ТЕХНОЛОГИЯ И ТЕХНИКА ПОЛИГРАФИЧЕСКОГО И УПАКОВОЧНОГО ПРОИЗВОДСТВА

TECHNOLOGY AND EQUIPMENT OF PRINTING AND PACKING MANUFACTURES

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INFLUENCE OF TECHNOLOGICAL DESCRIPTIONS OF BOOK BLOCKS ON DURABILITY OF EDITIONS IN BINDING 7 TYPE

In the article presented results of researches of tear-out of book's blocks are in binding 7 type that characterizes description of durability of editions. Were analyzed modern state of problem making editions is in a cover and binding and presented requirements for providing the price – quality of book edition. Were chosen modern materials and basic formats of editions with the corresponding volume of pages in a block. As technological descriptions it is chosen thickness and length book block, thickness of binding cardboard, offset, newspaper and chalk-overlay paper of different mass. Researches of glue connections in the counterfoils of book blocks was conducted with determining description of durability through effort of tear-out of book block on binding as 7 types. Was calculated the effort of tear-out of book block from binding and specific effort of tear-out of book block from binding. The received results allowed to build the histograms of specific effort of tear-out for the different thickness of book block, area of book's spine by taking the basic formats of editions $60\times90^{1}/_{16}$ and $70\times100^{1}/_{16}$. On the basis of the built histograms it is possible to affirm that does not have dependence between specific effort of tear-out of book block, his thickness and area of counterfoil. Varying technical descriptions it is impossible to build direct dependence of influence of kind and paper mass on description of durability.

Key words: effort of tear-out, book block, format, thickness of block, area of counterfoil, durability.

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ВЛИЯНИЕ ТЕХНОЛОГИЧЕСКИХ ХАРАКТЕРИСТИК БЛОКОВ НА ПРОЧНОСТЬ ИЗДАНИЙ В ПЕРЕПЛЕТНОЙ КРЫШКЕ

В статье представлены результаты исследований на вырыв книжных блоков в переплете типа 7, который характеризует прочность издания. Проанализировано современное состояние проблемы изготовления изданий в обложке и переплете, представлены требования для обеспечения цены – качества книжного издания. Избраны современные материалы и основные форматы изданий с соответствующим объемом страниц в блоке. В качестве технологических характеристик определены толщина и длина книжного блока, толщина переплетного картона, офсетная, книжная и мелованная бумага различной массы. Исследование клеевых соединений в корешках книжных блоков проводили, определяя характеристику прочности усилием вырыва книжного блока с переплета типа 7. Было рассчитано усилие вырыва, а также удельное усилие вырыва книжного блока

с переплетной крышки. Полученные результаты позволили построить гистограммы удельного усилия вырыва для различной толщины блока, площади корешка книжного блока с помощью форматов изданий $60\times90^{1}/_{16}$ и $70\times100^{1}/_{16}$. На основе построенных гистограмм можно утверждать, что удельное усилие вырыва книжного блока не имеет зависимости от его толщины и площади корешка. Варьируя техническими характеристиками, нельзя построить прямую зависимость влияния вида и массы бумаги на характеристику прочности.

Ключевые слова: усилие на вырыв, книжный блок, формат, толщина блока, площадь корешка, прочность.

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Introduction. It is difficult to imagine the modern stage of development of the information society without printed publications, newspapers, magazines, books. Production and distribution in any country is carried out by publishing and printing enterprises. The production process of printing production is a unity of various technological processes. In recent years, the printing industry has been characterized by the introduction of new technologies that increase the quality, strength and durability of products and cut the production time.

The design of literary, artistic, educational and scientific publications in recent years has become more complex, respectively, the cost of publications is high. This leads to the need to develop simpler schemes of the technological process and the use of optimal consumables, with which it was possible to make price – quality. This is especially important for school textbooks, educational and methodical literature, various guides and reference books, technical instructions, cookbooks. Since the publication must be practical and durable.

The use of papers with different functional properties for the manufacture of blocks of 1000 pages, the use of binding materials (cardboard, glue, cover material) requires special attention to the assessment of performance [1]. The structure of the view, the format, the size of the corners, the size of the strips to the set, the type of solid frame, the resetting of the elements on the rolls, allow the evaluation of the polygraph display, the aesthetic and functional quality of the book [2].

An element of the external design of publications is a cover or binding. They tell the core of the publication using images, type, and encourage a person to pay attention to the book. While they are important for convenient book research, they must be durable and made from inexpensive environmental materials [3] Modern production of books and magazines requires that covers and bindings are technological in design, and the processes of their manufacture and block connection be mechanized and automated [4].

The process of making classic books is very time-consuming, requires expensive equipment, large production areas and large staff. And the books themselves are quite massive and not easy to use. Especially when it comes to educational and technical literature for everyday reading. At the same time, despite these disadvantages, the authors do not agree to publish their books in a fragile cover. And for the duration of use remains the production of bindings of type 7 [5].

The cover of the publication must meet the following requirements:

– high strength (provided by sewing threads and connecting the block with the cover);

– abrasion resistance (due to pressing the film on the cover material);

– ease of opening (the book opens easily on any page and remains open in the open without extra effort);

– accuracy (there should be no glue or threads and smeared letters, or fuzzy embossing);

– durability (provided by the materials used and manufacturing technologies) [6].

In [7–13], the authors in various aspects covered the study of the use of technology of unstitched adhesive bonding. Particular attention was paid to such issues as: gluing of the spine and processing of the block, edging of the spine, trends in the improvement of devices for processing of the spine of the block, etc.

In [14, 15], studies of the effort to pull out a block from one-piece bindings of type 7 are presented, as well as experimental studies to decide the strength characteristics of covers made on coated papers of different weights using various adhesives.

The analysis of the conducted researches [16] showed dependence of changes in durability of the glued binding materials. It has practical application at production of new frames and a choice of materials with high operational characteristics.

The production of a simplified cover from different materials and with the use of different types of adhesives is considered in [17]. However, the question of the influence of the characteristics of the elements of the adhesive joint on the result is not given enough attention. Therefore, it is advisable to consider the peculiarities of the formation of strength characteristics of book blocks in type 7 covers.

Main part. For making of blocks of editions use an offset, newspaper and chalk-overlay paper.

Research results

Format and part of the sheet	Block thickness (cm)	Block length (cm)	Type of paper	Volume in pages	Cardboard thickness (mm)	The force of tearing the block from the cover (N)	The specific force of the block from the cover (kgf/cm)
60×90/16	2,5	21,5	book paper	344	1,75	105	4,88
60×90/16	2,7	22,0	coated	264	1,75	102	4,63
60×90/16	2,5	21,6	coated	288	2,0	85	3,93
60×90/16	4,0	22,0	offset	528	1,75	98	4,45
60×90/16	2,3	22,0	offset	260	1,75	101	4,59
70×90/16	1,2	22,0	coated	160	1,75	102	4,63
70×100/16	1,8	24,0	offset	192	1,75	110	4,58
70×100/16	1,8	24,8	offset	216	1,75	125	5,04
70×100/16	3,0	25,0	offset	396	3,0	110	4,40
70×100/16	1,5	24,0	offset	176	1,75	114	4,75
70×100/16	1,8	24,8	offset	224	1,75	118	4,76

The cover material for binding covers is a cloth basis (kneecap, lederin, pique etc.) a paper or unwoven (glued unwoven materials); with starch, nitrocellulose, polyvinyl chloride, polyamide, latex or polyether urethane coating. For a block back apply a cardboard, paper overwrapped, pressboard (polished cardboard), leather, artificial leather, polyvinyl chloride material (plastic).

To reinforcing materials in the process of making books include: gauze, capital (colored tape), cotton, nylon threads, wire, adhesives (mainly polyvinyl acetate dispersion) [18].

The purpose of the experiment is to study the effort of tear-out book blocks to determine the impact of technical characteristics of consumables on the strength of the book.

Experimental researches were conducted on the bursting machine – 30 m.

For realization of researches 11 copies of books were used with different descriptions of formats of edition and volumes of pages in blocks (Table). A glue solution PVA (poly (vinyl acetate)) DFM-51 was used to insert the blocks into the frames.

For experiments were make book with binding 7 types with cardboard plate.

For the cover material we used paper which after printing was lamination and one copy a Baladek.

Research of glue connections in the back of book blocks conducted determining their characteristics of durability through effort of tear-out of book block from binding.

On Fig. 1, 2 histograms over of specific effort of tear-out of block of variable thickness and paper made from different kinds are brought for formats $60\times90^{1}/_{16}$ and $70\times100^{1}/_{16}$, accordingly.

From fig. 1, 2 we can see that on specific effort of tear-out of book block from binding does not influence from such technological characteristics as thickness of block, format and type of paper.

On Fig. 3, 4 are presented the histograms of specific effort of tear-out of book block with the different areas of book's spine made of different types of paper for formats $60\times90^{1}/_{16}$ and $70\times100^{1}/_{16}$ accordingly.

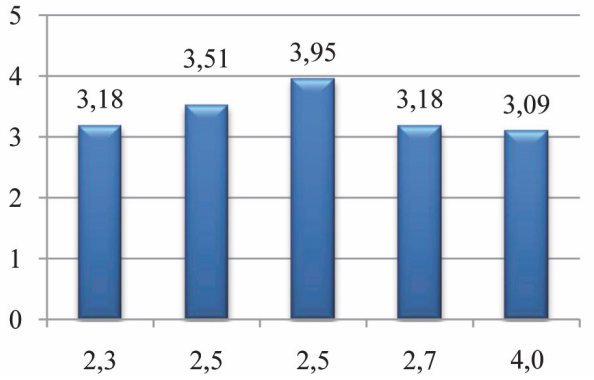

Fig. 1. Histogram of specific effort of tear-out of block of variable thickness by a format $60\times90^{1}/_{16}$

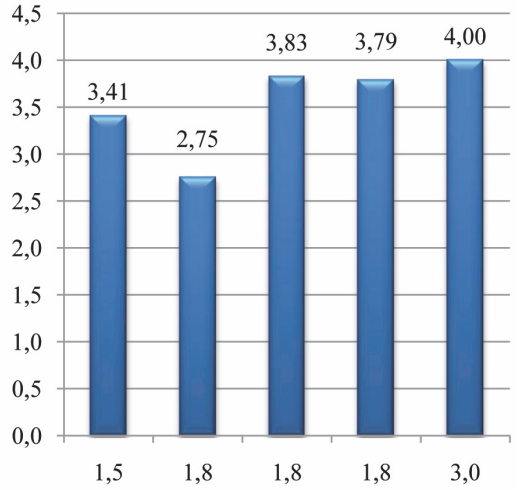

Fig. 2. Histogram of specific effort of tear-out of block of variable thickness by a format $70\times100^{1}/_{16}$

From Fig. 3, 4 evidently that specific effort of tear-out does not depend on the area of counterfoil of block for formats $60\times90^{1}/_{16}$ and $70\times100^{1}/_{16}$.

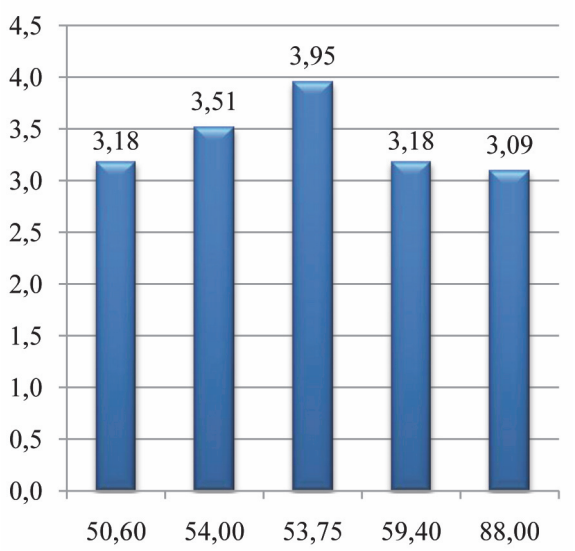

Fig. 3. Histogram of specific effort of tear-out of block for the different areas the back of format $60\times90^{1}/_{16}$

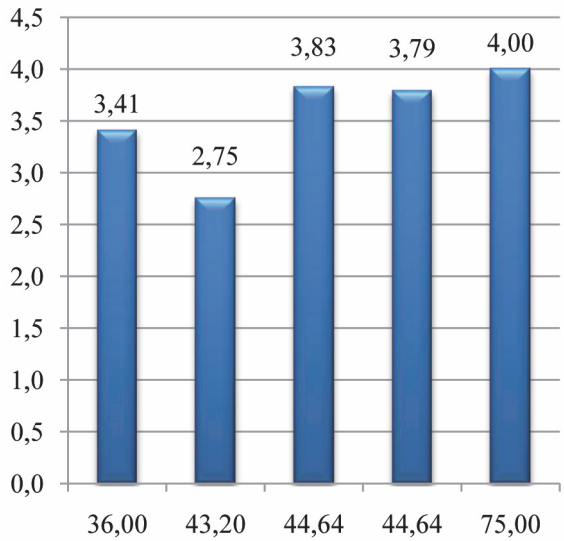

Fig. 4. Histogram of specific effort of tear-out of block for the different areas the back of format $70\times100^{1}/_{16}$

On Fig. 5 it is represented histogram of specific effort of tear-out of book for block thickness:

– 1,2 cm – coated of paper, format $60\times90^{1}/_{16}$;
– 2,3 cm – offset of paper, format $60\times90^{1}/_{16}$;
– 2,7 cm – coated of paper, format $60\times90/^{1}/_{16}$;
– 4 cm – offset of paper, format $60\times90^{1}/_{16}$.

From Fig. 5 evidently that for formats $60\times90^{1}/_{16}$ and $70\times100^{1}/_{16}$ and permanent height of book block a 22,5 cm there is not dependence of specific effort of tear-out.

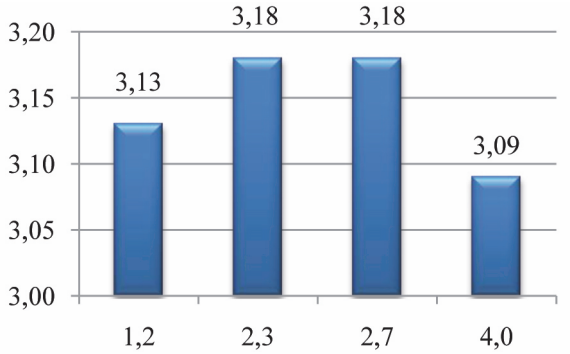

Fig. 5. Histogram of specific effort of tear-out of block for a variable thickness and permanent height of block a 22,5 cm

Also from the above figures it can be affirmed that the type of paper used in the manufacture of book blocks does not affect the specific force of tearing.

Thus for further research characteristics of durability it would be worthwhile to investigate the effect of glue.

Conclusion. In-process the presented researches of specific effort of tear-out of book blocks are from the format of editions, thickness of book block, area of counterfoil, using here the different type of paper: book, offset, chalk-overlay. Experimental data showed that for the investigated formats 60×90 and 70×100 with a fate 16:

– does not have dependence between specific effort of tear-out of book block and it thickness;
– does not have dependence between specific effort of tear-out of book block and the area of counterfoil.

Undertaken studies showed that type of paper that is used at making of book blocks does not have an influence on specific effort of tear-out of block from binding.

To further study durability of books in binding 7 types, the characteristics of adhesives should be analyzed and investigated.

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