EFFECTS OF THE SURFACE TREATMENT ON A PAPER AND PRINT MATERIALS

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ABSTRACT

The quality of the polygraphic production is ameliorated considerably through the process of improvement, when the choice of raw materials, equipment and technology is properly done. Different methods for improvement are used depending on the kind and destination of the production and they may be implemented separately or in combinations one with another. Different polygraphic products are submitted to improvement: label-packing production, covers for books and journals, art reproductions, cards, amendments for books and journals, post stamps, advertising materials, etc.

In the present investigation two of the different means for improvement are studied: varnishing and laminating. The technology for improvement of the printed production through varnishing and laminating and their influence on the quality of the polygraphic production and the color reproduction is investigated.

For realization of the goals of the experiment in the present investigation out a set of experiments for establishing the changes occurring in the physical-mechanical properties of the printing production after lamination and UV-varnishing are carried, as well as the changes of the color reproduction of the test samples.

Keywords: color differences, cold laminating, UV-varnishing, physical-mechanical properties, border properties, color reproduction.

INTRODUCTION

The market requires more and more products with the best possible quality, advertising materials for the vast consumer masses, which have to posses the ability to be used everywhere at any time, products with high run lengths and printed materials for direct advertising [1].

A significant part of the illustrated production after printing the run requires additional treatment (improvement), which gives the ability to enhance the service features of the printed production, as well as to import finished appearance [2 - 4].

During the process of amelioration, assuming that the right prime materials, equipment and technological process are choosen, the quality of the polygraph production is significantly enhanced. Depending on the kind and destination of the production, different methods for amelioration are adopted, which may be applied individually or in a certain combination one with another [5 - 7].

Besides rendering an attractive outlook, the varnishing and the laminating prevents the image from erasing, humidity, sun rays impact, shortens the drying time of the imprint.

The aim of this research is to evaluate the influence of the UV-varnishing and laminating on the physical and mechanical properties and the color reproduction of printed materials in real production conditions.

EXPERIMENTAL

During the present research experiments have been carried out for amelioration of the physical and mechanical properties of printed production through lamination
and UV- varnishing. An attempt was done for deter-
miming the color reproduction changes of examined
samples after UV-varnishing and after cold laminating.
The assessment was carried out on five identical color
reproductions, on which the color characteristics were
measured before and after cold lamination and UV-
varnishing.

On each reproduction six particular fields
for measurements have been marked.

The following materials were used:
- Uncoated offset paper 80 g/m\(^2\), produced in EC;
- Coated paper 150 g/m\(^2\), produced in EC;
- Coated paper 200 g/m\(^2\), produced in EC;

The offset printing machine, which has been used is
four color sheet feed “KBA RAPIDA 105”.

The printing inks, which have been used, are manu-
factured by “Huber grupp”, Refecta Ecolutensive series.

For amelioration were used:

UV – varnish for entirely varnishing senolith
360020/50 of Weiburger Germany, fulfilled on produced
in Switzerland machine Kolibri 74 of “Seineman”.

15 μm laminating film, BOPP film produced by
“Manuli” Italy. The reproductions were laminated on
laminator for cold lamination “Lotus” 72 of “Seineman”
– Switzerland. The following indices were determined
on the trial samples before and after printing, as well as
after UV-varnishing and cold lamination:

- breaking length (m);
- folding resistance (number);
- water absorption according the method Cobb\(_{60}\) (g/m\(^2\)).

Examination of the color reproduction changes af-
fter UV-varnishing and laminating was carried out with
spectrophotometer/densitometer of type SpectroEye of
Gretag Macbeth and the values for Lab and ΔE were
determined on the unprinted and saturated fields of
CMYK inks. All measurements are in accordance with
ISO 12647-1[8]: D50 illuminant, 2° observer, 0/45 or
0/45 geometry, black backing in accordance with.

Table 1. Qualitative indices of paper samples before printing.

<table>
<thead>
<tr>
<th>Paper kind g/m(^2)</th>
<th>Breaking length, m</th>
<th>Folding resistance, nb.</th>
<th>Water absorption Cobb(_{60}) (g/m(^2))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MD</td>
<td>CD</td>
<td>MD</td>
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<tr>
<td>80</td>
<td>4381</td>
<td>2380</td>
<td>95</td>
</tr>
<tr>
<td>150</td>
<td>5150</td>
<td>3201</td>
<td>140</td>
</tr>
<tr>
<td>200</td>
<td>5843</td>
<td>3365</td>
<td>159</td>
</tr>
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</table>

Table 2. Qualitative indices of paper samples after printing.

<table>
<thead>
<tr>
<th>Paper kind g/m(^2)</th>
<th>Breaking length, m</th>
<th>Folding resistance, nb.</th>
<th>Water absorption Cobb(_{60}) (g/m(^2))</th>
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<tbody>
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<td>80</td>
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<tr>
<td>150</td>
<td>5102</td>
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<tr>
<td>200</td>
<td>5798</td>
<td>3320</td>
<td>148</td>
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</table>

Table 3. Qualitative indices of paper samples after UV – varnishing.

<table>
<thead>
<tr>
<th>Paper kind g/m(^2)</th>
<th>Breaking length, m</th>
<th>Folding resistance, nb.</th>
<th>Water absorption Cobb(_{60}) (g/m(^2))</th>
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<tr>
<td>200</td>
<td>6132</td>
<td>3568</td>
<td>142</td>
</tr>
</tbody>
</table>

Table 4. Qualitative indices of paper samples after laminating.

<table>
<thead>
<tr>
<th>Paper kind g/m(^2)</th>
<th>Breaking length, m</th>
<th>Folding resistance, nb.</th>
<th>Water absorption Cobb(_{60}) (g/m(^2))</th>
</tr>
</thead>
<tbody>
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<td>MD</td>
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<tr>
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<td>3452</td>
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<tr>
<td>200</td>
<td>8063</td>
<td>3918</td>
<td>198</td>
</tr>
</tbody>
</table>
RESULTS AND DISCUSSION

The results received during the studies are depicted on Tables 1, 2, 3 and 4, as well as on Figs. 1, 2 and 3.

On Table 1 and Table 2, are shown according to the results received for tearing strength, folding resistance and water absorption. The carried out examinations depict that the physical and mechanical properties lightly decrease after printing, which probably is due to a complex of technological factors, which exercise influence on the printing substrate, as well as to the technical characteristics of the printing machine.

The received imprints are subjected to amelioration with UV-varnish and cold laminating. On Table 3 and Table 4 are shown the results from the examinations for determining the qualitative indices after the additional treatment of the imprinted samples. From the data in the Tables and Figs. 1, 2 and 3 can be seen that at both methods for amelioration of printed samples, the tearing strength raises regardless from the kind and mass of used paper samples, whereas the folding resistance increases significantly after lamination. A trend towards diminishing the folding resistance is observed after UV-varnishing. This fact probably is due to the changes of the elastic – plastic properties of the treated with UV-varnish samples. On Fig. 1, 2 and 3 are shown the changes of particulate paper qualitative indices after the relevant printing and amelioration and the values for transverse and longitudinal directions are mean.

Water absorption diminishes considerably for both amelioration methods.

Experiments for partial determining the influence of UV-varnishing and laminating on the color background were carried out.

The researches were executed with spectrophotometer and the four fields (C, M, Y, K) were measured off five scales, as well as on unprinted sections and the values $L^*, a^*, b^*$ were determined. On each sample three measurements were done and middle value results were drawn. The values for $\Delta E$ were defined and for all analysis they rest under one. The results obtained show that significant changes in color reproducibility were not established both for varnishing and laminating. Deviations were in the limits of permissible mistakes. VISually was perceived increase of opacity and amelioration of ocular perception. It is necessary additional studies to be carried out in future and color profiles for the outgoing devices to be drawn, including the stage of varnishing and laminating.
CONCLUSIONS

The following conclusions were drawn, based on the results from this investigation:

During the process of amelioration, assuming that the right prime materials, equipment and technological process are picked up, the quality indices and the physical and mechanical properties are significantly enhanced (tearing length, water absorption according to the method Cobb60, folding resistance in number of double bendings) on the studied samples. Solely the physical and mechanical characteristic - number of double foldings diminish when amelioration is by varnish. For this reason it can be recommended the use of lamination or partially UV - varnishing in places where multiple foldings may take place.

Water absorption diminishes considerably for both amelioration methods. Consequently, the conclusion that not only the strength characteristics of imprints, but also their protection properties are influenced by cold lamination and UV - varnishing can be taken out.

Refinement of polygraph production leads to amelioration of exterior look, strength characteristic and defense properties of the imprint. The results poses practical interest and could be used for polygraphic formatting of book covers, postcards and packings.

REFERENCES

8. ISO 12647: (all parts), Graphic technology – Colour and transparency of ink sets for four-colour-printing.