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# RESEARCH ON APPROACHES TO THE SELECTION OF MATERIALS IN THE PRODUCTION OF POS PRODUCTS FOR MEDIAMOMENTS PRINT AND PRODUCTION B.V.

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**Abstract**

The article examines the current state and prospects for the development of the publishing and printing industry in the context of constant technological changes and increasing customer requirements. The emphasis is on the need to introduce new materials and improve production processes, which is due to market transformation and the increasing role of visual communications in marketing activities. Particular attention is paid to POS materials (Point of Sale materials), which are an important tool for promoting products and creating brand awareness directly at points of sale. The paper analyzes traditional and modern materials used for the manufacture of POS products. It is noted that cardboard has long remained the main material due to its accessibility, ease of processing and environmental friendliness. At the same time, modern operating conditions for POS materials, in particular increased requirements for durability, moisture resistance, mechanical strength and stability of appearance, limit the possibilities of using cardboard products. In this regard, there is growing interest in the use of polyvinyl chloride (PVC) and other synthetic materials that provide broader functional and design capabilities. The methodological basis of the study is the expert evaluation method, which allowed for a comprehensive comparison of different materials according to technical, economic and environmental criteria. The work defined a list of the main equipment, materials and parameters necessary for conducting a comparative experiment, as well as formulated the evaluation criteria and features of its implementation. This approach ensured the objectivity of the results obtained and took into account practical production conditions. Based on the results of the study, a substantiated choice of material for the manufacture of POS products was made, which most fully meets the specified operating conditions, the specifics of the enterprise's work and its location. It is emphasized that a comprehensive comparison of materials has not only theoretical, but also applied value, since it is focused on current market needs and the possi-

bilities of practical implementation. The conclusions obtained can be used when planning production processes and making decisions on optimizing the material base in the field of manufacturing POS materials.

***Keywords:*** *POS-products, printing materials, cardboard, polyvinyl chloride, marketing, printing.*

## Introduction

A wide range of products and a variety of choices have led to the emergence and spread of advertising and information materials at points of sale. Such materials attract the buyer's attention, provide additional information about the product or brand and help make a decision to make a purchase in a retail store filled with similar products.

POS materials (Point Of Sales) areadvertising and information materials placed at the point of sale [1]. POS displays include various advertising elements: displays, shelf design, various designs, packaging, stands, signs, banners, stickers, stands, posters, etc. and include: shelftalkers, shelf organizers, strip holders, placards, posters, show cards, wobblers, brochures, leaflets, flags, three-dimensional designs, dispensers, etc. Among the wide variety of types of POS materials, several categories can be distinguished, according to the time of use: permanent displays (for use longer than six months); semi-permanent displays (term of use – from 2 to 6 months); temporary displays (duration no more than 2 months).

The main tasks of POS materials: attracting the consumer's attention to a specific product, depicting a lifestyle using this product, encouraging buyers to purchase, providing information about the brand. Additional functions of POS materials can also include [1 – 3] localization (as indicating the location of the product); informing about the product; motivating to invite consumers to purchase the product; displaying as emphasizing, drawing attention to the product; branding to form associations with the product or brand.

The study of promotional materials at points of sale has found its place in the works of scholars studying marketing, business and communications. The influence of the quality of POS materials and brand familiarity on trust and intention to purchase a product is noted. This can be relevant for both indoor and online retail, since POS products are an inexpensive but effective way to influence consumer behavior in stores [4, 5].

Usually, POS displays in retail outlets are supplied, placed and serviced by the manufacturer of these POS products. Therefore, manufacturers are interested in manufacturing such products that will deliver advertising messages to consumers as quickly and accurately as possible, and will

perform basic and additional functions within the planned time under the expected conditions of use without loss of quality. All these requirements can be met through the optimal choice of materials from which POS products are made.

Common materials for use in POS are cardboard, paper, polyvinyl chloride, acrylic, banner fabric, aluminum composite sheets, etc.

For the advertising industry and as POS materials, displayboard cardboard is often used – this is a material in the form of a board, which is quite rigid and durable, characterized by the number of layers and thickness. Key advantages of cardboard for POS [3 – 5] include its recyclability, affordable cost and ease of manufacture. Cardboard is easy to print and shape, enabling the production of both flat and three-dimensional structures.

Disadvantages of cardboard include vulnerability to moisture; fire hazard; attractiveness to rodents; fragility and susceptibility to damage during intensive use; the need for additional edge processing, uneven trimming due to the composition of the material.

Polyvinyl chloride (PVC) is colorless, transparent plastic, thermoplastic polymer, a product of vinyl chloride polymerization [6]. Sheet PVC (polyvinyl chloride, vinyl) is known as one of the most durable, versatile, economical and easy-to-process polymer materials available on the market today. PVC is used to create the background of advertising structures, volumetric letters, direct UV printing, the manufacture of stands and POS materials. PVC is easy to manufacture and process, moderately rigid, durable, bends and glues well, and also has a wide palette of thicknesses and colors. In the advertising industry, PVC is often the best choice, due to a number of advantages, including ability to print and form non-flat shapes; light weight, which facilitates transportation and installation; strength, resistance to dents; relatively low cost of PVC; ease of production, cutting and processing and no need for post-printing edge processing; resistance to UV radiation, moisture.

Disadvantages of PVC are low deformation temperature and average frost resistance. As a result, this material is generally unsuitable for large-sized external structures and and requires appropriate recycling.

Thus, PVC is a worthy choice for the advertising industry, due to its relative budget-friendliness, durability, ease of manufacture and suitability for bright printing.

Acrylic, also known as polymethyl methacrylate (PMMA), is a polymer material; it is a product of radical polymerization of methyl methacrylate. It is a thermoplastic material that is often used as an alternative to glass due to its transparency and lightness. Acrylic is the most popular among transpar-

ent and translucent sheet polymer materials. Acrylic is resistant to weathering, can be used both indoors and outdoors for exhibition stands, signs, illuminated letters, light boxes, POS materials.

Acrylic is a good choice for developing high-quality transparent advertising materials and for using them outdoors. However, its high cost and vulnerability to strong impacts/damage significantly limit its use.

Banner fabric is a PVC-coated fabric, which is a type of composite textile material. This material is often used in outdoor advertising, interior design of points of sale and events. Banners are suitable for large-format printing. Such fabric is very durable, flexible, resistant to temperature extremes and ultraviolet radiation, waterproof.

Banner fabric is an interesting and multifunctional solution when it is necessary to use a textile material with resistance to the external environment.

Based on the analysis of the printing materials market, it can be assumed that the use of cardboard materials is not the optimal solution for use in POS products.

There are certain problems associated with the use of cardboard. During production, due to the heterogeneous cellulose structure of cardboard, a poor cut occurs, i.e. defective die-cutting. Due to the multilayer nature of cardboard and its vulnerability to moisture, the material delaminates during operation, which is an important component.

There is an assumption that the transition from the use of cardboard materials to the use of polyvinyl chloride (PVC) in the POS products manufacturing is advisable in view of improving technological and operational characteristics and increasing the durability of finished products.

Therefore, the main of the study is a detailed analysis of the characteristics of the materials used, the most relevant solution for use in POS products and improve the quality of the printed products.

**Methodology and equipment**

To verify the formulated hypothesis, it is necessary to conduct a study – an expert comparison of the quality of printing materials based on certain criteria, which will form a comprehensive assessment of the copies. This, in turn, will provide a clear understanding of the weaknesses and strengths of each material, reduce the number of production defects and, accordingly, the term and cost of product manufacturing.

A comprehensive assessment of the choice of materials for use in the production of POS materials involves determining a number of criteria for analyzing the choice. It is advisable to form criteria in the following groups: technological, economic, environmental, functional.

The technological criteria employedin the evaluaetion were strength and resistance to mechanical damage; moisture resistance; ease of production; durability of use. Economic benefit (cost) was considered as an economic criterion, recyclability – as environmental, visual appeal – as functional criteria.

The process of manufacturing POS products in publishing and printing is studied at the enterprise Mediamoments Print and Production B.V. (Duivendrecht, Netherlands) [7]. This is a digital printing house specializing in large-format sublimation printing, manufacturing visual communication products on various materials for B2B clients, including retailers, event organizers, advertising agencies, corporate brands and international sporting events.

The study will compare materials for use as a show card or advertising photo booth in the store premises at the point of display of goods.

For POS materials, Mediamoments uses mostly cardboard materials, although polyvinyl chloride, acrylic, banners, self-adhesive stickers, other compositional options (depending on customer requests) are also used. Let's consider the most commonly used materials.

1. Cardboard Katz Displayboard is an environmentally friendly material based on wood pulp, laminated on both sides with white paper. Katz Displayboard offers excellent printing properties, stability, and is used to make tabletop displays, hanging signs, advertising and communication products. The manufacturer offers several types of thickness of such cardboard: 1.6 mm, 2 mm, 3 mm, 5 mm. For use in an outdoor environment, it is necessary to use a special type of Katz Displayboard, which will serve outdoors for up to 12 weeks [8].

During the manufacture of POS products from cardboard Katz Displayboard and its use, a number of shortcomings were identified, namely: low quality of cutting (Fig. 1); low water resistance (Fig. 1); delamination (Fig. 1); low resistance to damage.


*Fig.1. Examples of poor die-cutting, delamination, and poor water resistance of Katz Displayboard*

Poor quality when material trimming leads to need for re-production or additional operations to improve the product appearance (manual trimming). This, in turn, leads to a cost increase (due to additional material costs). Defects can reach up to 50% of the print run, which increases the time for manufacturing products.

Since cardboard is made from wood pulp, the disadvantages are also related to the material composition (Fig. 1).

2. Kroma Displayboard is a rigid, lightweight cardboard specially designed for indoor use, POS materials and packaging. This durable cardboard is made of cellulose fibers and is 100% recyclable. Kroma Displayboard cardboard appeared on the market quite recently and was offered as a premium version, a higher quality and stable alternative to Katz Displayboard. These two materials are quite similar, but Kroma Displayboard cardboard is significantly more expensive than Katz Displayboard. Kroma is indeed less problematic in production, but still does not have the best cutting quality (Fig. 2).

It is known that recyclability is inherent in cardboard, this material also has a corresponding certificate confirming its environmental friendliness [8].

3. Polyvinyl chloride Vikupor is a foamed PVC sheet for long-term indoor applications, as well as for short-term and medium-term flat applications outdoors (Fig. 3) [8].

*Fig. 2. Kroma Displayboard cardboard in the POS products manufacturing*

As an alternative material for comparison, polyvinyl chloride (PVC) material, Vikupor was used, which is similar in its physical properties to cardboard, but is more stable in production due to the homogeneity of the material composition and is less susceptible to external factors (Fig. 3). Material shortage is typically limited to 1 copy per 10-piece run, making POS production with Vikupor faster than with cardboard.


*Fig. 3. Polyvinyl chloride Vikupor in the POS products manufacturing*

PVC is not an environmentally friendly material, but the company manufacturer offers its partial recyclability.

**Presentation of research results**

The work conducts an experiment to determine the most suitable type of printing material for POS products used in the studied company. Materials for use as a show card or photo stand in retail outlets, indoors, are compared.

Cardboard and polyvinyl chloride were selected as materials similar in terms of application: cardboard Katz Displayboard; polyvinyl chloride Vikupor; cardboard Kroma Displayboard.

These three materials are available for use, are in a similar price category, are popular for use in POS, and have similar physical characteristics (weight, thickness, shape). POS products are manufactured from these materials using the same technology.

Three samples of printing materials were selected for the experiment: cardboard Katz Displayboard, polyvinyl chloride Vikupor, cardboard Kroma Displayboard 3 mm thick.

The supplier [8] provided information on the cost of materials (Table 1).

*Table 1. Cost of materials for POS products*

| Material | Delivery format, mm | Price, EUR/m$^2$ |
|---|---|---|
| Cardboard Katz Displayboard | 2440×1220×3 | 8,84 |
| Polyvinyl chloride Vikupor | 3050×1560×3 | 12,76 |
| Cardboard Kroma Displayboard | 3050×1560×3 | 10,40 |

Nine criteria were selected for comparative assessment: visual appeal; recyclability; moisture resistance; resistance to mechanical damage (damage, scratches, dents); material price; quality of trimming (defects on the edges of the product during trimming); quality of edge processing (paint shedding on the cut, the need for additional actions to improve the appearance of the cuts); durability of use (stability of shape, appearance); resistance to UV radiation.

Experts were asked to rate these criteria when filling out the questionnaire and evaluate which material they thought was the best and worst in nine categories. The assessment was carried out using the ranking method, where the lowest numerical score corresponds to the best result. The survey obtained a rating of the criteria (Table 2).

*Table 2. Rating of evaluation criteria*

| | Evaluation criterion | Criterion rating |
|---|---|---|
| K1 | Visual appeal | 0,022 |
| K2 | Recyclability | 0,124 |
| K3 | Moisture resistance | 0,169 |
| K4 | Resistance to mechanical damage (damage, scratches, dents) | 0,089 |
| K5 | Material price | 0,138 |
| K6 | Trimming quality (defects on the edges of the product when trimming) | 0,120 |
| K7 | Edge finishing quality (paint shedding on the cut, the need for additional actions to improve the appearance of the cuts) | 0,076 |
| K8 | Durability of use (stability of shape, appearance) | 0,067 |
| K9 | Resistance to UV radiation | 0,196 |

To determine the concordance coefficient, the formula is used [9]:

$$W = \frac{12S}{n^2(m^3-m)}, \quad (1)$$

Where $n$ – number of experts; $m$ – number of criteria; $S$ – sum of squared deviation.

$$W = \frac{12 \cdot 1168}{5^2(9^3-9)} = 0{,}779.$$

Based on the result obtained, W=0.779, we can say about a sufficiently high level of consistency of experts' opinions.

Thus, it was found that visual attractiveness is the most important criterion in the production and use of POS materials indoors, and resistance to UV radiation is the least important criterion, which is logical.

In the next step of the experiment, three alternatives were ranked according to nine criteria using expert ratings (alternatives receive ratings from 1 to 3, where 1 is the best option). The degree of consistency of experts' opinions was determined using the concordance coefficients calculated by relation (1). The evaluation results are presented in Table3.

According to the criteria of visual appeal and resistance of materials to UV, the consistency of experts' opinions was mediocre, and according to all other criteria – high, which confirms the reliability of the survey results.

*Table 3. Alternatives ratings by criteria*

| Material | | | Concordance coefficient |
|---|---|---|---|
| Cardboard Katz Displayboard | Polyvinyl chloride Vikupor | Cardboard Kroma Displayboard | |
| Visual appeal | | | |
| 0,47 | 0,23 | 0,30 | 0,52 |
| Recyclability | | | |
| 0,33 | 0,50 | 0,17 | 1 |
| Moisture resistance | | | |
| 0,43 | 0,17 | 0,40 | 0,76 |
| Resistance to mechanical damage | | | |
| 0,47 | 0,17 | 0,37 | 0,84 |
| Material price | | | |
| 0,40 | 0,17 | 0,43 | 0,76 |
| Trimming quality | | | |
| 0,50 | 0,17 | 0,33 | 1 |
| Edge finishing quality | | | |
| 0,50 | 0,17 | 0,33 | 1 |
| Durability of use | | | |
| 0,40 | 0,17 | 0,43 | 0,76 |
| Resistance to UV radiation | | | |
| 0,40 | 0,20 | 0,40 | 0,48 |

The weighting coefficients for the nine criteria were calculated for choosing the best of the proposed alternatives (Table 4).

*Table 4. Calculation of the rating weighting factors*

| Alternatives | Material rating |
|---|---|
| Cardboard Katz Displayboard | 0,42 |
| Polyvinyl chloride Vikupor | 0,22 |
| Cardboard Kroma Displayboard | 0,36 |

The results of the alternative comparison are displayed graphically on a radar chart, the best indicator is the lowest weight of the criteria (Fig. 4). It is noticeable that polyvinyl chloride is the leader in comparison with other materials.

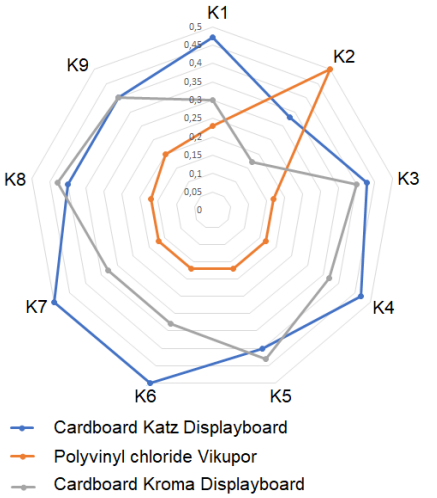


*Fig. 4. Comparison of alternatives estimates*

Based on the results obtained, it can be concluded that the best material for the manufacture of POS products, namely show cards for use in indoor retail outlets, is polyvinyl chloride.

Its overall rating is better than the rating of two different types of cardboard, according to expert assessments.

It can be concluded that for POS materials, the visual appeal of the product, the quality of edge processing, and durability of use play a decisive role, which really makes sense, because POS materials should primarily attract attention with their neat appearance and pleasant visuals.

It is worth noting that the final results of the choice of materials are also influenced by customer preferences for materials, or the principles/features of the printing company's work.

## Conclusions

The study analyzed the work of the enterprise and studied in detail production processes. The main POS materials used in the company was considered, taking into account its specifics of work. The main equipment, materials for research, criteria and features of conducting a comparative experiment were determined.

A review of the studied enterprise and literature made it possible to formulate general recommendations for material choice. The disadvantages of using cardboard for POS materials were identified and an available alternative was proposed.

Based on the research, a material for the manufacture of POS products was selected, which best meets the set conditions, taking into account the specifics of the work and location of the enterprise. A comprehensive comparison was performed taking into account the fact that it has a relevant demand and practical application in today's conditions.

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