INTEGRATED EVALUATION OF THE QUALITY OF EXTRUSION PACKAGING FLEXO-PRINT

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From the moment of its appearance on the market, the tube packaging has gained popularity for consumers and manufacturers of various products. The tube packaging is indispensable for toothpaste, creams, balms, and also for many food products. Tube like a packing is convenient and practical, it is able to give the products a good appearance. Therefore, companies that are engaged in producing the tube packaging, attach a great importance to the quality of their products.

As an object of research was chosen the company "Tube plant" (Kharkiv). This is the largest enterprise in Ukraine for the production of tube packaging. To improve the efficiency of quality control of printing tube packaging, was decided to develop an integrated quality indicator that will consider the main parameters affecting the quality of print.

Control of this type of products at the company is performed only by visual methods. An integrated assessment of the quality of the printing links the visual assessment, instrumental evaluation and physical quality indicators of the stamp obtained by flexo printing.

For the quantitative assessment, it is necessary to determine the main parameters that affect the quality of the print, they are single quality indicators that can be identified during the printing process.

For this issue was decided to use a simplified scheme of complex analysis. For this purpose, were determined the following initial data for the experiment: product type is extrusion tube; printing method is flexographic printing; color of the plastic is white.

The main unit indicators are: 1) dot gain – percentage of increase in the relative area of the raster element; 2) off-register – micrometers, relative to black paint; 3) change in the overall contrast, expressed by a change in the optical density; 4) color deviation (the size of the color difference) – the discrepancy between the original Lab color coordinates and those obtained during printing.

The reference (base) and boundary values of these parameters were determined based on their regulatory requirements (industry standards and technical specifications for tubular products developed at the company).

The next stage is the formation of an integrated index of print quality, which is a function of single indicators with given weight coefficients.

For determination the weight coefficients was conducted an expert survey. The main issue for selecting members of the expert group is to attract industry experts who are able to solve the issue as precisely as possible. Seven experts were chosen who are directly involved in the production of packaging and have a good knowledge of the issues of evaluation and quality control of printing products: 1 – the technologist (flexoprint); 2 – prepress engineer (flexoprinting); 3 – quality engineer

(flexoprinting); 4 – director of the enterprise (flexoprinting); 5 – chief engineer (flexoprinting); 6 – printer (flexoprinting); 7 – engineer-technologist (production of flexoforms).

To assess the consistency of the experts` opinions was determined the concordance coefficient which equals 0.92 and confirms the good consistency of the experts. To determine the consistency of individual indicators, the coefficients of variation were estimated for each of them. All indicators were not below average, so expert poll was held and certain weight factors can be used for formulation and calculation an integrated indicator.

After analysis the values of the obtained weight coefficients, was get that the most significant (0.33) is the observance of the necessary growth – the main requirement for the quality of flexographic printing. This is due to the specifics of flexo printing (flexible forms, non-absorbent material) and the need for strict implementation of all technological modes. The second most important coefficient (0.26) is the correct reproduction of colors, because it directly affects the quality of the finished product and the customer's opinion. During printing a tube package, in spite of a slight weakening of the requirements for incompatibility of paints (0.2 mm for tubes and 0.1 for films), this parameter, according to experts, is also important (0.24). Less attention in assessing quality, according to the members of the expert group should be given to the contrast of the image, because with the right technological process (the correct choice of paints, varnishes, etc.), the image is saturated and contrasting.

The considered basic indicators can be monitored by instrumental methods during the printing process and based on the data obtained, the quality level is cam be determined by using integrated assessment. To calculate the integrated quality assessment, was developed a desktop application based on Java FX technology, which allows to users to download a file with the values of 4 main indicators (as a cxf format file, which is based on xml format), and the application also works in manual data entry mode. If you select the necessary option in the application window, the calculation of the integrated indicator and brief recommendations are displayed for its application. The application processes files (format cxf, xml) obtained as a result of measurements with a densitometer, a spectrophotometer and a printing microscope. This application is cross-platform and can be installed on any device that supports Java Virtual Machine.

The using of an integrated quality indicator in the workplace will automate the process of determining the level of product quality, which will simplify the quality control operation, eliminate errors in visual control and, on the whole, accelerate the production process.

Literature

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