

# QUALITATIVE ANALYSIS OF MAGAZINES PRODUCTION OFFSET PRINTS

Čebruk A. , Venytė I.  
Kaunas University of Technology

## **Abstract**

Qualitative analysis of magazines production offset prints has been conducted. It is important to pay attention to the quality of separate prints as well as to the quality of the publication as a whole while printing magazines production. In this article the analysis of most common defects, sources of these defects and ways to eliminate them is introduced. The findings suggest that quality of print is adversely affected by improper choice of materials or incorrect development of technical process itself. In case where in single publication of magazines production different quality paper is used, there could occur variety of color characteristics which negatively affects visual quality of the publication

**Keywords:** *magazines production, defects, quality, offset printing.*

## **Introduction**

Printing companies keep on improving their equipment, quality of work and the technological process but print press quality issue persists. It is known that the allowed amount of defects can be up to 0.5% of total production amount [1]. Srividya B. from Anna University has analysed the press print quality and provided several options of how it would be possible to decrease the amount of defects in offset print process. [2]. In the analysis of Е.А.Никанчикова and А.Л.Попова, the authors also suggest what the conditions shall be in order to avoid future defects and improve quality in quality [3]. In his analysis, Peter Muller points out the crucial effects that happen when cylinders contact the paper [4]. The purpose of this research is to carry out a qualitative research of magazines produktion of offset printing and to determine the main causes of defects and propose the tools to avoid them. Taking into account the mentioned scientific researches, the qualitative research was carry out on various types of paper reglamented by ISO standards. Every paper structure is different because of the materials used in paper making process. The investigation

and quality analysis of two different paper types was made. *Galerie brite (LWC)* and *Lumipres ART (MWC)* are amongst more popular types of paper in most printing houses. The qualitative analysis was carried out on selected types of paper. The percentage of defects is shown in the graphs.

### Research methodology

This analysis is based on most common print defects on various types of paper. 50 of imprints with various kinds of defects were manufactured on *Galerie brite* and *Lumipres Art* paper.

The printing process was carried out using *GOSS M600* printing press. After visual analysis of the defects, the most common defects among various types of paper were identified. For most common defect types the deeper research and evaluation of quality was carried out. The measurements of colour difference  $\Delta E$  between the analyzed objects was made. The results of colorimetric analysis were compared to imprints made according to ISO 12647-2 standard. Following the mathematical formula the colour difference  $\Delta E$  were identified. The measurements of optical density between two equally length colour waves was carried out. As well as changes in colour space between control imprint and imprint that has a color defect. Results were determined using *Gretag Macbeth D19* densitometer and *Gretag Macbeth Spectroeye* spectrophotometer.

Table 1. Technical characteristic of analysed paper

<i>Characteristics</i>	<i>Galerie brite</i>	<i>Lumipres ART</i>
Grammage	60 g/m <sup>2</sup>	130 g/m <sup>2</sup>
Brightness	80 %	99 %
Whiteness	70 %	122 %
Opacity	91 %	95 %
Gloss	57 %	70 %

### Results and discussions

After the analysis of magazines production offset prints examples of the most common defects for given kind of paper were identified. Results are in given in Table 2.

Table 2. Print defects, their causes and ways to avoid the defects

Defects	Defect cause	Ways to avoid
<b>Structural defects</b>		
Printing elements double imprint. (Galerie brite) 	Less than 120 N/cm tense of offset cylinder rubber surface (dekel). Uneven stretching of paper. Mechanical vibration in printing section. Pressure between cylinders exceeds 120 N/cm.	After noticing the defect, turn on the automatic rubber cleaning mode. Evaluate paper acclimatization. Tense the offset rubber.
Stretching of print elements. The imprint becomes longer or shorter. (Galerie brite) 	The dekel is wider than required (0.23 mm). Vibration of mechanical bearings near the cylinders. The belt needs tightening. The pressure between forming and offset cylinder is too high.	Choose the right dekel according to the technical properties. Tighten the offset gum. Evaluate paper grain direction.
Press element extortion. (Galerie brite) 	Viscous ink. The amount of ink is too big for paper-type.	Adjust the water and ink supply. Use the softening paste.
Spots, dots, noise inside the imprint (Lumi pressART) 	Dust and refuses, sticked to gum offset or plate, cover the raster points.	Clean the offset gum or plate. Remove dust and refuses from ink spindles. Perform a process monitoring.
Colour derivation (Galerie brite) 	Non coincident CMYK colours in according to alignment.	Precisely perform colour squaring. Evaluate the status of the forms., check if they are equally bent.

<b>Procedural defects</b>		
<p>The emulsifying of press elements (<i>Galerie brite</i>)</p> 	<p>Paint emulsifying with irrigation fluid affects paint irrigation from printed area. Too much of irrigation fluid is given to print form.</p>	<p>Adjust pH. Adjust the paint and irrigation fluid balance.</p>
<p>The imprint is too bright (<i>Lumi press ART</i>)</p> 	<p>The amount of ink is too big. Elements receive ink even if they are not supposed to.</p>	<p>Adjust ink rollers. Reduce the amount of ink.</p>
<p>The contrast of imprint is too low (<i>Galerie brite</i>)</p> 	<p>The gain of 80% raster point of black colours is 7%, when 16% is needed The optical density of the ink is higher than standard amount.</p>	<p>Adjust ink transfer spindles. Increase ink transfer. Adjust ink balance. Evaluate the ICC profile of colours before printing.</p>
<b>Halftone graduation defects</b>		
<p>Primary paper layer rupture. (<i>Lumi press ART</i>)</p> 	<p>The adhesion of ink is too intense. Offset gum receives paper pieces.</p>	<p>Start printing after the ink and press rollers will warm up. Add softening paste into the ink.</p>
<p>Paper wrinkles (<i>Galerie brite</i>)</p> 	<p>The deformation of roller affects unequal stretch of paper line.</p>	<p>Adjust the rollers of paper stretch. Change the paper roll.</p>

Optical defects		
<p>Inadequate coverage of ink (<i>Galerie brite</i>)</p> 	<p>The gum fiber of paint transfer roller is stamped and during the contact the amount of ink is not adequate. There is no raster elements left in whitespace when creating a printing plates. The viscosity of ink is low. Emulsion with water.</p>	<p>Adjust rollers, change the deformed rollers with new ones. Check the ink coverage amount on plate cylinder.</p>
<p>The reflection of press ink (<i>Lumi press ART</i>)</p> 	<p>The amount of ink is too big. The ink is too liquid. The drying temperature of imprints is lower than 140°C.</p>	<p>Take into account the structure of paper and optical density standards for different paper types. Use inks that dry faster.</p>
<p>Ink gets washed (<i>Galerie brite</i>)</p> 	<p>The emulsifying of ink with irrigation fluid.</p>	<p>Adjust the balance between ph, ink and irrigation fluid.</p>
<p>Ink gets washed away from the imprint (<i>Galerie brite</i>)</p> 	<p>Raster point is washed away from offset cylinder with gum surface.</p>	<p>Adjust the supply irrigation fluid.</p>

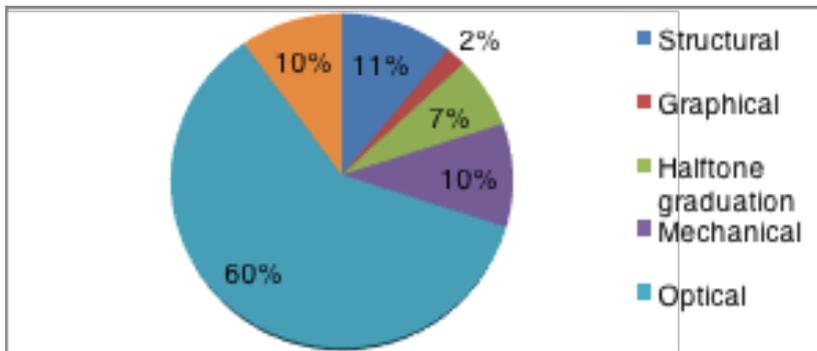


Fig. 1. The distribution of amount of defects

The results show (Fig. 1) that in journals press production optical defects account 60% of all analysed specimens (sample: 50 items). In analysed imprints 11% of defects were structural damage which was done by misusing the printing press. Processing defects account only 10% because various printing machines have various ink absorption. While printing on 130 g/m<sup>2</sup> coated paper, the paper could not absorb the ink and viscosity was high. In this case it is necessary to use softening paste. 13% of halftone graduation defects appeared because of incorrect choice of materials or factors related to it. It was noticed that while printing on a coated paper using well adjusted ink transfer system, the first layer was torn after the contact with offset cylinder. It was due to too viscous ink which did not penetrate into paper. It was found that in the printing Sequence cyan and Magenta, in blue section ink coverage was not sufficient and in purple section ink torn happened.

After performing the visual analysis of print quality, most common optical defects were determined. Comparison with real magazines production imprints printed on (*Galerie brite and Lumipress art*) was carried out. The results revealed different shades of same colour. The evaluation of imprint colour coverage was carried out as well as CIE L\*a\*b colour conveying accuracy check between imprint and imprint with optical defects.

It was found that magenta and yellow colour coverage is unstable. This caused the different shades defect because  $\Delta E$  value is higher than critical colour difference. The comparison between imprints showed that with the increase of the thickness of ink layer, the b\* coordinate varies in accordance from colour, meaning yellow and magenta will often strengthen its values and cyan colour will absorb yellow shades.

The coordinate L\* shows the brightness of the colour and suggests that imprint with optical defect was 93.82 when 86.33 was needed. It means

Table 3. Different imprints CIE L\* a\* b\* coordinate values

Color	Control imprint						Imprint with defect, Galerie brite			
	Coordinates									
	L* a* b* Stand.			L*	a*	b*	L*	a*	b*	ΔE
Paper	93	1	-0.5	99	1	0.2	99	1	0.2	1,3
C	55	-37	-50	59.2	-37.1	-52,3	59.2	-37.6	-52.3	1.20
M	48	74	-3	50,7	81,4	-2,65	46,88	72,20	-7,15	10,42
Y	89	-5	93	86,3	-5,85	93,5	93,82	-6,16	102,2	11,38
K	16	0	0	15,9	0,69	3,53	11,24	0,69	3,19	4,85

that the shade is lightening. Red and yellow ΔE differences between control imprints were over critical 9ΔE limit which is set by ISO standard.

Mathematical colour description was made using diagram of a\*b\* coordinates. It confirms that the characteristic of printed surface has a lot of influence on colour conveying and gives an ability to roughly chek the level of inconsistency between colours.

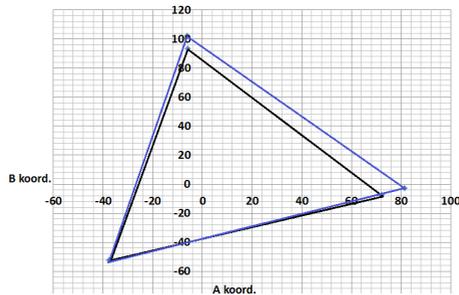


Fig.1 Mathematical colour description

## Conclusions

The analysis of printing process has showed that optical parameters and used materials directly influence the quality of the prints. After analysis of most common defects that have been obtained on *Galerie brite* and *Lumipress Art* papers it was found that most of these defects are caused due the incompatibility of materials and instability of technological process.

The quality of paper ink and adjustment of water-ink supply also greatly influences the quality of imprints.

Any extraneous objects, dust or spots that appear on imprint during printing and are larger than 1.3mm are considered as a critical defect.

In order to improve the imprint quality it is required to evaluate the different types of paper, adjust ink supply in accordance to the standard and constantly control the process.

While analysing the quality of the imprints it was found that high viscosity of ink might influence some defect factors. The effective solution would be softening paste which is put into the ink tub with ratio 1–1,5 % from total amount of ink. It is an effective way to soften the ink.

The diagram of samples shows how far from control imprints are the factual CMY values.

Most common defects occur on paper *Galerie brite*. It is a wood pulp paper with whiteness of 70%.

Most common defects are optical and account up to 60% of all analysed defects. The results of this research allows us to state, that not only the process of printing should be evaluated, but also the processes before printing in accordance to paper structure.

## Literature

1. Offset lithographic processes, International standard iso 12647-2; 2004.
2. Srividya B. Investigation of print quality in news paper, printing using print offset, International journal of innovations in engineering and technology, 2016.
3. Color Management With ISO 12467, [interaktyvus]. internetinė prieiga: [http://ip2010.eap.gr/docs/Guest\\_WilcoDe%20Groot.pdf](http://ip2010.eap.gr/docs/Guest_WilcoDe%20Groot.pdf).
4. Полиграфические дефекты и брак печатной продукции. Podolsk, 2015. Informacija ištraukta iš <http://itm-x18.narod.ru>
5. Müller Peter, Offset printing book: Frankfurt, Verlag GmbH: Press 1998.
6. Дмитрий Ширенов, *Брак и качество*. Peterburg, Peter burskij universitet, 2000.
7. Karolis Rimkus. Osetinės spaudos spalvų kaitos analizė tiraže. Pranešimas konferencijoje. Inovacijų taikymas technologijose, Kaunas, 2015. balandžio 19d.
8. Jonas Sidaravičius, Densitometrinė ir kolorimetrinė spausdinimo medžiagų ir atspaudų kontrolė. Vilnius, 2012.