ANNALS OF DAAAM FOR 2011 & PROCEEDINGS

OF THE 22ND INTERNATIONAL DAAAM SYMPOSIUM
"INTELLIGENT MANUFACTURING & AUTOMATION:
POWER OF KNOWLEDGE AND CREATIVITY"
23-26TH NOVEMBER 2011, VIENNA, AUSTRIA

ORGANIZED BY:
DAAAM INTERNATIONAL VIENNA
INTERNATIONAL ACADEMY OF ENGINEERING
VIENNA UNIVERSITY OF TECHNOLOGY, UNIVERSITY OF APPLIED SCIENCES
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UNDER THE AUSPICES OF: THE DANUBE RECTORS’ CONFERENCE & RECTORS’ HONOR COMMITTEE OF DAAAM INTERNATIONAL

EDITOR: B. [RANKO] KATALINIC
DAAAM INTERNATIONAL Vienna / Austrian Society of Engineers and Architects / International Academy of Engineering / University of Applied Sciences Technikum Vienna Vienna University of Technology

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THE 22ND INTERNATIONAL DAAAM SYMPOSIUM / 5TH EUROPEAN DAAAM INTERNATIONAL YOUNG RESEARCHERS AND SCIENTISTS CONFERENCE
THE 22ND DAAAM WORLD SYMPOSIUM

THE 22ND DAAAM INTERNATIONAL SYMPOSIUM "INTELLIGENT MANUFACTURING & AUTOMATION: POWER OF KNOWLEDGE AND CREATIVITY" & 5TH EUROPEAN DAAAM INTERNATIONAL YOUNG RESEARCHERS’ AND SCIENTISTS’ CONFERENCE
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Welcome to the 22nd DAAAM World Symposium
Welcome to the DAAAM International Network

We founded DAAAM International Vienna twenty two years ago on 5 November 1990 in order to celebrate the 175 Years of Vienna University of Technology. The main idea was to establish a new kind of international scientific and academic cooperation in the fields of intelligent manufacturing and automation. Our primary focus is on all aspects of production of technical products made out of parts and corresponding automation and knowledge, and transdisciplinary application of methods.

From the very beginning of our activities in the year 1990 we are following idea of: (a) Balance between technology and nature; (b) Conference on the measure of men; (c) Partnership and not colonialisms, and (d) Tolerance, tolerance and tolerance

I wish that we all together are working in the direction to make
• World better place to live and
• Increasing the tolerance and harmony between people and between nature and technology.
• We have to work against the tendency of animalization of people in the name of profit.
• We have to work on improvement of social ranking and importance of engineers in modern society
• We have to use our creativity, power of mind inside of field which is covered by our competence, personal responsibility and ethics.
• We have to work against key problem of modern world: misuse of technology combined with egoism.

Twenty years is short period of time in the history of technology, but in the life of one person is very long. DAAAM International is today a large international Network which includes thousands of active people from more than fifty countries and hundreds of institutions. The number of members, activities and publications are continuously growing during last twenty years. We want to keep high quality of our activities, and balanced growing during coming years.

It is my pleasure to invite you to be a member of large researchers’ and scientists’ family of DAAAM International.

I hope that you already find old friends and partners, and I wish you to make new friends for many of years coming.

Bronko Katalinic
President of DAAAM International
Verba volant, littera scripta manet. [In English: Words fly away; written letters remain.]

Jubilee Gold Medal of DAAAM International

Who is in the field, and not in the DAAAM he/she does not exist.
(Jyrki Popsel 1996)

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BRANKO KATALINIC: ACTIVITIES OF DAAAM INTERNATIONAL VIENNA 1990-
Jubilee Gold Medal of DAAAM International

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(Jyri Pappstel 1996)

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ENVIRONMENTAL SUSTAINABILITY AND GRAPHIC PRODUCTION

BOLANCA MIRKOVIC, I[vana]; MAJNARIC, I[gor] & BOLANCA, S[tanislav]

Abstract: The research results on the influence characteristics of graphic materials and conditions in printing on the print quality and efficiency of the recycling are presented in this paper. Research was carried out in the field of offset printing and digital printing based on electrophotography with liquid and solid toner. Comparing the results through the segment of gamut volume and the recycling efficiency of prints a certain correlation in which the variable conditions in the printing have an important role were noticed. Obtained results justify further research in the direction of environmentally friendly materials and processes across the lifecycle of graphic products, including the settings of industrial ecology and sustainability.

Keywords: offset printing, digital printing, gamut, recycling, image analysis

1. INTRODUCTION

The concept of environmental sustainability refers to the systematic conditions that should not be disturbed by human activities either at a global or regional level more than the planet allows. At the same time all the natural resources must not be depleted, and have to be sufficient for the next generations. These two requirements should be in balance with the third one regarding sustainability which refers to the principle of ethics and fairness (Halada, 2003). Environmental awareness, health and safety factor have an important role in identification of printing technologies for the future (Moberg, 2010). In order to increase effectiveness of resource usage and effectiveness of environmental management systems, lifecycle assessment of the product has to be considered and included in planning and projecting, starting from early stage of design (Kadam, et al.2009). The purpose of this paper was to review environmental aspects of printed products through certain segments of the life cycle within the issues of environmental sustainability. Since the different materials and processes focusing on those ecologically suited were used is it important to determine the reproduction quality, and then continue to follow a life cycle with special reference to its last phase. Significant contribution of research is explanation and combining the impact of printing conditions on the efficiency of prints recycling with the aim of obtaining results with applications in the field of environmentally suitable materials and processes taking into account the environmental sustainability settings.

2. EXPERIMENTAL

The samples of colour prints are obtained by the offset printing with ink with higher share of renewable raw materials, (Heidelberg sheet fed machine), indirect electrophotography with liquid toner (Turbo Stream HP Indigo machine) and electrophotography printing with dry toner (Xerox DocuColor 5000 machine). The test form contained different printing elements: standard CMYK step wedge in the range from 10-100% tone value, standard ISO illustration for the visual control, textual positive and negative microelements, wedges for determination the greyness and the standard wedge with 378 patches for production of ICC profiles and 3D gamut. The unique test form was used in printing. The prints were made on the fine art paper and the wood free natural paper. In offset printing process the conventional and model ink with renewable raw materials has been used.

The recent investigations have proved the bad effectiveness of print recycling made in the indirect electrophotographic printing with liquid toner and therefore the series of prints made with changing the conditions in this printing technique. For prints recycling the method of alkaline chemical deinking flotation was used, which was described in details in the previous work (Bolanka Mirkovic, 2009). The handsheets were made using a laboratory sheet former, according to standard method T 205. The spectrophotometric analysis was made with X-Rite SwatchBook and ColorShop 2.6 application. From ICC profile with the use of MONACO Platinum program the gamut of prints is established. Residual specks, toner number and area were assessed with image analysis software Spec2Scan, Apogee System. This system is utilizing scanner to digitize image. Threshold value (100), white level (75) and black level (65) were chosen after comparing computer images to handsheet.

3. RESULTS AND DISCUSSION

As an indicator of reproduction quality two dimensional and three-dimensional reproduction gamuts were used (Fig. 1).

Fig. 1. Gamut of prints: a) indirect electrophotography with liquid toner and offset printing with conventional ink and ink with higher share of renewable raw materials, b) indirect electrophotography with a liquid toner with offset cylinder voltage of 500, 600 and 700 V

Indirect electrophotography print with ElectrOInk compared with the offset print made with the higher share of renewable raw materials in the ink has larger gamut. The differences in gamut volume \( \Delta V \) CIE L* a* b* CCU of calibrated standard offset prints and indirect electrophotography with liquid Indigo toner amounts below 2.0 spatial units. Considering that in electrophotography for a better transfer of ink from the
The results show that the sheets made from recycled fibers from offset prints have most spectra values of less than 0.04 mm². In the dirt spot size greater than 0.01-0.15 mm² neither one particle was measured. Increasing renewable raw materials for offset ink also increased the number and specks area, while the trend in the distribution of specks inside the dirt spot size remained its characteristics. Handsheets made from recycled fibers of indirect electrophotography at + 600 V voltage of the offset cylinder contain a total of fewer specks, but a larger area. This is otherwise recycling characteristic of such prints compared to the prints of other printing techniques. Using the described experimental conditions specks does not exceed the class 1.00 to 1.50 mm² what is a certain achievement in the relation to the previous results (Balcan, Mirkovic, 2007).

Handsheets made from recycled fibers from prints based on electrophotography with solid toner contain a small number of smaller areas specks. Such prints are characterized by greater efficiency in recycling compared to prints made with liquid toner electrophotography. One of the major factors of the recycling efficiency is a type of printing substrate. The results indicate a somewhat lower efficiency of recycling compared to uncoated paper. On uncoated paper the adhesion of printing ink to paper depends on paper properties such as surface structure, fiber type, ash content and drying mechanism of the chosen printing process. Printing inks which form firmly sticking, example offset inks containing large shares of oxidative drying oils such as linseed oil or soy oil. Except the earlier mentioned, the fact must be acknowledged that the coating process assists in dispersing the fillers in the coating. In a recycling process at time dispersants are surface active and together with alkali can lead to acceptable ink detachment from the coated paper. These species can hydrophile ink containing agglomerates and hinder flotation efficiency.

4. CONCLUSION

The research results give an answer in the relation between the characteristics of graphic materials, the printing conditions, print quality and characteristics in the area of recyclable print waste process. Comparing the results through the offset print gamut volume segment and the one based on electrophotography with liquid toner it may be concluded that there is a growing convergence when it comes to environmentally favorable materials. Comparing the results of the gamut volume segment and the efficiency of the prints recycling a certain correlation, in which tested conditions in the press have an important role, was noticed.

Obtained results justify further research in the direction of environmentally friendly materials and processes across the lifecycle of graphic products, including the settings of industrial ecology and sustainability.

5. REFERENCES

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Fig. 3. Dirt content histogram: a) conventional offset printing ink b) offset printing ink with a higher share of renewable raw materials c) indirect electrophotographic printing with liquid toner with the voltage of the offset cylinder +600 V, d) electrophotographic printing with solid toner; substrate: uncoated paper