art forms. Harmony (as the basic principle of composing) and my vision of the world (as imagination) are equal in this game. That game is an allegory of the endless complementarity between rationality and imagination. This serie doesn't deal with digital photography, or photography on the traditional way, but whith combining these two kinds of saving/noting light informations. By combining and overlaying negative and diapositive films, I achieved the effect of the multyplied exposition. I scaned these overlayed films and edited them in programs which are used for photography treatment.

Equipment: ZENIT 122, analog; PENTAX ME SUPER, semi-automatic; film Agfa 200 ASA.



OUT OF PLACE, CONFUSION, DISORDER, DISCONECTION OF THE ELEMENTS

Maša Cvijanović - Academy of Arts, Novi Sad
ingahoff@gmail.com

ART OF GLOBAL WARMING

Nikola Bradonjić - FTN , Graphic engineering and design, Novi Sad
muveizabe@gmail.com

Резиме

Плесни перформанс инспирисан поемот ‘‘Мислим реку’’. Музика прати странчев ход.

Summary

Dance performance inspired by poem ‘‘I mean river’’. Music follows the stranger’s walk.

MOMENTS

Irma Puškarević - FTN, Grafičko inženjerstvo i dizajn, Novi Sad
burmese.bu@gmail.com

Резиме

Најинтересантнија ствар у вези са уличном фотографијом јесте константна активност која се одиграва на улицама, посебно у већим градовима. Чак и у најзабаченијем делу града постоји прича вредна бележења. Људи су кључни фактор и у том случају фотограф мора да заборави на стидљивост због тога што је циљ прићи субјекту што ближе, изаћи из калупа снимања класичних и досадних фотографија и забележити тај моменат који ће у посматрачу изазвати неку реакцију. И код концертне фотографије постоји слична ситуација што се тиче дешавања, за разлику од, нпр. пејзажне и студијске фотографије, где објекат сликања мирује. На концертима се све покреће и нико не мирује. Када стојите испред бине, знате да је иза вас стотине фанова који су љубоморни на вас.

Summary

The most interesting thing about street photography is that there's always action, especially in big cities. Even at the most deserted part of the city lies a story, scene, a moment...People are the main subject here and there is no room for shyness. Photographer needs to get close to its subject, try to take a shoot from a different angle and not to take boring pictures. A photo needs to yield a certain reaction in a viewer.

Concert photography also refers to movement unlike portraiture or landscape photograpy where the object of photograph is not moving. Nobody stands still. In fact, even the notion of standing still ruins the idea of a good music photo. You have five thousand fans behind you, and there is a band in front of you. he bouncers hate you, because you are in their way. The crowd is jealous of you.

STREET FASHION

Marina Paulenka - University of Zagreb, Faculty of Graphic Arts
rinnci@gmail.com

Резиме

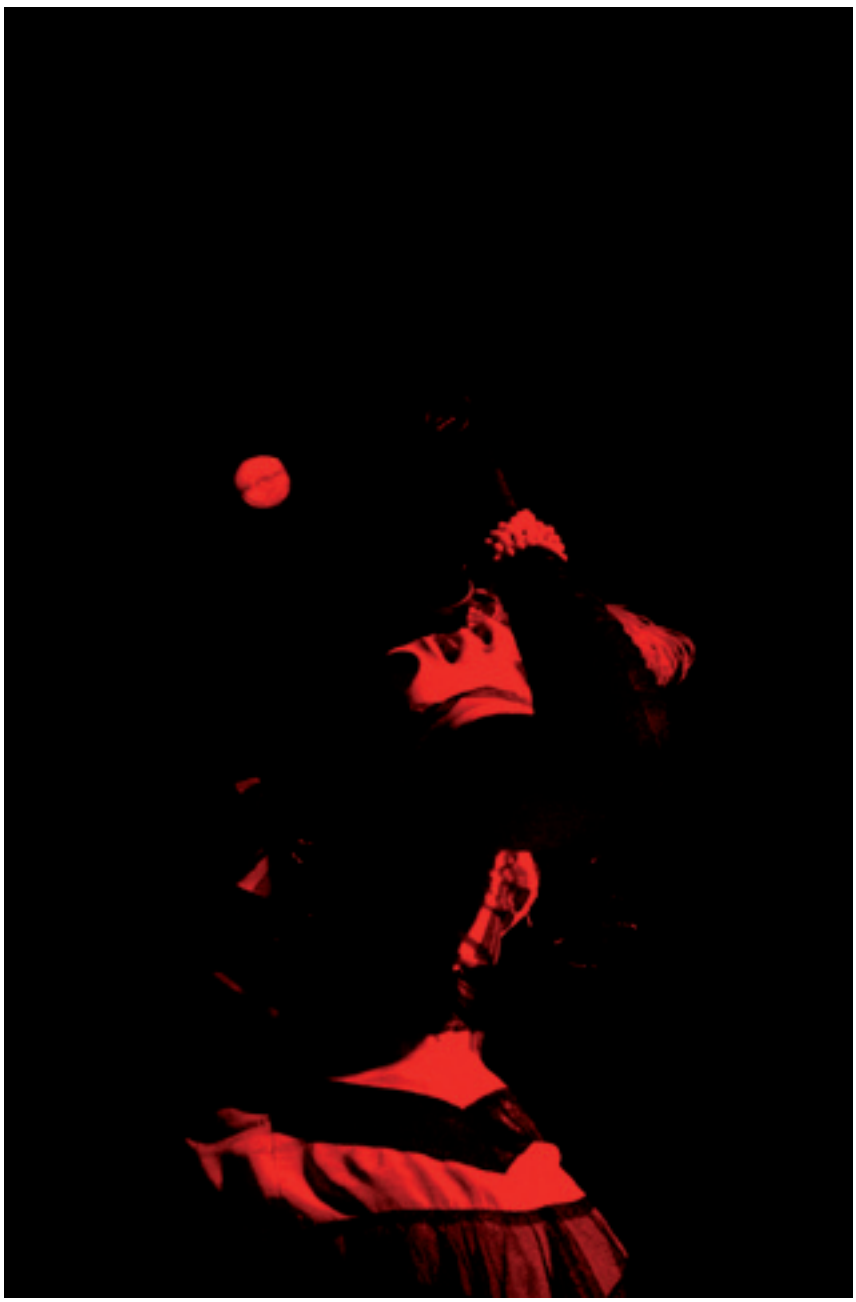
Први део ове серије фотографија чине портрети инспирисани ликом и делом Фриде Кало у комбинацији с амазонским утицајима. Други део серије настао је у тежњи реконструкције ретро стила у комбинацији с елементима данашње уличне моде.

Summary

First part of this line of photography is inspired with image and act of Frida Kahlo in combination with an Amazon impacts/influence. Second line of photos is created in ambition of reconstruction of retro style in combination with elements of nowdays street fashion.

FIGURATION, EXPRESSION THROUGH MOVEMENT, DARKNESS, CONTRAST

Mihaly Molnar Megyeri - Academy of Art, Novi Sad
mihalymm@gmail.com



ROAD KILL

Vanja Todorić - Academy of Art, Novi Sad
vanja3d@gmail.com

Резиме

Ништа нам не даје за право да усмртимо неко живо биће, без обзира на то колико је оно по некима, безначајно и мало. Људи обично раде ове ствари, и чак се ни не осврну да виде хаос који су направили или створење коме су управо одузели живот. Ове фотографије стоје као подсетник на ову људску необазривост.

Summary

Nothing gives you the right to drive over a living being, no matter how small or insignificant it is. People usually just drive over something, and never look back to see the mess or the creature they've just killed. These photographs stand as a reminder to this human inconsideration.

PANORAMA OF GARBAGE

Natalija Ninkov - Academy of Art, Novi Sad
natalija.ninkov@gmail.com

Резиме

Случајно сам се задесила баш на овом месту. Испрва сам се запитала шта уопште тражим ту, међу хрпом смећа, старих кола, зарђалог метала… Не неки чудан начин, ипак сам била импресионирана количином, величином, разноликошћу тог одбаченог материјала, И машинама које су већ тако мртве ствари својим зубима још више мрвиле. То је отпад, панорама на крају града.

Summary

I happen to be in this place by accident. At first, I was wondering what am I doing here, among hills of junk, old cars, rusty metal… In a strange way, I was impressed by amount, largeness, and diversity of those abandoned materials, and by machines which were smashing those already dead things with it's teeth. That is the junk, panorama by the side of town.

EUROPEAN POSTCARD

Danijel Pap - FTN , Graphic engineering and design, Novi Sad
danijel.pap@gmail.com

Резиме

Ако сте погледали моје фотографије, сигурно сте приметили да то нису класичне туристичке фотографије. Кроз дате кадрове сцена и детаља сам покушао да пренесем тај утисак и атмосферу коју су та места оставила на мене. Трудио сам се да их прикажем на начин на који сам их ја доживео. Јединтвен је осећеј путовати, бити негде другде, сагледати себе и свет из потпуно другачије перспективе. Стајати испред Ајфелове куле, Аја Софије, Колосеума и схватити да је све могуће, да човек нема границе, да смо ми сви исти а опет различити. Тек када смо негде другде, схватимо колико пуно имамо и колико вредимо.

Summary

It's a unique feeling when you travel, being on some other places than usually, looking at your self and the world in a much different way than before. Standing in front of the Eiffel Tower, Hagia Sophia, Koluseum gets and realizing that everything is possible, that man has no boundaires, that we all are the same but again different with something that makes us special. Only when we are somewhere else,we understand how much we have and how much we worth. If you view my photos, you have certainly noticed that are not traditional tourist photos. Through the staff scenes and details I tried to take the impression and atmosphere that this place left in me. I tried to show them the way that I have experienced them.

Сви пројекти унутар овог документа приказани су у оригиналном облику, онако како су предати од стране аутора. ‘’PDP convention’’ тим није одговоран за евентуалне грешке, било да су оне граматичке или правописне природе. Такође, ‘’PDP convention’’ није одговоран за евентуалну нетачност информација представљених у садржају пројеката. Сваки од аутора носи потпуну одговорност у вези са својим радом.

All the projects in this document are presented as received from their authors. PDP convention team will not be held liable for questionable project contents, i.e. errors, false statements, grammatical or spelling mistakes that might have occurred in the making of the projects. All final products fall under full responsibility of their authors.

Стручни жири:

Штампа:

Проф. др Драгољуб Новаковић, ФТН, Нови Сад

Асст. мр Игор Карловић, ФТН, Нови Сад

Асст. мр Живко Павловић, ФТН, Нови Сад

Дизајн:

Проф. мр Слободан Недељковић, Академија уметности, Нови Сад

Проф. Бошко Шево, Академија уметности, Нови Сад

Асст. мр Урош Недељковић, ФТН, Нови Сад

Фотографија:

Дизајнер фотографије Иван Карлаварис

Асст. Горан Јуреша, ФТН, Нови Сад

Председник ФКВСВ Душан Живкић

Patrons

SCREEN MEDIA TECHNOLOGY

manroland

xerox

KBA MÖDLING SUED OST D.O.O.

Gold sponsors

NEW DEAL www.new-deal.biz CTP & PREPRESS EXPERTS

PRO FOTO

ŠTAMPARIJA "PREŠ KOMERC"

DPC DIGITAL PRINTING CENTER

Silver sponsor

Futura

CENTRO papir plus

GRAFIKUM

Foto-OKO ŠTAMPARIJA

Bronze sponsor

AMB GRAFIKA 1907

DANIEL PRINT ŠTAMPARIJA

AGFA

KONTAL

QUADRA

grafičko preduzeće sitoprint

Crveni Taxi

grafoprodukt štamparija

Media patron

PTB Радио-телевизија Војводине

Organizer

СУФТН Студентска унија Факултета техничких наука

pdp Team

Support

Universitas Studiorum Neoplantensis

Факултет техничких наука Нови Сад

GRID