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In this edition the Researches of scientists on the following directions are presented: technology and production of threads, fabrics, knit and nonwoven fabrics; design and production of clothes; equipment of the clothing, textile and shoe industry; economics and management in clothing, textile and shoe industry.

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DEVELOPMENT OF MATERIAL-SAVING ACTIVITIES FOR ENTERPRISES OF THE SEWING INDUSTRY

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Key words: textile waste, rational layout, rational cutting.

Abstract. The article presents one of the options for saving materials in the garment industry, by reducing the waste along the width of the flooring. The proposed event will allow to expand the assortment of the enterprise, reduce the amount of waste generators and will bring additional profit to the enterprise.

The amount of waste generated in the manufacture of garments has a direct impact on their material consumption. Any layout is characterized by the formation of interlocal and other types of textile waste and their quantity is almost always greater than the minimum possible value. This is due to the fact that the details of garments have a complex configuration. Increasing the amount of waste even by 1% is completely unacceptable. Consequently, before the light industry workers is a very difficult task to find a tight layout for the cutting of materials.

Irrational residues arise as a result of the calculation of a piece of material in the flooring because of the non-multiplicity of the total length of the webs involved in the calculation, the length of the piece. The number of irrational residues takes a value from 0 to 4 % for different assortment groups and types of materials used.

At the Department of "Designing and Technology of Clothing" of Ural State Technical University, the possibility of using inter-sheet waste by the length and width of the flooring in products for clothing purposes is being investigated. We propose to make a new model of a sweater from the remainders of the width of the flooring of a monophonic knitted fabric and attacks, which were formed as a result of cutting a dress from a coupon knitted fabric.

Appearance of the dress is shown in Figure 1. The layout of the patterns on the product is shown in Figure 2.

The appearance of the jumper is shown in Figure 3. The layout of the patterns for the jumper is shown in Figure 4.

To determine the effectiveness of this task, we compare the cost of a cardigan made of solid material and a cardigan made of waste produced by cutting a dress.

In the calculation of the cost of the product included all items of expenditure. The cost of the product was 16.67 rubles of the single-piece material and 9.68 rubles - from waste. As a result of the use of waste from the main production, the cost of a sweater decreased by 41.9 % compared to the cost of a jumper made of single-piece material.

Figure 1 – Appearance of the dress

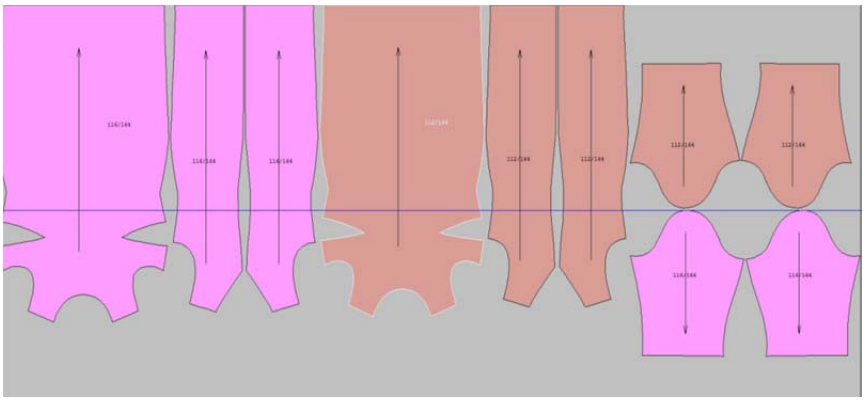

Figure 2 – Layout of the dress patterns

Figure 3 – Appearance of the sweater

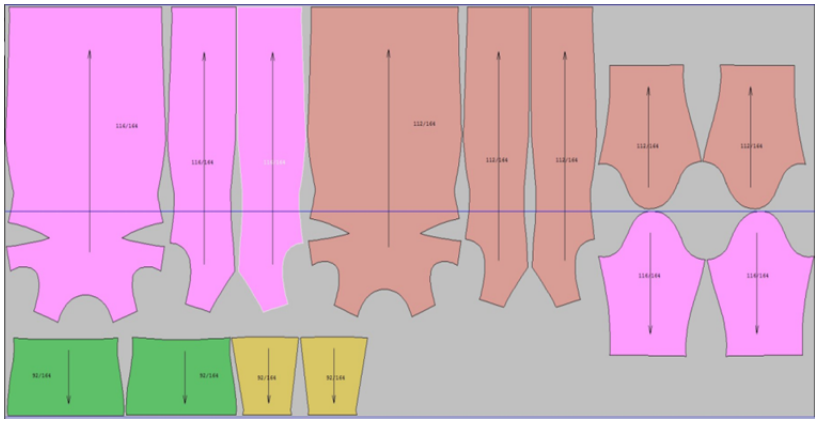

Figure 4 – Layout of the patterns on the dress and cardigan

The magnitude of inter-leaf losses along the length and width of the deck characterizes the economics of the layout and the use of the area of the fabric. A useful area is considered to be the area of the curves of all parts of the product. Consequently, the rate of flow of the web with regard to the additional product is less than without an additional product. When cutting the canvas without an additional product, the rate of application of the web and waste is increased.

Thus, it can be concluded that additional products are advantageous for production. As an additional product, products are used that can be made from this article, taking into account the way of laying, the width of the fabric.

This event allowed to expand the assortment of the factory, to get a new product with a low cost that will reduce the amount of waste generators and bring additional profit to the enterprise.

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THEORY OF LOCATION DURING ASSEMBLY
ТЕОРИЯ БАЗИРОВАНИЯ ПРИ СБОРКЕ

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Key words: location in the assembly, the methods of location, the problem of location.

Ключевые слова: базирование при сборке, методы базирования, проблемы базирования.

Abstract. Methods of location during assembly, the methods of location, the base part, and the assembled elements are considered in the article.

Аннотация. В статье рассмотрены методы базирования при сборке, способы базирование базовой детали и собираемых элементов.

Assembly is the final stage of manufacturing machines and mechanisms, which largely determines the operational reliability and durability of the product. The volume of assembly work at the current level of engineering production is significant and amounts to a total labor input of manufacturing the product: in mass and large-scale production 20 ... 25%, in the serial production - 25 ... 35%, in single and small-lot production - 40 ... 50%.

In various branches of machine building, the share of assembly works varies. For example, in heavy machine building, the laboriousness of assembly is 30-35% of the total laboriousness of manufacturing a product, in machine tools 25-30%, in the automotive industry 18-20%, in instrument engineering up to 45%. [1, p.209] Therefore, the acceleration of the assembly process is extremely important.

According to GOST Assembly - the formation of connections of the component parts of the product. The essence of the assembly consists in the consecutive connection and fixation of all the parts that make up this or that assembly unit in order to obtain a product meeting the technical requirements established on it. [2]

The assembly process of the product follows the assembly process. The assembly as technological process is a part of the production process, directly connected with the joining of parts in certain technologically and economically expedient sequence for the production of assembly units and products fully satisfying the requirements established for them.

The assembly process consists of a series of operations to connect the conjugate parts to the nodes, and knots to the machine. [1, p.212]

There are several common methods of assembly:

1. assembly by the basic part (drawing);
2. assembly by marking;

3. assembly by the assembly holes;
4. assembly using special assembly tools.

Assembly by the basic part – is used in the case when the assembled parts have a great deal of their own rigidity, and the dimensions of the finished product are provided by the system of tolerances and landings adopted in the general engineering industry. When assembling nodes from parts with low stiffness by this method, its realization is difficult to implement.

Assembly by marking – requires the mandatory presence of one such part in the assembled product, which could serve as the main (base) and on which it is possible to apply marking lines to other parts that are interfaced with it. In this case, universal tools and tools (clamps, dies, cores, compasses, etc.) are used. The details are marked by hand.

Assembly by the assembly holes – a process in which the relative location of assembled parts is determined by the position of the assembly holes available on them.

Assembly with the use of special assembling devices is the most popular way of assembling during mass production. Assembling devices provide the required relative positioning of the assembled parts, tools, shaping of insufficiently rigid parts and assemblies during assembly. [3]

Each of the assembly methods includes the installation of the part (location), its fixing and connection. The assembly of the part is done by assembly bases.

Assembly bases are called bases, which determine the position of this part in the assembly unit and in the complex. These are the supporting and mating surfaces of the base and hull parts, the grooves in the shafts, and so on. [4]

In most cases, the assembly begins with the base part. The base part is installed and fixed first, has well-defined base surfaces, ensuring its stable position during assembly. The largest overall dimensions in comparison with the parts that are mounted on it. To perform this task, the theory of location in machining is applicable. The main difference is that we take into account the forces that arise when joining elements to the base part, and not the forces that arise during its processing.

Depending on the type of the base part, the methods of location differ. Basically, the base part has flat or cylindrical surfaces less often spherical and shaped. In the case of a flat base surface, the best way is to use a kit with an installation base (Figure 1).

For basic parts with a cylindrical shape, it is rational to use a set of bases with a double guide (Figure 2).

For basic parts with a spherical surface, a set of bases with a triple guide is used.

After the main part is based, the elements attached to it are based. The assembled parts can be based both on mating surfaces and on auxiliary surfaces. At the same time, the cylindrical, flat, threaded, conical and combined surfaces are the most used for location. Spherical, core and knife surfaces are used less often.

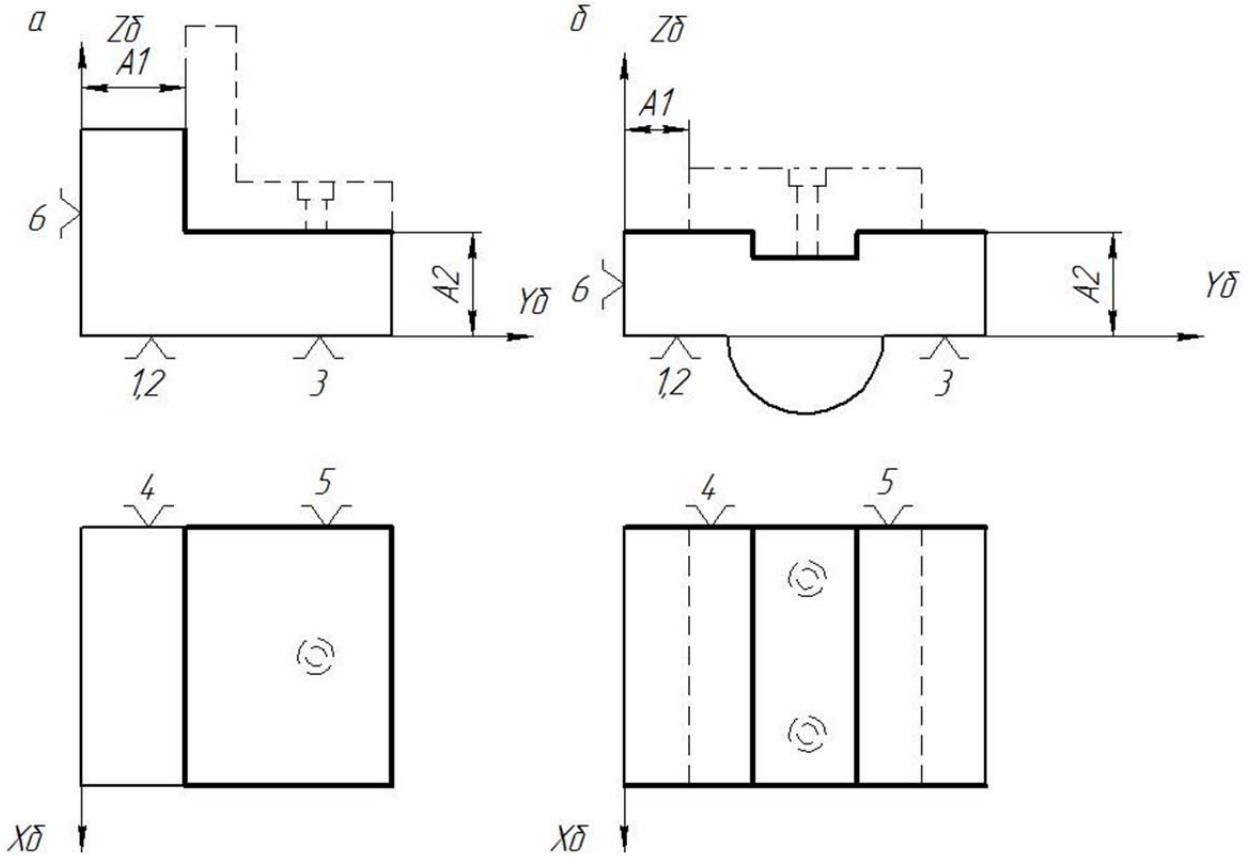

Figure 1 – assembling location, a base part with a flat surface

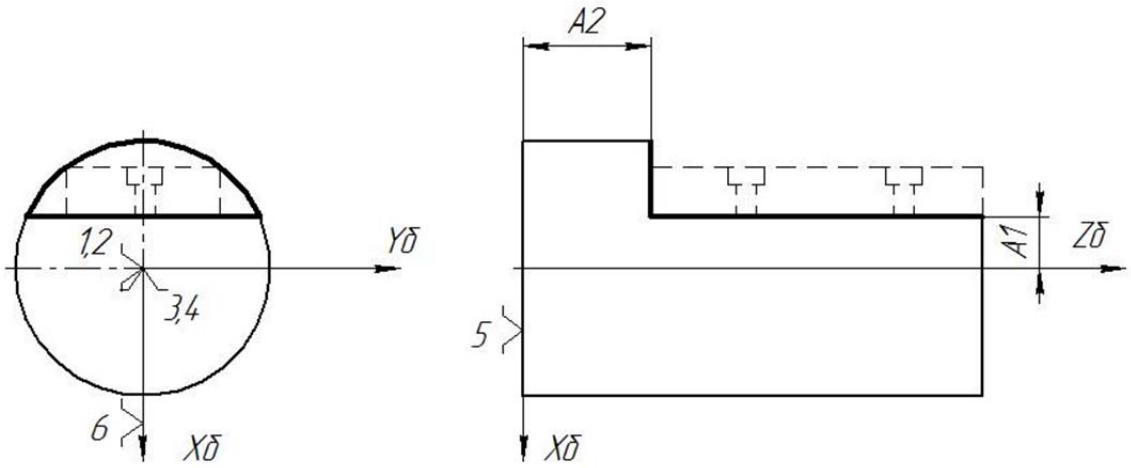

Figure 2 – assembling location, a base part with a cylindrical surface

The simplified assembling location algorithm looks like this:

1) Location of the base part taking into account the sizes and tolerances to the joining surface of the elements of the assembly.

2) Determination of the type of surface in the place of attachment of the next element of the unit, the requirement for precision of joining parts and the need for the use of assembly equipment.

3) The basis of the attached element, taking into account the specificity of the fixation (bolted connection, welding, etc.)

At the moment, an extended classification of the correspondence of the attachment surfaces of the set of bases and the applied assembly devices is being developed.

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THE STRUCTURE AND PROPERTIES OF ARTIFICIAL LEATHER

СТРУКТУРА И СВОЙСТВА ИСКУССТВЕННОЙ КОЖИ

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Key words: artificial leather, natural leather, footwear, physical–mechanical properties, quality.

Ключевые слова: искусственная кожа, натуральная кожа, физико-механические свойства, качество.

Abstract. Nowadays, artificial leather is often used in footwear manufacture. The article presents the results of the study of physical and mechanical properties of the artificial leather in comparison with natural leather.

Аннотация. В настоящее время искусственную кожу часто применяют в производстве обуви. В статье представлены результаты исследования физико-механических свойств искусственной кожи в сравнении с натуральной кожей.

Artificial leathers are becoming popular as an alternative material owing to limited availability of natural leathers. This material is multilayered and composite. Artificial leathers are generally produced by coating PU over a base fabric, which generally comprises woven or knitted fabric made of synthetic fibers and forming open cells to maintain air permeability. PU is a polymer compound that has a urethane bond (-

NHCOO-) and a chemical structure in which soft segment, which is formed by the reaction of diisocyanate and polymeric polyol, and hard segment, which is formed by the reaction of diisocyanate and chain extender, exist simultaneously in a molecule. Due to this molecular structure PU has both tenacity and elasticity, which is a very unique property [1].

The subject of the research in this paper has been artificial leather and natural leather for the footwear. It materials are used at JSC "Krasny Oktyabr" in the shoe model №833018 and others models. This material has three layers: finishing layer, nanopur layer, woven fabric or knitted fabric. Microscopic images of artificial leather are presented at the figures 1-3.

This article describes the research of the basic physical-mechanical properties: breaking load, tensile strength, breaking elongation, coefficient of non-uniformity in elongation.

Physical–mechanical properties were tested according to GOST 17316-71 "Artificial soft leather. Measuring method of tearing load and elongation break" and GOST 938.11-69 "Leather. Tensile strength test" on a tensile machine IP 5158-5 [2,3]. All tests were carried out according to standard test methods in conditioned atmosphere of (20 ± 2) ºC and (65 ± 2) % RH. In the GOST 939-94 "Upper leather. Specifications" are written standardized values of physical–mechanical properties for natural leather [4].

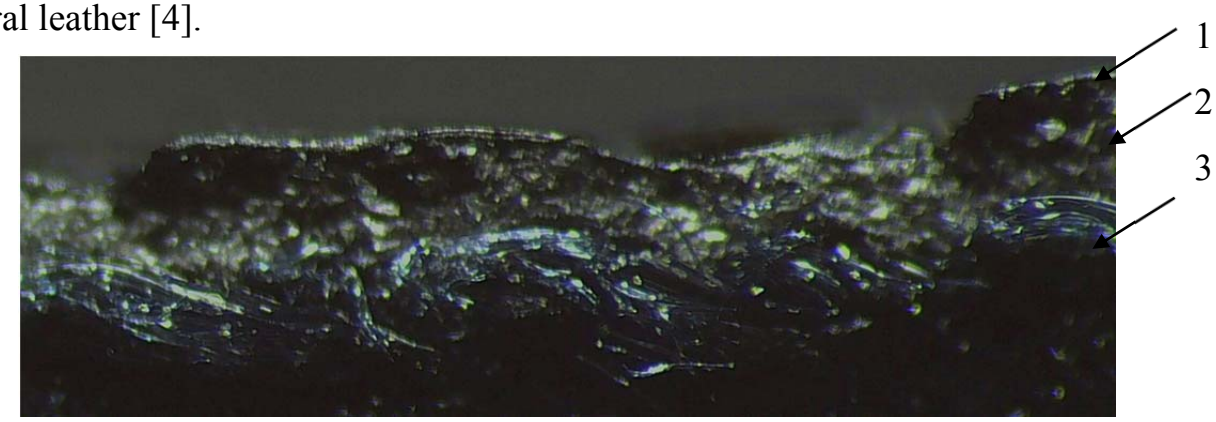

Figure 1 – Microscopic image of artificial leather №1:
1 – finishing layer, 2 – nanopur layer, 3 – knitted fabric

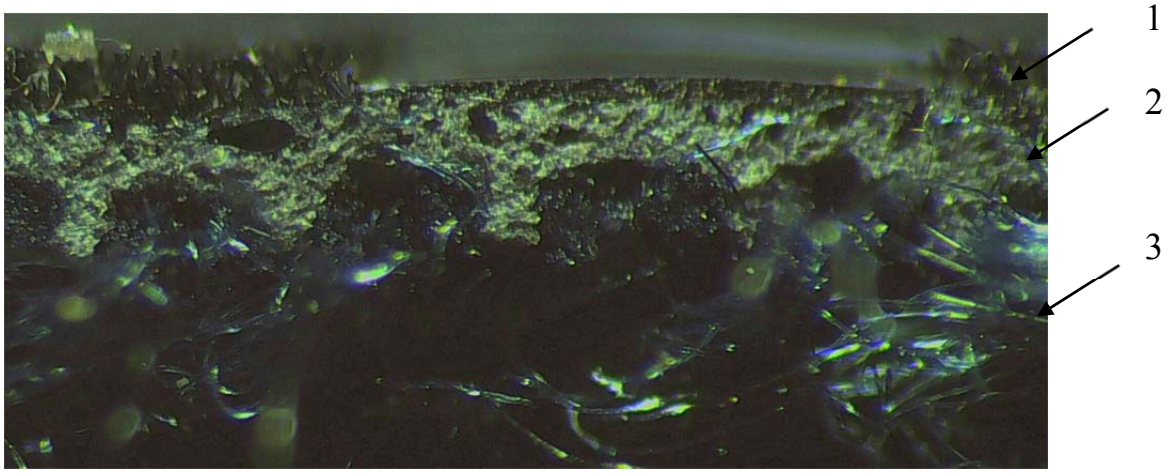

Figure 2– Microscopic image of artificial leather №2:
1- finishing layer, 2 – nanopur layer, 3 – knitted fabric

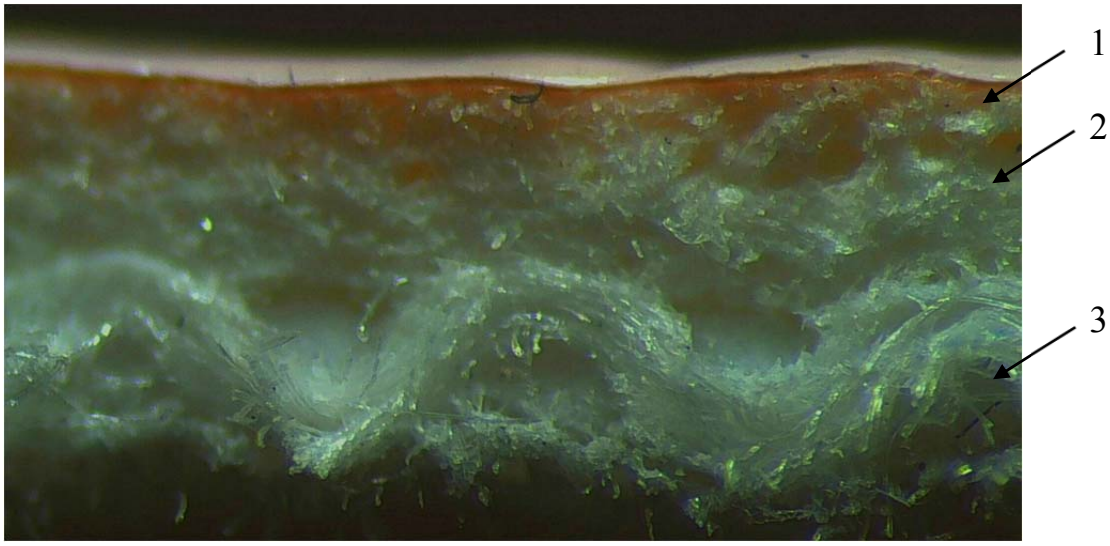

Figure 3– Microscopic image of artificial leather №3:
1 – finishing layer, 2 – nanopur layer, 3 – woven fabric

The table displays the physical–mechanical properties of tested artificial and natural leather.

Table – Physical–mechanical properties of artificial leather and natural leather

Materials	Thickness, mm	Surface density, g/m^2		Breaking load, *N*		Tensile strength, *MPa*		Breaking elongation , %		The coefficient of non-uniformity in elongation, %
		Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft	
Artificial leather №1	0.97	398	394	224	162	11.8	8.2	49	125	0.72
Artificial leather №2	0.85	439	460	288	178	16.9	10.5	53	117	0.62
Artificial leather №3	1.15	599	644	404	308	17.6	13.4	26	40	0.76
Natural leather № 1	1.50	1003	923	368	318	12.3	10.6	72	48	0.86
Natural leather № 2	1.50	1088	957	430	314	14.3	10.5	59	70	0.73
Natural leather № 3	1.30	947	905	512	384	17.1	12.8	52	49	0.75
Standardized values by GOST 939-94	0.90 – 1.63 mm	555–638 g/m^2		–		not less than 13–18 MPa		–		not less than 70 %

As the table shows values by thickness and surface density of artificial leather and natural leather correspond to GOST 939-94. The property “breaking load” is not standardized in the standard. Natural leather has higher breaking load than the artificial leather. Tensile strength is the ability of a material to withstand a longitudinal pulling force. In the standard this property should be within not less than 13–18 MPa. The table indicates that artificial leather and natural leather has lower

tensile strength along weft. The artificial leather №1 and natural leather № 1 are not correspond values of the property "tensile strength" along warp. The coefficient of non-uniformity in elongation characterizes the anisotropy of the material. Artificial leather №1 and №2 has fine anisotrophic properties as natural leather. As a result of the analysis we can conclude that artificial leather does not have sufficient physical and mechanical properties. The use of artificial leather in footwear manufacture does not allow to create high-quality footwear.

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TECHNOLOGY FOR PRODUCING LATEX BRAIDED THREADS

ТЕХНОЛОГИЯ ПОЛУЧЕНИЯ ЛАТЕКСНЫХ ОПЛЕТЕННЫХ НИТЕЙ

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Key words: thread, technology, equipment, formula, tension.
Ключевые слова: нить, технология, оборудование, формула, натяжение.

Abstract. The offered technology and the created equipment allow to form latex braided threads of a wide range of linear densities. The optimization of the technological process and an analytical description of the main stages of the technology make it possible to obtain the required values of design and technological parameters. The work is implemented and used in real production conditions. Latex

braided threads obtained by the proposed technology implement the import substitution program for the Republic of Belarus.

Аннотация. Предлагаемая технология и созданное оборудование позволяют сформировать латексные оплетенные нити широкого диапазона линейных плотностей. Оптимизация технологического процесса и аналитическое описание основных этапов технологии позволяет получить требуемые значения конструктивных и технологических параметров. Работа внедрена и используется в реальных производственных условиях. Латексные оплетенные нити, полученные по предлагаемой технологии, реализуют для Республики Беларусь программу импортозамещения.

The authors developed, created and use in production conditions a machine for the production of latex braided yarns. The ORM-1 machine was used as the base machine. The modernization consisted in changing the design of spindles, brake and spreading devices, installing a mechanism for feeding the latex tape into the working zone of the spindles.

It is known that the covering component on the hollow spindle moves to the point of contact with the core component in a spiral with variable pitch. For each mass unit of the thread the following forces act: centrifugal, aerodynamic, gravity, Cariolis. Having considered the movement of the thread element in Cartesian and polar coordinate systems and having carried out the corresponding mathematical transformations, formulas were obtained that make it possible to determine the thread tension at different sections of the thread-forming machine.

It is known that when moving to the point of contact with the core thread, the covering component of length dl and mass dm moves in a spiral with variable pitch. This motion can be represented as the sum of two motions: a spiral motion in the XOY plane perpendicular to the spindle axis and translational along the Z axis, aligned with the axis of the spindle. To move the thread element in the XOY plane, you can use the formula:

$$\rho = \frac{A}{\varphi + \varphi_0}. \tag{1}$$

Here ρ is the current radius of the filament element with mass dm in the XOY plane, φ - is the rotation angle at time t for uniform rotation with constant angular velocity, φ_0 - is the initial rotation angle, and A is a constant determined from the initial conditions.

At t=0, ρ=R, φ=0, that is, the element of the covering component moves as it rotates by an angle φ_0. Therefore:

$$\varphi_0 = \frac{A}{R}; A = L = \varphi_0 R; \varphi = \omega t. \tag{2}$$

Finally, the function describing the movement of the thread element:

$$\rho = \frac{LR}{R\omega t + L}. \tag{3}$$

We superimpose the coordinates of the element with mass dm in the XOY plane (Fig. 1).

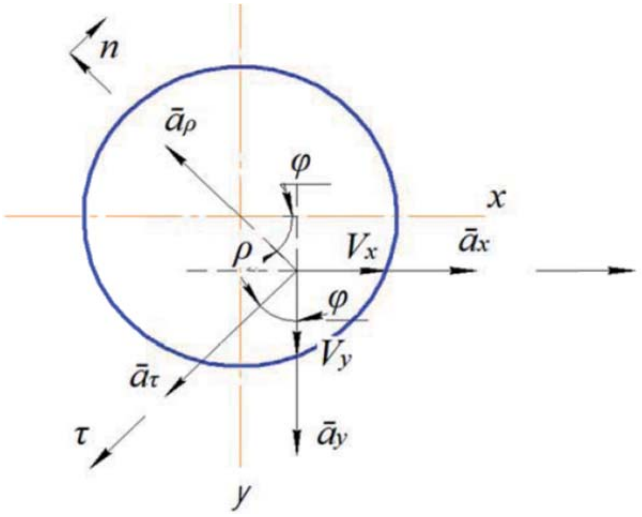

Figure 1 – The calculation scheme

$$x = \rho\cos\varphi = \frac{LR}{R\omega t + L}\cos\omega t, \tag{4}$$

$$y = \rho\sin\varphi = \frac{LR}{R\omega t + L}\sin\omega t. \tag{5}$$

The projections of the element's velocity vector on the X and Y axes:

$$V_x = \dot{x} = -\frac{LR^2\omega}{(R\omega t + L)^2}\cos\omega t - \frac{LR\omega}{R\omega t + L}\sin\omega t, \tag{6}$$

$$V_y = \dot{y} = -\frac{LR^2\omega}{(R\omega t + L)^2}\sin\omega t + \frac{LR\omega}{R\omega t + L}\cos\omega t. \tag{7}$$

The velocity vector of the thread element is decomposed into three components in two ways:

$$\overline{V}_a = \overline{V}_x + \overline{V}_y + \overline{V}_z, \tag{8}$$

$$\overline{V}_a = \overline{V}_\rho + \overline{V}_\tau + \overline{V}_z. \tag{9}$$

Here $\overline{V}_\rho$ and $\overline{V}_\tau$ are the projections of the velocity vector $\overline{V}_a$ on the directions of the radius ρ and the tangent τ of the trajectory of motion in the XOY plane, $\overline{V}_z$- is the projection of the velocity vector $\overline{V}$ on the Z axis, $\overline{V}_x$ and $\overline{V}_y$ are the projections of the velocity vector $\overline{V}_a$ on the X and Y axes, respectively.

On the other hand:

$$V_x = -V_\rho\cos\omega t - V_\tau\sin\omega t, \tag{10}$$

$$V_y = V_\tau\cos\omega t - V_\rho\sin\omega t. \tag{11}$$

Since V_x and V_y represent the decomposition of the same vector V on the X and Y axes, comparing the coefficients for the corresponding trigonometric functions, we obtain:

$$V_\rho = \frac{LR^2\omega}{(R\omega t + L)^2}, \tag{12}$$

$$V_\tau = \frac{LR\omega}{R\omega t + L}. \quad (13)$$

The projection of the velocity vector V onto the Z axis:

$$V_z = \sqrt{V^2 - V_x^{\,2} - V_y^{\,2}} = \sqrt{V^2 - V_\rho^{\,2} - V_\tau^{\,2}}, \quad (14)$$

$$V_z = \sqrt{V^2 - (\frac{RL\omega}{R\omega t + L})^2 \cdot [1 + (\frac{R}{R\omega t + L})^2]}. \quad (15)$$

Here V - is the absolute speed of the thread element, that is, the speed at which the formed thread is withdrawn from the working area.

The acceleration vector $\bar{a}$ of the thread element decomposes into components in two ways:

$$\bar{a} = \bar{a}_x + \bar{a}_y + \bar{a}_z, \quad (16)$$

$$\bar{a} = \bar{a}_\rho + \bar{a}_\tau + \bar{a}_z. \quad (17)$$

Here a_ρ and a_τ are the projections of the acceleration to the radius and the tangent of the trajectory of the motion, a_z is the projection of the acceleration to the Z-axis, a_x and a_y are the projections of the acceleration on the X and Y axes, respectively.

$$a_x = \dot{V}_x = \frac{R^2 L\omega^2}{(R\omega t + L)^2}\sin\omega t - \frac{RL\omega^2}{R\omega t + L}\cos\omega t + 2\frac{R^3 L\omega^2}{(R\omega t + L)^3}\cos\omega t + \frac{R^2 L\omega^2}{(R\omega t + L)^2}\sin\omega t, \quad (18)$$

$$a_y = \dot{V}_y = -\frac{R^2 L\omega^2}{(R\omega t + L)^2}\cos\omega t - \frac{RL\omega^2}{R\omega t + L}\sin\omega t + 2\frac{R^3 L\omega^2}{(R\omega t + L)^3}\sin\omega t - \frac{R^2 L\omega^2}{(R\omega t + L)^2}\cos\omega t. \quad (19)$$

Here we have the following relation:

$$a_x = -a_\tau \sin\omega t - a_\rho \cos\omega t, \quad (20)$$

$$a_y = a_\tau \cos\omega t - a_\rho \sin\omega t. \quad (21)$$

Comparing (18), (19), (20), and (21) we obtain:

$$a_\tau = -2\frac{R^2 L\omega^2}{(R\omega t + L)^2}, \quad (22)$$

$$a_\rho = \frac{RL\omega^2}{R\omega t + L} \cdot [1 + 2\frac{R^2}{(R\omega t + L)^2}], \quad (23)$$

$$a_z = \dot{V}_z = \frac{R^3 L^2 \omega^2}{(R\omega t + L)^3} \cdot \frac{1 + 2\frac{R^2}{(R\omega t + L)^2}}{\sqrt{V^2 - (\frac{RL\omega}{R\omega t + L})^2 \cdot [1 + (\frac{R}{R\omega t + L})^2]}}. \quad (24)$$

From the known acceleration parameters, we find the projections of the force acting on the filament element dm. From the formulas (18) - (24) after the necessary transformations we obtain:

$$\Delta F_\tau = -2dm\frac{R^2 L\omega^2}{(R\omega t + L)^2} = -2dm\frac{\omega^2}{L} \cdot \rho^2. \quad (25)$$

The obtained value of the yarn tension increment allows us to conclude that for fixed parameters ω, L, dm the increment of tension is proportional to the square of the radius.

With the development of the technology the optimization of the technological process was carried out. Criteria for optimization are the breaking in the process of formation and the filling of the core by the pile component. It has been experimentally established that the most influential parameters on the breaking are the velocities of the core and covering components fed into the formation zone, as well as the linear density of the core component.

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HYDROCARBON POLLUTION OF THE RIVERS OF THE INDUSTRIAL CENTERS IN VITEBSK REGION

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Key words: environmental risk, industry, petroleum products, pollution, water object.

Abstract. The greatest amount of environmental pollution comes from industrial enterprises. Pollutants are transferred at large distances falling into watercourses in different ways. This can cause contamination of adjacent territories. The Vitebsk region is a developed industrial region, which contains many organizations or production units, where used oil and oil products. There is always the risk of accidents and emergencies at industrial complex, including the risk of pollutant transfer into water bodies. A study of the state of the region's water bodies under these conditions is very relevant.

The aim of the work is an analytical assessment of watercourses flowing through the largest industrial centers of the Vitebsk region, from the position of ecological risk of pollution of water areas with oil products.

The State Water Cadastre materials were used for the work, including summary data on water resources and their quality in previous years. We used a statistical and contrastive-comparative method of investigation.

The result of statistical analysis of the data set [1]:

– Value of runoff highly variable. From year to year the amount of precipitation varies, because of the specific circulation. All this is reflected in the river runoff, the same dynamics which can be seen in the basins of the Western Dvina and the Dnieper rivers. Since 2013 a sharp decrease in river flow has been noticed, which is favorable from the point of view of ecological risk of water pollution, because with the reduction of volume of melted snow and rain water fills the river, which is surface runoff, and decreases the probability of falling pollutants from industrial areas and industrial facilities into the waters.

– The concentration of oil products in points of hydrochemical observations is constant and minimal in recent years. In the period from 2003 to 2007, the observed sharp increase of the oil concentration in the Dnieper river, which is associated with the process discharge of pollutants from the Russian Federation. The most influential industrial centers on pollution of rivers with oil products are Orsha, Polotsk and Novopolotsk.

– Dynamics of the water contamination index in points of the hydro-chemical observation shows that over time the water in the rivers has changed for the class of pollution moderately polluted to clean – the basin of the river Western Dvina, and from contaminated to clean – the basin of the Dnieper river. Most large load of the river comes from the cities: Orsha (mostly), Polotsk, Novopolotsk. The value of self-purification of rivers is small, because the pollutants remain almost in its amount from one locality to another.

– The average annual discharge of wastewater into water bodies in the Vitebsk region is 141.6 million m^3/year – the 4th value for the country. The volume of wastewater of Novopolotsk in water bodies is quite varied, compared to Vitebsk twice as high as average values across the region and Vitebsk, although the volume of regulatory treated wastewater is approximately equal. The value of the discharge of contaminated wastewater in the region is minimal and is constant in contrast to the country's values.

– In the Vitebsk region the capacity of the treatment plant, after which the wastewater is discharged into water bodies, varies markedly over the years, increasing, and again decreasing its rate, thus becoming extremely unstable. From the viewpoint of environmental risk, the most favorable situation would be a tendency to increase the power values.

– The volume of discharge of oil and oil products in water bodies in recent years have stabilized. Novopolotsk detected its significant "contribution" to the rivers of the region: the overall average rate of dumping of petroleum products in the waters of the Vitebsk region is only 1,7 times more than in Novopolotsk.

For the location of industry characterized by a high level of territorial concentration – 4 the largest industrial center – Vitebsk, Orsha, Novopolotsk, Polotsk account for about 70% of the products of the industry in the region. However, this situation creates the risk of water pollution of basins of the rivers Western Dvina and the Dnieper due to their immediate adjacency to the industrial centers. The concentration of oil products in points of hydrochemical observations in recent years is constant and minimum, over time the water in the rivers has changed for the class of pollution moderately polluted to clean. The worst cities from the perspective of environmental risk of water pollution with oil products are Novopolotsk and Orsha.

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INFLUENCE OF GEOMETRIC PARAMETERS ON CHARACTERISTICS OF INTERDIGITAL DIELECTROMETRY SENSOR FOR MEASURING MATERIALS WITH DIELECTRIC ANISOTROPY

ВЛИЯНИЕ ГЕОМЕТРИЧЕСКИХ ПАРАМЕТРОВ НА ХАРАКТЕРИСТИКИ МНОГОСЕКЦИОННЫХ ЭКРАНИРОВАННЫХ ЭЛЕКТРОЕМКОСТНЫХ ПРЕОБРАЗОВАТЕЛЕЙ ДЛЯ ИЗМЕРЕНИЯ АНИЗОТРОПИИ МАТЕРИАЛОВ ПО ДИЭЛЕКТРИЧЕСКОЙ ПОНИЦАЕМОСТИ

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Key words: *anisotropy, dielectrometry, nondestructive testing, edge effect, capacitive sensors.*
Ключевые слова: *анизотропия, диэлектрометрия, неразрушающий контроль, краевой эффект, емкостные датчики.*

Abstract. Capacitive transducers are widely used for non-destructive testing (NDT) of a great number of polymer materials. The input data for NDT tasks applied for the testing of composition and structure, strength and deformation properties are presented as the complex of electrical characteristics. This paper focuses on the principles of design of MSAIC (Multichannel shielded attachable instrument capacitors) and mirror-symmetrical SAIC. In addition, the analysis of the following characteristics is presented: depth of a control zone, service capacity, sensitivity to the anisotropy of dielectric properties.

Аннотация. Электроемкостные преобразователи широко применяются для неразрушающего контроля полимерных материалов. Входные данные для задач неразрушающего контроля, применяемых для контроля состава и структуры, прочностных и деформационных свойств представляет комплекс электрических характеристик. В статье рассматриваются принципы проектирования многосекционных экранированных и многосекционных зеркально-симметричных измерительных конденсаторов. Кроме того, анализируются следующие характеристики: глубина зоны контроля, рабочей емкости, чувствительности к анизотропии диэлектрических свойств.

The efficiency of NDT of composites and polymers mainly depends on the precise measuring of anisotropy of their physical and mechanical properties which is characterized by the permittivity tensor components. Permittivity tensor components

provide information on density, composition, structure, and humidity. They are a part of the input data complex for the quality inspection of materials with low anisotropy [1, 2, 3].

The control methods of anisotropy of dielectric properties of polymers are based on the formation of parallel plate fields in objects to be tested with the help of two types of transducers - the Maxwell's parallel-plate capacitor which requires destruction of the tested object, and the attachable instrument capacitor (AIC) which does not destroy the tested object [4]. However, the use of AIC is not always effective because the fields at the faces of strip electrodes of AIC differ from parallel plate ones [5], which, in their turn, lead to procedural errors in measurement of anisotropy of dielectric properties. The error may go well beyond 10%. Moreover, the edge effect at the faces of electrodes is impossible to determine as opposed to the control of isotropic media [6]. In addition, the sizes of the electrodes should be selected so that the penetration of the transducer's electric field is less than the minimum thickness of the material [7] and, consequently, any change in the thickness does not affect the measurement results. The absence of effective means and methods of NDT of anisotropy of polymer materials leads to low efficiency of testing of strength and deformation properties of polymers, water content measurement of materials with anisotropic structure.

The mathematical models of the sensors are constructed by an integral equation method where potential electrodes are presented as mirror-symmetrical equipotential surfaces spaced apart at the electrodes thickness [7]. The models of mirror-symmetrical SAIC and SAIC are of a universal nature and in a particular case, if shield is removed, it turns into the model of the AIC [5]. The calculation of electric fields of capacitive sensors (Fig. 1a, 1b) filled with an anisotropic material was performed by the method of isotropizing coordinate transformation.

When coordinate axes coincide with axes of material anisotropy the indices of reflection and transmission are replaced with similar indices for isotropic medium considering that material permittivity equals: $\varepsilon = \sqrt{\varepsilon_x \varepsilon_z}$. For anisotropic medium, distances between electrodes h, and electrode thickness d are changed as well:

$$h_1 = h\sqrt{\varepsilon_x / \varepsilon_z}, \quad d_1 = d\sqrt{\varepsilon_x / \varepsilon_z}.$$

Values of specific constants εx, εy and εz vary insignificantly for most anisotropic materials. Thus, errors resulted from non tight contact of electrodes with the inspected surface, and errors caused by edge effect at the electrode faces where the field is not parallel-plate may lead not only to quantitative but also qualitative changes in the idea of anisotropy of the tested material. Solution of this problem relates to the design of sensors which enable to create fields mainly along the axes of material anisotropy in the ZOX and ZOY planes [6].

In case of difference the high sensitivity of the measuring device can be achieved by differential measuring method. When determining the values of constants of permittivity tensor to remove errors caused by edge effect two capacitive transducers of different length but with the same configuration of strip electrodes at the faces

shall be used. The difference between capacitances of transducers, measured for various electrode lengths, L1 and L2, reflects capacitance per electrode length without edge effects at the faces [6]. Figure 3 shows calculated dependences of the difference of normalized capacitances Cx/C0 and Cy/C0, for differential mirror-symmetrical AIC, SAIC and AIC, which enable to create fields along anisotropic axes of a material. C0 is capacitance of a capacitive transducer in the air. Field force lines of the first sensor are closed in ZOX plane and those of the second one - in ZOY plane. Values of material permittivity in direction of axis are εx = 1.9 and in perpendicular directions are εy = εz =1.2 [7]. In contrast to AIC, mirror-symmetrical AIC and SAIC demonstrate a clear maximum on the relative capacitance difference curves (Cx – Cy)/C0 from a relative gap dr/h. Moreover, the smaller the thickness of transducers substrates is, the higher the sensor sensitivity to anisotropy. It is caused by the fact that the shields at the base of substrates accumulate the larger part of the flow of electric field intensity. Z-type field bending takes place in the space between electrodes. It increases which results in the increase of the share of the flow closed between the potential electrodes through the inspected anisotropic material, isotropic material of the substrate, and in the decrease of the share of the flow closed between potential electrodes in the substrate. The loss of sensitivity to anisotropy for small gaps dr is caused by the decrease of the share of horizontal component of field intensity. The fields, to a greater extent, are coupled to shields making force lines protrude which decreases capacitive transducer sensitivity to anisotropy.

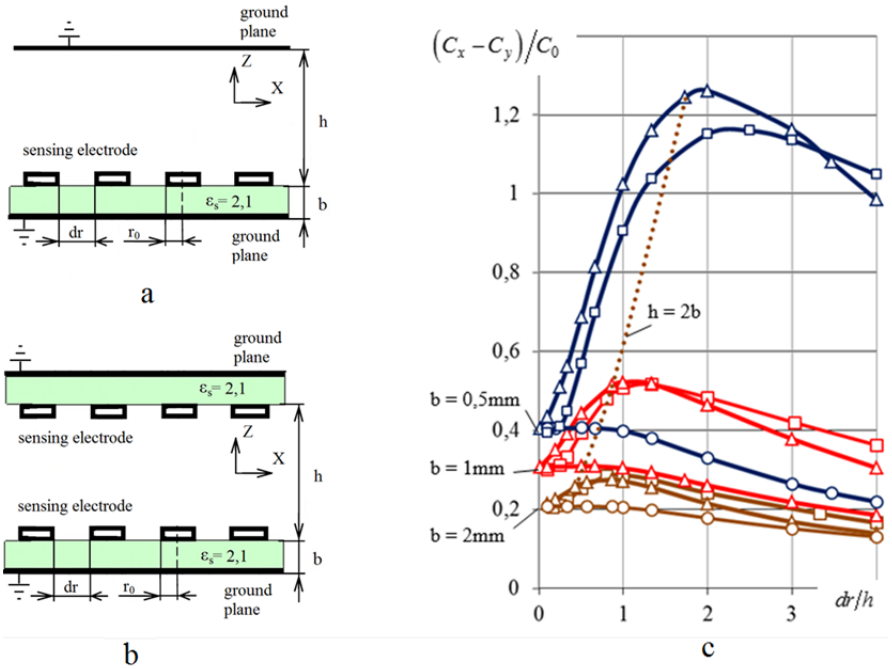

Figure 1 – Characteristics of capacitive sensors:
a - design of mirror-symmetrical SAIC; b - design of mirror-symmetrical SAIC
c - Calculation pattern of dependency of relative capacitance difference on a relative gap dr/h: Δ – SAIC; □ – mirror-symmetrical AIC; ○ – AIC.

The sensitivity to anisotropy of capacitive transducers produced on relatively thin substrates b ≈ dr (upper curves in Fig. 1c) is higher than that of capacitive transducers on thick substrates. However, small capacitance values of capacitive transducers bring to naught this advantage. Figure 1c shows the changes in capacitances between electrodes of mirror-symmetrical AIC and SAIC which are observed as long as the gap between electrodes, dr, decreases. The electrodes of capacitive transducers abrade during the period of exploitation. The thickness loss of the electrodes results in the loss of sensitivity to dielectric anisotropy of a material. The loss of relative difference of capacitances, which create the fields along the anisotropy axes, equals to 0.5 % when the loss of electrode thickness ranges from 5 μm to 35 μm. When the size increases h → ∞ relative differences (Cx – Cy)/C0 tend to the values of relative differences of capacitances of multichannel AICs. They do not depend on the size h (thickness of the inspected material). The maximum difference (Cx – Cy)/C0 is observed for sensors when the thickness of an inspected material equals h ≈ 2b.

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COMMODITY NOMENCLATURE OF SHOES QUALITY INDICATORS

ТОВАРОВЕДНАЯ НОМЕНКЛАТУРА ПОКАЗАТЕЛЕЙ КАЧЕСТВА ОБУВИ

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Key words: *nomenclature, shoes, commodity, quality, quality indicators.*

Ключевые слова: номенклатура, обувь, товароведение, качество, показатели качества.

Abstract. These characteristics of consumer goods are formed within quality indicators nomenclature. This nomenclature is a set of properties and indicators that determine the satisfaction of real and perceived human needs. There are groups and subgroups within the nomenclature, which reflects the characteristics of consumer properties of goods. There is a different range of consumer properties for each product group.

Аннотация. Качественные характеристики потребительских товаров формируются в пределах номенклатуры показателей качества. Номенклатура показателей качества представляет собой совокупность свойств и показателей, которые определяют удовлетворение реальных или предполагаемых потребностей человека. В пределах такой номенклатуры существуют группы и подгруппы, которые отображают особенности потребительских свойств товаров. Для каждой товарной группы существует своя номенклатура потребительских свойств.

Development of commodity nomenclature uses the typical commodity nomenclature which consists of consumer properties and quality indicators for a particular group of goods.

The definition of the nomenclature of footwear quality indicators by Sadovsky and Nesmelov [1]: "The requirements for footwear are determined by its purpose, operating conditions, fashion trends, seasonality, climatic features and other factors. Among the requirements for shoes, the main ones are: social, functional, ergonomic, operational (reliability requirements), aesthetic."

This classification of requirements for footwear is more complete and extended in compared with РД-17-06-152-89 [2], in which the quality indicators for footwear are represented by the consumption properties (reliability, durability), ergonomic properties (hygienic, anthropometric, physiological) and safety (electrical for example).

The specialists of VSTU made their nomenclature in the field of integrated assessment of footwear quality.

Gorbachik and Linnik [3] proposed an enlarged scheme for assessing the quality of footwear, in which the quality of shoes was proposed to be evaluated in two directions: production, economic and consumer properties, and the last two groups were divided into another two groups - aesthetic and operational. The ergonomic quality indicators and indicators durability and reliability were sorted as operational qualities.

This division is of interest because the group of functional and safety indicators is not classified this despite of the fact that these indicators have lead places in the classification of goods.

Also it is necessary to note that operational parameters of shoe soles quality (reliability, maintainability, maintainability and durability) Lyubich [4] identifies the exploitation characteristics which make influence on binding shoe details and characterizes then as holding strengths of upper parts (formed by the protruding edge

of the top and the insole, the sole, the sole and the insole, the welt together with the sole, with the insole and sole), holding strengths of welt with upper and lower details, plantar bonds and heel bindings.

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COMPARATIVE ANALYSIS OF FLAX FIBER PROPERTIES

СРАВНИТЕЛЬНЫЙ АНАЛИЗ СВОЙСТВ ЛЬНЯНОГО ВОЛОКНА

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Key words: flax fiber, information system, quality control, quality indicators.
Ключевые слова: льняное волокно, информационная система, контроль качества, качественные показатели

Abstract. Using the information system of quality control the possibility of using oilseed flax fibers for the production of linen textile materials was investigated.
Аннотация. С использованием информационной системы контроля качества была исследована возможность использования волокон масличного льна для производства льняных текстильных материалов.

Improving quality and expanding the range of textile materials is one of the topical tasks of the industry of the Republic of Belarus. RUPTP «Orsha Linen Mill» is the biggest enterprise in Eastern Europe, which processes flax fiber and produces linen

fabrics. Specialists of Vitebsk State Technological University have developed an information system for quality control of flax fiber, which is used in production processes of the linen mill [1].

One of the important tasks to expand the raw material base for the flax processing industry is the use of oilseed flax fiber. Stems of oil flax as well as stems of short fiber flax include bast pieces of cellulosic fibers. With a certain technological processing of oil flax stems, it is possible to extract textile fibers with physical and mechanical properties which satisfy the requirements of the industry for the manufacture of textile products for various purposes [2].

Using the information system of quality control of the RUPTP «Orsha Linen Mill», based on data on the physical and mechanical properties of the Belarusian short fiber of the crop in 2016, were analyzed the physical and mechanical properties of the fibers of the Ukrainian flax oilseed. The fibers were extracted using the technology proposed by the specialists of Kherson National Technical University. The physical and mechanical properties of individual oilseed flax fiber samples satisfy the requirements for a short flax fiber for the production of pure flax yarn for bagging and wrapping fabrics, linear densities from 220 to 600 Tex.

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IMPROVING THE COMPETITIVENESS OF TEXTILES

УЛУЧШЕНИЕ КОНКУРЕНТОСПОСОБНОСТИ ТЕКСТИЛЬНЫХ ИЗДЕЛИЙ

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Key words: information system of quality control, textile materials, production efficiency.
Ключевые слова: информационная система контроля качества, текстильные материалы, эффективность производства.

Abstract. Modern innovative methods of products quality control, allowing to increase the effectiveness of measures to control the quality of textile products and improve its competitiveness.

Аннотация. Современные инновационные методы контроля качества продукции, позволяющие увеличить эффективность мероприятий по контролю качества текстильной продукции и повысить ее конкурентоспособность.

Improving the quality of textile products to the level of world standards, expanding assortment of production, is one of the conditions for the effective work of textile enterprises of the Republic of Belarus. Competitors from goods from Russia, Central Asia, Turkey and China require the textile enterprises to use innovative methods to improve competitive ability.

RUPTP «Orsha Linen Mill» is the largest textile enterprise in the Republic of Belarus and Eastern Europe for the production of linen fabrics and products thereof. This mill processes up to 90 % of long and up to 50 % of short Belarusian linen fibers and produces a wide range of linen fabrics. Linen products have good hygienic properties. The technological equipment installed at the mill and modern technologies allows producing high-quality products from flax raw materials.

The specialists of Vitebsk State Technological University have developed an information system [1] for quality control that has the following functional capabilities:

– accumulates data on the qualitative characteristics of incoming flax fiber [2];

– generates various types of statistical reports that allow analyzing the quality of flax fiber [3];

– automatically identifies cases of improper quality of raw materials.

To increase the productivity of employees, they have the opportunity to access the information system of quality control at any place of the enterprise using mobile computers. This allows to make timely decisions on production management. Modern information technologies have allowed to completely replace paper documents with electronic ones.

Using modern information system for industrial quality control allows:

– to control the changes in the physical and mechanical properties of flax fiber [4] and linen textile materials (sliver, roving, yarn, etc.) at various stages of textile production;

– to reduce the complexity of work in the laboratory of the enterprise;

– to predict the qualitative characteristics of yarn on the basis of laboratory studies of a single party of flax fiber, using previously accumulated data [5].

The use of the modern information system on RUPTP «Orsha Linen Mill» has increased effectiveness of quality control of manufactured products and efficiency of making managerial decisions, which allowed to improve the quality and competitive ability of the products.

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PROBLEM OF DESIGN OF PRODUCTS FROM SEWING WASTE AT THE ENTERPRISE

ПРОБЛЕМА ПРОЕКТИРОВАНИЯ ИЗДЕЛИЙ ИЗ ШВЕЙНЫХ ОТХОДОВ НА ПРЕДПРИЯТИИ

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Key words: *sewing industry, waste processing, the location of the templates, cabbage.*
Ключевые слова: *швейная промышленность, переработка отходов, раскладка лекал, межлекальные выпады.*

Abstract. The main purpose of recycling sewing waste at the enterprise is the rational use of materials and the creation of additional products from waste. This article examines the main problems and issues that each sewing enterprise faces. The necessity of improving the «The location of the templates» module during the development of goods from waste identified and justified. Based on the research, a software module developed to automate the process of accounting for wastes, which formed when cutting and developing products from them.

Аннотация. Основной целью переработки швейных отходов на предприятии является рациональное использование материалов и создания дополнительных изделий из отходов. В данной статье рассмотрены основные проблемы и вопросы, с которыми сталкивается каждое швейное предприятие. Выявлена и обоснована необходимость совершенствования модуля «Раскладка лекал» в процессе проектирования товаров из отходов. На основании исследований

разработан программный модуль для автоматизации процесса учета отходов, образующихся при раскрое и разработке изделий из них.

The possibilities of processing sewing wastes in additional products at light industry enterprises without the use of special equipment are relevant not only from the point of view of environmental protection, but also from the point of view of economic gain, since waste is a cheap raw material.

The results of monitoring organizations in the production of textiles identified a number of key issues when designing such products:

– group of goods, products that an enterprise can produce;

– demand of this product in the market of services (availability of consumers);

– the market segment in the quantitative indicator (the volume of necessary products);

– material costs of the technological process and the cost of products;

– labor intensity of designing additional products.

At present, there is no automation of the design and preparation of production process, taking into account the rational use of waste generated during cutting.

Therefore, the questions on the use of waste for the production of new competitive products are addressed individually at each sewing enterprise, but their processing is not effective for a number of reasons: the complicated recording and collection of waste, the large time consuming for cutting materials, increasing the labor input by additional joining parts of products, and also large material costs for the modernization of the technological process [1].

Basically, cabbage and end residues used to produce parts for smaller products, decorative items in the product as parts to improve the functionality of the product, for fastening a stack of parts cut. Also it is the realization of waste in recyclable materials, in retail and related industries, and the production of non-profile products in the framework of the side production [1, 2].

As a result of the analysis of automated design systems, the most important stage in the development of garments from waste identified - the module «The location of the templates».

According to the results of experimental calculations a time-consuming part in the process of the location of the templates is observed when performing operations of selecting and uploading a kit of parts in cabbage, which in turn leads to lower performance standards of the operator and productivity.

Based on the research, a software module has been created that will automate the process of accounting for waste generated during cutting and designing products from them [2,3].

The software provides the allocation of plots of cabbage between the parts of the layout that are needed for further processing, parametric analysis of selected sites, using three-dimensional modeling analytic geometry, putting some of the template sets products information stock (databases).

The information stock is a database of an assortment of goods for clothing and household purposes, which can made from waste. The list of assortment of projected products from waste preliminarily formed by the economic and marketing

departments of the enterprise, taking into account the demand for household goods (slippers, hats, children's toys, finishing elements for products, cloths for animals).

Thanks to this stock, the companies have an opportunity to cooperate in the production of products and processing of waste, and create a separate database, which is available only for this user of the software module.

Application of the developed program at the enterprises of light industry will allow to:

– reduce the percentage of attacks between templates by 2-5%;
– reduce the volume of waste utilization;
– ensure the economic distribution of material resources;
– expand the range of household products from waste;
– increase the level of automation of the processes of designing clothes and rational use of raw materials;
– improve environment;
– create new jobs at sewing and non-profit enterprises for the manufacture of goods.

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A NEW SEED COTTON REGENERATOR

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Key words: seed cotton, cleaner, regenerator, waste, large trash, small trash, flying of seed cotton, regenerative effect.

Abstract. The article considers the problems of improving the quality of cotton fiber by developing a new design of cotton regenerator that provides more efficient and qualitative regeneration and cleaning of seed cotton from cleaner's waste of cleaners.

The content of flyings in the wastes, depending from the moisture content and contamination of the seed cotton to be cleaned, as well as from the degree of wear of the doffing brushes, guide drums, lapping brushes and the size of the gaps between the saw drums and grid bar, is 1-2% from cleaned seed cotton in the serial cotton cleaning units of UChK. While cleaning seed cotton with high moisture and contamination, contentof seed cotton in the wastes increases [1].

Regenerators RX (1RX) [2],which were developed in the early 80s of the last century to extract flyings from the wastes of the RX-1 serrated cleaners,were used to prevent the losses of seed cotton with wastes and were included in the pneumatic transport system of the PLPH production lines and worked under vacuum. The wastes of the cleaners contained mainly large trash and flyings of seed cotton. With this waste composition, the regenerator RX provided reliable operation with a capacity of up to 1 ton / hr, its regenerative effect was 95%, and the cleaning efficiency, depending on the contamination of the wastes, reached 80%.

In the 90s of the last century, instead of the production lines of the type PLPH, cotton ginneries were equipped with cotton-cleaning aggregates UHK, consisting of sections where the separated small and large trash particlesenter the common bunker and are withdrawn from it by a screw. Due to the combination of small and large trash, the load on the regenerators increased by 2-3 times, and under the influence of the screw, small trash particlesbegan to penetrate into the flyings of seed cotton and become difficult to remove. As a result of this, the cleaning effect of the regenerators of RX has decreased to 50%, and the contamination of regenerated flyings during the cleaning of seed cotton of hard-to-clean varieties has reached 70%. Consequently, when they were mixed with seed cotton, the quality of the produced fiber began to decrease by one or two classes.

The recommendation on separate processing of seed cotton and regenerated flyings developed in 1995 and then included in the technological procedure [2] due to some reasons is not fulfilled at all ginneries. The implementation of this recommendation improves the quality of cotton fiber by one class, and the quality of fiber from regenerated flyings is reduced by one to two classes.

A promising solution to the problem is the development of a new complex of cotton ginning equipment with a separate withdrawal of large and small trashes containing seed cottonflyings. Currently, it is advisable to develop a new more efficient regenerator of seed cotton from waste.

Observations of the operation of the regenerator RX showed that the cleaning rate of regenerated flyings is 3-4 times. The cleaning effect of the regenerator is reduced to 50-60% if more than 30% of fine trash ispresent in waste products of cotton, which is observed when cleaning seed cotton withtrash content more than 5%. In this case the impurity of regenerated flyings increases to 20 or more percent, that after mixing of flyings to seed cotton begins to decrease the quality of the produced fiber [3,4].

During the operation of the regenerators RX it was also noticed that with increasing productivity its catching effect was practically unchanged, and the cleaning effect was reduced.

In the regenerator of RH, the outdate working bodies are used:

– gripping serrated drums, the sawings of which break and come off the shells, which reduces the gripping ability of the drums;

– doffing brush drums, whosebrushes quickly wear out and shorten, that reduces the efficiency of seed cotton doffing;

– lapping brushes, which deviate from the serrated drums, that reduces the gripping ability of the sawings.

Currently, to replace these unreliable and requiring frequent replacements, and repairs of working parts, new more reliable and efficient working tools have been developed for seed cotton cleaners. These are gripping saw cylinders designed to replace the serrated drums, doffingcylinderdrum with metal bars - to replace the brush drum, fixing metal bars - to replace the lapping brushes.

The abovementioned analysis showed that the main drawbacks of the serial regenerator are related to the construction of the pneumatic feeder and working parts. At the same time, the use of two gripping drums - the main and regeneration drums - is sufficient and acceptable for the regenerator being developed.

Serrated drums of regenerators RX have a diameter of 480 mm, and modern gripping saw cylinders are made from over-intersected gin saws with a diameter of 300 mm. Accordingly, with a decrease in the diameter of the cylinder, the length of the arc of the arrangement of the bars is reduced, and with the optimal gaps between them equal to 40 mm, their number decreases from 10 to 6 in the main drum and from 15 to 8 in the regeneration one. Due to the reduction in the number of bars, a certain reduction in the cleaning effect will occur, which will be compensated by an increase in the cleaning rate of regenerated flyings from 3-4 times to 6-8 times [6].

The installation of the saw cylinders, as well as the serrated drums in the regenerator RX, on the same vertical axis is optimal for achieving a compact location with the doffing drum adjoining both cylinders and for providing convenient maintenance of the grid bars.

Taking into account the revealed shortcomings of the pneumatic feeder of the semi-cylindrical shape in the developing regenerator, it is expedient to form a channel from the inlet to the outlet hole above the sidewall and side of the main gripping drum, which should be located at opposite sidewalls.

In order to prevent the transit of seed cotton flyings, impurities, free fiber and fibrous motes in it, it is advisable to place an air permeable bar drum along its longitudinal axis with the arrangement of the rods along the helical line. When rotated, such drum will ensure the winding of the air around it with an axial displacement in the direction from the inlet to the outlet. Due to this, the waste moving with the air flow will repeatedly pounce on the surface of the main gripping saw cylinder. In this case, the frequency of supply of waste and regenerated flyings can be regulated by the speed of rotation of the bar drum.

The regenerative effect of the new regenerator will be roughly the same as for the 95% as in the RX regenerator, and the cleaning effects, due to the exclusion of transit of trash impurities and the increase in the cleaning rate, will be much higher: a total of 85-90%, by large trash 90-95 %, by small trash 80-85%, by motes 50-70%. At the

same time, the content of seed cotton in the waste of the new regenerator will be no more than 2-4%, which corresponds to a similar indicator of a serial regenerator of RX, and the contamination of the regenerated flyings should not exceed 10-15% [7].

On the basis of the developed scheme and above selected parameters of working parts, drawings of a pilot industrial sample of a new regenerator of seed cotton from wastes of cleaning equipment have been prepared.

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IMPROVED TECHNOLOGY FOR HUMIDIFYING OF COTTON PRODUCTS

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Key words: seed cotton, cotton fiber, humidifier, moisture, humidification, cotton bale, press, gin, cleaner.

Annotation. The article considers the problems of improving the quality of cotton fiber by developing a new design of humidifiers for seed cotton and cotton fiber which provide more efficient and qualitative humidification of cotton materials.

Cotton fiber is one of the most important strategic commodities in the world trade. According to the International Cotton Advisory Committee (ICAC), world production of cotton in the season 2015/16 reached 26.2 million tons [1].

The analysis revealed that cotton fiber produced by cotton industry of the republic has an average moisture content of about 5.0 %, indicating the shortcomings of existing technology and the necessity of development of new and effective methods of humidification of the fibrous material and devices for their implementation [2].

In the process of primary processing of cotton, the essential importance belongs to technological moisture of fiber before pressing process. In accordance with state standards O'z DSt 604:2016 "Cotton fiber. Technical specifications" [3] and production schedules of primary processing of seed cotton PDI 17-2017 [4] cotton fiber before pressing should be moisturized to 7.5-8.5%. Technological operation of fiber moistening before its pressing to the above given rate provides optimal structural and mechanical properties of cotton fiber. After moistening fiber becomes less elastic and more susceptible to the mechanical influence, reduced tensile force acting on the strapping belt, improved presentation of fiber, static electricity on the fiber is neutralized, volume density and weight of bales increase, overall dimensions reduce. As a result reduction of energy consumption of pressing equipment, saving packaging materials, prevention of belt breaking and bale repressing, reduce transport costs, the prices of fiber, the exclusion of price discounts (because of low humidity moisture) can be achieved.

The research results of domestic and foreign scientists emphasize the importance of ensuring the required technological parameters of moisture content of seed cotton, cotton fiber at each stage of the cotton primary processing. These previous findings suggest that ginning of over-dried cotton (5.0 %) leads to a shortening of the length of the fiber due to the increase of mechanical damage, the formation of defects. Seed cotton ginning with high moisture content (over 8.5 %) reduces the gin performance, increases mechanical damage of seeds and leads to the formation of combined defects.

Cotton humidifier in the form of humidification chamber prompted to be installed on an inclined unloading tray of cleaning machine UHK (1HK) [5]. The principle of operation of the humidifier is based on the warm-humid treatment of seed cotton coming out of the machine UHK (1HK) by the humidification agent, having high moisture content (relative humidity of about 85-90 %) and the temperature (about 70 ° C). The supply of humidification agent to the cotton flow, moving along the inclined unloading tray, to be carried out above the conveying surface. For this purpose, the surface of the tray itself, in order to allow the passage of humidification agent is made in the form of louvre grid. In this case, a thin layer of seed cotton, moving on the surface of the unloading tray, will be wrapped by the steam of the humidification agent which is being discharged through the slots of the sheets forming a louvered grid. In order to improve efficiency of heat-mass transfer processes, and in particular, to ensure the aerodynamic interaction of humidification agent with cotton flies, it was suggested to install a diffuser at the top of the humidification chamber, conjugated with pneumatic system for sucking of the used humidification agent.

During the experimental studies the optimal moisture parameters of seed cotton before ginning were identified, which ensure preservation of the natural properties of the material and an increased fiber output [6].

Several variants of the device for humidification of seed cotton UHS, providing humidification of thin and loosened cotton layer, leaving the UHK (1HK) by warm and moist humidification agent have been developed on the basis of the analytical and theoretical studies [7].

The patents of the Republic of Uzbekistan on useful model UZ №FAP 00800 and UZ №FAP 00957 "Device for humidification of seed cotton" for the proposed methods and devices for humidifying of seed cotton before ginning, have been received [8].

Qualification testing of experimental-industrial pilot sample of the device for humidification of seed cotton UHS in conjunction with the generator of humidification agent EBG, conducted on Chinaz cotton ginnery in Tashkent region, have shown that the device is able to provide the seed cotton moisture increase up to 0.5 %.

Evaluation of the quality parameters of cotton fiber produced with different levels of moisture content of seed cotton, showed that such characteristics as micronaire, maturity, reflectance degree, yellowness of cotton fibers do not tend to change depending on the seed cotton moisture content and remain virtually constant. However, some significant effect of seed cotton moisture content on such characteristics as upper half mean length, length uniformity was revealed.

So, the upper half mean length of fiber obtained by ginning of seed cotton with moisture content 7.64 % was 0.005 inches longer than of fiber, obtained by ginning of seed cotton with moisture content 7.13 %. Changing of the seed cotton moisture content only to 0.5 % ensured preservation of modal weight length for 0.2 mm, the staple length for 0.21 mm, the mean length for 0.82 mm. Short fiber index in the samples of fiber, obtained after ginning of non-humidified seed cotton, was 2.13 % higher than in the humidified seed cotton.

Experimental studies of influence of different initial moisture content of seed cotton before ginning to the change of the parameters of quality and cotton fiber output have been conducted for the purposes of scientific substantiation of the optimal technological moisture of seed cotton before ginning, in relation to the existing seed varieties and modern technological equipment. As a result of ginning of seed cotton with moisture of 3.8 %, 6.5 %, 8.1 %, 9.7 % and 10.7 % it was determined that the highest fiber output was fixed at 8,1 % moisture content. During the tests a significant effect of seed cotton moisture on such characteristics as strength, upper half mean length, short fiber index, length uniformity, was revealed.

Several variants of the device for humidification a cotton fiber before pressing UVR have been developed on the basis of the results of the analytical and theoretical studies.

For the proposed methods and devices for humidification of fiber prior to pressing, the patents of the Republic of Uzbekistan (UZ №IAP 02731, UZ №FAP 00390, utility model application for the patent of the Republic of Uzbekistan UZ №FAP 20150044) were received [9].

The State acceptance tests of the prototype device UVR, carried out on Buka cotton ginnery of Tashkent region, showed its efficiency and functionality.

Humidification of cotton fiber with an initial moisture content of 8.28 % was carried out with a water flow at the rate of 30 and 45 l / h. Increase of the moisture in the first case amounted to 0.63 %. The average moisture content of fiber was 8.91 % and the standard deviation – 0.25 %. Gain of fiber moisture from the water flow rate of 45 l/h was 1.11 %. The average value of moisture content – 9.38 %, standard deviation – 0.19 %. The obtained results are characterized by high uniformity of fiber's humidification by volume.

For the scientific justification of the proposed options and of the moisture range limit, experimental studies were carried out in order to reveal the effect of different initial moisture fiber to the quality parameters change during prolonged storage. Quality indices of cotton fiber samples, artificially humidified to 8.6 %, 10.3 %, 13.8 %, 17.5 %, were compared with the original quality of cotton fiber moisture content of 7.3 %.

Results of studies in the area of humidification of seed cotton and cotton fiber have allowed to create the new device for humidification of seed cotton before ginning and new apparatus for humidification of cotton fiber before pressing. Both devices received patents of the Republic of Uzbekistan for useful models.

Humidification of seed cotton before ginning and cotton fiber before pressing provided the net gain of moisture up to 1.6 %, and the corresponding weight gain of 7-8 kg for bale. Applied humidification technology does not deteriorate the fiber quality parameters, while avoiding moistening of fiber greater than 8.5 %.

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TECHNOLOGY OF PRODUCING THICK-AND-THIN FANCY YARN ON FLYER FRAME MACHINE

ТЕХНОЛОГИЯ ПОЛУЧЕНИЯ ПЕРЕСЛЕЖИСТОЙ ФАСОННОЙ ПРЯЖИ НА КОЛЬЦЕВОЙ ПРЯДИЛЬНОЙ МАШИНЕ

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Key words: *fancy yarn, structural effects, thickening, thinning, volume effect, controlled speed mode control.*

Ключевые слова. *Фасонная пряжа, структурные эффекты, утолщение, утонение, эффект объемности, контролируемое управление скоростным режимом.*

Abstract. The article considers a new technology of producing thick-and-thin fancy yarn on flyer frame machine. One of the most interesting and promising directions in the production of fancy yarn is the technology of thick-and-thin yarn. A thick-and-thin is the name of yarn with periodic or accidentally alternating thickening and thinning. The technology makes it possible to get a variety of color and structural effects.

Аннотация. В статье рассмотрена новая технология получения переслежистой фасонной пряжи на кольцевой прядильной машине. Одним из наиболее интересных и перспективных направлений в производстве фасонной пряжи является технология переслежистой пряжи. Переслежистой называется пряжа с периодически или случайно чередующимися утолщениями

и утонениями. Технология позволит получать фасонную пряжу с бесконеченым разнообразием цветовых и структурных эффектов.

Thick-and-thin yarn is a type of yarn with periodical or accidental alternation of thickening and thinning areas.

At the spinning and knitting mills of the Republic of Belarus this type of yarn is not produced; at the same time, manufacturers from Turkey, Italy and other European countries produce a wide range of knitwear from thick-and-thin yarn. In addition, a number of manufacturers release specialized spinning equipment for yarn production due to the uneven stretching process of roving or tape [1].

This technology can be implemented at cotton and woolen spinning mills and allows to produce a variety of color and structural effects.

The problem that must be solved in the process of research is the control of the machine speed rate for producing structural effects in yarn. Obviously, the presence of elements of concentrated mass in places of thickening produces a significant distortion in even yarn when abrupt changes in density are very rare and considered as defects.

Naturally, thickenings in the fancy yarn impose their imprint on both the random tension characteristics experienced by the yarn and on the random characteristics of its strength.

In the educational institution "VSTU" a new technology was desuigned for producing thick-and-thin yarn, realized on a flyer frame machine for wool. The technology allows to get thick-and-thin yarn from two or more multicolored rovings, receiving various melange and structural effects. In the finished yarn, alternate sites with thickened and thinned areas of different colors. In knitted fabrics such yarn allows to receive a variety of external effects and give the product an effect of bulkiness.

The technology is implemented by upgrading the 3 × 3 drawing rollers for wool. Two rovings come through a sealer in a three-cylinder drawing roller. We control speeds of supply- and strap-pair with joined to them asynchronous motors with frequency converters. Due to the speed difference in delivery of supply and strap-pair, the use of different straps between the push and the feed roller, two rovings receive different stretching, which facilitates the production of thick-and-thin fancy yarn with different effects. This type of yarn is used for making fabrics and knitted cloth for garments.

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CLASSIFICATION OF GOODS ACCORDING TO THE DEGREE OF DANGER FOR THE CONSUMER: STANDARDIZATION OF THE REQUIREMENTS

КЛАССИФИКАЦИЯ ТОВАРОВ ПО СТЕПЕНИ ОПАСНОСТИ ДЛЯ ПОТРЕБИТЕЛЯ: СТАНДАРТИЗАЦИЯ ТРЕБОВАНИЙ

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Key words: degree of danger, harm, classification, safety requirements, consumer goods, standardization
Ключевые слова: степень опасности, вред, классификация, требования безопасности, потребительские товары, стандартизация

Abstract. The article is devoted to the problem of identifying the degree of danger of products for consumers. In the commodity the term "safety products" is often used. The risk of harm to the life, health and property of the consumer safe product under normal conditions of use, storage, transport and disposal is limited to an acceptable level. But in practice, the consumer is difficult to assess the degree of real and hidden dangers of different products because there is no system to classify them according to this indicator. The solution to this problem consists in generating requirements for the classification of goods according to the degree of danger. Standardization of this classification will allow the user to have important information about the product and consciously making the choice when buying.

Аннотация. Статья посвящена проблеме идентификации степени опасности товаров для потребителей. В товароведении чаще используется термин «безопасность товара». Риск вреда жизни, здоровью и имуществу потребителя безопасного товара в обычных условиях его использования, хранения, транспортировки и утилизации ограничен допустимым уровнем. Но на практике потребителю сложно оценить степень реальной и скрытой опасности различных товаров потому, что отсутствует система их классификации по данному параметру. На решение данной проблемы направлена разработка общих требований к классификации товаров по степени опасности. Стандартизация этой классификации позволит потребителю получать важную информацию о товаре и сознательно делать выбор при покупке.

The safety of a product represents the totality of features and characteristics of the goods upon which it is not harmful and poses no danger to life, health, heredity, property of the consumer and the environment under normal conditions of use, storage, transportation and disposal of the product [1]. In the commodity we

distinguish among electrical, mechanical, chemical, biological, physiological, acoustic, electromagnetic, radiation, fire safety. The safety indicator has the norms that regulate standards for product.

The consumer usually does not know the real numbers and can‘t assess the degree of danger of the product, because they do not have professional knowledge on technologies, materials and other nuances. Thus, information on product safety for the consumer is presented in the form of marking data. Significantly simplified situation is a universal gradation of danger (actual and potential) products.

In Belarus there is no universal classification of degree of danger products for consumers. Because the interest is the experience of Russia, where the draft national standard is created and being discussed “The degree of danger of groups of consumer goods. Classification. General requirements"[2]. It’s planned to come into force in 2018.

The developers have extended the scope of the standard for mechanical, electrical and electronic goods intended for the personal use of consumers. The proposed classification allows to create the basic values of danger classes that may be used in assessing the risk from these products.

Definition and assignment of degree of danger for a group of goods is carried out by experts on the different types of dangers. These dangers can be caused by a particular commodity when the interaction of the consumer with the product (fire, intoxication, an electric shock, toxicity and others).

The draft standard also contains examples of dangers, typical scenarios and basic characteristics of various injuries. The process of definition and assignment of degree of danger should include the following steps:

- consideration of the terms of use;
- impact analysis;
- identification of all likely hazards that may occur while using this product;
- description of possible trauma scenarios;
- the definition of typical wounds;
- the intent of the code hazard group or subgroup of product.

When determining whether risk is accounted for as use of goods and improper use or maintenance. Grading the danger of the use of the product must take into account the age of the consumer group. Information for identificationof danger is a consumer complaints, analysis of data on injuries, standards, certificates, test reports and even data on the Internet and the press.

The degree of danger the product group takes into account the maximum possible typical wounds. Codes of danger levels of the product groups listed in table 1.

Table 1 – The values of degree of danger

value of the level	description of the danger
1	the danger of a direct threat to life
2	the danger of a indirect threat to life (fire, burns the 3rd degree, injury)
3	burns 2nd degree, poisoning,injuries of moderate severity, fractures
4	trauma, hematoma
5	burns of the 1st degree, cuts
6	bruises and minor injuries

The proposed classification in the first place, will help the consumer to adequately assess the risk of unsafe use of a product. For these purposes it is necessary to use symbols and icons. These funds can be of a contrasting colour and has necessarily uniform and standardized.For producers of goods identification of potential dangers creates an information resource to improve product quality and minimize risks to consumers.The type and degree of danger of the product allow you to analyze its production causes. They can be design flaws or component part of the product, technology, application and maintenance and other reasons.

The experience of Russian specialists in the field of standardization of goods classification by severity deserves attention. The project developer is an independent non-profit organization "Russian Institute for consumer tests", specializing in comparative studies of goods, consumer protection and other activities. This organization has a good reputation for objective, independent entity.

Interest is the introduction of the developed system in the conditions of the Belarusian consumer market that will help to systematize approaches to the assessment of danger of goods and will improve the protection of domestic consumers.

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UDC 691

PAVING SLABS WITH ADDITIVES OF INORGANIC IRON-CONTAINING WASTE

ТРОТУАРНАЯ ПЛИТКА С ДОБАВКАМИ НЕОРГАНИЧЕСКИХ ЖЕЛЕЗОСОДЕРЖАЩИХ ОТХОДОВ

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Key words: *inorganic waste, slimes, combined heat and power plants, deironing stations, paving slabs*

Ключевые слова: *Неорганические отходы, шламы, теплоэлектроцентрали, станции обезжелезивания, тротуарная плитка*

Abstract. Waste deironing stations and combined heat and power plants represent a certain danger to the environment, and, therefore, economic problems. However, such waste perhaps contains substances to use which expediently to use for production of products of construction and finishing materials and products. The open statistical material of the presence of waste in the regions of Belarus is presented, showing the urgency of utilization. The monitoring of the qualitative and quantitative chemical composition of iron-containing inorganic wastes for water pumping stations in Vitebsk was carried out. The possibility of use of waste in production of paving slabs for replacement of a part of initial raw materials is shown. The results of the scientific publication can be used for further research on the introduction into production of technological processes for the manufacture of paving slabs from waste.

Аннотация. Отходы станций обезжелезивания и теплоэлектроцентралей представляют собой определенную опасность для окружающей среды, а, следовательно, и экономические проблемы. Однако в таких отходах, возможно содержатся вещества использовать которые целесообразно использовать для производства изделий строительно-отделочных материалов и изделий. Представлен открытый статистический материал наличия отходов по регионам Беларуси, показывающий актуальность утилизации. Проведен мониторинг качественного и количественного химического состава железосодержащих неорганических отходов проводился для водонасосных станций г. Витебска. Показана возможность использования отходов в производстве тротуарной плитки для замены части исходного сырья. Результаты научной публикации могут быть использованы для дальнейших исследований по внедрению в производство технологических процессов изготовления тротуарной плитки из отходов.

At present rational usage of natural resources has particular significance. Development of effective waste-free technologies offers the solution of this current economic problem due to complex use of raw materials that at the same time leads to elimination of the huge ecological damage rendered by storages of waste. Data on quantity of iron-containing waste in the regions of Republic of Belarus show the following: the Gomel region – 1176.89 tons; the Vitebsk region – 114 138.54 tons; the Minsk region – 3910.54 tons; Minsk – 7193.85 tons. These data is received throughout the country for the following types of waste: iron-containing slime, code 3551800; slime of iron oxide in the reduction processes, code 3551801; precipitation of water treatment, code 8410500; sediment after leaching of deironing filters, code 8420300; dehydrated sediment of deironing stations, code 8420500. The maximum quantity of waste is accumulated in the Vitebsk region [1]. The most rational direction of utilization of industrial wastes is their use as a technogenic raw material in obtaining various types of products and, first of all, for building purposes.

The purpose of the presented work is the research of compositions of inorganic iron-containing waste of deironing stations and combined heat and power plant, identification of a possibility of using waste in production of paving slabs.

Monitoring of qualitative and quantitative chemical composition of iron-containing inorganic wastes was carried out for water pump stations No. 1 - No. 4 in the city of

Vitebsk. Similar studies were conducted in 2008, 2010, and 2014. The table shows the results of the studies: the content of iron ions in weight percent (in terms of dry substance).

Table 1 – Content of iron ions in weight percent in waste

Год	Water pump stations of Vitebsk.			
	№ 1	№ 2	№ 3	№ 4
2008	32 – 33	38 – 39	36 – 38	41 – 43
2010	36 – 38	39 – 40	34 – 36	40 – 41
2014	33 – 35	38 – 39	35 – 36	42 – 44
2016	32 – 32,5	39 – 40	34 – 36	43 – 45

Wastes from the deironing stations in Vitebsk have the following composition. Station № 1: SiO_2 – 45–47 %; Fe^{3+} – 31–32 %; Ca^{2+} – 4.5–5.5 %; Mg^{2+} – 1.5–2.5 %; anions – the rest. Station № 2: SiO_2 – 48–49 %; Fe^{3+} – 30.5–31.5 %; Ca^{2+} – 4.5–5.2 %; Mg^{2+} – 2.0–2.5 %; anions – the rest. Also determined the chemical composition of inorganic waste combined heat and power plants (slime water treatment), in terms of dry substance, mass. %: $Fe_2(SO_4)_2$ – 12.8–14.2; SiO_2 – 41.9–44.5; $CaSO_4$ – 2.4–2.6; organic substances – the rest. At a research of the chemical composition of slimes possible fluctuations in the content of the basic compounds are established (%): SiO_2 – 0.5–4.9; Fe(OH)3 – 5.8–10.5; $CaCO_3$ – 62.8–68.2; $CaSiO_3$ – 3.9–6.6; organic substances – 5.2–8.9. Fluctuations in the slurry composition in a narrow range suggest a sufficient stability of its component ratios of components [2,3]. Monitoring content of the iron-containing waste microelements (heavy metals) are also held. The studies were conducted in 2008, 2010, 2014, and 2016 by means atomic emission analysis on the PGS-2 spectrograph. As a result of the executed researches it is established that the content of heavy metals (minerals) doesn't exceed admissible sanitary standards. Analyzing the chemical composition of sludge from deironing stations and combined heat and power plants, the content of heavy metals (microelements) in them, it was concluded that these wastes can be used for the manufacture of paving slabs.

For the manufacture of paving slabs can be used as a method of vibrocompression, and the method of vibratory casting, as well as a plastic method (for ceramic tiles for exterior decoration).

Vibrocompression method is based on the use of a special mold (matrix) located on constantly vibrating bed. From above on solution in mold presses a punch – the compound detail of a vibropress , densely entering into it, like a piston into a cylinder. After the mold, is raised on the pallet, the finished block remains.

The method of vibrocasting provides consolidation of mixture on constantly functioning vibrotable. The solution, in this case, is placed in rubber or plastic molds of various configurations, carefully monitoring the correctness of their filling. Surplus of the concrete mixture is cut off, and after vibration treatment of the products, the molds transferred to a warm place for drying for two days, after which the finished tiles being removed.

As raw materials for production of paving slabs, by methods of vibropressing or vibrocasting are used: cement, sand, water and inorganic iron-containing waste.

Inorganic waste from deironing stations and combined heat and power plants can be replaced by a part of the sand in the mixture. Colored paving slabs can be manufactured by methods vibropressing or vibration casting, coating a colored layer 2-2.5 cm thick on the previously formed gray tile, replacing inorganic waste pigment color layer.

Ceramic tiles for exterior decoration (streets, facades) produce by plastic method (from the dough-like mass by heat treatment - under pressure, clay is crushed, then sent to a clay mixer where it is mixed with additives before obtaining homogeneous plastic). In the manufacture of ceramic tiles for exterior decoration (streets, facades) by plastic method, as a raw material used clay feedstock and attenuating additives. Inorganic waste from deironing stations and combined heat and power plants can be replaced by a part of the raw material or attenuating additives in the mixture [3].

For a research the physical-mechanical and physical-chemical properties of gray paving slabs, series of gray paving slabs with percentage attachment of inorganic iron-containing waste from 5 to 30% were prepared. The research of physical-mechanical properties of gray paving slabs was carried out in accordance with STB 1071–2007 “Concrete and reinforced concrete slabs for footways and roads” and STB 1152–99 “Vibropression concrete pavement slabs and vibropression concrete border stones”.

For a research the physical-mechanical and physical-chemical properties of colored paving slabs, series of colored paving slabs with different layer heights were prepared, as well, series of ceramic terracotta tiles. Physical and chemical properties of gray and color paving slabs are investigated. It is established that the effectiveness of the action of additives depends on their dispersion and grain composition.

In the production laboratory of the JSC "Obolsky Ceramic Plant" tests of gray paving slabs (compressive strength, flexural strength, frost resistance, water absorption).

Annually at the deironing stations and combined heat and power plants of the Republic of Belarus thousands of tons of slimes are formed, which mainly consist of oxides, hydroxides, iron, calcium, magnesium, aluminum carbonates, and, are valuable chemical raw materials. Their chemical, phase, the particulate composition may vary widely depending on the composition and water purification methods. As a result of the research the possibility of their use for production of paving slabs is established. The developed compositions for the manufacture of paving slabs with additives of inorganic iron-containing waste meet the urgent tasks of obtaining high-quality building materials and can significantly improve the ecological situation in the territory of water pump stations and heat and power plants.

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REVIVAL OF TECHNOLOGIES AND TRADITIONS OF MANUFACTURING SLUTSK BELTS AND DEVELOPMENT OF PRODUCTION OF NATIONAL SOUVENIR PRODUCTS

ВОЗРОЖДЕНИЕ ТЕХНОЛОГИЙ И ТРАДИЦИЙ ИЗГОТОВЛЕНИЯ СЛУЦКИХ ПОЯСОВ И РАЗВИТИЯ ПРОИЗВОДСТВА НАЦИОНАЛЬНОЙ СУВЕНИРНОЙ ПРОДУКЦИИ

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Key words: Slutsk belts, weaving, jacquard machine, technical drawing, souvenirs, national brand.

Ключевые слова: слуцкие пояса, ткачество, жаккардовая машина, технический рисунок, сувениры, национальный бренд.

Abstract. The main subject of this research is the development of authentic Slutsk belts, piece products based on the artistic concept of authentic Slutsk belts, as well as technological developments related to the reconstruction of historical Slutsk belts on modern weaving equipment of RUE "Slutsk Belts". The developed products are aimed at creating Belarusian national cultural brand and reconstructing the historical Slutsk belts.

Аннотация. Основным предметом этого исследования является развитие аутентичных слуцких поясов, штучных изделий, основанных на художественной концепции аутентичных Слуцких поясов, а также технологических разработок, связанных с реконструкцией исторических слуцких поясов на современном ткацком оборудовании РУП «Слуцкие пояса». Разработанные изделия направлены на создание белорусского национального культурного бренда и реконструкцию исторических слуцких поясов.

The President of the Republic of Belarus A.G. Lukashenko set the task of reviving a unique phenomenon of Belarusian folk art – the Slutsk belts in his Appeal to the Belarusian People and the Parliament of the Republic of Belarus.

Slutsk belts are recognized throughout the world as the national relic of the Belarusian people as a unique kind of hand weaving and a symbol of self-determination of the nation. Technologies for creating belts have been lost to date. However, the loss of the original should not interfere with defending historical symbol. The Slutsk belt can become a symbol of the whole country along with other national sights.

Vitebsk State Technological University was designated as a realizer for studying and developing the technology for manufacturing analogues of the Slutsk belts and studying and selecting raw materials and technological equipment for their production in accordance with the protocol of instructions of the President Administration of the Republic of Belarus.

The problem proposed for development has not been solved either in Belarus or in other countries. Weaving technologies used in the manufacture of belts required detailed scientific research. It was not a question of restoring authentic Slutsk belts, but of reconstructing and making copies on modern weaving equipment.

The first reconstructed Slutsk belt was the complete replica of the original historical masterpiece and was presented to President of Belarus and kept in the Palace of Independence.

Replicas of historical belts contain natural silk, threads with gold and silver or izamet. There are no analogues of these products in the world.

In 2015-2017 researchers developed and improved technology of manufacturing of Slutsk belts of more complex structures and drawings, designing and manufacturing of souvenir production of various kinds. The aim of the presented scientific work is the revival of the phenomenon of Belarusian identity and the continuation of the traditions of the production of Slutsk belts.

The work includes the following sections:

– development of technical specifications for the construction of the loom;

– justification of the choice of weaving equipment for the development of Slutsk belts;

– analysis of the raw material of historical belts, selection of raw materials for the warp and weft;

– analysis of different types of structure and drawings of historical samples of Slutsk belts, their reconstruction, the development of weaves for all color effects of the drawings of Slutsk belts;

– development of technological parameters and their manufacture on modern weaving equipment with use of information technologies;

– design and development of an assortment of analog copies, artistic stylizations of Slutsk belts, souvenir products.

A technical task for technological equipment for the production of analogues of Slutsk belts was developed. Technological equipment for the development of Slutsk belts was produced at MAGEBA (Germany).

The German company EAT has developed the software for controlling the operation of the loom. The technology which includes raw materials, parameters of

the loom, density of warp and weft, programming of the work of platinum jacquard machines, programming of the work of shuttles was developed at the VSTU, as well as the structure of the belt including weaves, which in only one belt can be more than one hundred are translated into algorithms that control the work of the loom.

The technology of making authentic belts on modern weaving equipment has been developed. Slutsk belts in their structure are weft tapestries. The structure of the weft tapestry allows to reproduce a rather thin pattern and rich coloristic design.

A characteristic feature of weft tapestry fabrics is that all the color effects on the outer sides of the fabric are formed exclusively by the weft threads. Therefore, the number of color effects depends on the construction of the multi-color weaving loom device.

Six-shuttles weaving device provides six clean color effects on the belt surface. Another color effects were achieved by developing model weaves so that it was possible to obtain a mixed color effect. The increase of the number of color effects was based on the programming level of the shuttle operation, which provided the change of the bobbins with different colors of threads in the shuttles during the automatic stopping of the loom.

At certain parts of the belt some shuttles were switched off, the part made a double stroke, pulling behind the unearned weft. It is necessary for ease the structure of the belt. The location of the bobbins with a certain color of weft in shuttle is calculated in such a way that the weft making a return move do not cross each other. The earning of gold threads in the middle layer without its presence on the front or back of the belt is excluded. It excludes costs of an expensive gold thread.

Scientific research on the reconstruction of historical belts formed the basis and found further development in the development of prototypes of souvenir products. This piece products include panels, bookmarks, mouse pads, scarves. The developed products are aimed for creating the Belarusian national cultural brand, a symbol that can be replicated in various variations, in parallel with the revival of analogues of authentic Slutsk belts, developing an assortment of souvenirs.

The work with tradition is very responsible. It dictates rigid restrictions for the demonstration of creativity, puts it in a narrow constraint, makes it necessary to find a compromise between copy and innovation. This is a complex task of the visual concept: not to go into complete copying, but also to preserve the figurative recognition of a historical source.

The developed piece products belong to the class of VIP souvenirs, because they have high cost. In the production of them natural silk, gold thread or izamet are used. The target audience is primarily state and non-governmental organizations, institutions that work in the sphere of international relations, as well as foreign tourists visiting the Republic of Belarus.

Weaving technologies, which were used in the production of Slutsk belts, required scrupulous scientific restoration. To develop a unique technology of Slutsk belts on modern weaving equipment and to expand the produced range became possible thanks to the great experience in designing fabrics of complex structures accumulated

in Vitebsk State Technological University. The production of the prototypes was made at RUE «Slutsk Belts». Previously lost technology for the creation of belts was recreated on modern weaving equipment.

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A COMPARATIVE ANALYSIS OF STRENGTH PROPERTIES BETWEEN BONDING AND SEWING KNIT FABRICS

СРАВНИТЕЛЬНЫЙ АНАЛИЗ ПРОЧНОСТНЫХ СВОЙСТВ КЛЕЕВЫХ И НИТОЧНЫХ СОЕДИНЕНИЙ ИЗДЕЛИЙ ИЗ ТРИКОТАЖА

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Key words: *bonded seam, thermoplastic tape, strength, elasticity, hemming, seaming.*

Ключевые слова: *клеевой шов, термопластичная пленка, прочность, растяжимость, подшивание, стачивание.*

Abstract. The strength and elasticity of the textile bonded and sewing seams was analyzed. Mechanical properties of single fold hemming both of bonded and sewing seams were examined as well as bonded and sewing plain seams.

Thermoplastic polyurethane tape was transferred from the base of silicone to knitted fabric using 160 °C temperature and 40 N pressing force. Knitted pieces bonded together by two different bonding machines and sewn together by coverstitch sewing machines.

Аннотация. Проанализированы показатели прочности и растяжимости клеевых и ниточных швов при соединении текстильных материалов. Исследованы механические свойства подшивочных и соединительных клеевых и ниточных швов.

Термопластичная полиуретановая тесьма переносилась с силиконовой основы на трикотажную деталь при температуре 160 °С и усилии прижима 40 Н. Детали из трикотажа соединялись посредством двух различных термоклеевых машин, а также сшивались на плоскошовной машине.

Sew free technologies such as adhesive bonding, hot melt fusing, ultrasonic welding and laser welding use to replace sewing in various garment manufacturing processes. New promising developments in the design, technologies and equipment of the textile thermodynamic bonding increase its role in the garment manufacturing. Besides functional properties (comfort, usability, and durability) seamless garment has design aesthetics. Sew free bonding applies for waterproof clothing, sportswear, home healthcare, illness prevention, citizen medicine and so on.

This technology introduces new properties of clothes however it has difficulties with practical implementation. Knitted wear manufacturers are still at the early stage of understanding the potentialities provided by this technology. So at the sewing factory “Milavitsa” implementation of the new production process of knitted underwear came up against bonding limitations. There are needed a different equipment for adhesion depending on operation conditions; there is no universal machines for realization thereof. Although adhesive technology well-known and widely used at fusing and seam sealing sewing processes, it has own limitations and disadvantages thus practically never used at a cloth assembling.

Glue creates an adhesive connection of the joining parts and forms a composite material whose properties are different from initial materials. There are technologies for such methods of adhesive activation as hot wedge, hot air, high-frequency currents, ultrasound and laser beam. Strength and stiffness of bonded seams depends on type of loads and possible deformations of glue joints, stretching or shifting in particularly. An optimal characteristic of glue joints is achieved by shifting loads; they have superior mechanical strength there.

Used adhesive tape consists two layers, one is heat activated fusing tape and one is siliconized paper. Heat activated (hot melt) adhesive tape has a strong holding power after a definite coaction of pressure and temperature during some time. The siliconized paper prevents the gluing of tape to a bonding machine’s transport roller. The bonding process occurs herewith in two stages. At first the tape is glued to one

piece, then an operator removes the paper and glues second piece from the back side of the tape.

Bonding microprocessor controlled machines used for making knitted fabrics for sportswear, underwear, swimwear, casual wear, thermal wear and the like. The gluing process is carried out at not high temperature (usually <200 °C) to avoid deformation of knitted products.

The produced seam has aesthetic properties, high extensibility in all directions, lack of needle punctures, smaller thickness.

Two types of joints both of bonded and sewing were made and analyzed as shown in Fig. 1. Bonded hemming seams (a) were produced on 335.32 Macpi bonding machine with switch-off side trimming device. A single specimen comprises knitted fabric folded upon itself to forming overlapping edge. An adhesive film is interposed between the overlapping edge. The force was applied along the seam by the tensile test of material specimens. Sewing hemming seams (b) were produced on MF-7500 Juki coverstitch sewing machine. The force was applied in the same direction as in the previous case. A single specimen of bonded flat seam (c) comprises two layers fabric and adhesive film, interposed between them. The shifting force was applied according to the scheme. Sewing flat seams (d) were produced on the same sewing machine.

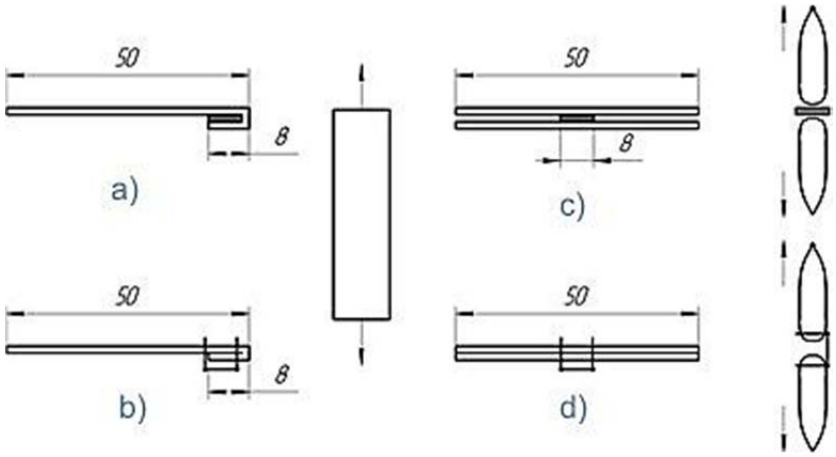

Figure 1 – Used joints and schemas of their tensile testing:
a) bonded hemming seam; b) sewing hemming seam; c) bonded flat seam;
d) sewing flat seam

At first, the thermoplastic film was glued on the fabric at temperature 160 °C and pressing force of 40 H. Then the siliconized paper was removed immediately after gluing. After that the second fabric was glued at the same temperature and by the same pressing force. Tensile test was carried out using electronic universal testing machine TIME WDW-20E. The clamping length of specimens was 100 mm. Statistical processing of experimental data was carried out. The appearance and consumer properties of bonded seams are much better than similar sewing seams, although performance of the bonding operation is lower. For comparison, maximal speed of bonding machine is 0,82 m/min whereas maximal speed of sewing machine is

23,4 m/min. Of course, such speed of sewing operation not achieved usually, but the difference is significant.

The results of experimental studies show that bonded hemming seam stronger than similar sewing seam by 64,3 %. Bonded flat seam stronger than similar sewing seamby 41,7 %. It is depends on high strength of the used thermoplastic film. The elasticity of sewing seams is higher in both cases.

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OPTIMIZATION THE PROCESS OF DISCRETIZATION DURING OBTAINING OF COMBINED FIRE-RESISTANT ELECTRO CONDUCTIVE YARN

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Key words: heat-resistant yarn, electrically conducting yarn, Arselon, antistatic effect.

Ключевые слова: термостойкая пряжа, электропроводящая пряжа, Арселон, антистатический эффект.

Abstract. This article is devoted to optimizing the discretization process in the production of electrically conducting heat-resistant combination yarn. Derringer's partial desirability functions are used to solve a multi-criteria optimization problem - select the type of card clothing for the discretizing drum that will provide the best combination of physical-mechanical properties in this type of yarn.

Аннотация. Данная статья посвящена оптимизации процесса дискретизации при производстве электропроводящей термостойкой комбинированной пряжи. Функция частичной желательности Дерринжера

используется для решения многокритериальной задачи оптимизации - выбор типа гарнитуры дискретизирующего барабанчика, которая обеспечит наилучшеесочетание физико-механических свойств готовой пряжи.

The production of electrically conducting heat-resistant yarn is one of the fastest-growing segments of the textiles industry. Working with Baranovichi Cotton Production Amalgamation (BCPA), the Department of Technology of Textile Materials at Vitebsk State Technological University has developed a new technology for producing electrically conducting heat-resistant yarns that is based on the card system of cotton-spinning and includes a modernized open-end spinning machine PPM-120AM, which has a hollow rotor. Arselon fibers and copper micro-wire are the raw materials in the technology. Figure 1 presents a micrograph of a prototype heat-resistant combination yarn.

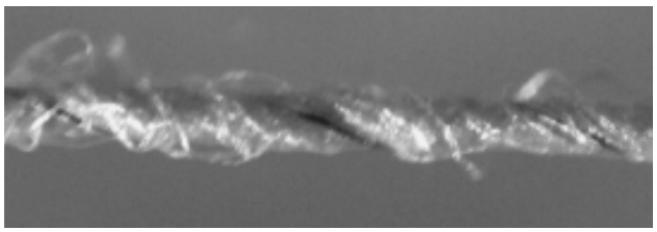

Figure1 – Micrograph of electrically conducting heat-resistant combination yarn

The electrically conducting yarn can be used to produce textiles that have shielding and anti-static properties. It can also be used to make special high-conductance protective clothing for workers exposed to hazardous conditions - in oil refining and gas- and benzene-processing facilities - and to high-power electromagnetic radiation.

The products made from Arselon yarn, which has high heat resistance, can function at 250°C for a period of up to 3 years. These products can be exposed to temperatures of up to 400°C for short periods of time with almost no melting or soot formation. The hygroscopicity of Arselon fibers is close to that of cotton. Arselon yarns' ability to be painted, their low flammability, and the fact that they retain their elastic properties at low temperatures allow them to be used to make fabrics that can be employed in the production of special heat-resistant and low-flammability anti-static and shielding clothing (for firefighters, rescue workers, and equipment technicians), filter cloth for hot gases, and individual protective devices (suits, gloves, mittens).

In the method being proposed here for making such yarn, an additional feeder is used to deliver copper micro-wire to the working zone of the spinning chamber together with the separate flow of Arselon fibers fed from dual-flange reel. The micro-wire has a linear density of 18 tex and envelops the yarn that is formed inside the chamber. The resulting heat-resistant electrically conducting combination yarn is led out of the chamber and wound around bobbin.

One of the main processes that is carried out in open-end spinning is the separation of masses of fibers into individual fibers. This operation is performed by a carding machine.

One feature of the discretization process in the processing of Arselon fibers is that the fibers are subjected to mechanical damage, and this is accompanied by a reduction in their length and rejection of some of the product. These developments lower the strength and quality of the yarn. To stabilize the spinning process and improve the quality of the electrically conducting heat-resistant yarn, it is important to ensure that the discretizing component performs in an efficient manner. The main factors that affect the discretization process are the type of card clothing used on the opening roller and its speed of rotation (Figure. 2). The card cloth should provide for the necessary degree of separation of the fibers from one another while minimizing the damage done to them in the process.

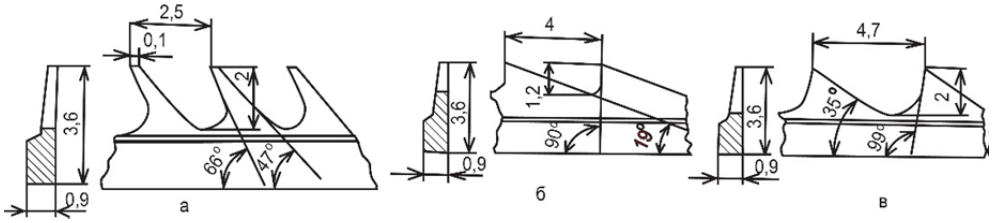

Figure 2 – Card clothing of discretizing drum: a) OK-40; b) OK-36; c) OK-37.

The PPM machines installed at the Baranovichi CPA has three types of card clothing (see Figure 2). Preliminary tests established that the yarn obtained with the use of each of these types of clothing has acceptable physico-mechanical properties. Although pair-wise comparisons were made of these yarns, it was not possible to determine the type of clothing that is best in regard to all of the main physico-mechanical properties (the coefficients of variation for linear density, twist contraction, breaking load, the value of the relative breaking load).

Thus, the given problem needs to be solved by multi-criterional optimization - selection of the type of card clothing which ensures the best combination of physico-mechanical properties in the electrically conducting heat-resistant combination yarn that is produced.The experiments were performed at the Baranovichi CPA on open-end spinning machine PPM-120AM.

The three types of clothing were used in succession on the discretizing drums as the yarns were being processed. The main physico-mechanical indices of the yarn were determined in the industrial laboratory at the Baranovichi plant. The following indices were chosen as the optimization criteria: Pl - the relative breaking load, cN/tex; Cvb - the coefficient of variation for the breaking load, %; Cvd - the coefficient of variation for linear density, %;Cvt - the coefficient of variation for twist contraction, %. The results of the tests are shown in Table 1.

It is apparent from Table 4 that the strongest yarn was obtained using card clothing OK-37 (P_l = 8.3 cN/tex), the yarn with the lowest coefficient of variation for the breaking load was obtained using the OK-36 clothing (C_{vb} = 6.7%), the yarn with the lowest coefficient of variation for twist contraction was obtained with clothing OK-40 (C_{vt} = 2.4%), and the yarn with the lowest coefficient of variation for linear density was obtained with clothing OK-36 (C_{vd} = 2.8%).

Table 1 – Physico-mechanical properties of yarn made using discretizing drums with different types of card clothing

Criteria	Type of card clothing		
	Ок-40	Ок-37	Ок-36
Coefficient of variation of linear density (Y_1), %	3,2	3	2,8
Coefficient of variation of twist contraction (Y_2), %	2,4	2,9	2,7
Coefficient of variation of breaking load (Y_3), %	10	8,1	6,7
Relative breaking load (Y_4), cN/tex	8,1	8,3	7,7

Thus, it is impossible to choose a card clothing that will ensure the best physico-mechanical properties for the electrically conducting heat-resistant yarn based on all of the given criteria simultaneously. We therefore resorted to the method of generalized desirability functions to solve the optimization problem.

In order to jointly examine criteria that have different units of measurement, it is necessary to convert them to dimensionless form by using Derringer's partial desirability functions. Table 2 shows the ranges of values for these functions.

Table 2 – Desirability limits of partial optimization criteria

Criteria	Least desirable (0)	Most desirable (1)
Coefficient of variation of linear density (Y_1), %	3,5	2,5
Coefficient of variation of twist contraction (Y_2), %	3,5	2,5
Coefficient of variation of breaking load (Y_3), %	10,5	5
Relative breaking load (Y_4), cN/tex	7,5	8,5

The generalized desirability function, which calculates the desirability of each partial optimization criterion, has the form:

$$D_{i,j} = \sqrt[n]{\prod_{i=1}^{n} d_{i,j}}, \quad (1)$$

where n is the number of partial optimization parameters that are examined, n being equal to 4 in our case; $d_{i,.j}$ is thedesirability of the i-th partial optimization criterion for the j-th card clothing.

Thus, the optimization problem reduces to determining the maximum value of generalized desirability function D.Table 3 shows values of the generalized function calculated for discretizing drums with different types of cardclothing.

Table 3 – Desirability limits of partial optimization criteria

Type of card clothing	Desirability
Ок-40	$D_1 = \left(d_{1,1} \times d_{2,1} \times d_{3,1} \times d_{4,1}\right)^{1/4} = 0{,}35766$
Ок-37	$D_2 = \left(d_{1,2} \times d_{2,2} \times d_{3,2} \times d_{4,2}\right)^{1/4} = 0{,}568873$
Ок-36	$D_3 = \left(d_{1,3} \times d_{2,3} \times d_{3,3} \times d_{4,3}\right)^{1/4} = 0{,}527424$

An analysis of the results shows that the most desirable card clothing is OK-37 (D = 0.56). Its teeth have a negative angle of inclination of 99° and a pitch of 4.7 mm, and this clothing also has the fewest teeth on the surface of the drum (compared to OK-40 and OK-36).

UDC 67.05

THREAD CHAIN CUTTING MECHANISM

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Keywords: thread chain cutting, clipper method, automation of cutting process.
Ключевые слова: обрезка цепочки ниток, способ гильотины, автоматизация обрезки.

Annotation. The article reviews the state of technical equipment used in the area of chain thread cutting; it highlights common technological and design features of thread cutting devices and mechanisms; the analysis of advantages and disadvantages of devices having different technical layout is carried out. In accordance with carried out analysis, the mechanism with improved layout is proposed, which implies the use of single actuator (e.g. solenoid stem) for the operation movement of three basic elements of the mechanism: safety fence and pressing element as well as the blade itself.

Аннотация. В статье выполнен обзор состояния технических средств в области обрезки цепочки ниток; выделены характерные технологические и конструктивные признаки устройств и механизмов обрезки цепочек ниток; дан анализ достоинств и недостатков различных технических исполнений устройств. В соответствии с выполненным анализом предложен механизм улучшенной комплектации, позволяющий от одного источника движения (в частности, штока электромагнита) обеспечить работу трех главных элементов механизма: ограждающего и прижимного элемента, а также самого ножа обрезки.

Thread chain cutting is a process necessary for automation of sewing machines; its goal is a provision of reliable separation between thread chain formed as a result of interweaving process in formed seam or shuttle stitch line overlapping the edge of sewn-up materials and thread fragments stuck to operative parts.

There are following features for these devices (or mechanisms) distinguishing them among common class of devices and mechanisms designed for thread cutting in sewing machine:

a) simultaneous cutting off of all threads forming the group involved in seam formation by single cutting edge or by several ones; it is also called joint cutting-off;

b) operation of the mechanism with no necessity in full or partial stop of main sewing mechanisms of the machine;

c) clipper cutting mode;

d) obligatory fabric retrieval from under the presser and its retrieval from cutting area.

e) preferred location of the device on external rear surface of the sewing head and its flexible sleeve;

f) preferred location of the main cutting tool at 25-30 degrees to chain forming line, as arising from paragraph (d)

While first four described features are technological ones, the last two are design-related; however, they are mostly owed to first features and typical morphology of flexible sleeve of sewing machine. Paragraph (d) imposes sufficient limitations on technological possibilities of mechanisms or devices of this kind. At the same time, paragraph (b) makes the mechanism convenient for use in appliances where some features are not necessary, e.g. auto stop tracking, accurate needle and thread take-up positioning etc.

Features, stated above are specific for a number of known devices and mechanisms [1-4; 5, p. 123-125; 6, p. 5-6; the range of Juki T030, T040, T050 pneumatic devices and their modifications]. In modern sewing machinery these features have found wide application in chain stitching machines, mostly in overlockers. Their use in semi-automatic or automatic sewing machines has not been widely supported, as it requires implementation of cycling type of these mechanisms. Implementation of cycling layout results in loss of one of advantages of these devices: optionality of stopping of sewing tools and their mechanisms. Out-of-cycle layout requires implementation of chain-arresting elements providing guaranteed cutting-off.

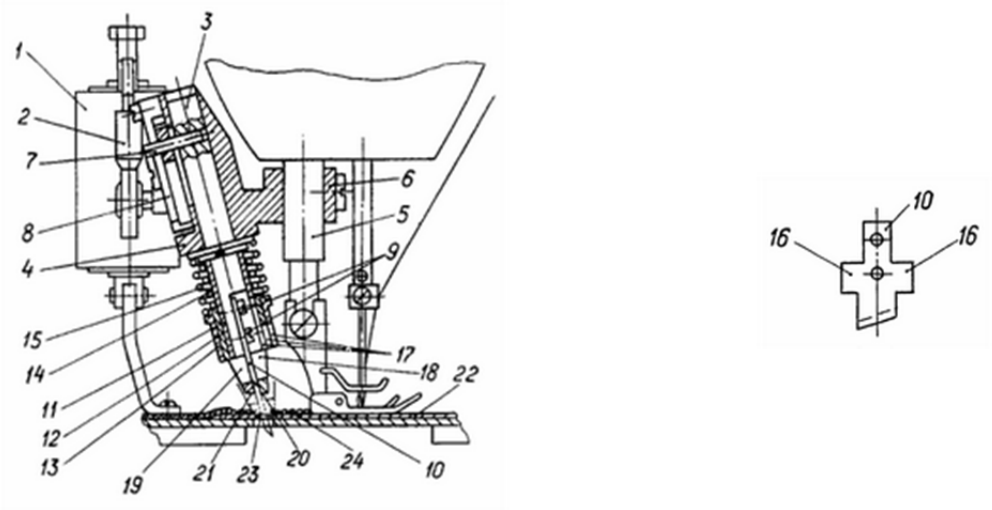
As the device is embodied externally and, as so, it is located in the area of hand manipulations performed by the operator of sewing machine or semi-automatic device, its operation is a subject of strict requirements aimed at trauma risk reduction. The use of safety fence, however, might result in reduction of working space adjacent to tail part of machine sleeve, which, in turn, might reduce application efficiency of devices of this type.

If the device has its own actuator, or its kinematics is maintained through its binding to actuators of sewing machine's main mechanisms, it falls under the definition of the mechanism. When designing the mechanism with autonomous actuator, the preference is given to pneumatic or electromagnetic actuators, as they are the simplest and at the same time fast and reliable when performing high-powered works.

Features of different thread chain cutting devices described above had been carefully analyzed which resulted in patenting of invention of chain thread cutting mechanism [4].

The mechanism (Fig. 1) comprises a solenoid 1, attached to the sewing machine's platform. This solenoid is kinematically connected with the stem 3 through leverage mechanism 2. The stem is installed in the opening in the bracket 4 so as to provide its reciprocal movement. The bracket itself is fixed to the tab arm bushing 5 through terminal connection 6. The plunger 7 is pressed into the stem; its other tail is placed in guides 8 and therefore secured from axial turn when moving in bracket opening. In the bottom part of the stem the blade 10 is attached through bolts 9; the guiding sleeve 11 is installed in the same place; it holds movable clamps 12 and 13 inserted into each other. Each clamp is spring-loaded with its own spring 14 and 15. Butts of each spring rest upon stem collar from one side and upon the clamp of corresponding butt from the other one. The sleeve 11 and clamps 12 and 13 are secured from falling out by blade ledges 16 (see Fig. 2). Ports 17 are cut for protrusion of screws 9 during blade installation. Clamps 12 and 13 have specially shaped areas 18 and 19 with flat surfaces 20 and 21. The throat plate 22 has an opening 23 for blade protrusion.

The mechanism has the following advantage: a single actuator, namely solenoid stem, provides the work of three components of the mechanism: pressing for fencing, pressing for arresting and chain cutting itself. Finally, the mechanism is made up quite compact and reliable, as it comprises all the key parts necessary to run chain cutting process. Previous layouts did not offer such possibilities (e.g. overlapping of clamping strap system) and therefore lagged behind a new one to a certain extent.



a b

Figure 1 – Thread chain cutting mechanism [4]

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PRODUCTION OF A HIGH-VOLUME COMBINED YARN WITH THE USE OF HIGH FREQUENCY CURRENTS

ПРОИЗВОДСТВО ВЫСОКООБЪЕМНОЙ КОМБИНИРОВАННОЙ ПРЯЖИ С ИСПОЛЬЗОВАНИЕМ ТОКОВ СВЕРХВЫСОКОЙ ЧАСТОТЫ

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Key words: yarn, degree of voluminosity, microwave, volume, shrinkage.
Ключевые слова: пряжа, степень объёмности, СВЧ, объём, усадка.

Abstract. The aim of the research is to develop a new technology for producing high-volume yarns using microwave currents. In the research experiments on increase of volume of the combined yarn are conducted, results of researches show increase in volume of a yarn in 1.5-3 times.

Аннотация. Целью проводимых исследований является разработка новой технологии получения высокообъёмной пряжи с использование токов СВЧ. В

работе проведены эксперименты по повышению объёмности комбинированной пряжи, результаты исследований показывают увеличение объёмности пряжи в 1,5-3 раза.

At present, much attention is paid to reducing the material consumption of textiles. There is a huge demand for the production of yarns and yarns with increased volume, as well as having good physical and mechanical properties. A promising direction in obtaining high-volume yarns and fibres is the use of a complex chemical high-shrinkage yarn as the core, and woolen, nitron fiber as coating material, as well as their mixtures [1, p. 143]. The use of modern technologies, such as microwave treatment, will allow for a deeper and even warming of textile materials, accelerate the process of heat treatment and reduce its energy intensity. The aim of the research is to influence the microwave currents to increase the volume and properties of the yarn after the heat treatment process.

As the core of the combined yarn, a complex polyester yarn was used with a linear density of 9.4 tex to 16.8 tex, with a linear shrinkage of up to 40% obtained at OJSC "SvetlogorskKhimvolokno" (Svetlogorsk, Republic of Belarus). As a covering material we used a half wool roving of a linear density of 1200 tex obtained at OJSC "Polesie" (Pinsk, Republic of Belarus).

The methodology for carrying out studies of the process of increasing the volume of combined yarns, of various linear densities using microwave electromagnetic waves, consisted of the following stages [2, p. 9-16.]:

1. Preparation of samples in accordance with GOST 6611.0 - 73.
2. Moistening of combined high-shrinkage yarns to excess moisture content.
3. Squeeze to a residual moisture content of 100-300%.
4. Microwave processing for given modes.
5. Determination of sample volume.

After the heat treatment of the combined yarn, the high-shrink component shrinks. The low-shrink component twists high-shrinkage, which gives the combined yarn properties such as increased volume and fluffiness, and also reduces the bulk weight. Table 1 presents the results of experiments to increase the volume of the combined yarn using electromagnetic microwave currents.

Table 1 – Results of experiments to increase the volume of the combined yarn with the use of electromagnetic microwave currents

	Combined aerodynamic yarn after heat treatment by microwave currents			
Microwave power, *Vt*	Linear density, *tex*	Shrinkage,%	Diameter, *mm*	Volume, cm^3/g
300	54	10	0.560	4.56
450	58	14	0.583	4.6
600	63	17	0.630	4.94
850	69	19	0.663	5.01
1000	73	23	0.705	5.34

Also, the results of the least squares experiments yielded a regression model of shrinkage shrinkage dependence on the initial moisture content, microwave power, and treatment time [3, p. 207]:

$$s = \frac{\tau \cdot P \cdot W}{((2,20 \cdot \tau + 193) \cdot (-0,197 \cdot P - 17) \cdot (0,515 \cdot 10^{-3} \cdot W - 5,08))}, \quad (1)$$

where: **S** – relative shrinkage,%;
τ – heat treatment time, sec;
P – Radiation power, W;
W – Relative humidity of samples before heat treatment,%.

As a result of the conducted studies, it was found that the use of a complex high-shrink chemical thread in yarns allows to obtain specific properties of yarn, such as high shrinkage of 15-25% and increased volume of 150-200% of volume to moisture-heat treatment. Application of microwave currents makes it possible to reduce the time of moisture-heat treatment by 1.5-2 times compared to the usual wet-heat treatment applied at JSC “Polesie” (Pinsk, Republic of Belarus), which will increase the volume of output and reduce energy costs.

The resulting knitted fabric, which has both softness and extensibility, reduced material consumption due to the use of the resulting combined yarn with increased volume. These properties will significantly expand the range of knitwear products.

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INTENSIFICATION OF THE PROCESS OF DYEING POLYESTER FABRICS BY DISPERSIVE DYES UNDER CONDITIONS OF ACOUSTIC VIBRATIONS OF ULTRASONIC RANGE

ИНТЕНСИФИКАЦИЯ ПРОЦЕССА КРАШЕНИЯ ПОЛИЭФИРНЫХ ТКАНЕЙ ДИСПЕРСНЫМИ КРАСИТЕЛЯМИ В УСЛОВИЯХ АКУСТИЧЕСКИХ КОЛЕБАНИЙ УЛЬТРАЗВУКОВОГО ДИАПАЗОНА

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Key words: dyeing, polyester fibers, disperse dyes, ultrasound, colorfastness.
Ключевые слова: крашение, полиэфирные волокна, дисперсные красители, ультразвук, устойчивость окраски

Abstract. The authors of the work carried out experimental studies on the dyeing of polyester fabrics by dispersed dyes under conditions of acoustic oscillations of the ultrasonic range affecting the dyeing solution. The results show that an increase in the power and temperature of the of the dyeing bath can reduce the temperature and time of the dyeing process of polyester fabrics with dispersed dyes, increase the color stability to physicomechanical influences.

Аннотация. Авторами работы проведены экспериментальные исследования по крашению полиэфирных тканей дисперсными красителями в условиях воздействия акустических колебаний ультразвукового диапазона на красильный раствор. Результаты показывают, что увеличение мощности и температуры озвучивания красильной ванны позволяют снизить температуру и время протекания процесса крашения полиэфирных тканей дисперсными красителями, повышают устойчивость окраски к физико-механическим воздействиям.

INTRODUCTION

For the dyeing of textile materials from polyester fibers, dispersed dyes widely used, which have a small molecule size, are polar organic compounds that are poorly soluble in water [1]. The limited solubility (0.1-150 mg / l) is due to the presence of strongly polar groups (- NO_2, -OH, -NH_2, -NHR, etc.) in small molecules. The solubility of the dyes increases at a temperature above 80 ° C and in the presence of surfactants.

Dye solutions of this type are highly disperse systems in which the dye particles are found both in the monomolecular (soluble) and in the solid phases. As the fiber absorbs dye molecules, an additional amount of colorant passes into the solution. Dye molecules diffuse into the fiber and fix on the fiber due to the weak intermolecular forces of Man der Waals and hydrogen bonds.

In order to increase the rate of diffusion of dispersed dyes into highly crystalline synthetic polymers, dyeing is carried out at high temperatures, or in the presence of special substances that cause swelling of the fiber or reduce the degree of its crystallinity.

Ultrasonic oscillations with a frequency of 20-100 kHz can increase the rate of dissolution of dyes in surfactant solutions and increase the dispersity of the dye as a result of cavitation [2]. Therefore, one of the innovative ways to address the issue of improving the dyeing technology of modern textile materials is the use sounding of dyeing baths under conditions of acoustic vibrations of ultrasonic range conclusions.

METHODS

The fabric of complex polyester yarns of decorative purpose with a surface density of 250 g/cm^2 was chosen as the object of research.

Dyeing of aqueous dispersions by a periodic method (traditional) was carried out according to the scheme shown in Fig. 1.

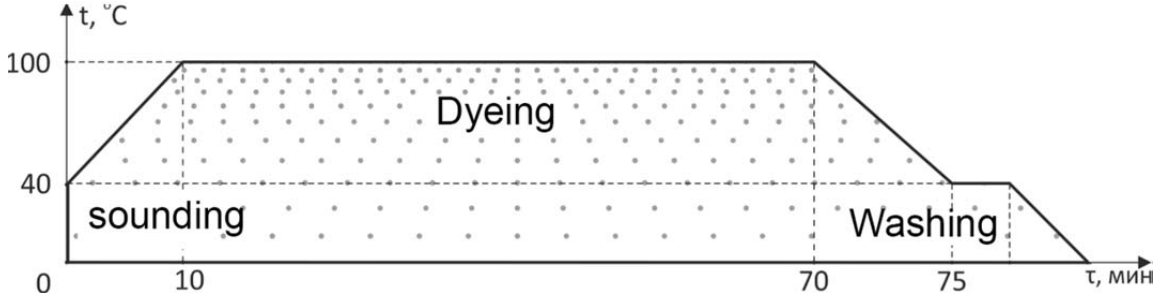

Figure 1 – The scheme of dyeing in the traditional way

Dyeing using ultrasound was carried out according to the scheme shown in Figure 2.

Preparation of the dye bath was accompanied by sounding the dye solution with ultrasonic vibrations at a frequency of 35 kHz for 5 minutes and 10 minutes. The intensity of ultrasonic oscillations ranged from 0.86 to 8.6 W / cm^2. A tissue sample was placed in the dyeing dye and the sample was heated for 5 minutes to a temperature of 100 °C. The dyeing process was carried out at the temperature of the dyeing solution 100 ° C for 30 minutes.

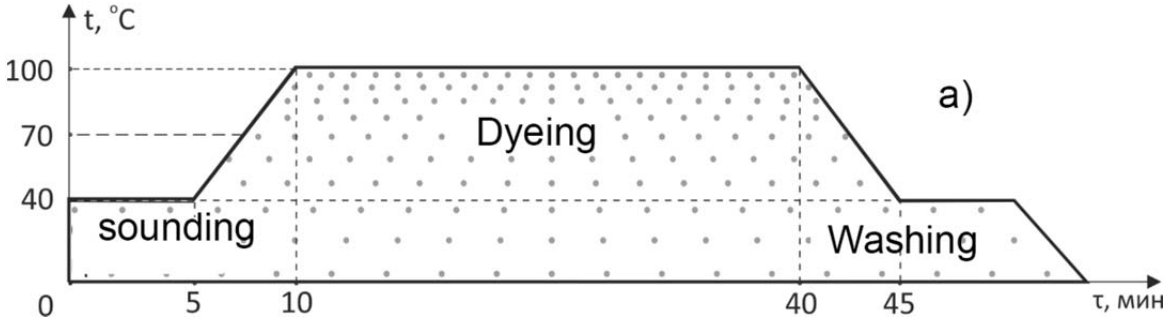

Figure 2 a – Diagram of polyester dyeing with a sounding dye

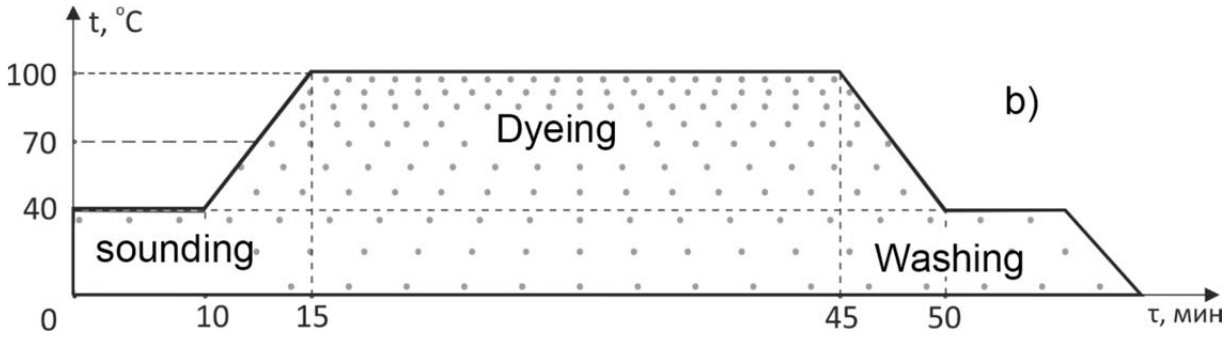

Figure 2 b – Diagram of polyester dyeing with a sounding dye

RESULTS

The results of measurements of color stability to the physicochemical effects and technological parameters of dyeing with the sounded dye solution (samples No. 1-8) and the traditional method (sample No. 9) are given in Table 1.

Table 1 – Parameters of sounding of a dye solution

№	Solution Sound Mode			Sustainability assessment		
	Temperature, °C	Power, W	Time, min	Dry friction	Wet friction	Washing
1	40	50	5	4,5	4,5	2,5
2	40	50	10	4,0	4,0	2,5
3	40	100	5	4,5	4,0	2,5
4	40	100	10	4,0	4,5	3,0
5	70	50	5	4,5	4,5	2,5
6	70	50	10	4,5	4,5	3,0
7	70	100	5	5,0	4,5	3,5
8	70	100	10	5,0	5,0	3,5
9	100	–	60	5,0	4,5	3,5

As a result of studies of the process of dyeing fabrics of polyester fibers with a dispersed dye, it has been established that preliminary sounding of a dyeing solution under conditions of ultrasonic vibrations with a frequency of 22-35 kHz influences the geometric dimensions of the dye particles, which facilitates their dissolution and accelerates the diffusion into the fiber structure, duration of the dyeing process while maintaining a high uniform color of the fabric.

The regime parameters for the preparation of dye solutions using ultrasonic vibrations and the process of dyeing polyester fabrics with a dye solution (preliminary sounding of the dyeing solution for 5-10 minutes at a power of ultrasonic radiation of 100 W (intensity 8.6 W / cm^2), a solution temperature of 100 ° C).

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EVALUATION OF CONSUMER PROPERTIES OF FURNITURE MATERIALS

ОЦЕНКА ПОТРЕБИТЕЛЬСКИХ СВОЙСТВ МЕБЕЛЬНЫХ МАТЕРИАЛОВ

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Key words: materials for upholstery, consumer-oriented properties, durability and strength.

Ключевые слова: мебельные материалы, потребительские свойства, долговечность, прочность.

Abstract. This article presents the results of studies of consumer properties of materials for upholstery: tapestry, jacquard, chenille, flock.

Аннотация. В статье представлены результаты исследования потребительских свойств материалов для обивки мебели: гобелен, жаккард, шенил, флок.

Padding is one of the first elements, which the consumer pays attention to when choosing furniture. Upholstery must have a set of aesthetic and performance properties to meet the requirements of furniture manufacture and the consumer. According to TR CU 025/2012 [1] for the manufacture of furniture should not be used flammable, and belonging to the group of T4 toxicity of combustion products of upholstery textiles.

For upholstery use fabrics, nonwoven fabrics and knitted fabrics, leather, eco-leather. Analysis of the furniture market revealed that Omsk manufacturers often use for upholstery fabrics of different fibrous composition and structure, flocking materials. As objects of study in the work silk upholstery materials were selected, including tapestry, jacquard, chenille, flock (table 1).

Table 1 – Characteristics of materials

Material name	Weave (production method)	Fiber composition		Linear density, Tex		The number of threads (loops) for 10 cm		Thickness, mm	Surface density, g/m^2
		lengthways	transversely	lengthways	transversely	lengthways	transversely		
Chenille	fine-patterned	НПэф	Н Кмб: Пр Вис; НПэф	46	139.64	370	120	0.78	268
Flock	electrofactory	НПэф	НПэф	190	170	110	110	1.49	250
Silk jacquard	jacquard	НПэф	НПэф	102	69.76	550	420	0.36-0.39;	266
Tapestry	jacquard	НПэф	НВис; НПэф	84 135	95.38; 38	320	600	0.56-0.64	326

The results of the survey identified the most important from the point of view of the consumer indicators of quality furniture materials: color stability, abrasion resistance, durability, compliance with artistic color design, structure, finish materials of the modern fashion trends. The results are presented in table 2.

Table 2 – Results of studies of the properties of upholstery materials

Name of the indicator, units	The value of the indicator for materials			
	Chenille	Flock	Silk jacquard	Tapestry
Tensile strength the actual lengthways transversely normative, not less	 915 270 392	 387 313 –	 1433 1612 392	 1706 16584
Tensile elongation, % the actual lengthways transversely normative, no more	 24 15 25	 9 11	 32 31	 33 32
Dust holding capacity, % the actual normative	 0.12 Not rated	 0.16	 0.05	 0.08
Color fastness to dry friction, score the actual normative, not less	 /5 3	 /4	 /5	 /5
Abrasion resistance, cycle the actual normative, not less	 9030 3000	 over 10000	 over 10000	 over 10000 4500

According to the obtained results in the increased breaking load, the chenille does not meet the regulatory requirements of GOST 24220-80 [2], jacquard and tapestry – increased elongation at break.

Materials with pile (flock, chenille) have the highest dust holding capacity.

All the investigated materials comply with the requirements in terms of resistance to abrasion on the plane. For color stability, all materials meet the requirements of GOST 7913-76 [3]. The investigated materials belong to the group of extra strong color stability.

Thus, all the studied materials possess a high resistance to abrasion, however, chenille and flock do not meet regulatory requirements for breaking load on a weft, and the tapestry and jacquard – in elongation at break. This can be a cause of reduced durability of furniture upholstery. Further studies are planned with the expansion of the range of materials and item properties.

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STUDY OF WAYS OF INTRODUCING PHASE CHANGE SUBSTANCES INTO THE FABRIC TO GIVE IT THERMOREGULATORY ABILITY

ИССЛЕДОВАНИЕ СПОСОБОВ ВВЕДЕНИЯ ВЕЩЕСТВ С ФАЗОВЫМ ПЕРЕХОДОМ В ТЕКСТИЛЬНЫЙ МАТЕРИАЛ ДЛЯ ПРИДАНИЯ ЕМУ ТЕРМОРЕГУЛИРУЮЩЕЙ СПОСОБНОСТИ

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Key words: phase transition, phase change materials, textile material, treatment, printing, thermoregulatory ability.

Ключевые слова: фазовый переход, материалы с изменяемым фазовым состоянием, текстильный материал, пропитка, печать, терморегулирующая способность.

Abstract. The concept of "phase change materials (PCM)" is presented in the article. It is noted that the use of such substances in the textile industry can give the material a thermoregulating ability. Substances with thermoregulatory properties are indicated. The main methods of introducing substances with a variable phase state into textile material are noted: treatment, printing, introduction to fiber. The most common way is to introduce PCM using printing technology. Direct introduction of PCM in the fiber is only possible for synthetic materials and require special temperature conditions. For the impregnation operation, a much larger amount of active substance is needed than in the previous methods, which affects the cost of the finished product. To determine the optimal method of introduction, it is also necessary to study the thermoregulating ability of the modified textile material.

Аннотация. В статье представлено понятие «материалы с изменяемым фазовым состоянием (PCM)». Отмечено, что использование таких веществ в текстильной промышленности способно придать материалу терморегулирующую способность. Обозначены вещества, обладающие терморегулирующими свойствами. Отмечены основные способы введения веществ с изменяемым фазовым состоянием в текстильный материал: пропитка, печать, непосредственное введение в волокно. Наиболее распространенным является способ введения PCM с помощью технологии печати. Непосредственное введение PCM в волокно возможно только для синтетических материалов и требует соблюдения температурного режима. Для осуществления операции пропитки необходимо значительно большее количество активного вещества, чем в предыдущих способах, что влияет на стоимость готового продукта. Для определения оптимального способа введения также необходимо изучение терморегулирующей способности модифицированного текстильного материала.

Nowadays, the textile industry in many countries is developing with innovation. There is extensive use of new technologies, equipment, raw materials. Manufactured textile materials appear with the following new or improved properties: protective, thermoregulating, cosmetic and others. The so-called "smart materials" are used in various fields: production of clothes, shoes, bedding, and materials for technical applications.

Of particular interest are the textiles having thermoregulatory ability. One way of giving them this ability is the introduction of active substances in their structure. Such substances are called phase change materials (PCM) - a substance that can change phase (aggregate) state within a specific temperature range.

There are about 500 kinds of substances that can change phase state of a change in temperature and absorb heat, but not all maybe used in practice. Maximum specific heat capacity and optimum temperature of the phase transition material have octadecane ($C_{18}H_{38}$) and nonadecan that can provide the most comfortable settings

under clothing space. Because when heated, these substances are melted, there are problems they are fixing in the textile material. To solve this problem, technology called microencapsulation is used.

The PCM would be encapsulated in very small spheres to contain them in a liquid state. These microcapsules have approximate diameters of between 1μm and 30μm. The microcapsules are resistant to mechanical action, heat and most types of chemicals.

The introduction of PCM into the textile material can be implemented in different ways: impregnation, printing, introduction into fiber.

Modification of the material by means of impregnation is the most simple. Microcapsules of paraffin are pre-mixed with water, adding a binder (based on acrylate copolymer). The binder makes the dispersion viscosity and ensures good connection with the textile material.

The textile material must be pre-dried before removal to remove excess moisture. The dispersion is applied by immersion, brushing or spraying. After impregnation by the dipping method, the textile material is wrung out by 85-90% and dried at a temperature of 150 °C for several minutes to better consolidate the active substance. Also, after impregnation with a spray or a brush, a fusing operation is necessary. If a lower temperature is used, PCM fixing will take place within a few days.

Fastening PCM is carried out on the surface of elementary yarns. With a higher PCM concentration in the solution, the distribution of the active substance on the surface of the fabric occurs more evenly.

Several types of fabric are suitable for impregnation: cotton, silk, synthetic fabric. A disadvantage of this method is the high consumption of active substance, which is economically inefficient.

The most common is the introduction of PCM by using printing technologies. The simplest kind of printing is screen printing (silkscreen). In silk screen printing, there are two ways of applying images: contact and non-contact. Contact printing method is used much more often. As for the non-contact method, that during use the material does not touch the grid, and the paint is transferred from the mold by means of electrostatic forces. When the contact method is used, the grid contacts the printed material, and the paint is supplied by the squeegee.

When printing to impart a thermoregulatory ability to the material, PCM is added to the paint for printing. At the same time, the paint must be water-based.

This method requires special equipment, technological modes. But the consumption of active substance in such a modification of the material is much less. And it is cost-effective.

Also PCM can be introduced into the fiber. But this method is only suitable for synthetic materials. The microencapsulated PCM is added to the polymer solution or melt. Then the fiber is dry or wet shaping. This method maximizes the anchoring of active substances, and resistance to impacts. The result of the application of this method requires strict control of temperature and pressure as the microcapsules of paraffin with a certain influence can be destroyed.

The most common is the introduction of PCM by using printing technologies. Direct introduction of PCM in the fiber is suitable only for synthetic materials and require special temperature conditions. To perform the operation of impregnation a much larger amount of active substance is required than in previous methods which affects the cost of the finished product. To determine the optimal method of administration is also necessary to study thermoregulatory abilities of the modified textile material.

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INVESTEGIATION FOR INFLUENCE OF KNITTING FABRICS'STRUCTURE TO PROPERTIES

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Key words: knitting, rib stitch, cardigan stitch, double jersey circular knitting machine, Terrot, structure, knitted fabrics` properties

Abstract. Rib has a vertical cord appearance because the face loop wales tend to move over and in front of the reverse loop wales. As the face loops show a reverse loop intermeshing on the other side, 1x1 rib has the appearance of the technical face of plain fabric on both sides until stretched to reveal the reverse loop wales in between. 1x1 rib is production of by two sets of needles being alternately set or gated between each other. Relaxed 1x1 rib is theoretically twice the thickness and half the width of an equivalent plain fabric, but it has twice as much width-wise recoverable stretch. In practice, 1x1 rib normally relaxes by approximately 30 per cent compared with its knitting width. In modern conditions the quality of knitted fabrics plays a special role because of their influence on efficiency and human health. In the research according to the results, knitted fabric, containing 4.5% nylon textured yarns, has good elasticity and meets technical and economic requirements. A small content of polyamide textured yarns in a knitted cloth of cotton yarn is beneficial to the elasticity and formability of the products does not worsen their hygienic properties, facilitates care of them. In this research work ten variants of interlooping with supplementary patterning items of knitwear were developed to determine technological parameters and physical-mechanical properties in knitwear, which

differ from each other by laying the yarn on the needle in the rapport of the interlooping to form patterns.

The simplest rib fabric is 1x1 rib that is knitted on flat machines. The first rib frame was invented by *Jedediah Strutt* of Derby in 1755, who used a second set of needles to pick up and knit the sinker loops of the first set. It is now normally knitted with two sets of latch needles. 1x1 rib is balanced by alternate wales of face loops on each side; it therefore lies flat without curl when cut. It is a more expensive fabric to produce than plain and is a heavier structure; the rib machine also requires finer yarn than a similar gauge plain machine. Like all weft-knitted fabrics, it can be unroved from the end knitted last by drawing the free loop heads through to the back of each stitch. It can be distinguished from plain by the fact that the loops of certain wales are withdrawn in one direction and the others in the opposite direction, whereas the loops of plain are always withdrawn in the same direction, from the technical face to the technical back [1].

Cardigan stitches are two-course repeat tuck rib knitwear structures, widely used in the body sections of heavy-weight stitch-shaped sweaters. The tuck stitches cause the rib wales to gape apart so that the body width spreads outwards to a greater extent than the rib border. The tuck loops increase the fabric thickness and make it heavier in weight and bulkier in handle, although the rate of production in rows of loops will be less than for normal 1x1 or 2x2 rib. The greater the proportion of tuck to cleared loops, the heavier and wider the finished relaxed structure.

In the production of a knitted stitch, the leading raising and cardigan cams for that bed and direction of traverse must be in action, whilst for a tuck stitch, the raising cams remain in action but the cardigan cam is taken out of action. It is important to arrange the camming for the needle beds so that, at the start of the traverse when tucking, the first needle is tucking and the last needle in action is in the opposite bed and is thus knitting. If the last needle is tucking, the selvedge tuck loop will withdraw from the needle hook as the reverse traverse commences.

Among the technological parameters, the thickness of the knitwear plays an important role in the consumption of raw materials and the improvement of quality indicators. The increase of the layer allows to increase the thickness of the knitwear. The presence of additional elements of patterning knitted fabrics in knitting lead to improved strength characteristics and thickness.

Also the studies considered multi-layered interlooping knitwear for the production of garments, having high heat-shielding properties, and to enhance patterning effects on traditional knitwear due to the volumetric relief images.

These types of interloopings are often used in patterning the knitted fabrics, which is one of the important and interesting directions for today. A number of works devoted to the development of structures and manufacturing techniques of knitted fabrics with different elements to create the pattern and extend the scope of their application in technology and everyday life.

Using the classification of knitted interlacings and on the basis of the device key-systems interlacing machines, the interlooping, the development of which is possible

on machines of this type. For this purpose, based on the structure of knitwear, all necessary external signs characterizing different types of interloopings and, given the looping process on the machine, identified the opportunity for their generation.

Doublerib knitwear, with a number of valuable properties of the eraser and its derivatives, is used for manufacturing high-quality range of products. Initially, interlock machines were mainly used in the production of linen products, high performance which are duly appreciated by the consumer. Such a unilateral use of delisting paintings led to the fact that the question about the possibility of obtaining patterns on machines, interlock has not been, until recently, current and not subjected to a comprehensive study. The issue in the production of cloth for the upwear products plays an extremely important role and is of considerable interest. Unlike other double cloths due to its structure preserves the appearance of the pattern when stretched in the transverse and longitudinal directions because the wrong hinges are not visible on the invoice. This is one of its strengths, because in the modern jerseys ornamentation occupies an important place.

In this research work developed and produced in manufacturing environments 10 variants interloopings in interlacing double Jersey circular knitting machine of "Terrot", class machine - 20", diameter of needle cylinder is 30", the number of systems – 72, number of needles – 3744. On this machine there are two positions of the needles in the dial that differ in the arrangement of heels and one needle position in the cylinder. To obtain patterning of looping of knitted fabric on the basis of interlacing interlooping is installed on your machine 36 patterning of pushers in each knitting system, which can occupy 3 positions: left / off position at which the needle does not rise to the knitting process, the average position for full lift on the process of concluding that this creates a loop of conventional size, the right position intended for incomplete recovery on the process of concluding that this creates a press fit in the outline and press the knitwear.

To determine technological parameters and physical-mechanical properties in knitwear, were developed ten variants of this type of interlooping with supplementary patterning items of knitwear, which differ from each other by laying the yarn on the needle in the rapport of the interlooping to form patterns. Analysis of the results of studies conducted by many researchers showed that the decrease of the surface density of the knitted fabric within a certain range reduces the consumption of raw materials and less dangerous for its strength properties, because the absolute value of the strength of knitted fabrics is high, and in operation are subjected to loads not exceeding 20% of the explosive.

According to the results of the analysis determined that technological parameters such as loop pitch, the height of the looped series, the density horizontally and vertically, the thread length in the loop in all variants change with small changes (within 10-12%) Jersey. The surface density (Fig.1) varies to 171.3-197,8 g/m^2 (15%). The volume density of the generated samples varies 330,8-to 388.6 mg/cm^3 (15%).

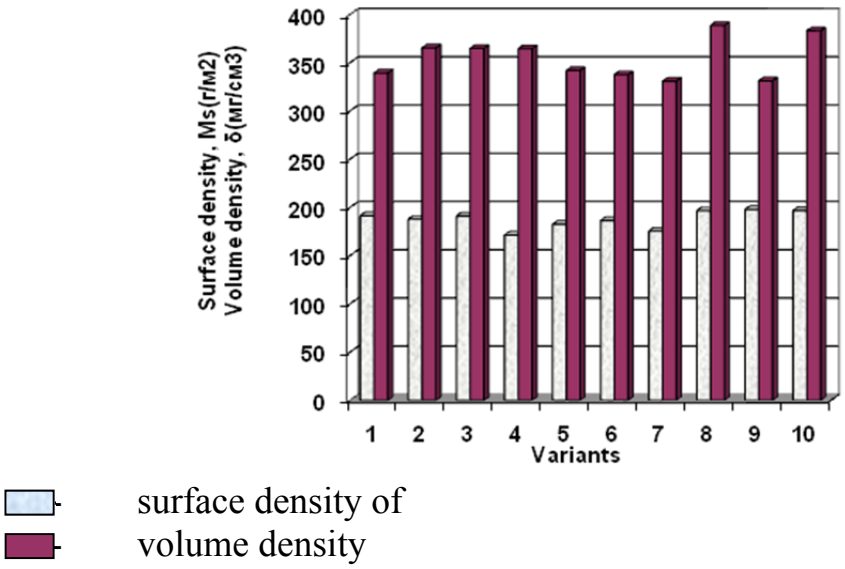

Figure 1 – Histogram changes the surface and volume densities according to the variants of interloopings based on delisting knitwear

It should be note that the lowest volume density in cases 7, 9, 6, 1. In these embodiments, the maximum thickness and surface density. Since knitwear is a three-dimensional structure characterized by a length, a width and a thickness, and lightweight of this structure must define not a two-dimension criteria (surface density), and three-dimensional (volumetric density). The volume density of knitted fabric shows the content of textile fibers in a unit volume. In the category of paintings with a reduced consumption of materials include fabrics with a loose structure having a substantial thickness compared to the baseline. Paintings by reduced consumption of materials called canvas, volume density lower than the baseline, optimal module identical loop of yarn.

So options 7, 9, 6, 1 should be recommended as models of interloopings with the lowest consumption of raw materials according to the analysis of the volume density of the developed options. It provides an opportunity to develop lightweight Jersey low material consumption without loss of properties. To achieve such a result allows the structure of the interlooping, as it introduced additional elements of patterned knitwear. The location of additional drafts and broaches affect the thickness of the knitwear.

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RESEARCHING OF THERMOPHYSICAL PROPERTIES OF THE NEWEST MATERIALS USED AS A HEAT-INSULATING LAYER FOR THE DESIGN OF WATER-RESISTANT CLOTHES

ИССЛЕДОВАНИЕ ТЕПЛОФИЗИЧЕСКИХ СВОЙСТВ НОВЕЙШИХ МАТЕРИАЛОВ ИСПОЛЬЗУЕМЫХ В КАЧЕСТВЕ ТЕПЛОИЗОЛЯЦИОННОГО СЛОЯ ПРИ ПРОЕКТИРОВАНИИ ВОДОТЕРМОСТОЙКОЙ ОДЕЖДЫ

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Key words: heat-insulating materials, the newest materials, thermophysical properties of materials, a stationary heat exchange, the gaseous medium.

Ключевые слова: теплоизоляционные материалы, новейшие материалы, теплофизические свойства материалов, стационарный теплообмен, газообразная среда.

Abstract. Certain types of newest thermal insulation materials have been investigated. The values of the coefficient of thermal conductivity of the samples are obtained.

Аннотация. Проведены исследования некоторых видов новейших теплоизоляционных материалов. Получены значения коэффициента теплопроводности исследуемых образцов материалов.

The assortment of materials used for designing clothes is rapidly expanding. Designing special water-resistant clothing is a difficult task, because special protective clothing represents a complete or partial barrier between a person and the environment. In the process of operation, clothing of special purpose must be hygienic, comfortable, durable, and not restrict movement, capable of removing perspiration in the form of a vapor-gas and wet phase.

The greatest inconvenience of operation in special protective clothing is caused by the thickness of package of materials. The greatest specific weight of thickness of a package of materials belongs to heat-insulating materials that is caused by their structure. In order to optimize the thickness of the material package, the thermophysical properties of the newest materials were studied.

Data on materials and their physical and mechanical properties are shown in Table 1.

Table 1 – Physical and mechanical properties of samples of materials

Indicator name	The sample number							
	1	2	3	4	5	6	7	8
Material name	Slimtex	Slimtex	Slimtex	Hoopon	Hoopon	Hoopon	Isosoft	Isosoft
Surface density, g / m^2	100	150	250	100	150	200	200	250
Thickness, m	0.004	0.004	0.004	0.010	0.020	0.030	0.015	0.035

Experimental equipment and heat exchange conditions. The sample of the material under study was given the shape of a relatively thin square plate 5, with dimensions of 100x100 mm. The temperature difference was created due to the thermal electric heating element (TET) 3, placed in a heat-insulated chamber 2, to provide a one-dimensional constant heat flow. The power of heat flow Q (W) is equal to the value of the power expended for heating the heater, and is measured directly with the wattmeter. The value of the heat flux Q is set by the autotransformer 1, and equal to 180 W. The temperature values of the surfaces of the test material are determined with the help of thermocouples 6, the hot junctions of which are sewn up both from the side of the influencing heat flux (acting on the lower layer) and from the side not exposed to thermal flux (the upper layer). The scheme of the special equipment is shown in Fig. 1.

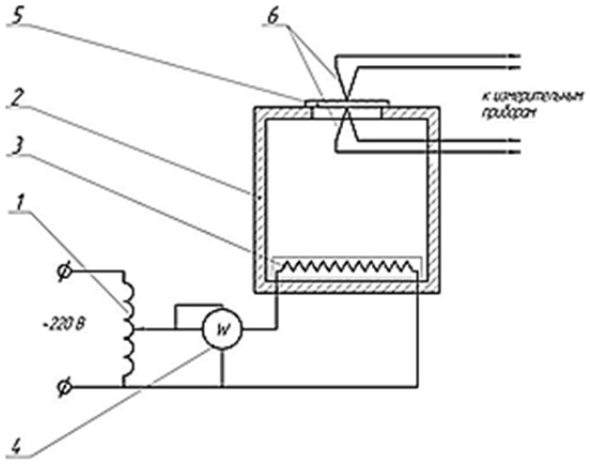

Figure 1 – The model of special equipment for the study thermophysical characteristics:
1 – autotransformer; 2 – the heat insulated chamber; 3 – thermal electric heating element; 4 – the wattmeter; 5 – test sample; 6 – thermocouples

The values of the change in temperature from the surface of the material were fixed from the moment the sample was placed in the experimental setup and until the onset of the stationary regime.

To ensure a constant heat flow after turn on special equipment to the network, it must be heated for 45-60 minutes. The temperature values on the upper surface were

fixed at regular intervals, in the interval from 10 to 160 seconds. Temperature of the radiation source $t_{изл}$ = 170 ºC the air in the chamber was heated to t_c = 130 ºC at the surface temperature of the material $t_п \approx 115$ ºC.

As a result, the typical temperature dependences of the surface of the material on the heating time of the internal surface are received and shown in Fig. 2.

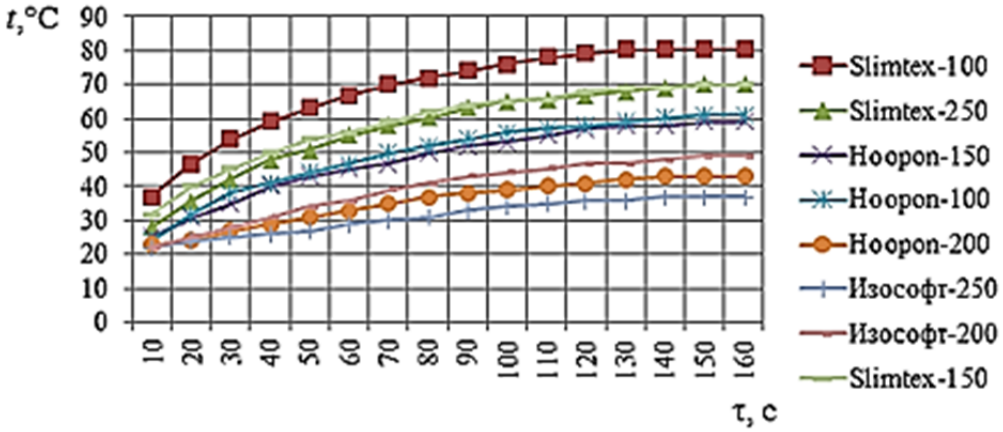

Figure 2 – Graphs of temperature change to time for the upper material layer with a heat flux of 180 W

Method for calculating the coefficient of thermal conductivity. Most of the experimental methods are based on observing the temperature field excited by the heat flux in the body under investigation. With reference to stationary conditions, the Fourier law is used:

$$Q = -\lambda \frac{\partial t}{\partial n} F \qquad (1)$$

and the differential heat equation in the form:

$$\frac{\partial^2 t}{\partial x^2} + \frac{\partial^2 t}{\partial y^2} + \frac{\partial^2 t}{\partial z^2} = 0 \qquad (2)$$

which is valid for bodies whose physical properties are independent of temperature.

The solution of the above differential equation applied to one-dimensional temperature fields for bodies of simple geometric shapes and allows us to find the thermal conductivity coefficient from:

$$\lambda = \frac{Q}{t_{ниж} - t_{верх}} \cdot \delta, \qquad (3)$$

where Q is the heat flux, W, δ is the thickness of the flat layer, m.

The general principle of measuring the coefficient of thermal conductivity is to determine the heat flux Q passing through a prototype of a given size, and the temperature difference t_{down}-t_{above} on both of its isothermal surfaces or in a careful measurement of the temperatures and location of junctions of thermocouples at any other two points in the direction of motion of the thermal flow. Expression (3) was derived on the assumption that λ is a constant independent of temperature [1].

The results of calculating coefficient of thermal conductivity of materials are presented in Table 2.

Table 2 – Results of calculation of coefficient of thermal conductivity of materials

Indicator name	The sample number							
	1	2	3	4	5	6	7	8
Material name	Slimtex-100	Slimtex-150	Slimtex-250	Hoopon-100	Hoopon-150	Hoopon-200	Isosoft-200	Isosoft-250
A coefficient of thermal conductivity of materials, W / m · ºC	0.019	0.025	0.017	0.027	0.050	0.066	0.038	0.062

The carried out experimental researches allowed to define values of factors of heat conductivity of new kinds of heat-insulating materials. Values are obtained and graphs of temperature variation in time for the upper material layer are constructed at a heat flux of 180 W. The results of the work will allow selecting the materials with the best thermophysical and physicomechanical parameters that will be used in the formation of packages of materials to improve the ergonomic, hygienic and operational performance of special protective clothing.

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UDC 677.024

COLLECTION OF JACQUARD CARPETS
КОЛЛЕКЦИЯ ЖАККАРДОВЫХ КОВРОВ

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Key words: collection of carpets, carpet design, artistic design.
Ключевые слова: коллекция ковров, дизайн ковра, художественное проектирование.

Abstract. With the use of modern information technologies and package of applied graphical programs Adobe Photoshop pictures of a collection of jacquard carpets were designed, which are supposed to perform two-canvas method from

polypropylene yarn. Every pattern of carpet of collection is an individual from the point of view of the psychology of color, causes some pleasant associations that were considered during the creation of the collection as a whole. Sketches are located in such sequence that allows the most active to open up their color and graphic characteristics.

Аннотация. С использованием современных информационных технологий и пакета прикладных графически программ программы Adobe Photoshop создана коллекция рисунков жаккардовых ковров, которые предполагается выполнять двухполотным способом из полипропиленовых нитей. Каждый эскиз коллекции является индивидуальным с точки зрения психологии цвета, вызывает определенные приятные ассоциации, что учитывалось при создании коллекции в целом. Эскизы расположены в такой последовательности, которая позволяет наиболее активно раскрыться их цветовым и графическим характеристикам.

With the aim of expanding the range of carpets, a collection carpets was created, which are was supposed for perform two-canvas method using the author's design. The following tasks are set in the work:

– to study the actual motivations for modern carpet weaving;

– to establish the main trends of the artistic transformation of the selected motif;

– to develop a collection carpets.

In the search of new phenomena in art of contemporary textiles, we studied ornamental complex of the popular Belarusian fabrics and we installed actual motivations for modern home interior: stylized shapes or parts of peacock feathers. We analyzed ways and methods of artistic transformation of the imaginary and symbolic foundations. We founded the source of inspiration, created by famous designers of interior products.

It is determined that the peacock is a symbol of family happiness. It is credited with qualities such as royalty and beauty, incorruptibility and fearlessness. Images of this bird can be seen in a variety of crafts products in many countries.

Beautiful peacock feathers have always attracted attention. Plastic lines and the proportionality of the elements of form, rhythm all these are taken as a basis, the designer is reworking the motifs and images of birds.

On the basis of the obtained data the collection of jacquard carpets was developed, consisting of eight sketches. The graphic series is built on symmetry, asymmetry, curvilinear lines, which contrast to the tone of the background. Plastic shape of the line allows to achieve a visual effect using only exquisitely complex configuration (figure 1). The feathers are smooth and have rounded shapes at the end more focused on ovals whith the round «eyelet» the spot with the active element in the center. Curvilinear elements are present from the beginning of the barrel of the pen all along the length.

Every single sketch of the collection is made with Adobe Photoshop and is an individual from the point of view of the psychology of color, causes some pleasant associations that were considered during the creation of the collection as a whole.

Sketches are located in such sequence that allows the most active to open up their color and graphics features.

The basic idea, the idea of the collection is the development of the artistic image and composition, creating a conceptual and compositional unity. All of sketches can be divided into primary (active) and secondary (passive). The major is built on the principle of symmetry, secondary – asymmetry.

When we build a visual effect of the large, medium and small parts, we allocate them in main and secondary lines in color and size. Thus in the composition of the pieces are manifested the principles of nuance and contrast. While not the motives, but only their individual areas of focus, performing the composition of the ornament functions of the dominant. Rhythmic organization emphasizes the color rhythm that manifests itself in different thickness and tone of the picture.

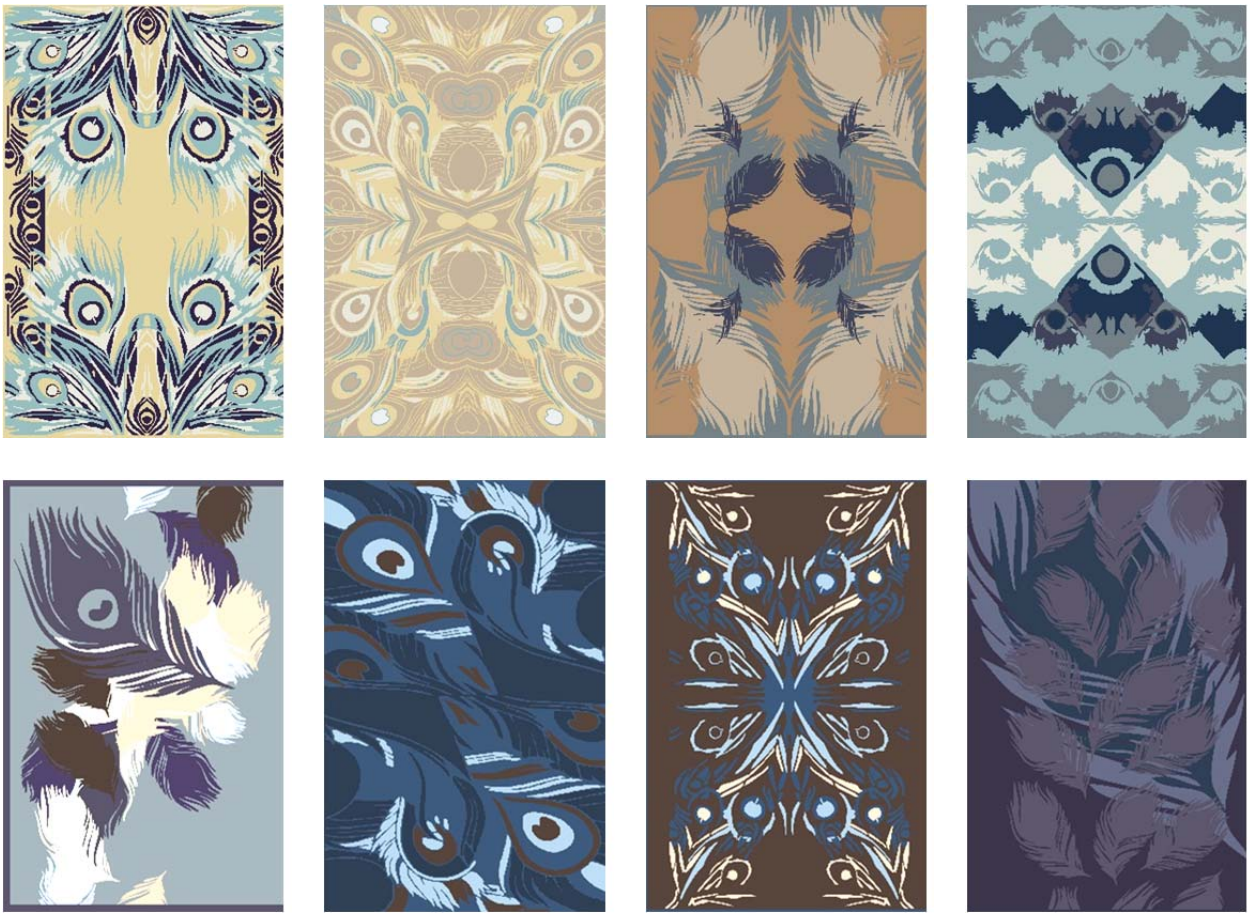

Figure 1 – The collection of jacquard carpets

Color palette of the collection is built on cold and warm colors, contrast of light and dark, used also a palette of nuanced shades in the color of the lines. Such combinations always look strictly, laconically. In the figure are used both static and dynamic elements. Color palette of the collection preserves the unity of the composition on svetlichnyj gradations. The composite series is constructed from light to dark, from warm to cold color. A small number of colors used in the drawings of

the carpet, gives the collection a touch of contrast. The basis for the development of the collection is the use of different depth and intensity of shades in the background and the figure. Dark colors are at the edges, lighter in the figure, the contrast in the figure, quiet in the background.

Texture is represented by a pile of 9 mm, is closely associated with the pattern itself and emphasizes its expressiveness. The properties of the yarns attach for added depth of color. Raw material composition – polypropylene yarns that have a low cost, high antistatic properties, susceptibility to heat treatment, resistance to many contaminants, do not cause allergic reactions and is able to maintain color throughout the service life.

One of the elements of the collection in the size 2x3 m was completed at the "Brest Carpets". We used four colors of yarns.

The collection of jacquard carpets is made in a minimalist design that will complement of originality to the interior. It is expected, that the carpets will be used in a residential living room that combines ultra-modern elements and ethnic components of the style.

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AUTOMATED DEVICE FOR DETERMINING OF HEAT-PROTECTIVE PROPERTIES OF PACKAGES OF CLOTHING MATERIALS

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Key words: coefficient of thermal conductivity, thermal resistance, coefficient of air permeability, packages of clothing materials, heat-shielding properties, automated device.

Ключевые слова: коэффициент теплопроводности, тепловое сопротивление, коэффициент воздухопроницаемости, пакеты материалов одежды, теплозащитные свойства, автоматизированная установка.

Abstract. The automated device is developed to measure values of heat-protective properties of clothing materials and their packages which construction gives the chance to reproduce temperature of the space under the clothes and parameters of the environment over a wide range that will allow to carry out tests of materials in the conditions which are brought closer to real conditions of their maintenance.

Аннотация. Разработана автоматизированная установка для определения показателей теплозащитных свойств материалов одежды и их пакетов, конструкция которой дает возможность воспроизводить температуру пододежного пространства и параметры окружающей среды в широких пределах, что позволит проводить испытания материалов в условиях, приближенных к реальным условиям их эксплуатации.

Great demands placed on consumer properties and quality of the modern clothes define its competitiveness in the market. From all diversity of properties of clothing materials one of the most important is heat-protective properties which characterize ability of clothing materials to protect a body of the person from thermal losses and overheating in case of different temperature conditions. Assessment of indices of heat-protective properties has the greatest value in case of design of demi-season and winter clothes and also clothes of a special purpose.

Now in literary and patent sources it is possible to meet the description of a large number of methods and instruments for measuring values of heat-protective properties of materials. The existing methods and means of assessment of heat-protective properties of clothing materials despite variety possess a number of shortcomings: they allow to define indices of heat-protective properties only in the limited test environments which often are not corresponding to real operating conditions of materials. Besides, the existing technical means of assessment of heat-protective properties are quite often characterized by big overall dimensions, high energy consumption and an outdated technical basis.

In this regard the relevant task is development of a method of measure values of heat-protective properties of clothing materials and their packages and its implementation in the form of the automated device on the basis of the modern technical means allowing to carry out tests as in the conditions of natural convection, and stimulated.

Proceeding the analysis of climatic conditions of the Republic of Belarus requirements imposed to automated system are formulated:

1. The reproduced indices: ambient temperature -20 … +40 ºC, temperature of space under the clothes 0 … 40 ºC, wind speed 0 … 7 m/s.

2. Defined indices: coefficient of thermal conduction, thermal resistance, coefficient of air permeability.

The method of the stationary thermal mode is put in a basis of a technique of determination of thermal resistance and coefficient of thermal conduction.

The diagram of the test camera of the developed device for measuring values of heat-protective properties of clothing materials and their packages is provided in a figure 1.

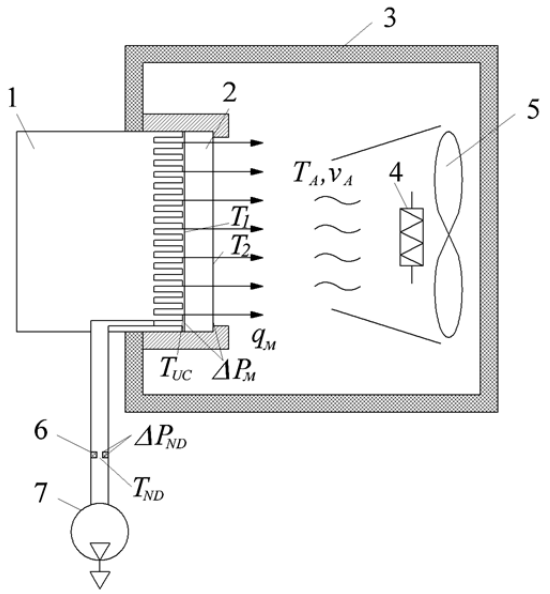

Figure 1 – Scheme of the test chamber of the apparatus for determining the heat-protective properties of clothing materials and their packages:
1 – the unit of reproduction of parameters of the space under the clothes, 2 – the researched sample, 3 – the camera for reproducing the environmental parameters, 4 – the electric heater, 5 – the fan, 6 – the narrowing device, 7 – the vacuum pump, T_1, T_2 – temperatures on the surfaces of material, T_{UC} – temperature of the space under the clothes, T_A – ambient temperature, v_A – wind speed, q_M – the heat flux passing through material, ΔP_M – differential pressure on material, ΔP_{ND} – differential pressure on the narrowing device, T_{ND} – air temperature, passing through the narrowing device

Structurally the developed device can be divided into two parts: the first allows to imitate a microclimate of the space under the clothes, the second – to reproduce climatic parameters of the environment.

Reproduction of temperature condition under clothes is realized by means of thermoelectric modules of Peltier together with the system of water cooling. The camera reproducing environment parameters allows to support as the positive, and the negative air temperatures near the researched sample. The electric heater which is set in a stabilizing branch pipe of the centrifugal fan creating an air flow is used for heating. Cooling of air in the camera is carried out by means of the compressor refrigerating aggregate.

Maintenance of set speed of an air flow, temperatures of the space under the clothes and the environment is carried out in an automatic mode. Data collection from sensors is carried out with use of specially developed software for the personal computer.

Such construction gives the chance to carry out tests of various clothing materials in the climatic conditions as close as possible to real operating conditions.

Determination of thermal resistance and coefficient of thermal conduction is carried out as follows. The researched material sample having the form of a round disk of 0.01 m^2 is placed in device. Thermoelectric modules of Peltier, the electric heater and the fan connect to a network and, regulating the power given on them, set the given temperature condition and speed of an air flow. In case of carrying out tests in the conditions of natural convection the fan is closed a wipe. After establishment of the stationary thermal mode take readings of temperature sensors on the surfaces of material, and on the hot and cold sides of thermoelectric modules of Peltier.

For determination of thermal resistance, K·m^2/W and coefficient of heat conduction, W/m·K clothing materials the following dependences are received:

$$R_M = \frac{Fc\left(T_1 - T_2\right)}{nKNc\left(2\alpha IT_C - RI^2 - 2k\left(T_H - T_C\right)\right) - \lambda_G F_G \left(T_H - T_C\right)},$$

$$\lambda_M = \frac{\delta_M nKNc\left(2\alpha IT_C - RI^2 - 2k\left(T_H - T_C\right)\right) - \lambda_G F_G \left(T_H - T_C\right)}{Fc\left(T_1 - T_2\right)}.$$

where T_1, T_2 – temperatures on the surfaces of material, K; F – the surface area of dispersion of the heat sink of device to which the researched sample of material, sq.m; δ_M – thickness of the researched sample of material, m; K – the coefficient considering losses of thermal power in nodes of the unit of reproduction of parameters of the space under the clothes defined experimentally; n – the number of thermoelectric modules of Peltier in device; λ_G – coefficient of thermal conduction of the thermopaste filling a gap between thermoelectric modules of Peltier, W/m·K; F_G – a gap cross-section area between thermoelectric modules of Peltier, sq.m; T_H, T_C – temperatures on the hot and cold ends of a thermoelectric branch respectively, K; c – thickness of thermoelectric modules of Peltier, m; N – number of couples of thermoelectric branches in the thermoelectric module of Peltier; α – thermoeMF swore a thermoelectric branch, W/K; R – electrical resistance of a thermoelectric branch, Ohm; I – the measured value of current intensity, passing through a thermoelectric branch, A; k – complete thermal conduction of a thermoelectric branch, W/K.

In addition to thermal resistance and coefficient of thermal conduction the developed device allows to define coefficient of air permeability of clothing materials which can indirectly be carried to indices of heat-protective properties. In this case by means of the vacuum pump on the researched sample of material differential pressure ΔP_M = 49 Pa is created. For air bleeds in the unit of reproduction of parameters of the space under the clothes, the special channel in which the narrowing device is set is provided.

The coefficient of air permeability B, dm^3/m^2 from the researched material is determined by a formula:

$$B_M = \frac{a \cdot \left(1 - b\Delta P_{ND}\right)\sqrt{\Delta P_{ND} T_{ND}}}{F_M},$$

where F_M, – the area of the researched sample of material, m^2; a and b – constructive coefficients; ΔP_{ND} – pressure differential on the narrowing device, Pa; T_{ND} – air temperature, passing through the narrowing device, K.

For the purpose of practical approbation of the offered technique of a measure definition of heat-protective properties on the developed automated device the pilot studies of clothing materials are conducted. Objects of researches were the materials used for manufacture of fighting clothes of firefighters and their packages.

The measure values of heat-protective properties received with use of the developed technique were compared to the values determined by a technique, standard for materials of fighting clothes of the firefighter (according to STB 1971-2009 and GOST 12088-77).

The analysis of the received results allows to mark that the error of determination of values of coefficient of thermal conduction and thermal resistance by the offered method does not exceed 6 %, and coefficient of air permeability – 10 %.

UDC 685.34.055.223-52:681.3

INVESTIGATION OF THE ACCURACY OF LOCATION BASED ON LOCATORS

ИССЛЕДОВАНИЕ ТОЧНОСТИ БАЗИРОВАНИЯ ПО ОРИЕНТИРАМ

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Key words: location, precision, stitching, zigzag, shoe upper, appliqué, control program.

Abstract. The article examines the experiment on the study of the accuracy of location of details of shoes according to the locators. The results are used in the development of an automated technology for applying applique to the details of upper shoe in a zigzag pattern.

With the automated execution of the operation of applying the applications to details of upper shoe, the movement of the semi-finished product is carried out in two coordinates according to the specified control program in a special technological equipment-cassette.

One of the auxiliary operations of the technological process is the completion of the rigging, that is placement of the details of the top of the shoe and details of the application in the cassette.

When placing parts, it is necessary to ensure the required accuracy of their location relative to the cassette and relative to each other.

The accuracy of laying the connecting stitch depends on the accuracy of the details.

Traditionally, the dimensions of the nests for laying the details of the application correspond to the dimensions of the parts.

The details of the application fit tightly into the cassette sockets, location is carried out along the contour of the nests.

Such a method of locating requires precise manufacturing of rigging, while for each size of application it is required to produce a separate cassette, which increases the cost of technology.

The task was set for developing an automated technology to make the tooling more versatile, to simplify the process of placing the details of shoes and application parts in the cassette.

It is suggested to make nests in a cassette for placing details of an application of a larger size than the dimensions of parts, with contours, equidistant contours of parts.

The locating is carried out on the locators - edges of the nests.

To assess the accuracy of basing on locators, an experiment was conducted.

Plastic model cassette was made of two glued together plates.

The lower plate is solid, and the upper plate has nests in the form of circles with diameters of 53.55 mm and 39.73 mm.

Specially made cutters on a cutting press made of genuine leather cut down ten pieces, the diameters of which are smaller than the diameter of the nests, and are respectively 38.13 mm and 29.73 mm.

An experiment for estimating the accuracy of basing by reference points was carried out for a socket with a diameter of 53.55 mm and parts of 38.13 mm and for a socket with a diameter of 39.73 mm and parts of 29.73 mm.

On the underside of each part, a rubber glue was applied and the part was pasted along the center of the corresponding socket, being oriented along its edges.

After that, the cassette model with the part was scanned.

Twenty images in a raster format were obtained.

The type of raster images is shown in Figure 1. In Figure 1, the following are indicated: 1-upper plate, 2-piece application, 3-circle for contrast, 4-gap between the part of application and the edge of the socket, S-gap value.

The resulting images were converted to a vector form.

Relative to the center of the nests in the digitized images, straight lines are constructed every 10 degrees.

Figure 2 shows the digitized contour of socket 1, the contour of detail 2 and lines 3 constructed.

After this, the function "trimming" the extra elements of straight lines up to the segments is performed.

The resulting image is shown in Figure 3. Figure 3 shows: 1- contour of the socket, 2-part contour, 3-segments.

On the lengths of the segments, the error of location on the locators was evaluated.

An algorithm is developed that automatically calculates the lengths of segments enclosed between circles 1 and 2, forms a database from the values of the lengths of the segments, and performs their statistical processing.

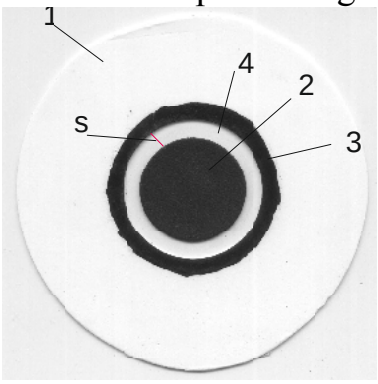

Figure 1 – Bitmap image

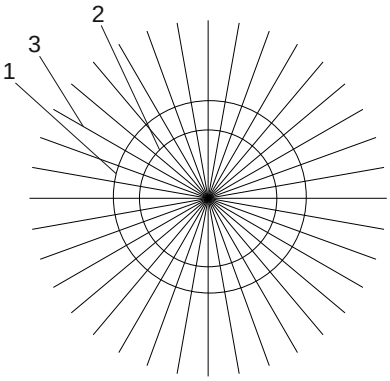

Figure 2 – Vector image

The results of the experiment for a larger diameter piece are shown in the graph in Figure 4, for a smaller diameter part, in Figure 5.

The gaps for the measurements taken are plotted from the line corresponding to the ideal gap size (for a socket and a larger diameter piece, 7.71 mm, for nests and parts of a smaller diameter - 5 mm).

The processed results of the experiment are summarized in Table 1.

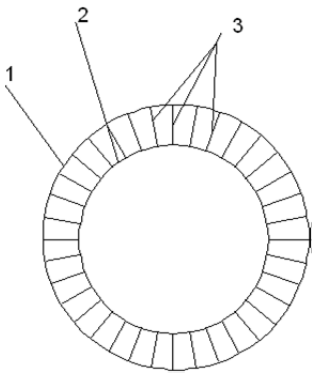

Figure 3 – Processed image

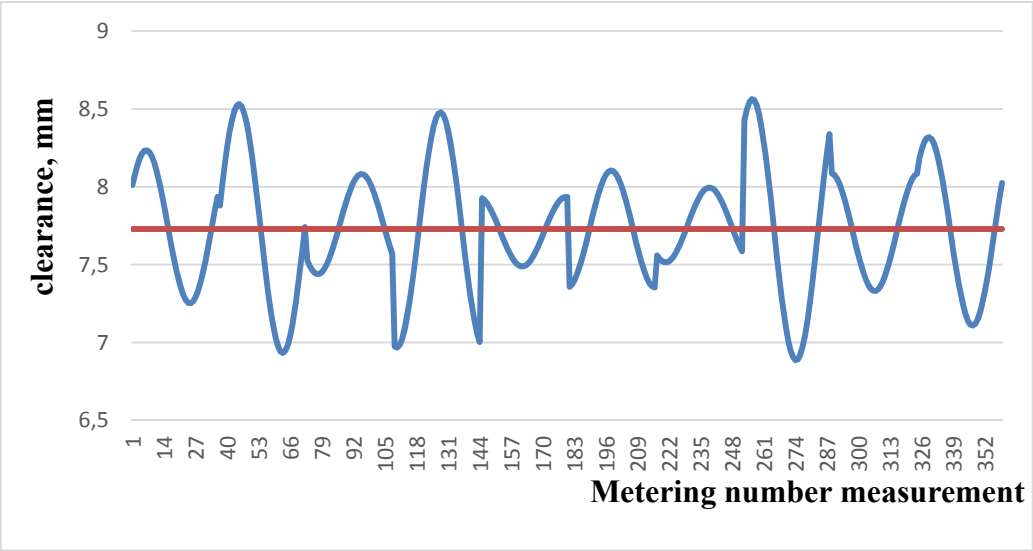

Figure 4 – Clearance for a part with a diameter of 38.13 mm

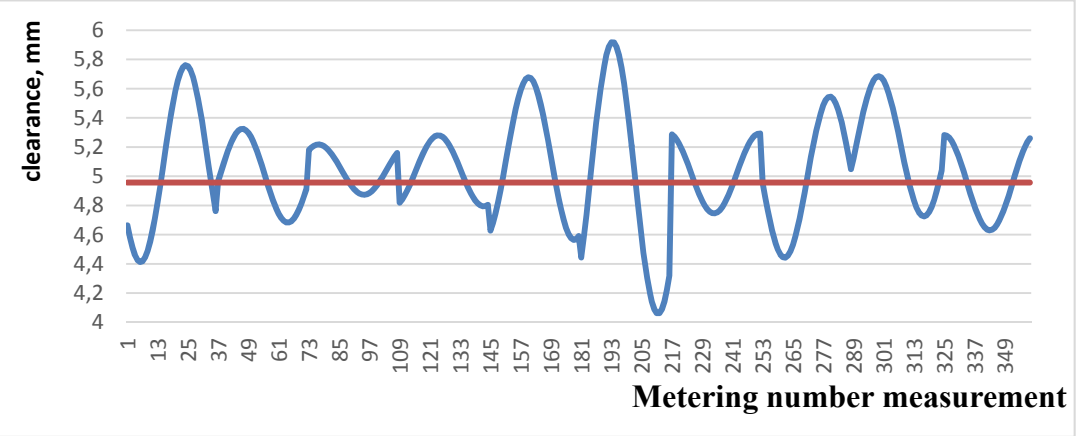

Figure 5 – Backlash for part with a diameter of 29.73 mm

Table 1 – Results of the experiment

Characteristics	Clearance error for part 38.13 mm	Clearance error for part 29.73 mm
Average	0.3203	0.297598
Minimum	0.0011	0.0006
Maximum	0.8426	0.9611

The experiment showed that the maximum error in basing by reference points is 0.96 mm. The magnitude of the error should be taken into account when programming a contour of a zigzag stitch for applying the application, so that neighboring needle punctures are always on different sides of the edge of the application part.

UDC 677.494

PROSPECTS OF USING HYALURONIC ACID IN SOLUTIONS FOR OBTAINING NANOFIBERS COSMETIC MATERIALS

ПЕРСПЕКТИВЫ ИСПОЛЬЗОВАНИЯ ГИАЛУРОНОВОЙ КИСЛОТЫ В СОСТАВЕ РАСТВОРОВ ДЛЯ ПОЛУЧЕНИЯ НАНОВОЛОКНИСТЫХ КОСМЕТИЧЕСКИХ МАТЕРИАЛОВ

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Key words: electrospinning, nanofiber, polyamide, hyaluronic acid, web.
Ключевые слова: электроформование, нановолокно, полиамид, гиалуроновая кислота, покрытие.

Abstract. The objective of the investigation was determination of the possibility of using hyaluronic acid for cosmetics effect in solution for fibers molding.

Solution was used with the PA6 (high-viscosity granulate), the formic acid – as solvent. The research results confirmed that drops consist of hyaluronic acid and polyamide-6. Further obtained materials can be used in cosmetology.

Аннотация. Цель работы - определение возможности использования гиалуроновой кислоты в растворе для формования волокон для придания косметического эффекта.

Использовался раствор полиамида-6 (высоковязкого гранулята), муравьиная кислота – растворитель. Результаты исследований подтвердили, что капли состоят из гиалуроновой кислоты и полиамида-6. В дальнейшем полученные материалы могут быть использованы в косметологии.

Method of nanofibers electrospinning is one of the most prospective technologies of up-to-date materials development for different applications. Electrospinning is a fiber production method which uses electric force to draw charged threads of polymer solutions or polymer melts up to fiber diameters in the order of several tens nanometers [1, 2].

Hyaluronic acid is used in cosmetics as the widespread component of skin care products: creams, lipsticks, lotions, etc. The active substance is capable of binding moisture, as a result of which the rejuvenating effect is achieved.

Hyaluronic acid is poly- (2-acetamido-2-deoxy-D-gluco) -D-glucuronoglycan. It is a polymer consisting of the residues of D-glucuronic acid and DN-acetylglucosamine,

alternately linked β-1.4- and β -1.3-glycosidic bonds. This is a composition of the acid atoms of carbon (C), oxygen (O), hydrogen (H) and nitrogen (N). A hyaluronic acid molecule can contain up to 25,000 disaccharide units (figure 1). Molecular weight of natural hyaluronic acid is 5,000 to 20,000,000 Da.

Using of low molecular hyaluronic acid leads to the following effects:

- increasing internal tissue volume;
- activating the action of fibroblasts;
- stimulating effect on cell division, increasing their migration;
- accelerating the penetration of active substances;
- promoting reduction of wrinkles.

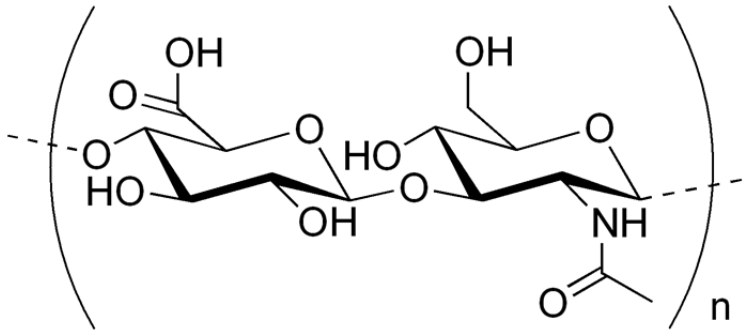

Figure 1 – Structural formula of hyaluronic acid

Solution of high-viscosity polyamide-6 was used as the raw material for nanofibers web production. In the first stage 11% solution of polyamide-6 in formic acid was obtained. Low-molecular hyaluronic acid was dissolved in warm water with thorough mixing until uniform gel-like substance was obtained. The substance was added to the polyamide solution. The percentage of hyaluronic acid was 0.4% of the weight of the resulting solution. The nanofiber web was applied to a polypropylene nonwoven. Experimental research of the technological process of electrospinning was carried out using the equipment Nanospider.

The SEM (scanning electron microscope) images of electrospun webs from solutions are obtained (figure 2). They showed frozen drops of the solution (defects in the form of glob). Their amount significantly exceeds the number of drops observed in the structure of the web that were obtained without the addition of hyaluronic acid in the composition. It was decided to conduct additional researches, including temperature-humidity processing of the obtained samples. Two variation of treatment were used: the sample conditioning with hot steam for 30 seconds and immerse of the sample into warm water for 30 seconds. Analysis measurements were made using program «ImageJ». After treatment the sizes of drops were increased. This fact showed that the drops consisted not only of polyamide, some of them are formed from a substance obtained by dissolving hyaluronic acid in water.

It was proved that hyaluronic acid does not turn out to be an isolated polyamide-6 inside frozen drops and nanofibers. It can interact with the human skin during the use of the obtained materials in cosmetology.

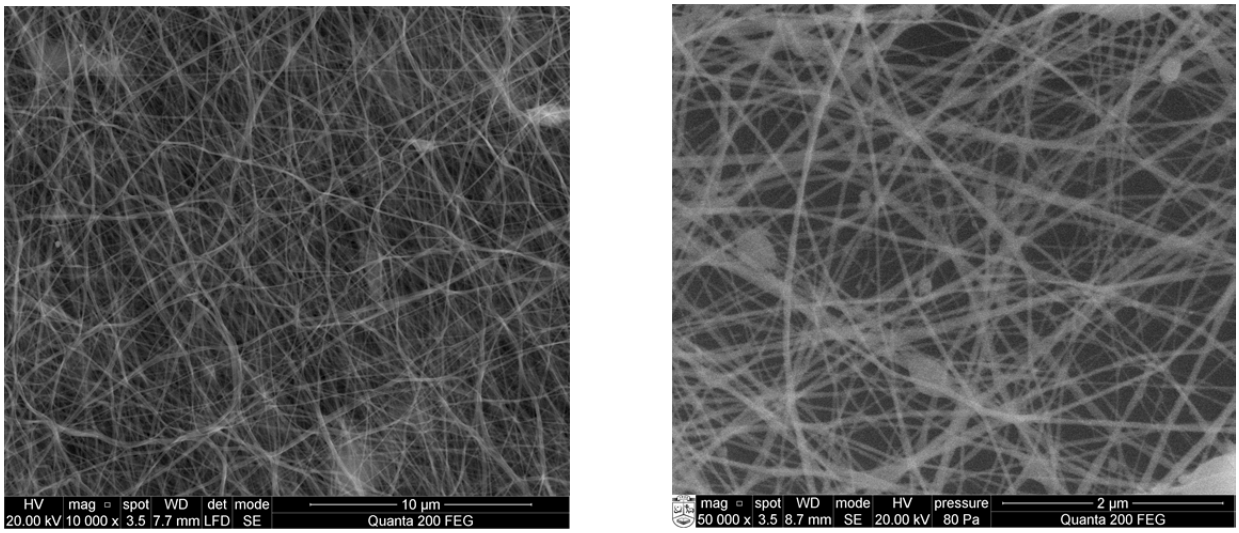

Figure 2 – Images of electrospun webs

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Section 2. SOCIAL, HUMANITARIAN AND ECONOMIC PROBLEMS OF EDUCATION AND SCIENCE DEVELOPMENT IN THE 21TH CENTURY

UDC 331.1; JEL Classification: M10, M21

LABOUR COSTS CONTROLLING FOR THE KNOWLEDGE ECONOMY

КОНТРОЛЛИНГ ЗАТРАТ НА ПЕРСОНАЛ ДЛЯ ЭКОНОМИКИ ЗНАНИЙ

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Key words: *labour costs, labour costs structure, labour productivity, labour costs controlling, knowledge economy.*
Ключевые слова: *затраты на персонал, структура затрат на персонал, производительность труда, контроллинг затрат на персонал, экономика знаний.*

Abstract. The analysis of labour costs structure in Belarus economy and its assessment was made by the author in this article. The inconsistency between the labour costs structure and the priorities of knowledge economy development, as well as the gap in productivity compared to the world level is identified. The author proposed to implement controlling instruments for labour costs management, defined the concept of labour costs controlling and specified the controlling objectives for labour costs management. The results expected are the enhancement of organization's performance and labour productivity increase.

Аннотация. В данной статье автором проведен анализ структуры затрат на персонал в Республике Беларусь и дана ее оценка, выявлено несоответствие структуры затрат на персонал приоритетам развития экономики знаний, а также отставание в производительности труда по сравнению с мировым уровнем. Автором предлагается использовать инструментарий контроллинга для управления затратами на персонал, определено понятие контроллинга затрат на персонал, сформулированы задачи контроллинга для управления затратами на персонал. Ожидаемым результатом является улучшение целевых показателей деятельности организации и рост производительность труда.

In the conditions of formation of the knowledge economy, human capital becomes a key resource affecting the effectiveness of the organization's operations, and requires new approaches to managing personnel costs. Intellect becomes the most

profitable object of investment. The holders of intellectual capital require additional investments in their development. The individual effectiveness of such employees is higher than the average for the enterprise, and, accordingly, the effectiveness of investments in them will also be higher. Working with personnel in the knowledge economy requires a differentiated approach in terms of the impact of individual employees on the performance of the enterprise. In modern conditions, the topical direction of research is not only the optimization of personnel costs, but also the differentiation of personnel depending on individual results of work, individual effectiveness, and the influence of the employee on the performance of the organization as a whole.

The structure of personnel costs in the Republic of Belarus has a number of characteristics. Wages and social protection costs dominate the cost structure, taking in total from 97% of all staff costs. Characteristically, since 1991, these two groups of costs have supplanted such cost elements as long-term motivation as providing workers with housing and cultural and consumer services. Their cumulative share decreased from 8% to 0.5% for the period under study.

Another feature of the structure of staff costs in the Republic of Belarus is the extremely low proportion of costs for vocational training (0.2%). And this means that the costs of training are now financed mainly from the income of citizens.

The low specific weight of the costs of vocational training hinders the development of the adult supplementary education market, as well as the emergence of the knowledge economy, where it is the organizations that become the centers for the formation of new knowledge and training through creating an enabling learning environment for their employees. The existing structure of staff costs is more characteristic of the industrial economy, but in the conditions of the knowledge economy, it requires revision.

Staff costs include not only funds for labor and compulsory contributions, but also a number of other expenses (payment for food, travel, housing, cultural services, training and development of personnel, etc.), which are not mandatory, but affect motivation staff and require funding sources. Such costs testify to the social responsibility of the enterprise to its employees, but are not always perceived by employees as an element of labor incentives. In addition, if these social benefits are equally accessible to employees of the organization, their value in the perception of personnel is reduced.

In the Republic of Belarus, the practical application of personnel cost management tools is complicated by a number of factors: the lack of personnel costs as an object of accounting, tax, statistical accounting (most often these costs are considered part of the cost of production and sales of products, while the costs of developing labor potential and some other types of personnel costs are not taken into account, remaining in other or other expenses); the management of personnel costs is not an independent function of personnel management; staff costs are not planned in full, but only in terms of labor costs and mandatory contributions, and other types of staff costs are often financed on a residual basis.

At the same time, management of personnel costs and optimization of their structure are one of the sources of growth in labor productivity and efficiency of organizations.

According to the international labor organization, labor productivity in the Republic of Belarus lags behind the world average by more than 2 times. The Republic of Belarus lags behind in the Eastern European region on average 1.5-1.7 times (Table 1). And, according to the ILO forecasts, until 2020 this gap will remain.

Table 1 – Labor productivity (ILO estimates and projections)

Years	Output per employee (US dollars)					Labor productivity ratio (in times)	
	Worldwide	Eastern Europe	EU	G20	Belarus	Worldwide /Belarus	Eastern Europe/ Belarus
2000	15565	9642	62755	18207	4435	3,51	2,17
2001	15607	10089	63633	18278	4630	3,37	2,18
2002	15715	10428	64530	18430	4848	3,24	2,15
2003	15882	10931	64900	18659	5175	3,07	2,11
2004	16233	11561	66013	19061	5753	2,82	2,01
2005	16501	12017	66642	19415	6271	2,63	1,92
2006	16924	12776	67655	19942	6889	2,46	1,85
2007	17309	13435	68499	20422	7461	2,32	1,80
2008	17382	13966	68117	20584	8199	2,12	1,70
2009	16943	13469	66297	20153	8207	2,06	1,64
2010	17436	13947	68042	20870	8837	1,97	1,58
2011	17713	14403	69217	21317	9337	1,90	1,54
2012	17888	14618	69141	21627	9502	1,88	1,54
2013	18080	14831	69523	21973	9609	1,88	1,54
2014	18266	15009	69766	22298	9787	1,87	1,53
2015	18480	14957	70722	22642	9444	1,96	1,58
2016	18671	15173	71427	22971	9252	2,02	1,64
2017	18933	15595	72394	23397	9306	2,03	1,68
2018	19220	16038	73600	23853	9462	2,03	1,70
2019	19529	16538	74928	24329	9675	2,02	1,71
2020	19841	17050	76300	24806	9923	2,00	1,72

Source: ILO simulated estimates, November 2016.

To overcome the backlog in the level of labor productivity, it is necessary not only to gradually reorganize the structure of the national economy in favor of high-tech and high-tech industries with high added value, but also to revise existing approaches to personnel management at the macro and micro levels.

It should also be noted that the level of wages in the Republic of Belarus is lower than in the neighboring countries, which provokes an outflow of highly qualified

specialists abroad and reduces the motivation of workers who continue to work in their country.

The problems of optimizing personnel costs are well covered in the work of economists, but the actual need remains to develop a system for assessing the results of labor and their impact on the performance of the enterprise, as well as creating a system for managing staff costs that provides a differentiated approach to the allocation of personnel costs based on the relationship of remuneration with the results of labor and the performance of the enterprise. In the current economic literature, there are no studies to quantify the impact of the level of expenditure on personnel and their structures on the performance of the enterprise and labor productivity, as well as mechanisms that allow managing staff costs in order to optimize them and ensure the growth of labor productivity.

For this it is proposed to use controlling tools. Controlling for the purposes of managing personnel costs means planning, information and analytical support and monitoring of the process of managing the costs of the organization's personnel in accordance with the achieved business results. This takes into account both the effectiveness of individual work, and the final results of the organization.

The main tasks of controlling in this case are: setting performance indicators for workers' performance; planning of personnel costs; the establishment of management accounting that provides a system for managing personnel costs with information on individual labor outcomes; setting up monitoring of external factors and constraints affecting the parameters of the personnel management system; the definition of criteria for optimizing staff costs; analysis of accounting data and calculation of indicators reflecting the contribution of employees and units to the achievement of the organization's goals; control budget of personnel costs taking into account the results of the enterprise as a whole; Evaluation of the effectiveness of the personnel cost management system and development of recommendations for its improvement.

The use of controlling technologies in the management of personnel costs will improve the performance targets of organizations and increase labor productivity.

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UDC 001.81-055.2(476)

WOMEN IN SCIENCE: A SOCIOLOGICAL ANALYSIS

ЖЕНЩИНЫ В НАУКЕ: СОЦИОЛОГИЧЕСКИЙ АНАЛИЗ

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Key words: *scientific personnel, researchers, field of science, gender characteristics.*
Ключевые слова: *научные кадры, исследователи, область науки, гендерные особенности.*

Abstract. On the basis of sociological research data analyzed are professional plans and migration intentions of women-researchers of the National Academy of Sciences (NAS) of Belarus. The data on assessment by women of the status and the prospects of development of Belarusian science as well as of their social position and the problems which they face in the workplace is given. It is concluded that despite the difficulties associated, first of all, with the global economic crisis, science is still attractive for a significant part of women, which is greatly facilitated by the measures taken by the government to improve the socio-economic situation of scientists and therefore attract young people into science.

Аннотация. На основе данных социологического исследования анализируются профессиональные планы и миграционные намерения женщин-исследователей Национальной академии наук (НАН) Беларуси. Приводятся данные об оценке женщинами состояния и перспектив развития белорусской науки, а также своего социального положения и проблем, с которыми им приходится сталкиваться в процессе трудовой деятельности. Делается вывод о том, что, несмотря на трудности, связанные, в первую очередь, с мировым экономическим кризисом, сфера науки по-прежнему является привлекательной для значительной части женщин, чему в немалой степени способствуют меры, предпринимаемые государством по улучшению социально-экономического положения ученых и закреплению в науке молодежи.

According to the government statistics as of 1 January 2017, the number of researchers in the Republic of Belarus was 16,879 persons, including 5,357 persons (31.7 %) who work as researchers in the National Academy of Sciences (NAS) of Belarus, with 47.7 % of the researchers of the Academy of Sciences being women.

What are the difficulties they face in their work, what are their professional plans and migration intentions as they assess the state and prospects of development of Belarusian science in the near future? The answers to these and other questions were obtained during a sociological survey conducted by the Institute of Sociology of the National Academy of Sciences among the scientific workers of the Academy in March 2016.

Data analysis of a questionnaire survey which covered 260 women-researchers has shown that the majority of them (55.2 %) work in research for more than 10 years, while 6 % of the respondents were Doctors of Sciences, 28.3 % were Candidates of Sciences, 65 % were researchers without a scientific degree. Measured on a 10 point scale, the majority of women (72.7 %) indicated that use their creative potential to more than a half (6 of 10 points), including 34 % who use it almost to the full (8-10 points). The most important things in the workplace for women researchers are: personal contribution to the development of science, participation in major research projects at national and world levels as well as recognition of their scientific achievements of foreign specialists and high prestige in the scientific community.

A significant number of women believe that abroad academic professions are highly valued by society and are more prestigious than in our country; however, 31.8% believe that the prestige of science and the social status of scientists in our country will definitely increase over time. The majority of academic women staff (69.4 %) do not plan to emigrate from the country. Every tenth woman researcher would like to go abroad for temporary work on a research grant or on contract, mainly in order to improve their skills and qualifications, and only 2.8 % of the respondents would like to leave the country forever.

The respondents believe that low salaries and insufficient research funding ate the most typical problems of their structural units of. About every fifth woman reported a problem of personnel aging and insufficient inflow of young people, lack of foreign travel and a modern experimental base of the research. Some are concerned about the increase in applied research at the expense of direct labor, distraction of employees to find additional earnings to the detriment of fundamental work, reduction in the number of researchers of the division.

At the same time, the majority of respondents noted that academic units in which they work, have virtually no such characteristics as low professional level of the majority of employees (63.8 % of the respondents think so), lack of informational support of research (47.4%), the outflow abroad of promising scientific staff (43.4%).

Most of the women-researchers of the NAS of Belarus (72.2%) have not had to deal with any manifestation of gender inequality in their labor collectives. However, 15.6% of respondents noted that they were faced with such facts (in relation to themselves or colleagues), particularly in pay, promotions and some other circumstances. However, it should be noted that these cases are isolated, their statement by the respondents is very subjective and, therefore, they cannot indicate the presence of any serious problems in this sphere. Moreover, the vast majority of women reported that they are fully satisfied with the relations in their primary research group (63.2%) and heads of their structural divisions (72,8%) and administration of the institutions in which they work (up 59.8%).

As for financial situation and living conditions of female researchers of the NAS of Belarus, 11.2% of them consider the material situation of their families as "good" and "rather good"; 53.7% as "average"; 29.1% as "rather bad" and "bad". About half of the women have separate apartments, with almost one third not satisfied with their housing conditions and 45.4% not expecting any improvement in the next five years.

The data showed that among the respondents there is no unity as to whether they as scientists consider themselves needed by society. So, the positive answer to the question was given by 25.1% of women, negative by 31.4%, undecided by 41.2%. Only 11.6% would want their children to follow a scientific career, 39% would not like this, 46.4% are unable to determine the answer. There is a large proportion of those who almost never felt a sense of belongingness to a global and international community of scientists and Belarusian research community (39.8%, 31.6% and 22.1% respectively) and those who found it difficult to answer this question (30.1%, 22.9%, 19.5% respectively). However, a significant number of women-researchers of the NAS of Belarus (68.2%) consider their scientific activities as their vocation, 52.4% value their jobs and do not plan to change it in the foreseeable future, 41.6% of women are attracted by the lifestyle and social environment of scholars, 33.8 % want to achieve a professional realization in their field of science.

According to a sociological survey "The Career of a Young Scientist in Academic Science," conducted in 2017 by the Institute of Sociology of the National Academy of Sciences of Belarus, 66.5% of young women are interested in building a scientific career, with the majority of respondents (64.1%) considering it as a possibility to receive a number of opportunities to engage in scientific activities and contribute to science. The question "What led you to science?" was answered as follows: interest in research activities (64.8%), self-realization (39%), job placement (39%), teacher recommendations (25.8%), the desire to be useful to their country (17%), the possibility of career growth (11%), the opportunity to test their own ideas and hypotheses (8.8%).

First and foremost, in the opinion of the majority of women building a scientific career requires decent remuneration. Important conditions are the availability of modern material and technical base at the institute, creative atmosphere in the team as well as the possibility of international cooperation, in particular, of foreign training and business trips. Almost a third of women said among the conditions conducive to a career in science were the possibility of obtaining grants, assistance in the work of the supervisor, the provision of benefits for housing. Every fifth woman highlighted the presence of scientific schools in the research institution as one of the necessary conditions for building a scientific career.

The majority of young women researchers are focused on the reconciliation of professional and family roles. To the question: "What is the meaning of family and work in your life?" 67% of women said that they both needed a job and a family. Almost for every third women family is more important than work. The fact that young women seek to reconcile professional and family roles is confirmed by the equal significance for them such values as family and children (76.7%), financial independence (72.5%), self-actualization (72%).

Most women are satisfied with the reconciliation of private life and research activities and not postpone having children because of the desire to improve their

professional status. Because women do not face the problem of combining professional and family roles, we can conclude that marriage and motherhood does not impede a scientific career for women in science.

Professional research activity is the women's form of self-assertion and development as an individual. Increasingly, women are more focused on research activities and on self-realization yourself as a professional, as a scientist. A woman stands as an equal and equivalent participant in the field of scientific activities requiring higher skills and special abilities. Most of them say that they are fully satisfied with their relations with colleagues and leaders of academic institutions and have never experienced any gender bias in their labor collectives.

The analysis of the dynamics of statistical data on the staffing of academic research shows that the share of women-researchers with a scientific degree of Candidate and Doctor of Sciences is constantly growing, not getting smaller as well as the number of women in the management of research institutes and other scientific subdivisions of the Belarus National Academy of Sciences. All these facts indicate that, despite the difficulties associated, first, with the global economic crisis, science is still attractive for a significant part of women and the measures taken by government to improve the socio-economic situation of scientists and attract youth into science, play a major role and are very attractive to those who effectively work, grow professionally and use in their work the whole arsenal of tools and capabilities that offered by the state to truly talented and active researchers. In the future it would be nice to establish for women who have achieved high achievements in science, special awards (annual scholarships, prizes), as is done in the Russian Federation (annual award of the L'Oreal UNESCO "For women in science", etc.) that would encourage those truly devoted to science and the most talented of them to more active work for the benefit of society.

JEL Classifications: M41

THEORETICAL PROBLEMS OF ACCOUNTING PROFIT AND CAPITAL IN BELARUS

ТЕОРЕТИЧЕСКИЕ ПРОБЛЕМЫ БУХГАЛТЕРСКОЙ ПРИБЫЛИ И КАПИТАЛА В БЕЛАРУСИ

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Key words: accounting, reporting, income, capital, IFRS, US GAAP, Belarus GAAP.

Ключевые слова: бухгалтерский учет, отчетность, IFRS, US GAAP, Belarus GAAP.

Abstract. In this paper we will discuss a number of theoretical problems of accounting approaches to determining the concept of profit and capital of an organization. We want to underline the fact that the main problem is related to the use in the Belarus income and capital accounting of various theories of profit and capital, starting from the ideas of Karl Marx, and ending with the ideas of developed socialism. In economically developed countries, only one theoretical concept of profit and capital is used for accounting purposes - the theory of comprehensive income of J. Hicks.

Аннотация. В предлагаемом материале будут обсуждаться ряд теоретических проблем бухгалтерского подхода к концепции прибыли и капитала организации. Результатами исследования явилось установления факта того, что основной проблемой белорусского бухгалтерского учета является попытка одновременного использования подходов различных концепций прибыли и капитал, начиная от Карла Маркса и заканчивая подходами адептов теории развитого социализма. В экономических развитых странах в настоящее время используется для целей бухгалтерского учета только одна теория прибыли и капитала - теория полного (совокупного) дохода Дж.Хикса.

No one remembers the former generations,
And even those yet to come
Will not be remembered
By those who follow them.
Ecclesiastes 1:11

There is no doubt that the economic life defines the economic mind. But one cannot deny a certain inverse relationship even in Belarus. However, the fact of the economic life of this country is as follows. Despite the fact that so far we have not established the nature of profit, capital, assets, liabilities and other economic categories, they are widely used in economic practice.

We do not know what profit is in Belarus, however we calculate it; we do not know what capital is, but still we calculate it as well. But there is the most interesting thing. As it turns out, changes to the regulatory acts of accounting do not have the desired effect either on the economic consciousness, or on the economic existence of the Belarusian society.

The theory of accounting profits in Belarus is a collection of slogans from the political economy of the time, when the Soviet Union was building the world's communist system. Moreover, in the composition of these slogans were included certain provisions of IFRS at the level of definitions related to the concept of comprehensive income. Namely, we have been borrowed definitions of income, expenses and equity. Moreover, the equity term has been translated and used as a term for capital. Accounting profit for 1992-2016 was considered as the difference between income and expenses.

The income statement for 2012-2016 has a component for comprehensive income, the essence of which, up to now, is unknown to most accountants. Comprehensive income in Belarus is not associated with any national concepts of capital and capital

maintenance concepts. Concepts of capital and capital maintenance concepts according to US GAAP and IFRS Belarusian accountants are virtually unknown.

Modification of the theoretical concepts of profit has been reduced to borrowing the term of income from IFRS, but not the content of these terms.

This approach is an indication that without proper theoretical justification the simple implantation of terms of other concepts of profit leads only to the misuse of borrowed definitions.

Only beginning with reports for 2012 the term of comprehensive income was introduced, which is calculated, of course, a bit differently than in developed countries according with US GAAP and IFRS. Absence of any information about the nature of this indicator also, in my opinion, will lead to Belarusian specifics when computing this indicator. Such an approach would make a misperception about comprehensive income by an investor.

Definition of capital in Belarus coincides with the definition of equity in US GAAP and IFRS. However, the lack of a capital theory and the capital maintenance concepts in the country (even borrowed from other accounting concepts) does not allow the use of the concept of profit under US GAAP and IFRS.

Values of capital and comprehensive income in Belarus are not comparable with those in the US GAAP and IFRS. It is related to the different composition of costs for the calculation of net income, and a number of provisions from US GAAP and IFRS that are not use in Belarus accounting for the valuation of assets and liabilities.

In particular, it is a limited application of fair value in Belarus; it is not carried out an impairment test on the assets under IFRS, etc. As a result, comprehensive income amounts will be distorted and not always in favor of the investor. It has taken four (4) national programs for the transition to IFRS in Belarus in 1992-2016, and only one of them have been implemented in 2017.

According to the latest program (1998), since 2008 the corporations had to prepare their financial statements under IFRS. The main problem, in our opinion, is that, after the transition to IFRS and application of standards for hyperinflation it will remain no any profitable enterprise in the country. IFRS (IAS) 29 "Financial reporting in hyperinflationary economies" was used in Belarus since January 1, 2011 up to December 31, 2014; the decision was acceptable "Big Four" international auditing companies in December 2011. In accordance with IFRS 29 the Belarusian economy is hyperinflation economy, and it causes recalculation of comparable data with the fall of the purchasing power of the Belarusian ruble in 2010-2016. The vast majority of Belarusian banks and corporations showed a net loss under the application of IFRS (IAS) 29 in their financial reporting for the year, ending December 31, 2016.

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IMPLEMENTING THE CROSS- CULTURAL SYSTEM OF LANGUAGE TRAINING AT A TECHNICAL HIGER EDUCATION INSTITUTION

ВНЕДРЕНИЕ МЕЖКУЛЬТУРНОЙ СИСТЕМЫ ЯЗЫКОВОЙ ПОДГОТОВКИ В ТЕХНИЧЕСКОМ ВУЗЕ

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Key words: foreign language competence in the sphere of professional communication, professionally oriented language education, language environment of higher education institution, international cooperation, professional skills of an engineer.

Ключевые слова: компетенция иностранного языка в сфере профессионального общения, профессионально-ориентированное языковое образование, языковая среда высшего учебного заведения, международное сотрудничество, профессиональные навыки инженера.

Abstract. The article deals with main methods of language education used in Vitebsk state technological university. The challenges of outer and inner university environment that influence professional portrait of a specialist in economy, technology and engineering, are discussed. The role of foreign languages is the object of analysis: they are an integral part of professional activity of a specialist today; knowledge of foreign languages allows conducting research and building education process on a new higher level of international cooperation. The new function of language education is discussed: the forming of university language environment on the principles of professionally oriented interdisciplinary approach to language education.

Аннотация. В статье рассматриваются основные методы языкового образования, используемые в Витебском государственном технологическом университете. Обсуждаются проблемы внешней и внутренней университетской среды, которые влияют на профессиональный портрет специалиста в области экономики, техники и инженерии. Роль иностранных языков является объектом анализа: сегодня они являются неотъемлемой частью профессиональной деятельности специалиста; знание иностранных языков позволяет проводить исследования и строить процесс образования на новом более высоком уровне международного сотрудничества. Обсуждается новая функция языкового образования: формирование университетской языковой среды на принципах профессионально-ориентированного междисциплинарного подхода к языковому обучению.

One of the main objectives of higher education is training of highly qualified specialists with well-developed labour awareness and flexible thinking. Nowadays the professional portrait of a modern specialist in the objective of a modern technical higher education institution consists not only in involvement of foreign specialists in conducting research, teaching, and sharing experience, but in the first place in reaching the key positions in the world of science and education. The level of international cooperation of a technical higher education institution has changed and at the present stage includes the complex of the most difficult problems that are directly related to foreign language skills, intercultural communication skills, the ability to work as part of a team, personal and professional traits which determine the level of research and teaching activities that can be actualized in case of the high level of the development of the foreign language communicative competence in the professional field of communication.

The work of the teaching staff is based on the gained extensive experience of training specialists and takes into account new opportunities connected with changes in the educational and sociocultural context of learning a foreign language on the whole: an increased interest in foreign languages. Vitebsk state technological university has been successfully fulfilling one of the most important objectives of modern professional training of specialists in the field of economics, engineering, and technology since 1965. This objective consists in ensuring high-quality language education through comprehensive language training focused on solving the problems of the inner environment of a technical higher education institution, as well as meeting the challenges of the modern social and economic development of the society in the context of globalization. The comprehensive development of the personality of an engineer-to-be, extension of the range of competences in his professional portrait that are demanded by the society and economy are only possible in case of compliance with the following principles of organization of professional and language training at a technical higher education institution: combination of knowledge of the humanities and technical one with a view to ensuring the balanced development of the personality of a specialist with the help of introduction of integrated study programs, various events held in the referential system of a foreign language; − the formation of the multicultural personality of a student as an independent thinker, the manager of his/her own learning process, who is capable of creativity and innovative activities. Training of specialists should include development of such a level of the communicative and sociocultural competence that would allow them to successfully cope with their professional responsibilities. The structure of the professionally oriented foreign language communicative competence includes all basic components of the communicative competence: cultural, language and speech, strategic, compensatory, and sociocultural competences. However, in terms of the content each component will be developed due to the inclusion of professionally oriented knowledge, skills, and individual abilities on the basis of the competence in the field of professional activity. The professionally oriented component of the language competence can be defined as a system of language

knowledge, skills, and capabilities that allow a specialist to generate linguistically correct and terminologically rich speech and the complex of linguodidactic knowledge and skills that allow of adequate presentation and description of linguistic phenomena for educational purposes. The professionally oriented component of the speech competence can be defined as a system of speech knowledge, bicultural skills, and individual abilities related to speech creation that allow a speaking/writing person to orientate oneself in the functional factors of communication with regard to generation of communicatively acceptable speech works. The professional perspective in the intercultural strategic competence helps to create favorable conditions for professional activity in teams. The intercultural strategic competence implies the ability of a speaking/writing person to vary communicative strategies under the conditions of foreign language intercultural communication. The inclusion of the intercultural strategic competence gives an opportunity to strengthen, coordinate, and balance all other competencies.

The internal strategic aim of such complex organization of language training at a technical higher education institution is the formation of language environment that ensures effective interaction between all participants of the educational process at all levels. In the future the language environment of a technical higher education institution will enable students and teachers to independently make decisions about the formation of a creative group of researchers with international participation, to summarize the research results in scientific publications in a FL and, as a consequence, to participate in international competitions and grants, and thus to gain recognition at the international level.

The group of personal skills, the development of which is also expected during the implementation of language training at a technical higher education institution, includes the so-called compensatory skills of activities and interaction. The group of skills helps to deal with projects, research activities and is responsible for the formation of research methodology, as well as the information competence of students. The following skills should be considered to be essential for students: selection of the optimum way of searching for information, ranging of the obtained information, searching for or prognostication of missing elements of a problem situation or task, the strategic format of the process of exploring a problem, phased prognostication of the result to be achieved, its correlation with the ultimate goal of activity, the adjustment of activities depending on changing conditions of their implementation.

The group of professional adaptation skills of an engineer, which is defined in the foreign literature as soft skills, should be mentioned. This group of skills is connected with the specifics of training of students of a technical higher education institution depending on specialities or areas of study. Soft skills allow them to organize and carry out laboratory works, work with equipment, plan, organize, and perform experimental research, interpret and summarize their results, and, if necessary, adapt the obtained data with a view to familiarizing the wide public with them, write scientific texts for professionals in this or related areas of knowledge. The soft skills

during foreign language classes give an opportunity to work with specific, professionally oriented texts. It should be noted that the content and structure of language training at an institute consist not so much in its focus on language and speech skills as in its focus on the requirements for the professional competence of a specialist in the field of science, engineering, and technology. Thus, at the initial stage of training at a technical higher education institution allows students to fulfill their potential as a young researcher, engineer, to consider themselves to be specialists who are ready and eager for innovations, carry out basic research, popular scientific projects, and make presentations. At the middle stage of training performs an informational function, forms professional views in the professionally oriented subjects, and allows of using new work formats that are in demand during classes in special subjects. At the final stage of training is involved in the professional and academic activities of students, master's students, postgraduate students as a means of self-realization, self-education, and further training during implementation of research projects in cooperation with foreign participants, publishing of research results abroad.

The main objective of implementing the system of language training at a technical higher education institution is to contribute to the fulfillment of the strategic objectives of the development of a technical higher education institution, in particular joining the world educational space. This global problem can be solved only with the help of highly qualified specialists – students and teachers that have an appropriate level of the professional competence of free orientation in the global information flow, as well as promoting one's own developments that are in demand and research results at the international level.

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INTER-SECTOR ANALYSIS OF BELARUS CONSUMER GOODS PRODUCTION ENTERPRISES

МЕЖОТРАСЛЕВОЙ АНАЛИЗ ОРГАНИЗАЦИЙ ЛЕГКОЙ ПРОМЫШЛЕННОСТИ БЕЛАРУСИ

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Key words: light industry, value added, interindustry balance, intermediate consumption, exports, foreign trade balance.

Ключевые слова: легкая промышленность, добавленная стоимость, межотраслевой баланс, промежуточное потребление, экспорт, сальдо внешней торговли.

Abstract. In modern conditions of economic and innovative development of Belarus, due to the impact of unfavorable external factors, the restoration of a balanced economic growth of light industry is one of the main directions of the state economic policy. The purpose of this study is to calculate its endogenous indicators (value added, intermediate consumption, exports of goods and services) based on the cross-sectoral analysis of light industry using an aggregated model of the interindustry balance, to compare the indicators obtained with other sectors of the economy, industry to find solutions that improve the economic sustainability of organizations.

Аннотация. В современных условиях экономического и инновационного развития Беларуси, вследствие воздействия неблагоприятных внешних факторов, восстановление сбалансированного экономического роста легкой промышленности является одним из главных направлений экономической политики государства. Цель настоящего исследования заключается в том, чтобы на основании межотраслевого анализа легкой промышленности с применением агрегированной модели межотраслевого баланса рассчитать ее эндогенные показатели (добавленная стоимость, промежуточное потребление, экспорт товаров и услуг), сопоставить полученные показатели с другими отраслями экономики, выявить особенности в деятельности легкой промышленности для поиска решений, позволяющих улучшить экономическую устойчивость организаций.

Light industry (production of textiles, clothing, leather goods and fur (CB subsection) in accordance with OKRB 005-2011 "Types of economic activity") is one of the most important branches of industrial production in Belarus, designed to provide the country's population with high-quality goods in a wide range of affordable prices. The results of the status of the CB subsection for 2012-2016. testify to the instability of the development of organizations. A specific structure remains in the industry: textile and clothing production accounts for 80% of the industrial output. Analysis of the dynamics of the number of organizations in the industry indicates a decrease of 5.2% in 2016 compared to the previous year, and compared to 2012, the decrease was 13.9%. Indices of industrial production (in comparable prices) demonstrate a downward trend, and only in 2016 there was growth, which affects the main indicators of the industry. The share of products of the subsection of CB in the total volume of industrial production for the period under study averaged 3.8%. The ratio of the growth rates of the volume of sales and profits from sales of products for textile and clothing production in 2015 shows that the profit of organizations grew faster (167.5%) of sales revenue (108.5%), therefore, the profitability of sales increased by 4 , 2 pp. and amounted to 9.8%. At the same time, there is a negative situation concerning the increase in the share of unprofitable organizations in 2015 by 4.2 percentage points. which was 35.6% compared to 2014. The same trend is observed in the production of leather, leather goods and footwear. In 2016, compared to 2015, the average number of employees in the analyzed industry decreased by 4.3 thousand people, or 4.8%, and by 2012 the decrease was 31.9 thousand people, or

27.2%. The productivity of labor of one employee in 2016 in actual prices increased by 90.8 million rubles. (by 31.6%) compared with 2015, and in comparable prices last year, the growth rate of the analyzed indicator was 110.7%. For the subsection of CB (for 2012-2015), there is a tendency for an outstripping decrease in labor productivity in comparison with real wages. The ratio of the growth rates of labor productivity with the growth of its payment in 2016 illustrates the lead by 1.1 times. The cost of fixed assets of organizations in 2016 increased by 3,475.4 billion rubles, or 16.1% compared to 2015, and compared with 2012, the increase amounted to 12,753.7 billion rubles, or 103.9%.

To assess the contribution of light industry to the Belarusian economy, we will perform cross-sectoral analysis. Its tool is the interbranch balance (MBO) of production and distribution of products, or an "input-output" analysis in the European interpretation. The statistical bulletins "The System of Tables" Costs-Outputs "of the Republic of Belarus for 2013-2014, compiled in accordance with the OKED methodology in the context of 31 types of economic activity (lines 01-31) served as an information base for analysis.

The results of the aggregate model of the Belarusian MoD for 2014 (31 types of economic activity are aggregated in 7 industries) show that interindustry flows of light industry products to agriculture, forestry and fisheries (the first branch) amounted to 166.6 billion rubles, spent on industrial consumption by industry - 1,736.2 billion rubles., Internal consumption for own needs of the subsection of CB is 7,557.6 billion rubles. or 61.7%. The largest contribution to the GVA is made by the industry - 190 109.7 billion rubles, its share is 27.03%. by branches of the economy. Analysis of the composition and structure of the GVA for OKED showed that over 5% of the contribution in the manufacturing industry was made by: food production, including beverages and chemical production. In 2014, the contribution of the GVS subsector to the CB decreased by 0.24 percentage points. compared with 2013 and amounted to 1.58% (including: textile and clothing production - 1.27%). The share of intermediate consumption of the CB subsector in its gross output of goods and services in 2014 increased by 3.3 percentage points. compared with 2013 and amounted to 45.9%. Over 53% is the share of material costs in the cost of industrial products. At the same time, for 2013-2014. GVA per ruble of intermediate consumption in the subsection of CB decreased from 0,949 rubles. up to 0,880 rubles. to 0.069 rubles. or 7.27%. The ratio between the growth rates of GVA (104.0%) and intermediate consumption (112.1%) in 2014 as compared to 2013 indicates a deterioration in the quality of economic development of the CB subsector organizations. The volume of GDP in 2014 amounted to 778.1 trillion rubles in current prices and increased in comparison with 2013 at constant prices by 1.7%. The GDP deflator index was 117.8%. The export share of the CB subsector in the total exports of the country in 2014 decreased by 0.07 percentage points. and was 2.86%. In 2014, the balance of foreign trade in the subsection of CB was negative in the amount of 1,332,781 million rubles, or 0.17% of GDP. In 2014, the negative balance of foreign trade increased by 928,762 million rubles, or 3.3 times [1].

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INITIAL PUBLIC OFFERING IN BELARUS

ПЕРВОНАЧАЛЬНОЕ ПУБЛИЧНОЕ ПРЕДЛОЖЕНИЕ АКЦИЙ В БЕЛАРУСИ

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Key words: initial public offering, attracting investment.
Ключевые слова: публичное предложение акций, привлечение инвестиций.

Abstract. The article deals with theoretical aspects and the essence of the process of IPO, and the benefits and disadvantages for the Issuer, the stages of entry into the market of the IPO. Analyzed the formation of the market of IPO in Belarus and prospects of its further development.

Аннотация. В статье рассмотрены теоретические аспекты и сущность процесса IPO, определены преимущества и недостатки для эмитента, этапы выхода компаний на рынок IPO. Проанализировано становление рынка IPO в Беларуси и перспективы его дальнейшего развития.

In international practice, one of the effective mechanisms to increase the capitalization of companies, including the financial sector, is entering the stock market through an initial public offering (IPO). In aslmost all economically developed countries IPO is one of the most common methods of raising funds to finance the activities of the corporation. At the initial public offer, the type of securities can be practically anything. The main purpose of an IPO is to attract investment. Public placement of securities is beneficial when it is necessary to relatively cheaply attract large funds. During the public sale of shares, capital is attracted, which does not require its return in the future.

There are several main objectives for conducting an IPO, the importance, which may vary depending on the case. Issue of securities or access to IPO is carried out:

1) in order to manage the structure of the company's balance sheet, i.e. to regulate the ratio of borrowed funds and raised funds;

2) in order to "cash" the former owner and founder of the company's own business.

The advantages of IPO in comparison with other forms of borrowing include the following:

– attraction of perpetual capital, which does not need to be serviced;

– acquisition of market value (capitalization);

– attracting investments in the future on more favorable terms;

– ensuring liquidity of ownership of the company's owners;

– increase in the value of shares;

– compilation of the financial reporting under the international standards and image improvement, increase of prestige of the company;

– obtaining a listing on the stock exchange.

The disadvantages of an IPO include the following:

– partial loss of the company's freedom, control and closure (if required);

– IPO requires certain significant costs for advertising, payment of various commissions to PR-agents, underwriters, audit organizations, law firms (consultants).

The first attempt to place an IPO in Belarus was made by OAO “Borisovskiy Zavod Meditsinskikh Preparatov”. But that share issue was a little strange - they had long negotiations with a strategic investor who was ready to buy up to 25% of the shares. And when they all prepared and went to the stock exchange, the investor changed their mind and bought nothing. As a result, only 0.2% of the shares were sold from the entire issue prospectus.

In 2012, OAO “Minskiy Zavod Igristykh Vin”, with the so-called "first public IPO", entered the stock exchange. Under the terms of the issue of shares, there were restrictions on the purchase of shares by one person (no more than 999 shares), also stocks could not be purchased by non-residents of the Republic of Belarus. Within the IPO, about 68% of the offered shares were sold. Just the timing of its holding was too limited, because it was not possible to sell all the shares. But the general meeting of shareholders of the IPO was recognized as successful. Soon there was an interested strategic investor who began to buy these shares on the secondary market. As a result, in 2013 there was another additional issue, just by the number of deals. These shares were sold during seven days of trading on the stock exchange. As a result, the factory received money for its investment projects, paid off ahead of schedule [1].

Then, in 2014, OAO “Gomelskiy Zhirovoy Kombinat” was set up on the IPO market. There were no restrictions on the purchase of shares by either non-residents or by the number of shares. This IPO was not as successful as the sparkling wine factory. For various reasons - a smaller percentage of shares was sold, there was no such massive advertising, etc. Shares were offered mainly to legal entities, and the company was looking for a strategic investor. However, not all recommendations found a lively response from the company's managers. Perhaps, because it is an enterprise with a predominant share of the state.

Individuals in the IPO market buy very few shares - 3-4% of all sold. And this is an occasion for reflection. According to legislators, no restrictions on the purchase of shares, including labor collectives, are needed. A few years ago, such restrictions were adopted - on the pretext that we need strategic investors, and they are interested

in controlling stakes and there is no sense in diluting shares among a large number of individuals. But if the collective buys shares, then from the point of view of PR it is a very good signal for other investors. If the employees themselves believe in their enterprise, then it is worth paying attention.

Under favorable conditions, several Belarusian enterprises can enter the Warsaw Stock Exchange (GPW) in 2017. Examples of a possible initial public offering of shares (IPO) on the stock exchange are Belarusbank, BelAZ, MPZ and Naftan [2].

GPW is an IPO partner in Belarus for seven years. Now there is an interest on the part of the exchange to step up work with Belarus to identify opportunities for companies to enter the IPO. There is growing interest in finding alternative sources of financing from the Belarusian side, both from the private and public sectors. Until now, this source was bank loans. But there is growing interest in raising funds through the sale of shares. The average Belarusian private and state-owned enterprises have a special potential for conducting an IPO.

The entry of Belarusian enterprises into the Warsaw Stock Exchange may be the first IPO of the resident of Belarus on the international site. However, the Estonian Silvano Fashion Group, which owns of ZAO “Milavitsa”, already successfully places its shares on GPW.

Holding an IPO is a very difficult process, for which the company spends a lot of money, time and effort. Therefore, an IPO must be carefully prepared so that all the advantages do not turn into disadvantages. In the world practice, there are many examples of unsuccessful IPOs, which are the result of an ill-conceived strategy of the company's development, premature access to the financial market, and other illiterate actions by the company's management. Such companies only worsen their financial position (due to high costs of IPO) and acquire managerial problems (due to the loss of some control over the company).

In Belarus, the IPO as a method of attracting investment has not received adequate distribution. The reason is the general underdevelopment of the country's stock market. Prospects for IPO of Belarusian companies depend on the degree of readiness of issuers for placement, the interest of investors in acquiring and the overall situation on world markets. In the near future large-scale IPO is not expected. However, in the present conditions, IPO can become an effective mechanism for attracting investments in the Belarusian economy, both domestic and foreign.

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PECULIARITIES OF PROFESSION ORIENTED COMPETENCY

ОСОБЕННОСТИ ПРОФЕССИОНАЛЬНО-ОРИЕНТИРОВАННОЙ КОМПЕТЕНЦИИ

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Key words: professional competence, communication skills, language skills, communicative methodology.

Ключевые слова: профессиональная компетенция, навыки общения, языковые навыки, коммуникативная методология.

Abstract. The article deals with an important role of profession oriented competence in English studying in our educational system for all subjects at the university level. Good communication skills are absolutely vital. The context approach is considered as one of the means to teach profession oriented communication. An electronic text book is being described as another innovative means of communicative competence forming.

Аннотация. В статье рассматривается важная роль профессионально-ориентированной компетенции в изучении английского языка в нашей образовательной системе для всех предметов на университетском уровне. Хорошие коммуникативные навыки абсолютно необходимы. В качестве одного из средств обучения профессионально-ориентированному общению рассматривается контекстный подход. В качестве инновационного средства формирования коммуникативной компетенции рассматривается электронный учебник.

New economic conditions, new approaches and requirements to the content of education can't be implemented without innovative approach to improvement of training methods. Modern expert’s professional level implies not only the ability to analyze and solve problems, but also the ability to improve one’s own activity technologies and to define one’s own strategy. The modern expert is more likely to master not the sum of knowledge, but the set of key competences including such modern resource as a foreign language. Foreign language occupies a special place in the education system in the era of culture globalization. For the modern professional it is not only a means of communication, but also the source of intellectual, cultural and professional personality development and the factor of society’s social, economic, scientific and technical progress. Foreign language skills in the field of professional communication enable to facilitate socialization in the labor market, to

adapt to dynamically changing conditions and to apply knowledge in creating new competitive products.

Profession oriented foreign language communication efficiency directly depends on the ability to consider cultural features of the interlocutor's country, on the ability to change communicative behavior tactics in changing conditions of communicative situation and to apply these skills for the solution of professional tasks. Ability to carry out effective foreign language communication in the process of professional activity is an important component of the expert's vocational training. Hence, it's necessary to create a qualitatively new education system, capable to provide the experts' effective communication in the modern global space.

Application of the context approach principles in foreign language training allows to solve such problems as: increasing foreign language learning motivation and forming professional interests and motives in complex with other disciplines; developing the expert's system thinking, understanding one's own professional identity, place and role in professional community and society as a whole; forming the expert's identity possessing social skills of interaction and communication, individual and joint decision-making; developing responsible relation to business, social values and principles of professional team or society. An example of context approach application in teaching profession oriented foreign language communication is conducting integrated classes in the form of foreign language educational projects developed by teachers of foreign languages department in cooperation with professional department specialists, speaking a foreign language at the level not disturbing communication.

Working at the content part of presentation, students mastered this content in monologue and dialogue forms, consolidating language knowledge and improving the language command. Teachers of English gave students differentiated help, and gradually students started to cope with the tasks, understanding the importance of mastering ready speech models in a real professional situation.

Development and implementation of the educational project demanded from all participants harmonious work for finding the optimal balance between two of its components, i.e. selection of the contents corresponding to professional activity and speech models for the practice oriented communicative competence forming. Foreign language teachers had to develop tasks for students' individual and group work with the purpose of developing educational activity according to each student's abilities and creating the feeling of success. Profession oriented context had to correspond to the language training content and promote available knowledge systematization and new speech models development, advancing students to achievement of the aims stated.

The electronic textbook should be developed according to the working program of the discipline and be the accumulator of the main didactic, methodical, scientific and directory materials used by teachers for preparation and implementation at all types and forms of classes. For students the electronic textbook is not only a means of applying training materials during educational process or preparation for the classes

under the direction of the teacher, but also a means for independent studying and a source of obtaining additional data in foreign language. Besides, the electronic textbook gives teachers the opportunity to carry out current and total control of students' progress quickly and objectively, and students can qualitatively solve problems of accumulated skills self-control. But, on the other hand, it is important to emphasize that, despite all the advantages of electronic educational editions, it is necessary to consider that electronic textbooks are only the auxiliary tool, they can supplement instead of replacing the teacher. Thus, there is nothing surprising that information and communicative technologies start being used as the innovative trends of modern education and are more actively used in training process. Educational activity of modern higher education institution is carried out in competitive market conditions that forces to pay special attention to quality of provided services. Efficiency of modern technologies and methods of training will depend in many respects on the teacher's ability to solve the problem not only of creating the comfortable psychological and emotional environment for training, but also of finding optimal balance between selecting relevant professional activity of the contents and speech models enabling to form practice-oriented communicative competence.

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COMPETITIVENESS OF BELARUS: PROBLEMS OF EVALUATION

КОНКУРЕНТОСПОСОБНОСТЬ БЕЛАРУСИ: ПРОБЛЕМЫ ОЦЕНКИ

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Ключевые слова: конкурентоспособность, Всемирный экономический форум, индекс восприятия коррупции, Глобальный индекс инноваций, индекс социального развития, индекс глобализации

Abstract. The article considers national competitiveness in conditions of globalization challenges. Competitiveness is an important indicator of the country on the world stage. It allows you to evaluate trade effectiveness in this country, productivity of labour, stages of competitive advantages of the country, etc. Reviewed are the ratings of international competitiveness in recent years and Belarus ' position in them. Belarus is considerably inferior to the countries-neighbors according to various indicators of competitiveness. Although in the period from 2002 to 2012,

Belarus was able to provide a high rate of growth and improving business environment, the country still has difficulty with the level of development of transport infrastructure and level of corruption. The greatest difficulties Belarus has experienced perhaps the most important component of competitiveness are the quality of institutions that define the "rules of the game" for economic agents.

Аннотация. В статье рассмотрена национальная конкурентоспособность в условиях глобализации вызовов. Конкурентоспособность – важный показатель, характеризующий страну на мировой арене. Она позволяет оценить насколько эффективно производство в данной стране, какова производительность труда, на какой стадии конкурентных преимуществ находится государство и многое другое. Рассмотрены рейтинги международной конкурентоспособности за последние годы и позиции Беларуси в них. Беларусь значительно уступает странам-соседкам по различным показателям составляющих конкурентоспособности. Хотя в период с 2002 по 2012 годы Беларусь смогла обеспечить высокие темпы роста и улучшение бизнес-среды, страна до сих пор испытывает трудности с уровнем развития транспортной инфраструктуры и с уровнем коррупции. Наибольшие трудности Беларусь испытывает в едва ли не самой важной составляющей конкурентоспособности – качестве институтов, которые определяют «правила игры» для экономических агентов.

Measuring the competitiveness of countries involved in two international organizations: the World Economic Forum (WEF) and the International Institute for Management Development (IMD). The Global Competitiveness Index (GCI) is made up of 114 indicators, of which 79 are formed by the results of a survey of company executives, and 35 indicators are based on statistical data of international organizations. Both these organizations do not include Belarus in their ratings because of problems with the reliability of official statistics. An attempt to measure the competitiveness of Belarus on the methodology of the WEF was undertaken in 2013 and 2014 by the CASE Research Center. CASE Belarus conducted a study wishing to determine the place of Belarus in the GCI rating in the reports of the WEF 2012/2013 and 2013/2014, if Belarus at that time included it. To do this, microdata was used to interview managers of 121 Belarusian companies on the questionnaire of the WEF. According to calculations by CASE Belarus, the value of GCI for Belarus for 2012-2013 was 4.29. It would allow Belarus to rank 61 in the ranking, settling down between Hungary and Bulgaria, and pushing Peru out of 61st place. If we assume that in 2013 the companies would assess the quality of the socioeconomic environment in the same way as in 2012 (there was no re-poll), updating 35 macroeconomic indicators, the value of the global competitiveness index for Belarus in 2013-2014 would be 4.34. It would allow Belarus to qualify for the 55th place, located between Costa Rica and Brazil. From the countries of the European Union, Belarus would outstrip Bulgaria, Romania, Slovakia, Hungary, Cyprus, Greece and the Balkan countries. From the countries of the former USSR would take 6th place, behind the Baltic countries, Azerbaijan and Kazakhstan.

Competitive position of Belarus is determined today in the following intercountry rankings:

1. In January 2016 the Corruption Perception Index was updated. Belarus took 107th place - the highest result since 2010 (compared to the previous year - an improvement of 12 positions). Russia is at 119th, and Kazakhstan - at 123rd place.

2. In November 2015, the Index of Prosperity-2015 was published. Belarus is on the 63rd place (deterioration in comparison with the previous year by 10 positions). The deterioration was mainly due to indicators of "personal freedom" (-24 positions) and "social ties in society" (-16 positions). The situation improved only in terms of "economy". Our country occupies the highest places on "social" subindex: "education" (31) "social ties in society" (37) and "health care" (38). Worse is the situation with subindexes "public administration" (121) and "personal freedom" (128th place). If Belarus outstripped Russia and Kazakhstan by the results of the previous report, in 2015 it lags behind them: Kazakhstan is at the 56th place, and Russia - at 58th.

3. In the updated Global Innovation Index on September 17, 2015, Belarus rose by 5 positions to 53 places, continuing the positive trend of the previous year, when the jerk for 19 positions was made. According to the subindex of the costs of innovation, Belarus is ranked 55th, which is 15 positions better than the previous year. At the same time, according to the subindex of innovation production, the position of Belarus has changed from 50 to 58. The decrease was mainly due to the decrease in applications for the registration of trademarks, registered trademarks for the Madrid system, the export of cultural and creative services.

4. In the Social Development Index-2015, published in April 2015, Belarus took 66th place (deterioration by 8 positions). The biggest impact on the worsening of the position in the Index of our country was provided by the "housing conditions" component: according to the previous report, 42% of the respondents indicated the availability of housing, in 2015 there are 32%. As well as the HDI, Belarus is ahead of Russia (71st place) and Kazakhstan (83rd place).

5. In March 2015, the KOF Globalization Index was updated. Belarus rose from 75th to 72nd place (3 positions). Progress was also noted in Kazakhstan, which managed to climb 6 positions to 76th place, and Russia, now ranked 53rd (an improvement of three positions).

6. The country's position in the ranking of logistics efficiency, compiled by the World Bank, is deteriorating. Belarus in 2014 occupied only 99 place from 160 countries (in 2007 - 74 places, in 2012 - 91) [1].

Thus, to improve the international image of Belarus and increase the confidence of national and foreign investors in economic policy, Belarus should be among the leading countries in leading international ratings that characterize competitiveness, the business environment, the level of innovation development, and the effectiveness of state government in the country.

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PRINCIPLE OF ORGANIZATION LANGUAGE TRAINING OF FUTURE TECHNICAL SPECIALISTS

ПРИНЦИП ОРГАНИЗАЦИИ ЯЗЫКОВОЙ ПОДГОТОВКИ БУДУЩИХ ТЕХНИЧЕСКИХ СПЕЦИАЛИСТОВ

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Key words: *interactive learning techniques, communicative competence, professional-oriented foreign language, machinery specialists, interactive process, innovative methods.*

Ключевые слова: *интерактивные методы обучения, коммуникативная компетентность, профессионально ориентированный иностранный язык, специалисты - технологи, интерактивный процесс, инновационные методы.*

Abstract. The article deals with the particularities of interactive learning techniques in order to create foreign language communicative competence of technical universities students. As the process of students’ foreign language learning should provide not only the acquirement of some certain level of knowledge, but also promote the successful implementation of educational and developing potential of academic subject. Such purpose of training, in our opinion, can be achieved thanks to the introduction of interactive teaching methods: “brainstorming”, method of projects, role-playing and business games, discussions, debates, round tables, where teachers and students act as equal participants of educational dialogue while also stimulating their creativity.

Аннотация. В статье рассматриваются особенности интерактивных методов обучения для создания коммуникативной компетенции иностранных студентов технических университетов на иностранном языке. Поскольку процесс обучения иностранному языку студентов должен обеспечивать не только приобретение определенного уровня знаний, но и содействие успешной реализации образовательного и развивающего потенциала академического предмета. Такая цель обучения, на наш взгляд, может быть достигнута благодаря внедрению интерактивных методов обучения: «мозговой штурм»,

метода проектов, ролевых игр и деловых игр, дискуссий, дискуссий, круглых столов, где преподаватели и студенты выступают равными участников образовательного диалога, одновременно стимулируя их творчество.

Foreign language training of technical specialists has become one of the most important components of modern high school. The English language teaching program for higher educational establishments indicates that the purposes of foreign language learning in high school are: mastering a foreign language as a means of communication, that promotes students' ability to use it as a communication tool in the dialogue of cultures and civilizations of the modern world; and the acquisition of professional-oriented foreign language competence. Language is considered as a means of interpersonal interaction in multinational and multicultural space. The process of foreign language learning in high school should provide the students with not only the appropriate level of language knowledge, abilities and skills to use it in various situations of life, but also this process should contribute to the successful implementation of educational and developing potential of the course. However, at the current stage of foreign language educational process the problem of students' speech competence formation which would correspond to the specific tasks of foreign communication situations and reproduce the entire content of professional activities.

To achieve this goal first of all it is necessary for the teacher in the process of learning to form the high level of students' professional self-development motivation. Therefore, in our opinion, to improve the students' motivation for foreign language learning with its further functional use, it is obligatory to use the interactive technologies which present the particular interest, as they create some comfortable learning conditions in which every student feels his success and intellectual ability. The basis of such educational process is the cooperation and productive communication aimed at solving some common problems, formation of abilities to notice the main point, to set goals, to plan activities, to distribute functions and responsibility, to think critically, to achieve the significant results solved.

The term "interactive pedagogic" is relatively new. The interactivity in education can be considered as the ability to interact, learning in the process of conversation, dialogue, action. Thus, literally, a method can be called interactive as if the person, who studies, is a participant, who performs something: speak, manage, simulate, write, draw and so on. He does not only act as a listener or an observer, but he is actively involved in what is happening and in this way actually creating this phenomenon. The content of interactive learning includes teaching each other, group form of educational process organization with the implementation of some active group learning methods for solving the didactics tasks. The teacher at the same time serves as an assistant in the work, a consultant, an organizer, becomes a source of information. However, students and teachers act as equal partners in the learning process. The interaction excludes the domination of any participant, any opinion or point of view above the others, but it must take into account the concrete experience and the practical application. During such dialogue training students learn to think critically, to solve complex problems by analyzing the circumstances and the related

information, weighing some alternative opinions, to make thoughtful decisions, participate in discussions and to communicate with other people. The implementation of these methods in technical colleges has its own peculiarities: the lexical material selection and the problematic situations playing off should be realized according to the curriculum. However, the future machinery specialists should get at these foreign language classes not only the fundamental knowledge of the chosen profession and some lexical minimum of a certain topic, but they also should improve their communicative skills in the simulated situations which are close to the reality. Considering this, let's study the possible implementation of some innovative methods at foreign language lessons of technical specialties.

The method of “brainstorming” consists of three stages. The first stage - problem statement. At this point the problem or theme should already be clearly defined. At this stage, we do the selection of participants , the presenters are determined and a student who can quickly record the ideas of his groupmates is selected.

The next stage is the generation of ideas. This is the main stage. At this time, students - brainstorming participants - produce and record the ideas arising on the given topic. Even the most incredible ideas should be encouraged and by no means should be criticized, as it leads to participants’ stiffness and isolation. To facilitate the work and to improve the tasks productivity fulfillment at this stage the participants can be divided into two groups according to the polar positions they take to address the challenging issue. Having noticed all the ideas that are available you can analyze, group and format them - this is the last stage of brainstorming - at this stage the ideas are estimated, the best are selected and then grouped and systematized. It should be emphasized that the method of brainstorming is aimed at developing the speaking skills. On the other hand, it is very important to introduce the method of “brainstorming” using the topic which is familiar to the students so they are not diverted to find the necessary words and structures, and can only be focused on the process of ideas generating of the familiar material.

The method of projects involves a certain set of teaching and learning tools and students’ activities which can solve a particular problem as a result of independent cognitive actions and involve the presentation of the results in the form of a specific product. As pedagogical technology it is a set of research, exploration, creative and problematic methods. During the training some various types of methods of projects are used: research, creative, informative, practical, method of games. They are present in different forms, among which we consider the most appropriate for the linguistic competence formation at English classes in high school are the following: role playing, report, press conferences organization, interviews, thematic exhibition and slideshows with the verbal support of students who present them and others. At the first stage, students learn the lexical material on the given topic. The next stage - the division into groups and getting the task to create a separate project presentations of some part of a car. The last stage – the conclusion: the discussion of advantages and disadvantages of the proposed projects. Thus, the use of project technologies enables the formation and development of research, communicative, technological,

informational competencies, generates creativity, stimulates intellectual activity, develops communication skills, helps to build interdisciplinary links, teaches to use information and telecommunication technologies in the study of foreign languages, helps to develop the skills of group work and creates social mobility. In addition, all these factors raise students' motivation, as in this case, language learning is not a goal, but a means of creating the final product. Even the weakest students can prove themselves out by performing some feasible tasks, and as a result, each student contributes to the creation of the project.

The interactive learning of foreign language communication contributes not only to the program material mastering, but also creates communicative competence, which is determined by the change of students' communication style, by the realization of some communication barriers, by the nature of solving some communication problems. The specific of this methodology implementation in technical universities is to solve the main problem of the educational process: learning some complicated material by each individual student in the most appropriate way, from the level of vocabulary mastering by means of reproductive material performing to the development of professional communication skills.

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THE PROCESS OF SOCIALIZATION AS AN OBJECT OF CAUSAL-COMPARATIVE RESEARCH

ПРОЦЕСС СОЦИАЛИЗАЦИИ КАК ОБЪЕКТ СРАВНИТЕЛЬНОГО ИССЛЕДОВАНИЯ

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Key words: *causal-comparative research, research methodology, socialization, scientific method, descriptive studies, public accumulation of knowledge.*

Ключевые слова: *сравнительное исследование, научная методология, социализация, научный метод, описательное исследование.*

Abstract. Our report deals with the process of a causal-comparative study in the field of socialization of students. It is presented an overview of pedagogical research: the ways of obtaining knowledge and the types of scientific research in the field of pedagogy. We made an attempt to explain the purpose of the analysis in a comparative study of the problem. Thus, having examined the pedagogical research and its types, we can say that the causal-comparative type of research is intended to determine the cause for or the consequences of differences between groups of people.

Аннотация. В нашем докладе рассматривается процесс выполнения причинно-сравнительного исследования в области социализации учащейся и студенческой молодежи. В нем дается обзор сущности педагогического исследования: представлены способы получения знаний, объясняется необходимость постановки проблемы научного исследования, описываются этапы проведения сравнительного исследования, делается попытка объяснить цель анализа при сравнительном изучении интересующей нас проблемы. Таким образом, рассмотрев сущность педагогического исследования и его типы, можно сказать, что в зависимости от цели, предмета, объекта научного исследования, мы используем соответствующий тип изучения.

Educational research takes many forms. In our report we introduce you to the subject of educational research, research problems and explain why knowledge of various types of research can be of value to educators as research is but one way to obtain knowledge, we describe several other ways and compare the strengths and weaknesses of each. We also give a brief overview of several research methodologies used in education to set the stage for a more extensive discussion of causal-comparative research which we can use if study the process of socialization.

How can educators, parents, and students obtain the information they need? Many ways of obtaining information, of course, exist. One can consult experts, review books and articles, question or observe colleagues with relevant experience, examine one's own experience in the past, or even rely on intuition. All these approaches suggest possible ways to proceed, but the answers they provide are not always reliable. Experts may be mistaken; source documents may contain no insights of value; colleagues may have no experience in the matter; one's own experience or intuition may be irrelevant or mistaken.

This is why knowledge of scientific research methodology can be of value. The scientific method provides us with another way of obtaining information—information that is as accurate and reliable as we can get.

Organizational socialization is not a fancy phrase; it is a theory. It is a theory about how new skills, belief systems, patterns of action and, occasionally, personal identities are acquired (or not acquired) by people as they move into new social settings. It is also a theory about what kinds of things happen in these settings when some people (agents) organize tasks and social relations for other people (recruits) in particular ways. Organizational socialization, then, is about recruit responses to agent demands as tamed or accentuated by the task and social organization characterizing a given setting.

For a example, we can investigate the process of students socialization in Great Britain and in the Republic of Belarus and see the difference between their behavior, their range of possible interests and their entering a particular social setting. Our purpose here is to suggest what might be learned by examining the links of a socialization chain rather than by examining any one socialization episode in isolation.

Causal-comparative research in socialization seeks to identify associations among students ways of life, attitudes towards the process of study and leisure time.

Causal-comparative research attempts to determine the cause or consequences of differences that already exist between these groups of individuals. The basic causal-comparative approach is to begin with a noted difference between two groups and then to look for possible causes for, or consequences of, this difference. The first step in formulating a problem in causal-comparative research is usually to identify and define the particular phenomena of interest, and then to consider possible causes for, or consequences of, these phenomena.

The important thing for socialization as a sample for a causal-comparative study is to define carefully its characteristics and then to select the differences in these characteristics.

It's necessary to remember that the results of causal-comparative studies should always be interpreted with caution, since they do not prove cause and effect.

The problems touched upon in the report are of great importance. There are many different ways of obtaining information, including sensory experience, agreement with others, expert opinion, logic and the scientific method.

The scientific method is considered by researchers the most likely way to produce reliable and accurate knowledge. The scientific method involves answering questions through systematic and public accumulation of knowledge. The description of some of the most commonly used scientific research methodologies in education was given. They are experimental research, correlational research, causal-comparative research, survey research, qualitative research, and historical research. Individual research methodologies can be classified into general research types. Descriptive studies describe a given state of affairs. Associational studies investigate relationships. Intervention studies assess the effects of a treatment or method on outcomes.

According to the title of our report we paid a special attention to the causal-comparative research and the process of socialization. Causal-comparative type of research is intended to determine the cause for or the consequences of differences between groups of people (for example, between students of Great Britain and the Republic of Belarus in the process of socialization). So it is possible to conclude that a reader is provided with some material on the interested theme.

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METHODS OF ANALYSIS OF COMMUNICATION AND COMMODITY POLICY OF THE ORGANIZATION

МЕТОДЫ АНАЛИЗА КОММУНИКАЦИОННОЙ И ТОВАРНОЙ ПОЛИТИКИ ОРГАНИЗАЦИИ

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Key words: product policy, communication policy, analysis of the organization, methods of analysis, performance evaluation of communication activities.

Ключевые слова: товарная политика, коммуникационная политика, анализ деятельности организации, методы анализа, оценка эффективности коммуникационной деятельности.

Abstract. During the analysis of directions of activity of any organization it is important to choose methods that largely take into account the specifics of the organization. Along with traditional methods of analysis it's using various mathematical, graphic, and functional-cost methods. This article offers economic-mathematical methods of analysis of commodity and communication policy of the organization.

Аннотация. При проведении анализа направлений деятельности любой организации важно выбрать методы, позволяющие в большей степени учесть специфику организации. Наряду с традиционными методами анализа используются различные экономико-математические, графические и функционально-стоимостные методы. В данной статье предлагаются экономико-математические методики анализа товарной и коммуникационной политики организации.

When assessing the effectiveness of communication a number of parameters are taken into account: the object and purpose of promotion, the time interval between exposure and reaction, the activities of competitors, etc. An evaluation of the effectiveness of marketing communications uses qualitative and quantitative criteria.

Qualitative assessment of efficiency of marketing communications is to achieve a certain level of indicators such as awareness about the organization (product, goods, services) as well as the organization's image / brand.

Quantitative assessment of marketing communications expressed through sales, awareness, market share, etc. Belarusian companies often focus on sales.

The authors propose to calculate the Cost Efficiency Index (CEI) for evaluation of the effectiveness of the communication tools and when its value is close to one to calculate the ROI (Return of Investments) keeping into account the discount factor.

This approach allows to correlate the results of the communication campaign of the company against competitors and to consider it as investment for communication.

The Cost Efficiency Index is calculated based on the comparison of own expenses for communication with the relevant expenses of competitors and, accordingly, the volume of sales [1]:

$$CEI = (Q1 : V1) / (Q2 : V2), \quad (1)$$

Q1, Q2 – volume of sales respectively over a period of time;

V1, V2 – expenses for marketing communication of these companies during the same period.

The Return of Investments (ROI) reflects the return of funds invested in communication activities [1]:

$$ROI = (Z_1 – Z_0) / I, \quad (2)$$

Z_1, Z_0 – profit at the end and beginning of the analyzed period;

I – the cost (expenses) promotions.

To represent the cost of communication as an investment for profit the discount factor (α) is included in the formula of ROI [1]:

$$ROI = (Z_1 – Z_0) / \alpha I. \quad (3)$$

According to this method it was conducted the analysis of the effectiveness of the communication policy of the enterprises of light industry of the Republic of Belarus. At the first stage of analysis it was calculated the Cost Efficiency Index indicator. As a result of his calculation it's revealed that optimal size of budget for communication policy is in RUPTE "Orsha Linen Mill" in the textile industry, in knitting industry– JSC "Polesie", and in sewing industry – JSC "Elema".

At the second stage it was calculated the Return of Investments indicator. The results of this calculations, found that only RUPTE "Orsha Linen Mill" is the positive effect from the investment of funds in activities conducted communication policy.

The next important problem for the domestic industry is the building of commodity policy based on the methodological positions of the effective product policy.

Currently, most scientists agree that domestic enterprises will have a difficult transition from planning of the commodity assortment to development of their commodity policy. It should be based on fundamentally new approaches during the process of its formation such as strategic and tactical management, taking into account changes of factors of external environment and real commercial production capacity.

Analysis of the economic literature allowed us to classify the methods of an estimation of a commodity policy of the enterprises [2]. These methods are schematically presented in figure 1.

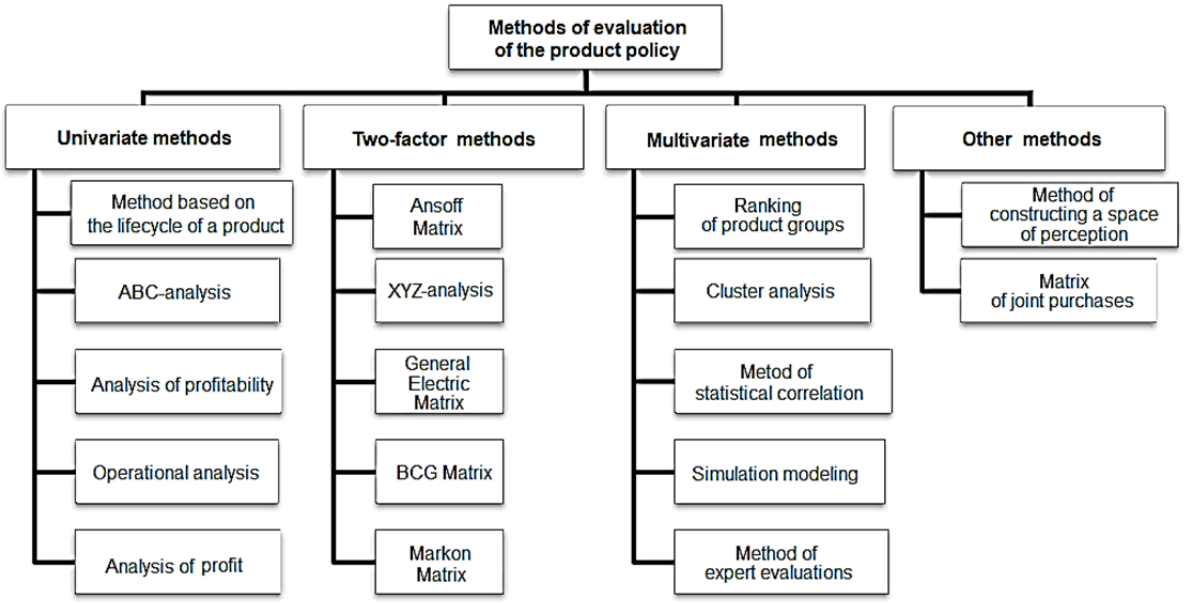

Figure 1 – Classification of methods of an estimation of a commodity policy of the enterprise

Thus in the economic literature the evaluation of the trade policy of the enterprises is performed according to the methods, which are characterized by the general and special characteristics.

With the aim of improving the commodity policy it's offered the following direction:

– to carry out a comprehensive analysis of the existing and future commodity markets with the objective of quick orientation with the general increased mobility of production;

– to change the trend of updating of assortment in the direction of increasing the rate of renewal of sub-groups, differentiated pricing policy;

– on the basis of detailed internal study of the life cycle to identify and remove from production the obsolete goods, to consider modification of the manufactured goods and to make proposals for the development of new products;

– to maximize the production programs according to market requirements;

– to control the lifecycle management to support products in the maturity stage (to study the market and promptly remove it from production if necessary);

– to assess the actual and future situation of the company on the selected market and gradually increase economic and financial image of the enterprise;

– to analyze the competitiveness of products and to compare it with the real possibilities of production.

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DEVELOPMENT OF FUTURE BUSINESS COMPETENCES
РАЗВИТИЕ БУДУЩИХ БИЗНЕС КОМПЕТЕНЦИЙ

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Key words: *system thinking, critical thinking, creative thinking, business competencies.*

Ключевые слова: *системное мышление, критическое мышление, креативное мышление, бизнес компетенции*

Abstract. New challenges determine the problems that face higher education today. The main of them is the change in approaches to learning and development. The article assesses what competencies the leaders need today to achieve high results. The author examined in more detail the leading competences from the World Economic Report - how they adapt to the business environment.

Аннотация. Новые изменения определяют сегодняшние вызовы, стоящие перед системой высшего образования. Главными являются изменения в обучении и развитии. В статье дана оценка, какие компетенции необходимы сегодня бизнес лидерам для достижения высоких результатов. Автор исследует ключевые бизнес компетенции, предложенные Всемирным Экономическим Форумом в Давосе, как они позволяют адаптироваться в бизнес среде.

New challenges determine the problems that face higher education today. The main of them is the change in approaches to learning and development. The article assesses what competencies the leaders need today to achieve high results. The author examined in more detail the leading competences from the World Economic Report - how they adapt to the business environment. These changes will increasingly manifest themselves as the generations change in the labor market: the thinking and motivation of representatives of the "generation Y" are seriously different from both the prevailing generation X, the baby boomer generation, and the "silent generation".

After all we approach "generation Z" - 15-16-year-old teenagers, which experts call "digital generation" (digital native).

New challenges determine the challenges that higher education faces today. The main of them is the change in approaches to learning and development. It is important to discuss widely what competencies are needed today for leaders to achieve high results. Experts identify two important new concepts: the "T-model" and the "Leader-catalyst". What does "T-Professional" mean? It is a specialist with deep knowledge, skills and experience in one area and a wide range of additional competencies. Schematically it is represented as a letter "T". Expert ("going in depth" - the crossbar of the letter T): has a functional / technical expertise; For years they have been doing the same job well; they are difficult to replace; you can count on them, you can trust them; they get recognition in the company; can work autonomously. Competent (a wide range of competences - the horizontal line of the letter T), flexible in learning, they easily learn new functions; well do the work that is first encountered; solve difficult / new problems; think strategically, have a wide vision (helicopter view); work well in conditions of uncertainty and complexity; have diverse interests; fast and impatient, do not respect the status quo. Organizations need leaders who had better achieve results in the company's core business. Therefore, you need to know the peculiarity of the company's activities. If it requires rich practical experience or deep knowledge; relatively stable; requires an understanding of the past, strong tactical decision-making skills; needs the development of staff, the institution of mentoring; depends on the relationship and maturity in the role. In this case, such an organization needs more those who leaders who are experts. If an organization faces new challenges that require a strategy; needs new ideas and ways of thinking; faces changes or its future is uncertain; requires serious adjustment of actions; depends on serious technical support, then in this case it needs more T-leaders who are flexible.

Now it’s being increasingly spoken about the need for a new role model - a manager who can support business in difficult circumstances and whose team is a catalyst. In the complex environment, the best results are shown by the female management model, which includes understanding, care, support and development assistance. When it is not clear how the elements of the medium interact, the teams compete not in the level of expertise, but in the speed of finding new, more adaptive patterns of behavior. In such a situation, the leader is not the main expert, but the "mommy", which can provide a safe environment for the work of experts. The main advantage in this case is the stability of the effective work of the team, because in a "friendly" environment, employees do not "burn out" psychologically, longer retain a high level of motivation and involvement. In a world full of uncertainties, creating security for working groups becomes a basic condition for the survival of the business. A strong corporate culture supports people and gives them the opportunity to show their talents, become "owners" of business. An example of supportive and caring leadership is clearly evident now in the IT environment. However, it is in this industry (taking into account the specifics of typical employee psycho types) that the limitations of such a leader role are already noticeable: the infantilism of employees

is not overcome, but aggravated. Therefore, this topic should be widely discussed among professionals.

Traditional trainings work with skills, treating them as patterns of effective behavior that need to be brought to automatism. They initially were not focused on "subtle" tasks - such as changing the type of thinking or changing the picture of the world. But this is aimed at reflexive games that model complex business reality. In addition, the most effective are not computer and desktop simulations, but role-playing games that allow you to act: in accordance with your own goal; in communication with other participants, "playing their game" under the general conditions. Role games allow you to "work out" different types of thinking - both during the game and in post-game reflection. Discussion of the content of training has shifted very strongly towards neuroscience - the use of achievements related to the study of brainwork - from neurophysiology to neurology. After the World Economic Forum in Davos, it became clear that most of the "competences of the future" are cognitive (related to thinking). Now in the training for the first role comes an understanding of the specifics of thinking, the application in practice of special skills, in demand in business. It is not surprising that scientists are actively involved in working in corporate universities and training centers, and recommendations for developing training programs based on research results. Researchers identify four types of business environments (frameworks):

1. Simple.
2. Complicated.
3. Complex.
4. Chaotic (chaotic).

Today, the business operates in a complex environment, the distinctive features of which are: a large number of elements; their complexity; multilevel links between them; dynamism (constant change) of connections. What competencies will be decisive for a successful adaptation of the company to such a complex environment? At the Davos Economic Forum, key competencies identified what is important for business success in the near future. Changes in the priority list are the result of understanding the direction of changes in the business environment. In 2020, competitive advantages and leadership for companies will provide cognitive (mental) competencies - thinking skills and creative abilities, on which the ability to effectively adapt to change depends. This means that these competences will be the focus of development programs for modern managers. Let's consider in detail the leading competences from the Davos list - how they adapt to the business environment.

System thinking. It is the ability to see in all the interrelated, hierarchically structured connections of processes and events, the perception of the world as ordered; to grasp the situation as a whole, and at the same time to highlight in it elements and interrelations between them; find optimal solutions that affect the causes of the problem, not its symptoms; predict the course of events. System thinking is especially important when you have to act in a complex environment, in a

situation of uncertainty. A leader with a developed systemic thinking does not just see his organization as a system, but acts as its "architect."

Critical thinking. The famous American educator John Gilai introduced the first concept of «reflexive thinking». After the publication of his report, The Nation at Risk, critical thinking has become an important component of all levels of education in the United States. What is critical thinking? This system of judgments used to analyze events and formulate sound conclusions. Critical thinking allows you to make an objective assessment, give correct interpretations, and apply the results correctly to the analysis of problems and the current situation. How can students develop critical thinking skills? First, ask research questions. Make a comprehensive analysis of the situation. Forming conclusions and avoiding "mental traps." Critical thinking skills provide an opportunity to identify the key challenges facing the organization; objectively and comprehensively analyze problems; to formulate optimal response strategies.

Creative thinking. Creativity is the ability for non-standard thinking and behavior, constant awareness and creative development of one's experience. Creativity is needed for: solving problems that do not have a suitable standard solution; finding a better / new solution to the problem / problem; design (recombination of things to obtain a new value); simplify / optimize products, processes, procedures; adequate response to changes; mastering new behaviors and activities. Creative thinking allows finding successful solutions in a changing context; resolve contradictions and dilemmas; create a unique value proposition and differentiate from competitors.

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HISTORICAL ASPECT OF DEVELOPMENT OF SOCIAL ENTREPRENEURSHIP ESTIMATION METHODS

ИСТОРИЧЕСКИЙ АСПЕКТ РАЗВИТИЯ МЕТОДОВ ОЦЕНКИ СОЦИАЛЬНОГО ПРЕДПРИНИМАТЕЛЬСТВА

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Key words: *social entrepreneurship, evaluation methods, foreign experience*

Ключевые слова: социальное предпринимательство, методы оценки, зарубежный опыт.

Abstract. Foreign experience in the development of social entrepreneurship demonstrates the diversity of methodological approaches to the assessment of the activities of the subjects of social entrepreneurship. The analysis showed that the application of foreign methods in national practice is difficult for a number of reasons, the main one of which is the absence of the concept of "social entrepreneurship" at the legislative level and the inability to calculate the proposed indicators based on the data of domestic accounting and statistical reporting.

Isolated manifestations of social entrepreneurship could be observed in Europe in the 19th century and in Asia in the first half of the 20th century. The phrase «social entrepreneurship» has come into use since 1980, when the former business management consultant B. Drayton created the Ashoka Foundation, which was the first to offer support and funding to people with disabilities [1].

To date, social entrepreneurship is one of the most dynamically developing areas of activity around the world. However, there is still no methodological unity in the definition of this economic term, the identification of its criteria and methods of evaluation.

The purpose of the study is a historical analysis of existing methods of assessment of the activities of social entrepreneurship and determining the possibility of its application in national practice.

Picture 1 shows the chronological sequence of methods of assessment of the activities of social entrepreneurship [2].

Next, will be considered the three most popular methods of evaluation and will be given a brief description of them.

In the world there is a database of standard indicators of social impact - the so-called IRIS-indicators - a catalog of indicators widely used to measure the social, environmental and financial effectiveness of organizations [3].

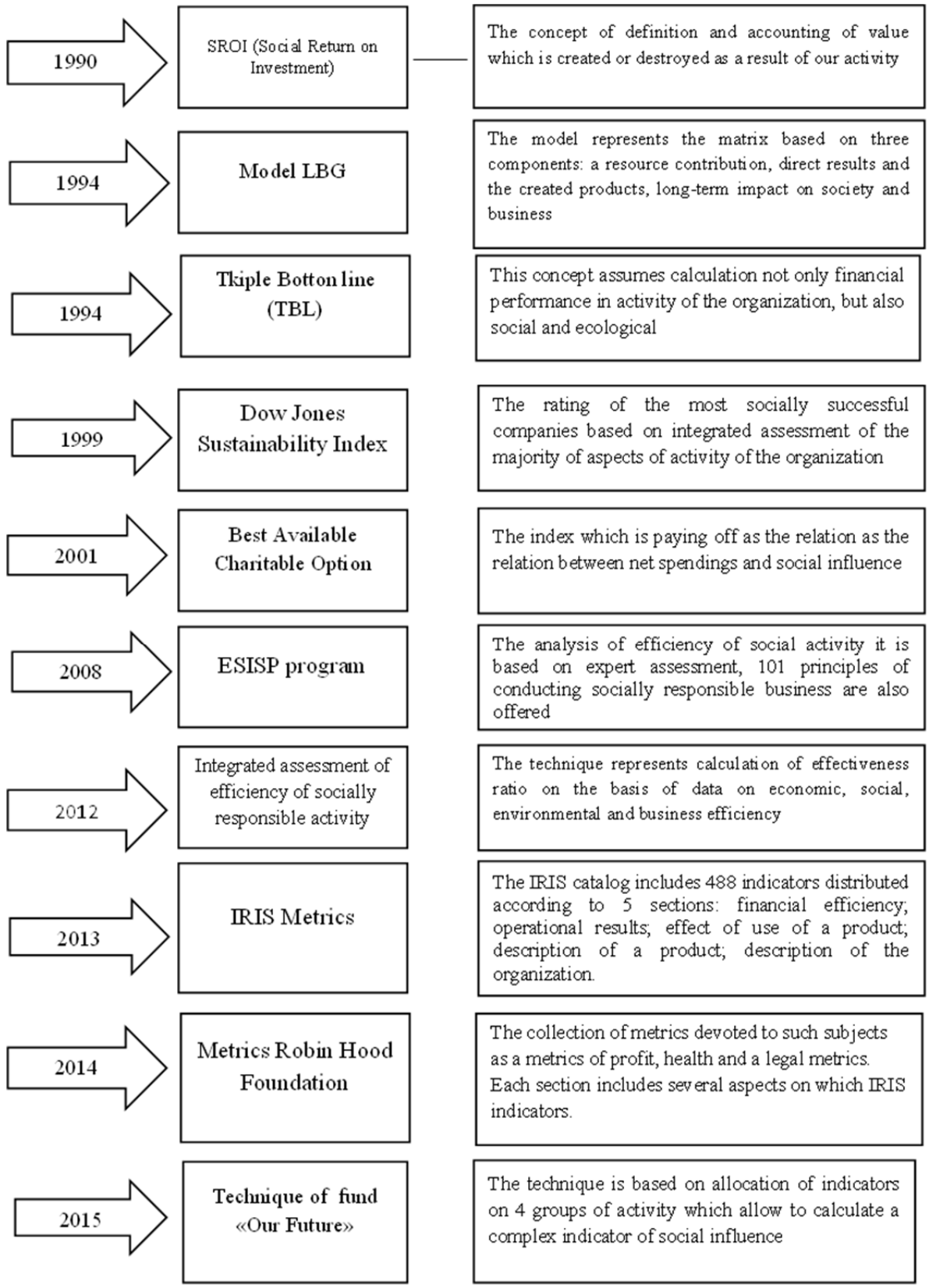
This method is used, both by subjects of social entrepreneurship, and by investors to assess start-ups in the field of social entrepreneurship.

Analysis of the organization's activities through IRIS indicators suggests that the proposed indicators, provided that the general parameters are used, will competently compare various projects and business ideas from different sectors of the economy. In addition, the system of indicators also includes a set of universal indicators used in any field of activity.

Let's present in Table 1 a set of indicators for assessing the social impact in education.

Quite common, both among the evaluation of the activities of social entrepreneurship subjects, and among social investors, is the social impact analysis method SROI-analysis (Social Return on Investment) [4]. Calculation of return on investment (ROI) is used by many organizations. This indicator is calculated as the return on investment for the investor. ROI, however, does not take into account the

impact of the project and the creation of social, environmental and cultural values (social impact) for various stakeholders.



Picture 1 – Systematization of methods of assessment of activity of subjects of social entrepreneurship

The method of assessing the social return on investment (SROI) is intended just to identify the social effectiveness of the project.

Unlike other methods for quantifying the effectiveness of social projects, SROI monetizes the results of calculations and presents social value in monetary terms. This, in particular, makes it possible to perform a comparative evaluation of various projects.

When analyzing existing methods, the experience of evaluating the activity of social entrepreneurship by the fund of regional social programs "Our Future" (hereinafter referred to as the Fund "Our Future") was studied.

The "Our Future" Foundation has developed its own evaluation system to monitor the results of the projects it finances. This method involves the division of activities into 4 main groups and 6 subgroups on the social impact [5, p. 383-384]:

Employment and living arrangement of representatives of socially unprotected groups; Medical rehabilitation and improvement of quality of life (including long and single medical services); The social services connected with preschool training (single and regular); Other social production (excursions, master classes, production of services, etc.) and social services.

This technique allows to estimate the scale of social influence, cost of unit of an indicator of social influence, speed of achievement of goals, financial stability, innovation and replicability.

The analysis of foreign methods of assessment of activity of subjects of social entrepreneurship showed that for their approbation in Republic of Belarus there is a number of difficulties: first, imperfection of the legislative base and definition of the place of social entrepreneurship in our republic, secondly, impossibility of calculation of the offered indicators according to accounting and statistical reports.

Therefore, it is expedient, relying on foreign experience, to develop the author's technique of assessment allowing to analyses the level of socialization of business of subjects of social entrepreneurship in different spheres of action in the Republic of Belarus.

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ROTATION OF STAFF IN JAPANESE MANAGEMENT SYSTEM AND THE POSSIBILITY OF USING ITS POSITIVE EXPERIENCE UNDER THE CONDITIONS OF BELARUSIAN ECONOMY

РОТАЦИЯ КАДРОВ В СИСТЕМЕ ЯПОНСКОГО МЕНЕДЖМЕНТА И ВОЗМОЖНОСТИ ИСПОЛЬЗОВАНИЯ ЕЁ ПОЛОЖИТЕЛЬНОГО ОПЫТА В УСЛОВИЯХ БЕЛОРУССКОЙ ЭКОНОМИКИ

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Key words: *management, rotation of staff, Japanese management system, employee training, self-training.*

Ключевые слова: *менеджмент, ротация кадров, японская система менеджмента, обучение работников, самоподготовка кадров.*

Abstract. The article investigates the Japanese experience in business management, in particular its most important element – the rotation of personnel. Using the experience of Japanese management in this area will reduce staff turnover, increase the interest of workers in the results of their work, timely identify and train the administrative staff, improve the overall competence and knowledge of workers. The article investigates the types of rotation, which exist in the Republic of Belarus, draws conclusions and provides specific proposals for improving the Belarusian enterprise management system.

Аннотация. В статье исследуется японский опыт управления предприятиями, в частности, такой его важнейший элемент, как ротация кадров. Использование опыта японского менеджмента в этой области позволит снизить текучесть кадров, повысить заинтересованность работников в результатах своего труда, своевременно выявлять и обучать управленческие кадры, повысить общую компетенцию и знания работников. В статье анализируются виды ротации, которые существуют в Республике Беларусь, делаются выводы и приводятся конкретные предложения по совершенствованию системы управления белорусскими предприятиями.

The growth of international competition, as well as the world crisis which influences the Belarusian industry, require careful study and a constructive analysis of the experience of enterprise management. This is one of the ways to increase the efficiency of domestic production and increase competitiveness of Belarusian producers in the domestic and foreign markets.

During the survey of Belarusian enterprises by IMF representatives held in October 2015 at the request of the Belarusian government, the following positive and negative features of the Belarusian economy were revealed. The advantages were high-tech equipment and a high level of human development, the main disadvantage was the poor organization of production.

Therefore, it is especially important to analyze the positive experience of managing industrial enterprises in other countries and to explore the possibilities of using it in a market economy of the Republic of Belarus. In particular, this concerns one of the most effective management systems - Japanese management. An analysis of various sources of economic literature reveals two main groups of factors that determine the effectiveness of enterprise management in Japan. First of all, it is a system of productive interaction with people, as well as the existence of a specific Japanese social culture. Due to the influence of mental features on the nature of management, it is impossible to transfer the entire Japanese enterprise management system in the organization of the Republic of Belarus. However, the analysis of the results of introducing foreign companies experience into the work of Belarusian manufacturers shows that our enterprises are easier to perceive Japanese management systems and organization of production than, for example, American, due to the similarity of many ethnic and cultural characteristics of Belarusian and Japanese people.

The Japanese management system is effective due to the synergetic action of a number of components: the system of lifelong hiring, personnel rotation system, reputation system, on-the-job training system and specific wage system. A special role here is played by the personnel rotation system, which allows the company's management to create conditions for long-term employment of employees. The lack of advancement of the employee on the career ladder for years eventually leads to a decrease in the productivity of their work, tiredness and lack of interest in the work, and even to dismissal by their own decision. In Japan, it is considered that a long stay of an employee in one position leads to a loss of their interest in the work and a decrease in the level of responsibility. Therefore, labor rotation is the norm and is often combined with career advancement. The frequency of rotation depends on a number of circumstances (age, length of service, specialty, etc.) and can vary from 4 to 7 years. As a result, each employee acquires up to five specialties and becomes a professional generalist. In many cases this solves the problem of the interchangeability of staff [2].

By frequency (speed) of displacements, one can single out an annual, monthly, daily, hourly rotation, etc. Thus, at Japanese automobile enterprises, the rearrangement of workers from one operation to another within the site is carried out

not only with an interval of a year or a month, but also daily, and in some cases even hourly [2].

Depending on the trajectory of motion in the practice of Japanese enterprises different types of rotations are used: ring, irrevocable, castling. This type of rotation is actively used by the corporations "Sony" and "Honda". Here it is considered normal if the head of the sales department changes his position with a colleague from the procurement department.

Depending on the specifics of the career space, Japanese enterprises use real and virtual rotation. The first is possible in an ordinary, actually existing organization. Depending on the specifics of the career space, Japanese enterprises use real and virtual rotation. The first is possible in an ordinary, existing organization. The second is a new type of rotation and has emerged as a result of the development of STP. It can be implemented in networked organizations based on the use of computers. Virtual rotation is a rotation that is done in a virtual organization in a real way, but without the physical presence of a person in the company. In addition, there are also vertical and horizontal rotations.

In the organizations of the Republic of Belarus vertical rotation is most widely represented, because it is associated with the least amount of paper work, personnel reshuffles, and, on the whole, is more familiar. In our opinion, in the current state of rotation in the organizations of the Republic of Belarus, it is the horizontal type of rotation that has the greatest chance of being implemented into the administrative apparatus. Horizontal rotation has a number of features that have made it so widely used in Japan. Among them the most significant are the possibility of long-term training both within the company (internal school) and external training, which can be considered as one of the motivating factors for the activities of employees (as a rule, if their wishes for their own development are taken into account); the allocation of independent projects and the empowerment of employees in the project (increase of responsibility, the possibility of involving other employees in the cooperation) [4]. In addition, rotation will reduce employee turnover; increase the number of rationalization proposals on the part of employees; reduce the level of stress caused by monotony (routine) work; improve the interchangeability of workers and the level of their qualifications, etc. That is, there is a synergetic, systemic impact of staff rotation on the organization and results of modern industrial production, which will allow achieving a tangible economic effect in most cases without significant expenditures of financial, material and labor resources.

Business practice of Japanese enterprises is characterized not only by in-house rotation, but also the exchange of personnel between companies, groups or even associations. Thus, one more basic value of the Japanese corporate model is manifested - group solidarity. This practice allows not only to strengthen partnership and business relations between cooperating companies, but also to enable workers to get more complete knowledge, to learn from experience and to improve their own skills.

So, now it is possible to figure out the following most promising and suitable for the introduction of the direction of improving the management of Belarusian enterprises in the field of staff rotation:

firstly, the introduction and active use of horizontal personnel rotation: the implementation of the movement of personnel within the enterprise; development of staff exchange between enterprises to improve cooperation and adopt advanced production and scientific experience;

secondly, to improve the management system of domestic enterprises, it is advisable to use the experience of Japanese firms to form a "reserve of a managers ", which will allow to timely detect a capable managers and to carry out their training in relation to the conditions of the given enterprise;

thirdly, it is also expedient to create within the Belarusian enterprises a self-training system for personnel based on individual programs developed jointly with the managers of the human resource management unit. These programs can be based on attestation characteristics, evaluation sheets that most reliably carry information about the actions, style of the employee's work, as well as empirical data obtained in the process of introspection. Self-education programs for employees should be linked to long-term development plans for the company and the team as a whole. In this case, a certain target orientation arises. It allows you to adjust the culture of production conditions, relationships and tasks. The fixed terms of being a candidate for senior positions will have a stimulating effect on employees in reserve.

In general, Japanese management, based on a creative, conscious and purposeful combination of the principles of American management with the methods, conditioned by the national mentality, can become the basis for improving management in the Republic of Belarus. Modern Belarusian enterprises need to implement this practice, as well as create their own systems of in-house training. This will allow not to miss potential employees who do not have highly specialized knowledge, and also to ensure professional and human growth of employees.

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EVALUATION AND SUBSTANTIATION OF DIRECTIONS OF IMPROVING COMMERCIAL EFFICIENCY

ОЦЕНКА И ОБОСНОВАНИЕ НАПРАВЛЕНИЙ ПОВЫШЕНИЯ КОММЕРЧЕСКОЙ ЭФФЕКТИВНОСТИ

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Key words: commercial efficiency, sustainability, methods for assessement of commercial efficiency, evaluation of commercial efficiency, evaluation methodology
Ключевые слова: Коммерческая эффективность, устойчивость, методы оценки коммерческой эффективности, оценка коммерческой эффективности, методика оценки

Abstract. The article formulated and systematized the main approaches to the definition of the concept of commercial efficiency, approved the author's methodology for assessing commercial efficiency on the example of a particular organization, and also determined the reserves for its increase.
Реферат. В статье сформулированы и систематизированы основные подходы к определению понятия коммерческой эффективности, апробирована авторская методика оценки коммерческой эффективности на примере конкретной организации, а также определены резервы ее повышения.

Over time, commercial activities are increasingly relevant to the production process, as it covers the processes of supply, production and marketing.

It is also worth noting that at present, commerce has gone beyond trade concepts or simply the process of buying and selling. There were commercial organizations, commercial activities, commercial sustainability, commercial efficiency, there was a transition from economic calculation to commercial, etc.

Analyzing the work of scientists, we can conclude that commercial activity is a broad concept, including such concepts as marketing, logistics, sales activities and sustainability. Estimation of the efficiency of commercial activity can not be given without taking into account all these factors, as in the aggregate they assume "commercial efficiency".

After the transition of organizations from economic calculation to commercial, the question arises of assessing the effectiveness of the organization. Earlier it was revealed that at present any organization is considered as commercial. Thus, an important condition for the study of existing approaches to the evaluation of commercial efficiency is the analysis of approaches to assessing the economic activity of the organization, since the directions and objectives of the analysis will overlap or coincide. So marketing directly affects the process of supply and marketing of products (market analysis, channel search, analysis of competitors' products, study of demand for own products, etc.), as well as logistics (inventory control, work with suppliers, construction of optimal routes for delivering products, optimizing the operation of storage facilities, etc.).

Having studied the work of domestic scientists, we can build the following table, reflecting the current directions of analysis of the commercial effectiveness of the organization:

Table 1 – Directions of analysis of commercial efficiency

Author	Direction of analysis
Савицкая Г.В., Шеремет А.Д., Гиляровская Л.Т. , Лысенко Д.В., Ендовицкий Д.А.	– Analysis of marketing activities – Analysis of sales, as a direction of analysis of production and sales of products – Analysis of general financial indicators as an integral part of the analysis of financial performance of the organization
Сосненко Л.С., Свиридова Е.Н., Кивелиус И.Н, Стражев В.И.	– Analysis of general financial indicators as an integral part of the analysis of financial performance of the organization
Алексеева А.И., Васильев Ю.В., Малеева А.В., Ушвицкий Л.И.	– Analysis of marketing activities – Analysis of sales, as a direction of analysis of production and sales of products
Любушин Н.П.	– Analysis of marketing activities – Analysis of general financial indicators as an integral part of the analysis of financial performance of the organization
Пласкова Н.С., Ермолович Л.Л., Ковалев В.В., Волкова О.Н., Бариленко В.И.	– Analysis of general financial indicators as an integral part of the analysis of financial performance of the organization – Analysis of sales, as a direction of analysis of production and sales of products

Made by author

Currently, the analysis of selected indicators of the evaluation of commercial efficiency makes it difficult that most of the industrial organizations do not analyze or keep records of the whole set of selected indicators in their activities. This is primarily due to the specifics of the activity, as well as the approaches to conducting its activities, which does not involve the use of all methods and tools of marketing. At the same time, the calculation of indicators and evaluation of logistics activities make it difficult for companies to use the services of third-party transport companies in the vast majority of their activities. Thus, the approbation of the developed methodology will be carried out according to the indicators available for evaluation

The second stage of the analysis of commercial performance is the analysis of the dynamics of selected indicators. As indicators, generally accepted indicators of dynamics such as growth rate, growth rate and absolute deviation will be used.

The object of research is the JSC "Vitebsk Carpets":

Table 2 – Analysis of the dynamics of generalizing indicators of commercial efficiency of JSC Vitebsk Carpets for 2014-2015

Indicator	Year		Change	Growth rate,%
	2014	2015		
Coefficient of turnover of circulating assets	2.94	3.103	0.163	105.54
Sales ratio	1.0261	0.988	-0.0381	96.29
Profitability of sales by net profit,%	0.23	0.13	-0.1	56.5
Profitability of sales on profit from sales,%	6.81	8.61	1.8	126.43
Net profit, mln.rub.	1507	977	-530	64.83

Made by author

Based on the analysis of commercial efficiency, the main reserves of increasing the commercial efficiency of JSC "Vitebsk Carpets" were identified:

1. Reserve growth in the sales ratio due to increased demand for products, as well as the holding of a marketing company.
2. Reserve growth in profitability of sales on net profit and on profit from sales due to lower cost of produced and sold products, as well as costs per unit of output, as in the reporting period, these figures increased.
3. Reserve growth in sales in foreign markets through the use of more advanced technology and technology, as well as through marketing research and companies.
4. Reserve for improving commercial efficiency by increasing the set of analyzed indicators of marketing and logistics activities.

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THE PRESENT STATE AND PROSPECTS OF THE DEVELOPMENT OF EXCHANGE TRADE IN THE REPUBLIC OF BELARUS

СОВРЕМЕННОЕ СОСТОЯНИЕ И ПЕРСПЕКТИВЫ РАЗВИТИЯ БИРЖЕВОЙ ТОРГОВЛИ В РЕСПУБЛИКЕ БЕЛАРУСЬ

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Key words: *exchange commodity, exchange section, exchange trade.*
Ключевые слова: *биржа: биржевой товар, биржевая секция, биржевая торговля.*

Abstract. The article deals with the theoretical aspects and parameters of the identification of an exchange commodity. A detailed evaluation of the characteristic features of the exchange commodity is given, current trends in the transformation of the exchange portfolio are highlighted. The analysis of the state of exchange trade for 2015-2016 is given. Negative trends that prevent the development of exchange trade in goods in the Republic of Belarus are determined.

Аннотация. В статье рассматриваются теоретические аспекты и параметры идентификации биржевого товара. Дается развернутая оценка характерных черт биржевого товара, выделяются современные тенденции трансформации биржевого портфеля. Приведен анализ состояния биржевой торговли за 2015-2016 год. Определены негативные тенденции, препятствующие развитию биржевой торговли товарами в Республике Беларусь.

In Belarus, according to the law "On Commodity Exchanges," an exchange commodity is anything that is determined by generic attributes not withdrawn from turnover, as well as property rights, unless otherwise provided by this Law and (or) the President of the Republic of Belarus, admitted by the commodity exchange to

exchange trade [3]. By definition, the characteristic features of an exchange commodity are the following: the mass nature of production and consumption, standardizability, uniformity, transportability and independence of quality characteristics from a specific manufacturer. Proceeding from this, energy goods (oil, gas, peat), ferrous and non-ferrous metals, agricultural products, industrial raw materials, etc., usually fall into this category. The realization of such goods through exchange trades allows to form an objective market price on the basis of the currently available demand and supply. In this case, stock quotes, as a rule, are taken as a basis for determining prices in the over-the-counter market. This is a worldwide practice, which Belarus adheres to, but with some exceptions. For example, such a classic exchange group of goods, like petroleum products, is sold not on the exchange, but on the Unified Trading Platform of the Belneftekhim Concern. You cannot buy potash fertilizers, gas and electricity on the exchange, although by their characteristics they ideally fall into the category of exchange. Despite the above limitations on the specific commodity to the exchange, the potential for expanding the range of exchange commodities is far from being exhausted, and first of all it concerns the trading in industrial and consumer goods. In this commodity category, anything can be traded, therefore, based on the requests of bidders, new demanded items are constantly being introduced into the exchange turnover.

In 2016, 273,000 transactions for a total of 2.53 billion rubles were concluded on the trading floors of the OJSC "Belarusian Universal Commodity Exchange" (hereinafter BUCE), which is the largest share in the overall exchange turnover fell on the metal products section, the volume of transactions in which amounted to 981 million rubles. The largest volume of transactions in terms of value was provided by ferrous metals, the second place in terms of exchange turnover was occupied by electro-technical and in third place - non-ferrous metal. In terms of sales growth, coal (12 times) and coke (2 times) demonstrated the best results [1]. The volume of trading in the section of timber products in 2016 amounted to 895 million rubles (an increase of 23%), this is due to increased supplies of roundwood to the domestic market and sawn timber for export. In the agricultural products section, the volume of transactions exceeded 482 million rubles, providing an increase of 38% compared to 2015. The main sources of growth were oilseed and fodder additives. In 2016, the section of industrial and consumer goods was able to increase its share in the all-round turnover to 6.8%, ensuring growth for the year by 1.6%. In an effort to improve the efficiency of trade and procurement activities, Belarusian and foreign business entities have concluded 27 thousand transactions in the amount of 172 million rubles. The list of the most sought-after commodity items for the year included construction materials, automotive equipment and food products. In the first half of this year, the volume of transactions in OJSC "Belarusian Universal Commodity Exchange" amounted to 1.5 billion rubles, which is 36% more than for the same period in 2016. As of July 1, 2017, 17892 companies were accredited to BUCE, including 3,717 non-residents from 59 countries of the world [2].

Analyzing the above, we can note the positive trends in increasing the volume of exchange trade in the Republic of Belarus. However, there are active factors in the

economy that restrain the development of exchange trade. The main one is the unwillingness of the leaders of Belarusian companies to learn new methods of work. According to the "Belarusian Universal Commodity Exchange", since the beginning of the year, Belarusian business entities have received almost 90 million rubles of additional revenues and savings through participation in exchange trades. The main advantage of the exchange mechanism for firms participating in exchange trades is the minimization of risks and expansion of the geography of trade.

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INTEGRATED COMMUNICATIONS AND EXHIBITION MANAGEMENT

ИНТЕГРИРОВАННЫЕ КОММУНИКАЦИИ И ВЫСТАВОЧНЫЙ МЕНЕДЖМЕНТ

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Key words: *event management, special events, exhibition activities, international exhibition, integrated communications.*
Ключевые слова: *событийный менеджмент, специальные события, выставочная деятельность, международная выставка, интегрированные коммуникации.*

Abstract. *The article describes the main mistakes having been made by the project managers and the top management of the Exhibition Unitary Enterprise "BELINTEREXPO" of the Belarusian Chamber of Commerce and Industry during the event management of the international exhibitions and the advice on the improvement of the enterprise's integrated communications system.*
Аннотация. *В статье изложены основные ошибки, допущенные менеджерами проектов и руководством Выставочного унитарного предприятия «БЕЛИНТЕРЭКСПО» Белорусской торгово-промышленной палаты в процессе событийного менеджмента международных выставок и*

предложены рекомендации по совершенствованию системы интегрированных коммуникаций на предприятии.

It's undeniable that the international exhibitions are a powerful tool for promoting the image of the Republic of Belarus abroad and boosting its competitiveness on the international market. The international exhibitions require thorough planning and effective execution to ensure participants, visitors and guests derive the maximum possible advantages from the exhibition [1, p. 363].

The object of the research is the theory of integrated communications in the exhibition activities.

The subject of the research is the integrated communications in the event management of the international exhibitions of the Exhibition Unitary Enterprise "Belinterexpo" of the Belarusian Chamber of Commerce and Industry.

The objective of the research is to identify the mistakes in implementation of the integrated communications theory in the event management of the international exhibitions by the Unitary Enterprise "Belinterexpo" of the Belarusian Chamber of Commerce and Industry and provide the solutions to correct them.

The results of case analysis can be summarized in the Table.

Table – Integrated Communications in the Event Management of International Exhibitions by the Unitary Enterprise "Belinterexpo" of the Belarusian Chamber of Commerce and Industry: Mistakes and Solutions

Mistakes	Solutions
1) Lengthy meetings without results.	– work out clear agenda of a meeting; – set time limits of a meeting.
2) No clear division of project managers' responsibilities.	– delegate responsibilities among the employees without their overlapping.
3) Vague event ideas (event concepts).	– formulate the ideas of events (international exhibitions and conferences) clearly.
4) Vague formulation of events target audience.	– conduct marketing research; – formulate the target audience of events clearly.
5) No Customer Relationship Management (CRM) system.	– install a CRM system.
6) No special service for e-mail distribution.	– install a special service for email distribution (e.g. MailChimp).
7) No special service for the managers of the enterprise to edit documents simultaneously.	– use Google Docs to create and edit documents simultaneously.
8) "This site may be hacked".	– modify the website or create a new one.
9) The enterprise's website has no English version.	– create the English version of the website.
10) The reasons for the event failure are not analysed.	– conduct failure analysis.

The perspective of the research is to create a handbook on the implementation of the theory of integrated communications in the event management of international exhibitions.

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NON PROFIT SPORT MARKETING SPHERE

НЕКОММЕРЧЕСКАЯ СФЕРА МАРКТЕИНГА СПОРТА

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Key words: *sport marketing, healthy lifestyle, segmentation in healthy lifestyle sphere, marketing research.*

Ключевые слова: *маркетинг спорта, здоровый образ жизни, сегментирование в сфере здорового образа жизни, маркетинговое исследование.*

Abstract. The article describes the goals, tools and objects of sport marketing in the non-profit sphere. It is logically proved that the state is interested in its development. Examples that prove the positive trends in the growth of the directions of a healthy lifestyle in the Republic of Belarus are given. The results of the marketing research of the attitude of the inhabitants of Vitebsk to sports activity are described. The author formulated the following hypothesis: segmentation of consumers in the sphere of a healthy lifestyle is advisable to conduct on the basis of age.

Аннотация. В статье приведены цели, инструменты и объекты маркетинга спорта в некоммерческой сфере. Логически доказано, что государство заинтересовано в его развитии. Приведены примеры, доказывающее положительные тенденции роста направлений здорового образа жизни в Республике Беларусь. Описаны результаты маркетингового исследования отношения жителей г. Витебска к спортивной активности. Автором

сформулирована следующая гипотеза: сегментирование потребителей в сфере здорового образа жизни целесообразно проводить по возрастному признаку.

The population of a country becomes the object of the non-commercial sphere of sport marketing. The main objectives of marketing activities - improving the health of the nation, increasing life expectancy. This can be implemented through such marketing tools as: demarketing a particular category of goods (cigarettes, alcohol), social advertising, event marketing, etc.

In accordance with the National Security Concept of the Republic of Belarus, approved by the Decree of the President of the Republic of Belarus dated 9th of November 2010, No. 575 "On the Approval of the National Security Concept of the Republic of Belarus," the increase in the overall health of the population is among the main national interests.

Since the beginning of 2017, several mass sports events have been held in Minsk. The Minsk half-marathon, held on 10th of September, 2017, gathered 30 thousand people: both professional athletes and amateur runners (fig. 1). The race has been running since 2015. In the capital's Victory Park on the 26th of August 2017 a charitable doubles race "1 + 1" was held for the first time to help children with serious illnesses.

It was possible to overcome the distance both independently and with a beginner runner. It was from this event that the 10-day charity event "Velcome - run" started. On August 13 in Victory Park there was a charitable "Onkomarafon" of 5 km distance. From each registered participant, 5 rubles were spent on the treatment of children.

Figure 1 – The Minsk half-marathon*

**Source: [1].*

Thus, Minsk is rapidly catching up with European capitals according to the number of sports initiatives.

High life expectancy, good health indicators of the population increase labor productivity, and, consequently, have a positive impact on GDP. Thus, the state itself is primarily interested in the development of sports marketing. The conduct of an active lifestyle is often laid down in the style of life of individual countries. For example, 69% of the Swiss population between the ages of 15 and 74 live an active lifestyle. The most popular sports here are skis, jogging and training in fitness centers.

The factor of sports activity of the population is one of the components of a high life expectancy in the country. Switzerland is on the 4th place in terms of life expectancy. According to the Swiss Federal Statistical Office (FSO), the average life expectancy of men in the country is 79.7 years, women - 84.3 years. The Republic of Belarus is only at 103 place in terms of life expectancy, Russia - 122 [12].

In relation to the population of the country, marketing of sports can set itself the goal of working with its passive part. The instruments used are familiarization with the sportive way of life. For example, in 2016 in Brest was given free access to sports facilities for 250 adolescents who are registered with law enforcement agencies, as well as for adolescents who are brought up in dysfunctional families.

Thus, an important tool for marketing activities here is to study the motivation of those involved, identify the reasons for not taking an active lifestyle, identify the basic needs and preferences for sex-age categories. To this end, a survey was conducted among the residents of Vitebsk. It was attended by 235 people.

Studies have shown that 41.7% of respondents lead an active lifestyle. The results for the individual sex and age categories are shown in Table 1.

Table 1 – Sports activity of the population study*

Sex / Age	Men		Women	
	Lead active lifestyle	Don't lead	Lead active lifestyle	Don't lead
16-25	12	10	18	12
26-35	10	14	18	22
36-45	8	12	13	20
46- 55	8	22	11	25
Total	38	58	60	79
	96		139	

**Source: compiled by the author.*

According to the results of the study, it can be seen that the most active segments are men and women aged 16 to 25 years. Most of this is due to age, the availability of free time and the lack of family. As for the sports, the subjects here prefer the gym (men), aerobics and dance directions (girls). In both cases, the main motivation at this age is the desire to look good.

At the age of 26 to 35 years, positive sports statistics (both men and women) are also clearly observed, but it is not as great as in the case of the first segment. This is due to the appearance of the family and a permanent workplace. Men of this age still give their preference to the gym. Women, in turn, are increasingly involved in yoga,

pilates, and bicycle riding. Men motivate themselves with the desire to look good and be strong, women are also a show of mood and health and immunity.

The segment at the age of 36 to 45 years is becoming less active, some are doing physical exercises at home. Men and women of this age tend to prefer seasonal sports, such as: skiing, cycling. From a permanent sport both sexes choose the swimming pool and motivated themselves by strengthening health and immunity.

The older generation (46-55 years) lead an active lifestyle only in 32% of cases, prefer to visit the swimming pool, and do exercise independently. They motivate themselves with good mood and health promotion.

As the study showed, segmentation is advisable to be carried out on this basis as age, because There are differences in sports activity between representatives of different ages.

Particular attention is paid to improving the physical education of children and students. Throughout the country, sport clubs for teenagers are organized. The Republic of Belarus has special centers for the training of professional athletes, including the Belarusian State University of Physical Education, the Olympic Reserve School, the specialized schools of the Olympic Reserve, and more than 185 children's and youth sports schools.

On the basis of the foregoing, we can conclude that the marketing of sports is a broad and topical issue affecting various spheres of life of a modern person and society as a whole.

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TOLERANCE IN MODERN WORLD

ПРОБЛЕМА ТОЛЕРАНТНОСТИ В СОВРЕМЕННОМ МИРЕ

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Key words: tolerance, tolerant attitude, a personality trait, a person with special developmental needs, humanization of education, individual professional style.

Ключевые слова: толерантность, толерантное отношение, свойство личности, лицо с особенностями психофизического развития, гуманизация образования, индивидуальный профессиональный стиль.

Abstract. The article deals with such a socio-humanistic problem of modern society development as tolerance. The phenomenon of tolerance is regarded here as a positive personal quality, which helps better integration into the society. The article stresses actual contradiction between the urgent necessity to solve the problem of development of tolerance to other persons, including those with special developmental needs and working out tools and mechanisms for its development in the higher education establishment.

Аннотация. В статье затронута такая социо-гуманистическая проблема современного общества, как толерантность. Феномен толерантности рассматривается здесь как положительное личностное качество, которое способствует лучшей социализации индивида. В статье подчёркнуто актуальное противоречие, заключающееся в явной необходимости решать проблему развития толерантности к другим, включая лиц с особенностями психофизического развития и отсутствием разработанных приёмов и механизмов для её развития в УВО.

We have our own particular convictions and points of view about many issues that encompass our lives. Regardless of whether it is about religious perspectives, political convictions or social contrasts we all have different views and respond to anything based on our personal experience obtained during our lifetime. Tragically, but some are not as tolerant to others as they should be. We often witness the absence of tolerance among people. Some individuals may verbally or even physically assault those whom they find dissimilar to themselves, judge their behaviour with prejudices that blindfold their minds.

Today we interpret the notion tolerance as willingness to allow others to hold opinions or follow customs different from one's own; a state of mind that implies non-judgmental acceptance of different lifestyles or beliefs, whereas toleration indicates the practice of allowing such freedoms and putting up with something that one disapproves of.

At the heart of tolerant attitude to other people is self-control. When we tolerate an activity, we resist our urge to forcefully prohibit the expression of activities that we find unpleasant. Toleration is usually based upon an assumption of the importance of individual independence. This assumption is a central idea in modern liberal theory and practice.

According to different authors tolerance is conventionally viewed as: acceptance of another person's individuality and one's own personality, the ability to understand emotional states of other persons, the urge to communicate and interact, refusal of dominance and violence, readiness to accept different opinions and logics, the right to be different, dissimilar, uncommon; attitude and personal quality as a stabilizing factor of the system (personality, society) from inside; a complex multiple-aspect

personal trait, which includes emotional, cognitive, behavioral components and psychophysical background.

The social-philosophical interpretation of tolerance views the essence of the notion as tolerance displayed by a social subject towards political, ethnic and other peculiarities of another social subject. This implies the orientation to certain value systems, which permits to discuss the ethical basis of tolerance – moral terms, norms, rules, values, as well as the mechanism of their inclusion in the regulation process of tolerant behavior. It should not be forgotten, that the phenomenon of tolerance is subject-objectively oriented and can be manifested selectively.

Valuable contribution to the development of the tolerance phenomenon in modern science has been done by the following researchers: G. Y. Soldatova 2001; E. V. Shlyiagina 2002; E. G. Vinogradova 2002; D. V. Kolesov 2003, T.A. Vlasova 2003, N. K. Bahareva 2004; D. V. Klokov 2005; G. S. Kozhyhar 2006; A. P. Tsykanova 2006; A.G. Asmolov 2008, G.V. Bezuleva 2009, S. K. Bondyreva, Vera V. Khitruk 2012.

Many leading scholars and educators use the theme of tolerance to help students in classrooms or at lectures understand issues centered on tolerance, non-violence and human rights. Educational establishments play a very important role in propaganda of tolerant attitude to people of different background, religious beliefs, and social status and, of course, to people with special developmental needs. They teach tolerant attitude by organizing various creative projects, scientific conferences, showing educational movies to present some modes of courteous acceptable behavior.

American psychologist Gordon W. Allport pioneered research into the psychological underpinnings of prejudice and discrimination. He believes that a tolerant person possesses the following characteristics: 1) self-knowledge (a tolerant person is aware of his own strengths and weaknesses and is not inclined to put the blame for his problems on others); 2) safety and security (the sense of security and strong belief that a person can cope with threat); 3) responsibility (a developed sense of responsibility which doesn't let a person to put the responsibility on others); 4) estimated requirement in determinacy and distinctness (a tolerant person doesn't divide the world into black and white but admits its diversity , a tolerant person is ready to accept any viewpoint and feels less discomfort in the state of uncertainty); 5) self-orientation (is much more aimed at self-sufficiency, and less at outward leaders and authorities); 6) less adherence to order (a tolerant person is not obsessive about order in a general sense, and social order in particular, open-minded, polite and cautious); 7) empathic ability (societally conscious and socially sensitive, with adequate judgment and assertion of other people); 8) a sense of humor (with the ability to laugh at him/herself, not only at others); 9) freedom and liberty priorities (public hierarchy is of no importance) [1].

Thus, the phenomenon of tolerance in foreign psychology is regarded as a positive quality, synonymic to ethics and moral.

To my mind, the theory of Gordon W. Allport is of great interest because it identifies the personal traits of a tolerant person.

Tolerant attitude as a personal quality has a subjective-objective orientation as it is formed towards a subject. People can be tolerant or intolerant to differences of these subjects: cultures, languages, origins, religions, beliefs, nations, races, mental capacity, physical characteristics and many others. The level of individual's personal growth, education, social surrounding and financial wealth influence on person's tolerant attitude. Nevertheless, if a person is tolerant to other person's race it does not mean that this person will show the same tolerance to a person with some special developmental needs. In my opinion, the problem of tolerant attitude to an individual with impaired development is one of the actual problems in modern special pedagogy and psychology around the world. People have got used to problems of immigrants, different religions and different cultures because of a modern tendency of globalization. However, it is sometimes difficult for people to accept a birth of a child with special developmental needs in their own family.

According to L.S. Vygotsky, a Soviet psychologist and the founder of an unfinished theory of human cultural and biosocial development, any physical disability — whether it is blindness, deafness or congenital dementia — not only changes an individual's attitude to the world, but affects other people's attitude to such an individual. Even in the family, there is an exclusive, different attitude to the child with impaired development in comparison with other children. L.S. Vygotsky has called the change in attitude to the child with biological defect and the resulting "feeling of little value", the "social realization of defect".

A child with special needs is a subject whose individuality should be accepted and taken into consideration under the conditions of inclusive education. Nevertheless, successful education can be guaranteed by a high level of tolerance as a personal quality of teachers. In a similar way, successful integration of people with special developmental needs (SDN) into the modern community and their successful social adaptation can be guaranteed by a high level of tolerance as a personal quality of all the people who surround them in their everyday life working in different social spheres, including shop assistants, doctors, teachers, lawyers and others.

However, tolerance is not a born characteristic; people should be taught how to be tolerant and how to behave in modern community with tolerance. The best way to teach tolerance is during the educational process and the time of professional training. Nowadays the humanization of education and higher education in particular, is paid much attention. A successful graduate must possess both strong professional skills and specific personal qualities to develop a tolerant attitude to people in general and those with SDN in particular. Among these are: ability to manage oneself; ability to influence others; striving for personal and career growth; resourcefulness; ability to cooperate with colleagues; tolerance and patience.

It is obvious that a graduate should possess a wide range of personality traits that will shape his or her individual professional style. However, tolerance and patience help a newborn professional to be sociable and develop a strong desire to help people in our diverse modern life. That is why it is so important to identify pedagogical conditions and work out tools and mechanisms for the development of students' tolerance through teaching different subjects, including foreign languages.

To conclude, being tolerant is to live your life without criticizing how others live theirs. Understanding other people needs enriches personal inner world, rises self-estimation, promotes career growth and develops tolerant attitude and respect to other people. Attitude with general social tolerance to other individuals despite their differences will bring more peace and happiness to our own lives.

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UDC 331.1

FEATURES OF PERSONNEL MANAGEMENT OF A CRISIS ENTERPRISE

ОСОБЕННОСТИ УПРАВЛЕНИЯ ПЕРСОНАЛОМ КРИЗИСНОГО ПРЕДПРИЯТИЯ

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Key words: crisis enterprise, mobilizing the personnel potential.
Ключевые слова: кризисное предприятие, мобилизация кадрового потенциала.

Abstract. The article outlines the main phases of the process of mobilizing the personnel potential of the crisis enterprise for the implementation of the financial recovery plan: staff's awareness of their dependence on further successes in improving the company's health, creating conditions for staff development, ensuring a high level of motivation for employees' self-development, the formation of new patterns of activity in the joint efforts of all employees of the enterprise. The main principles of a productive approach to increasing the level of competitiveness of a crisis enterprise are formulated, creating an image of the company that is attractive to consumers.

Аннотация. В статье обозначены основные фазы процесса мобилизации кадрового потенциала кризисного предприятия на реализацию плана

финансового оздоровления: осознание персоналом их зависимости от дальнейших успехов в оздоровлении компании, создание условий для повышения квалификации персонала, обеспечение высокого уровня мотивации к саморазвитию сотрудников, формирование новых образцов деятельности при объединении усилий всех работников предприятия. Сформулированы основные принципы продуктивного подхода к повышению уровня конкурентоспособности кризисного предприятия, создающие привлекательный для потребителей образ фирмы.

The process of mobilizing the personnel potential of a crisis enterprise to implement a financial recovery plan can be presented in the form of successive major phases of the company's management:

• agitation phase - creating a sense of "strategic discomfort" for the staff associated with the realization that the personal fate of employees depends on the survival of the firm is due to radical changes in the management strategy; formation of the image of a reliable and influential leader; establishment of bilateral channels of organizational communication between the crisis management and the enterprise team;

• professional development phase - creation of conditions for staff development; the formation of mechanisms that support the learning processes in the organization; ensuring a high level of motivation for self-development among workers in a crisis enterprise; the formulation of a new mission of the enterprise and a vision of its future; use in the communication of special language tools, symbols and metaphors for effective mutual understanding and emotional support of employees of the enterprise; mastering the mechanisms of the market economy, entrepreneurial culture by the employees of the enterprise;

• the integration phase - the creation of new role models that fix new patterns of activity and behavior in the culture of the crisis enterprise; creative development and improvement of these models on the basis of constant comprehension of practice; selection and implementation of a series of projects in which promising ideas that combine the efforts of all employees of a crisis enterprise are successfully embodied.

There are two principal approaches to increasing the level of competitiveness of a crisis enterprise:

• elimination of existing shortcomings in the structure of the organization, impeding the increase of the competitiveness of personnel. In personnel work, this approach, as a rule, finds its practical implementation in the reorganization, associated with the elimination of structural units and workers who "do not fit" in the strategy of bringing the enterprise out of the crisis situation;

• search for unique features of companies that create an attractive image for consumers of the company. Experience shows that this approach is more productive; it is based on several essential principles.

The principle of optimization of the personnel potential of the enterprise. The reorganization associated with the reduction of personnel is a common practice in a crisis enterprise. However, it can be either effective or ineffective.

In carrying out the reorganization, effective practice presupposes:

• preference to reduce levels in the organizational structure of management, rather than jobs, paying attention to strengthening the personnel reserve for the top management of the enterprise;

• the interdependence of the structural elements of the organizational structure in the conduct of reductions, for which, if necessary, subsequently implement measures to stabilize the new organizational structure and psychological support staff;

• the personnel structure most suited to the current situation, and the financial recovery plan that is supported by the team; Do not get involved in large-scale staff reductions;

• periodic re-evaluation of the personnel structure of the enterprise;

• identification, support and training of employees of the enterprise, showing leadership qualities and propensity to manage activities;

• support for educational programs implemented at the enterprise;

• preliminary preparation of prospective candidates for key management positions in the organization, paying primarily attention to skilful execution of management functions in a crisis;

• decentralization of the management structure with the delegation of the necessary authority to key figures in the management apparatus and ensuring maximum flexibility in the development of management decisions at both the strategic and operational levels;

• teamwork, and not individual efforts - the formation of working groups, teams (both between departments and in different divisions of the enterprise);

• identification and preservation of the core of the personnel potential of the enterprise;

• continuation of recruitment, support of its professional growth, especially in the vital and priority areas of its activities for the company.

The principle of the formation of the unique potential of the crisis enterprise. Increasing the level of competitiveness of a crisis enterprise depends critically on its intellectual and information potential, the value of which exponentially grows depending on the scale of investments in it and the experience gained by the staff. Intellectual leadership of a company in some area attracts talented people, which allows you to count on creating a unique combination of professional abilities that make up the core of the staff potential of highly competitive firms.

The principle of orientation to the professional core of the personnel potential of the enterprise. The aggregate capabilities of the company's employees, which are necessary to select, execute and coordinate the actions that provide the firm with strategic advantages in the markets of goods, services and knowledge, form the core of human resources. These advantages are based on the fact that competitors are unable to produce similar quality products or services or are late with their modernization. Due to this, the firm gets a monopoly position in this or that segment of the market. It's not about those capabilities that are characteristic for the organization that ensure a steady growth in profits (ability to innovate, create and maintain internal and external links, create an attractive company image, control over

strategically important resources), these capabilities are obvious and vulnerable over time to competitors . The capabilities that make up the core of the personnel potential of an enterprise have the following properties:

• essential for the firm's survival in the short and long term;

• inaccessible to competitors and can be simulated with great difficulty;

• represent a combination of skills and knowledge of staff, and not their implementation in the products or functions of the organization;

• are a unique source of increasing the profitability of the enterprise through a combination of scientific, technical, production, organizational, managerial and human resources;

• can be maintained and reproduced by the firm for a certain period;

• are inherent in the organizational system of the enterprise, rather than individual outstanding employees;

• are important for the development of the main, and ultimately all, of the products produced at the enterprise;

• essential for the implementation of strategic plans of the company;

• serve as a long-term basis for the development and adoption of flexible, strategically important decisions (staff reduction, product diversification, rationalization of the organizational structure, creation of joint ventures, etc.) that ensure the evolution of the firm's organizational system and its adaptation to changing environmental conditions;

• provide the firm with a dominant position in certain market segments, since it allows taking into account long-term market trends and current customer demands.

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FORMATION OF EXPORT STRATEGY OF ORGANIZATIONS BASED ON INNOVATIVE MARKETING TECHNOLOGIES

ФОРМИРОВАНИЕ ЭКСПОРТНОЙ СТРАТЕГИИ ОРГАНИЗАЦИЙ НА ОСНОВЕ ИННОВАЦИОННЫХ МАРКЕТИНГОВЫХ ТЕХНОЛОГИЙ

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Key words: *export, innovation, strategy, marketing, light industry.*

Ключевые слова: *экспорт, инновации, стратегия, маркетинг, легкая промышленность.*

Abstract. The article considers topical issues of development of export strategies of domestic enterprises. Export is one of the main priorities of development of economy of the Republic of Belarus. Increasing the level of competitiveness of enterprises in modern conditions of the global market can only be achieved through the introduction of innovative marketing technologies. Marketing innovations are beneficial not only for individual companies but also for the economy as a whole.

Аннотация. В статье рассмотрены актуальные проблемы разработки экспортной стратегии отечественных промышленных предприятий. Экспорт – это один из основных приоритетов развития экономики Республики Беларусь. Повышение уровня конкурентоспособности предприятий в современных условиях глобального рынка может быть обеспечено только за счет внедрения инновационных маркетинговых технологий. Маркетинговые инновации приносят выгоду не только отдельным предприятиям, но и экономике страны в целом.

The role of exports for countries with a market economy is very large. Exports, as a powerful stimulating factor of economic development, plays the role of a "locomotive" in overcoming the crisis, helps to maintain production and employment in export-oriented industries, providing a positive impact on the economy as a whole.

It should be noted the negative impact of the global financial and economic crisis on the export potential of the Republic of Belarus, which has led to a reduction in the solvency of major trade partners and a significant decrease in demand for the major Belarusian goods on the foreign market. Thus, the problem of the development of export strategy on domestic industrial enterprises is currently highly relevant at both macro and micro level.

At the present stage in the Republic of Belarus transition of economy on innovative way of development is the most important task. Completing this task is one of the main ways of achieving dynamic development of the country in the long term and improving the standard of living of the nation.

Light industry of the Republic of Belarus has a high degree of export orientation.

The competitive advantages of branches of light industry of the Republic of Belarus are determined by the availability of raw materials (flax, chemical fiber and filament, yarn, fabric, leather and fur raw materials), highly qualified personnel, lower in comparison with other sectors the capital intensity of production. Products textile & leather industry is raw materials for other industries of the country, most of which is the production of industrial-technical means and is sent for further processing. The main consumers of knitted products, clothing and footwear industries are people.

To increase a positive balance light industry enterprises of the Republic of Belarus seek to reduce their dependence on imports of raw materials by increasing production of flax in Belarus, creation of new types of chemical fibers and threads, dyes, leather materials for footwear. In this regard, it is planned to introduce the technology of production of textile and knitted materials based on the new textile raw materials

produced by chemical industry enterprises of the country with improved hygienic properties.

The concern "Bellegprom" is a coalition of organizations and is a diversified industrial complex engaged in production of textile, knitting, garments, manufacturing of leather goods and shoes, also part of the group include the organization of trade, science and education.

In 2015 products of the concern "Bellegprom" were exported to 58 countries, including the countries of Western Europe and the United States. The main region for the industry in the implementation of export is the Russian Federation (about 72.5% of total exports) [1].

The total volume of exports for the period 2011-2015 amounted to nearly $3.3 billion, including last year $492.8 million. This indicates a demand for light industry products of domestic production.

The main item of exports – garments, shoes, jerseys, leather goods, fabrics, cotton, linen, wool, artificial and synthetic rugs and carpets, flax yarn.

If we consider global trends, it can be noted that the active development of enterprises of light industry in developing countries with significant government support and the availability of their own raw materials, had an impact on the redistribution of the productive forces of the industry. The centre of production has shifted from Western Europe and the USA to the countries of South-Eastern and Central Asia (China, Pakistan, India), South America [1].

In the system of light industry enterprises organization of marketing and sales has its own characteristics. Here the success of new products depends mainly on the accuracy to match the requirements of buyers. Therefore, the industry must continually conduct market research not only to the markets of finished products but also of markets for new materials, colors, technology, to predict the development trends of fashion, and actively use in their activities innovative marketing techniques.

During 2011-2015 the spending of enterprises of light industry of the Republic of Belarus on marketing innovations is low and shows a high level of variability.

Therefore, more effective promotion of products of light industry enterprises to new export markets is possible due to:

− use various methods of marketing communications, information communications technology, the development of e-Commerce, cooperation with well-known multi-brand online stores;

− organization of work on optimization and increase of efficiency of commodity distribution network abroad;

− the introduction of additional incentives for specialists of marketing and foreign trade services, organization of training, conducting training seminars;

− strengthen the participation of enterprises in tenders and exhibitions and fairs held abroad.

Thus, further development of market relations, entrepreneurship, increased participation of Belarusian light industry enterprises in the international division of labor, increased competition in the domestic market create favorable conditions for

the use of marketing strategies and their tools will adapt to specific market conditions and the specifics of private domestic enterprises.

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ANALYSIS OF AMERICAN EXPERIENCE IN BUILDING OF ENTREPRENEURIAL ECOSYSTEM ON EXAMPLE OF NORTH CAROLINA

АНАЛИЗ АМЕРИКАНСКОГО ОПЫТА ПОСТРОЕНИЯ ПРЕДПРИНИМАТЕЛЬСКОЙ ЭКОСИСТЕМЫ НА ПРИМЕРЕ ШТАТА СЕВЕРНАЯ КАРОЛИНА

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Key words: ecosystem, entrepreneurship, American experience, Research Triangle, start-up.

Ключевые слова: экосистема, предпринимательство, американский опыт, исследовательский треугольник, стартап.

Abstract. The article examines US experience of developing an entrepreneurial ecosystem in the United States based on the example of North Carolina, main differences with the Belarusian experience. On the basis of revealed differences, the ways of development of the entrepreneurial ecosystem in Belarus are suggested.

Аннотация. В статье рассмотрен американский опыт развития предпринимательской экосистемы в США на примере штата Северная Каролина, основные различия с белорусским опытом. На основе выявленных различий предложены пути развития предпринимательской экосистемы в Беларуси.

Similar conditions for doing business in the State of North Carolina with Belarus are noted: a comparable territory, a population of about 10 million people, a high level of education and a lack of minerals.

State of North Carolina began its transition to an innovative economy more than 40 years ago. And today it is not an agrarian state, as it was, but the fastest growing state in the US, which successfully competes with Silicon Valley.

There are about 800 thousands businesses in North Carolina now. Most of them are high-tech. More than 70% of jobs are created by small and medium-sized businesses [2].

Belarus has already taken steps, like the creation of HTP, for the transition to an innovative economy. However, this is only the first step. The creation of an ecosystem linking entrepreneurs, investors, universities, consultants will be the next step that will allow us to feel improvements in the economy in the coming years. North Carolina can be an excellent example of what and how to do.

The Raleigh region (the capital of North Carolina), Durham, Chapel Hill (Raleigh satellite cities) are the largest venture capital centers on the East Coast of the United States along with Boston and New York.

This part of North Carolina is called Research Triangle or Triangle (Research Triangle or simply Triangle - since there are 3 cities in the region). Infrastructure for the business community in Research Triangle began to develop when traditional industries for the region - the textile industry, tobacco production - went on a decline. More than 50 years ago, a research center, Research Triangle Park, was established here, which in the 21st century became the largest technology park in America, the starting point for innovations in biomedical sciences and technology [1].

Ecosystem Triangle is the complex system of organizations, people, initiatives, thanks to a large number of internal connections reminiscent of the web (Figure 1).

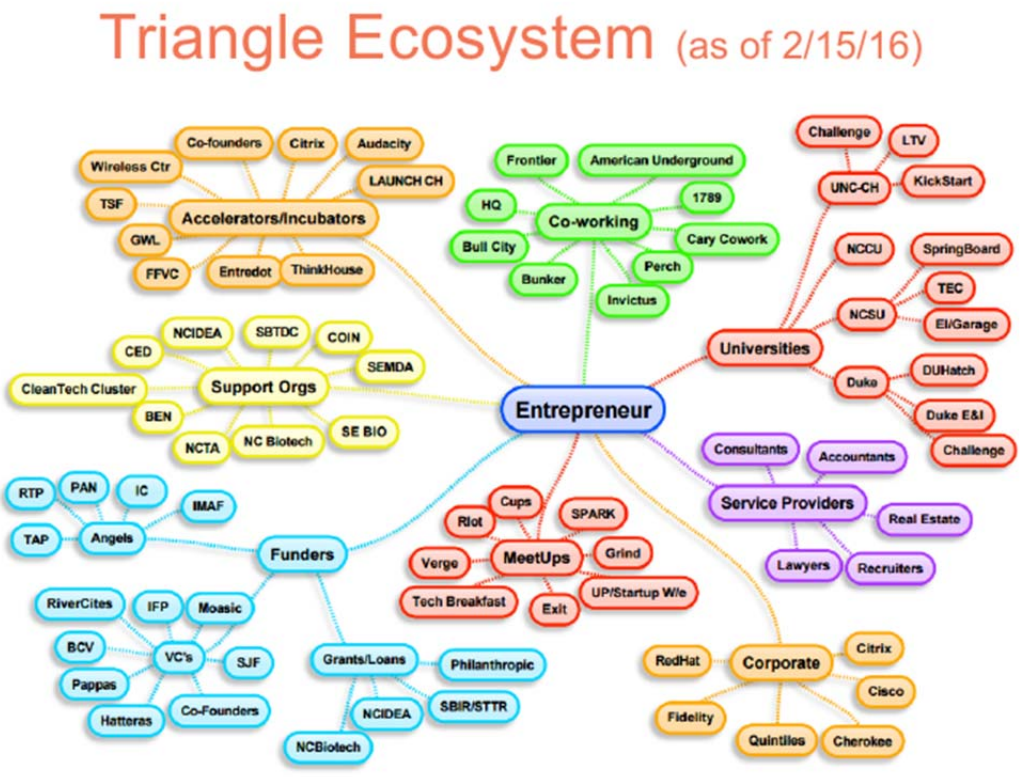

Figure 1 – Ecosystem Triangle as of February 15, 2016 [1]

The ecosystem is developed to create effective conditions for the development of entrepreneurship and the observance of the interests of all players in the market: investors, universities, large corporations, service providers, non-profit organizations supporting entrepreneurship [1].

The role of universities. A lot of technological projects start in the walls of alma mater. The three main universities in the region (UNC, NC State and Duke) attract talented researchers and generate intellectual property. It feeds the system of start-ups.

Often inside the university there are own accelerators and even venture funds. Universities actively cooperate with funds, investors and business angels, attracting them to mentor student projects. Their graduates participate in the life of universities very actively, including financially.

The goal of the university is not simply to leave the project at the level of a patent or an article about it, but to capitalize an invention created within the walls of an R&D laboratory. For this, start-ups are helped to receive grants. There are entrepreneurship training programs.

In Figure 1 we see that such an organization as SBTDC belongs to supporting organizations. But the North Carolina Small Business and Technology Development Center (SBTDC) is a statewide program supported by the University, the U.S. Small Business Administration and others. It provides individualized management counseling to over 4,000 businesses each year. The counseling is designed to help businesses achieve their goals and gain a competitive advantage. Their professional staff are highly educated and experienced – most with prior business ownership or executive experience [2].

Their services primarily revolve around key issues critical to growing businesses such as 1) identifying funding options & securing financing, 2) managing essential operational issues, 3) planning for the future and 4) assessing & improving strategic performance. Since 1984, the SBTDC has helped over 130,000 North Carolina business owners and prospective entrepreneurs make better decisions – often leading to increased revenue and employment. The SBTDC is a sponsor of the annual University of North Carolina Social Entrepreneurship competition where over 500 participants from all 16 campuses develop business plans for a social enterprise and then pitch their idea to a panel of judges [2].

Thus, the experience of the entrepreneurial ecosystem of the United States was studied using the example of the state of North Carolina. We can note the following points of ecosystem development in Belarus, starting with universities:

An important role in Belarus belongs to private initiatives aimed at supporting and developing entrepreneurship.

It is necessary to introduce a large number of programs for training entrepreneurship in senior classes, universities and business support centers.

It is essential to establish a deep connection between the local community, universities and business;

It requires an increase in the number of business incubators and accelerators and an improvement in the quality of the assistance provided to them;

A legal basis is needed to the possibility of investing the university in a student start-up and also for the possibility of independent development of a start-up; possibility of co-investment.

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BRANDING OF TERRITORIES AS AN ELEMENT OF REGIONAL MARKETING

БРЕНДИНГ ТЕРРИТОРИЙ КАК ЭЛЕМЕНТ РЕГИОНАЛЬНОГО МАРКЕТИНГА

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Key words: *regional marketing, territory branding, branding, marketing, positioning.*

Ключевые слова: *региональный маркетинг, брендинг территорий, брендирование, маркетинг, позиционирование.*

Abstract. In the article the problems of regional marketing and branding are considered. In this connection, in the modern world any country competes with another country for attracting the population, tourists, investors, etc. In the context of globalization, this led to the fact that the development of marketing territory, the brand of the state itself comes to the fore along with many important goals and tasks of the state. The purpose of the article is to reveal the notion of territory branding. Problems of branding of territories in the Republic of Belarus. Topicality is expressed in the fact that more countries and cities around the world are purposefully engaged in marketing their territories and regions, forming their own brands that determine the investment and tourist attraction for the area. Therefore, the development of branding of territories is very important.

Аннотация. В статье рассмотрена проблематика регионального маркетинга и брендинга. В этой связи в современном мире любая страна конкурирует с другой страной за привлечение населения, туристов, инвесторов и т.п. В условиях глобализации это привело к тому, что развитие маркетинга территории, бренда самого государства выходит на первый план

наряду со многими важными целями и задачами государства. Целью статьи является раскрытие понятия брендинг территорий. Задачи анализ брендинга территорий в Республике Беларусь. Актуальность выражается в том, что все больше стран и городов по всему миру целенаправленно занимаются маркетингом своих территорий и регионов, формируя собственные бренды, которые обуславливают инвестиционную и туристскую привлекательность для местности. Поэтому развитие брендинга территорий является очень важным.

The process of marketing and branding of cities and countries is inevitable, because this is one of the trends of globalization and competition of the world economy.

The country's reputation is not something detached and secondary, but a very important component of its overall "rating". Peculiar marketing of national scale. It should be noted that such leading countries as Canada, New Zealand, USA, France, South Africa, South Korea, Japan and many others are engaged in forming a positive image. The branding of territories includes the following:

Human potential. The most important wealth of any country is its people. The human potential is measured with the help of a general level of education and qualification of the workforce. But it also includes rather blurry concepts, such as the degree of hospitality, tolerance and friendliness.

Structure of power. In determining this concept, first of all, the degree of people's trust in power structures and their satisfaction with their work are taken into account. Public statements of the country's leaders on such fundamental issues as democracy, poverty, justice and the environment are also evaluated.

Export opportunities. Here, it is taken into account that a particular country can "offer the world." Goods and services produced in the country, and interest from other consumers are taken into account.

The cultural heritage unites achievements in the cultural sphere, including cinema, music, sports, literature and historical monuments.

Development of tourism. It is characterized by interest to the country from foreign tourists, ensuring their safety and an abundance of cultural and natural attractions.

Investment and immigration climate. They determine the extent to which the state attracts business and visitors from other countries in terms of studying, working and living.

Despite restrictions on the use of territorial marketing, Belarus is trying to increase exports, increase tourism attractiveness, search for investments, and brand Minsk and regional centers. All this reveals the urgency of considering issues of regional marketing and branding of Belarus and Belarusian cities.

There is no Republic of Belarus in the final report of Brand Finance for 2016, concerning the most expensive national brands in the world (Nation Brands 2016). In the first place the United States, then China, Germany. Russia is at 18th place, Ukraine – at 59th. [1].

Different countries have different approaches to improving the image, using the resources at their disposal. Thus, the main promising areas for the development of branding of the territory of the Republic of Belarus should be:

1. The initiative, both on the part of the population, and on the part of the state authorities. When implementing any activities related to the development of the branding strategy of the Republic of Belarus, the opinion of citizens should be taken into account. The Administration of the President of the Republic of Belarus, the Ministry of Foreign Affairs, the Ministry of Sport and Tourism, and the sectoral ministries should first of all work on the development of strategies on the part of the state.

3. Creation of large industry and regional associations and associations that would assume the function of positioning and promoting products produced in the country to the international market.

4. Development of the tourist and roadside industry, which allows increasing the flow of money to the country.

5. Creation of large industrial centers for saving material and non-material resources, as well as saving money for the development of logistics.

Thus, the world experience of regional marketing and branding of territories has already passed the first stage of its development, there were first mistakes and results. It's time for Belarusian cities and the country in general, using this experience, to develop their branding, branding, marketing strategies and attract talents, investments, tourists, increasing exports, increasing the efficiency of the Belarusian economy and the living standards of its population.

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UDC 378.1

DEVELOPMENT OF LIFELONG LEARNING IN VITEBSK STATE TECHNOLOGICAL UNIVERSITY

РАЗВИТИЕ НЕПРЕРЫВНОГО ОБРАЗОВАНИЯ В УЧРЕЖДЕНИИ ОБРАЗОВАНИЯ «ВИТЕБСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНОЛОГИЧЕСКИЙ УНИВЕРСИТЕТ»

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Key words: *Lifelong learning, advanced training, e-learning, textile speciality.*

Ключевые слова: *непрерывное образование, повышение квалификации, дистанционное образование, текстильная специальность.*

Abstract. The article deals with the history of lifelong learning and its development in VSTU for textile specialists. It reviews different groups of people engaged in textile sector according to their demands. The author scrutinizes the introduction of e-learning for advanced training of textile specialties.

Аннотация. В статье рассматривается история непрерывного образования и его развитие в УО ВГТУ. Делается попытка произвести обзор различных категорий граждан задействованных в текстильной промышленности. Автор описывает начало внедрения дистанционного образования для повышения квалификации текстильных специальностей.

«Lifelong learning (LLL) is the self-directed, continuous quest to seek formal or informal education for personal enjoyment or to develop career skills.»[1]

It is considered that the term was evolved from "life-long learners", created by Leslie Watkins and was first used by Professor Clint Taylor (CSULA) in 1993, which means that the term is rather young.[2]

If we trace back its history we'll find out a lot of interesting facts about lifelong learning. In Africa for instance lifelong learning was ageless. It included the concept of knowledge and learning that "emphasized relevance; responsiveness; respect for the dignity and integrity of all irrespective of age, gender, creed and color; equality; equity; socio-economic and political justice." For example, Botswana had learning institutions which required everybody to learn all the time, from birth to death. The objective was the pursuit of wisdom at all times in all pre-occupations—i.e., labor, craftsmanship, relationships, interaction, labour, socialization and integrative communal co-existence. Many Africans believe that the acquisition of wisdom is paramount so even when someone dies, he/she will continue the search for wisdom. Learning was an integral part of the indigenous educational system in Africa, which means that the term "lifelong" itself is much older. For example, among the Yorubas[3], the dead it has always been advised not to eat worms or millipedes in heaven. It is expected that learning continues even after death.[4]

So, learning has always been comprehensive, integrated and aimed at problemsolving, encouraging self-employment and the development of community spirit and healthy living. It cultivated self-reliance through the acquisition of various competencies—cognitive, affective and psychomotor. In other words, it envisioned the total development of everyone. Since ancient times it was lifelong and aimed at inculcating the basic values of integrity, tolerance and respect.

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[1] *http://study.com/academy/lesson/what-is-lifelong-learning-definition-benefits.html*
[2] *https://en.wikipedia.org/wiki/Lifelong_learning*
[3] *a Niger-Congo language of southwestern Nigeria and parts of Benin and Togo; also : a member of any of the Yoruba-speaking peoples of this region*
[4] *Integrating Lifelong Learning Perspectives, UNESCO Institute for Education, 2002, p.39 (317p.)*

But being well-educated is not necessarily the key to good employment. Employers are searching for specialists with transferable skills, which include the ability to learn and to develop. A more highly skilled worker is an asset to any company and can lead a faster promotion with associated salary increases.

Someone who can offer more expertise will be of more value not just to employers but also to customers, because expertise is a key quality of an effective leader. This is true from the financial point of view too. The more knowledgeable managers are the more profit the company can raise.

There are several groups of people in Belarus and several types of demands.

The first group clearly represents those already incorporated in the formal education system but inexperienced ones. Mainly the first group is represented by students. They face a system that is lacking in quality in terms of educational provision and that has not been proven useful in terms of delivering basic competencies and work-related competencies.

The challenge here is a matter of providing quality education, specially for those who have less. Another problem is a fast growing variety of new technologies appearing worldwide today and out of date equipment which does not let the specialists apply those new technologies. So, their demand is to gain managerial skills, to know the latest equipment in order to meet market requirements.

The second group is clearly the one to which LLL programs are channeled to. This group is represented by people whose common school level does not go beyond ten years. In Belarus there are thousands of people hired in textile who do have only basic education. These people either could not have access to education or have abandoned colleges or high schools basically for economic reasons; others join short training courses and end up in low grade economic activities in the formal labor market, or are trying to carry out self-employment strategies. In this context, LLL has very clearcut demands. People are basically concerned with having work skills and competencies in order to be able to incorporate themselves in productive activities. The problem is they also face serious deficits in terms of basic competencies.

Lifelong learning is not only an educational principle but a criteria for guaranteeing equal opportunities. Its two basic purposes are the promotion of citizenship and to increase people's capacity for productive incorporation. It is a matter of simultaneous education for social life and work—an educational and work dimension not isolated from each other. This is the main trend so far, but articulated in a continuum that goes from the first years of school to very corner and niche of everyday life all life long.

But how can we provide such a process for every group of specialists, ensuring them with the opportunities to get wages and gain knowledge simultaneously? How to organize on the job training for those who need to stay at the plant most of their time?

Nowadays when E-learning is gaining its popularity covering every stage of education, it will be not difficult to create such a structure which will propose

advanced trainings for every group of specialists: those with higher education, technical one and none at all.

There is an essential advantage of such delivery in advanced training for staff.

Specialists can gain new knowledge in their spare time. It is as good as gold for those enterprises which are distantly located from the educational institutions.

Throughout such project as Tempus project "University and Industry for the Modernization of textile manufacturing sector in Belarus" we have analyzed our existing system of advanced training for Belarus enterprises.

The results show that specialists as well as managers are very cautious about distance learning. For example answering the question:

"Do you consider for a specialist acceptable such form of advanced training as e-learning?" we could see that about third of the polled (that is 34,9 %of specialists and 29,4 % of managers) didn't know anything about such form of training. About 20% still do not accept such form of advanced training as e-learning.

All in all we have polled the staff of 16 Belarus enterprises and created a top list of distance courses according to their value for the specialists. There have been created 4 course modules dealing with:

- Quality evaluation of yarns and semi-products.
- Up-to-date methods of textiles finishing.
- Computer Aided Design in garment industry.
- Vector graphics Corel Draw.

Result level shows that E-learning is alternative to the face-to face teaching method and does not waste students' time; which fits the main ideas of LLL-process. E-learning complements face-to-face teaching method, and increased collaboration learning and interaction. Although VSTU has a stable internet provider to support easy and fast learning and teaching there are still significant challenges of E-learning in Vitebsk State Technological University education such as inappropriate finance for e-learning advertisement campaign.

"Vitebsk State Technological University proved to be a trusted provider of E-Learning. We were proposed a range of courses to suit every need. An e-course costs less to deliver, promotes the linkage of employment and study, allows students to work and live at home and avoids the burden of excessive debt." - mentioned all of the students.

The range of subjects is broad enough and tutor support is easily accessible, while the format allows students to combine their coursework with paid employment and so avoid excessive debts. By the way the average debt for a student starting advanced training course last year will be twice as much.

We can surely confirm that distance learning can be a fine platform to support LLL process for specialists of light industry and it will grow in popularity each year.

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COMPUTER SIMULATION OF THE MARKET EQUILIBRIUM OF THE PRODUCTS OF MILAVITSA CJSC

КОМПЬЮТЕРНОЕ МОДЕЛИРОВАНИЕ РЫНОЧНОГО РАВНОВЕСИЯ ПРОДУКЦИИ ЗАО «МИЛАВИЦА»

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Key words: competitiveness, demand function, supply function, equilibrium price, coefficient of elasticity of demand, correlation-regression analysis, regression equation, computer mathematics system, table processor.

Ключевые слова: конкурентоспособность, функция спроса, функция предложения, равновесная цена, коэффициент эластичности спроса, корреляционно-регрессионный анализ, уравнение регрессии, система компьютерной математики, табличный процессор.

Abstract. The article discusses the possibility of using application software packages to determine the competitiveness of light industry products in the domestic market. Statistical analysis of the data was used as a research method.

Аннотация. В статье рассматриваются вопросы возможности использования пакетов прикладных программ для определения конкурентоспособности продукции легкой промышленности) на внутреннем рынке. В качестве метода исследования выбран статистический анализ данных.

The purpose of the study was to study the competitiveness of CJSC “Milavitsa” products (articles of the women's assortment of the corset group) on the domestic market, determine the equilibrium price and the elasticity of demand.

Research methods: correlation-regression statistical analysis, optimal planning.

Initial data: real data obtained by students of the VSTU at the trading floors of CJSC “Milavitsa”.

Research tools: Maple computer mathematics (SCM) system (Statistics library) and MS Excel spreadsheet (functions of the Statistical category, tools Parameter selection and Solver).

The research algorithm in the Maple SCM environment can be represented as a sequence of the following steps:

1. Defining the source data (the producer price C and, corresponding to it, the values of the demand value Spr and the supply quantity Pr) as data arrays of the statsdata type.
2. Identification of the closeness and type of communication between the studied factors. Construction of a correlation field for demand and supply curves. Determination of the correlation coefficient.
3. The calculation of regression equations.
4. Determination of the equilibrium price of the goods and values of the elasticity of demand.
5. Conclusions.

The following results were obtained during the calculations. The value of the correlation coefficient between the price and demand R1 = -0.99482, which indicates a fairly close feedback between these indicators. The value of the coefficient of correlation between price and supply R2 = 0.99716, which means that the relationship between the price and the supply line and is also quite close.

The coefficients R1 and R2 in both cases are close to unity. Hence the possibility of calculating the regression equations for further determination of the equilibrium price is fully justified.

As a result of using the LinearFit (falg, Y, X, v, options) function of the SCM Maple Statistics library, two regression equations were obtained:

Demand = f (Price): F_lin1 = 181.-1.64*x and

Supply = f (Price): F_lin2 = 9.52+0.152*x.

According to these equations by performing a simple substitution, you can easily calculate the predicted values of supply and demand at a given price.

So, for example, at a conditional price of the product, equal to 50 den. units value of demand = 99.00 den. units, offers = 85.51 den. units.

To determine the equilibrium price we solve equations of the form F_lin1 = F_lin2, composed of regression equations. The root of this equation is the equilibrium price. In Maple SCM, this solution looks like:

RavnCena := evalf(fsolve(F_lin1 = F_lin2), 2).

For the original data set, the result value RavnCena := 54.27.

The values of demand and supply size, corresponding to the equilibrium price, are determined by substituting the value of the equilibrium price in the corresponding regression equations:

RavnSpros :=evalf(subs(x = RavnCena, F_lin1), 4); result: 92.00

RavnPredl:=evalf(subs(x = RavnCena, F_lin2), 4); result: 92.00

A study of the elasticity of supply and demand is of sufficient interest. For the group of goods under study, the elasticity coefficient, determined by the known formula, was Elasticnost = -0.8835, that < 1.

This means that in this case there is inelastic demand, that is, the buyer reacts poorly to a large price change.

The studies carried out in the MS Excel environment confirmed the results obtained in the SCM environment of Maple.

Based on the analysis of the competitiveness of CJSC «Milavitsa» products, the following conclusions can be drawn.

1. The use of modern software packages as a tool for both symbolic and numerical solution of economic and management problems made it possible to conduct a comprehensive analysis of the competitiveness of the products of the selected assortment group.

2. Since the correlation coefficients R1 and R2 in both cases are approximately 0.99, and the coefficient of determinancy $R^2 = 0.99^2 = 0.98$, we can say with certainty that the change in supply and demand by 98% is determined by the change in the price of the commodity. Accordingly, the values of the size of the equilibrium price, supply and demand can be considered adequate, real and used for analysis and determination of the strategy for promoting the goods of the assortment in question.

3. Since the coefficient of elasticity <1, in this case there is inelastic demand, that is, the buyer reacts poorly to a large price change. So, the decision-makers of CJSC Milavitsa can be recommended to develop an appropriate plan of measures, including a new strategy to attract customers, in order to increase the competitiveness of the products produced by the women's assortment, the group considered.

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JEL: O 310 O 320

THE INFORMATION AND COMMUNICATION TECHNOLOGY AS A FACTOR OF BUSINESS NETWORKS DEVELOPMENT

ИНФОРМАЦИОННО-КОММУНИКАЦИОННЫЕ ТЕХНОЛОГИИ КАК ФАКТОР РАЗВИТИЯ БИЗНЕС-СЕТЕЙ

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Key words: business networks, modern business organization, global competition, supply chain management, Living Labs.
Ключевые слова: бизнес-сети.

Abstract. The role of information and communication technology as a key factor of business networks development and their role in global competitiveness were analyzed in the article. It was concluded, that information and communication technology development is not only a prerequisite for networking and essential for innovative development, but is an important factor for global competitiveness.

Аннотация. В статье рассматривается роль информационно-коммуникационных технологий как ключевого фактора развития бизнес-сетей и их роль в глобальной конкурентоспособности стран. Сделан вывод о том, что развитие информационно-коммуникационных технологий является не только предпосылкой для развития сетевой экономики и основой инновационного развития, но и важным фактором глобальной конкурентоспособности.

The theory of networks began to develop quite a long time ago. For example, the development of graph theory, which is an integral part of it, dates back to 1736, when the German and Russian mathematician Leonhard Euler solved the "problem of Koenigsberg bridges". Although the term "graph" was introduced by the Hungarian mathematician Dénes Kőnig 200 years later (in 1936) (Бурков 2004: 4). Further, the theory of networks developed as an interdisciplinary theory, including sociology, economic and mathematical methods, digital technologies and communication, ergonomics, marketing, management, logistics and supply chain management.

At present, networks are becoming a characteristic feature of the new economy, which is associated with: the proliferation of digital and Internet technologies, mobile phones, new operations-management tools, based on the rapid progress of computer processing and analysis methods (Кастельс 1999, Дерябина 2014, Радаев 2008); the sharply increase in dynamic of environmental changes (Man 2004); high level of interdependence and uncertainty (Man 2004); increased competition in foreign

markets (Hamel, Prahalad 1994); rapid technological change (Hamel, Prahalad 1994); reducing the cost of interaction (Hagel, Singer 1999); the need to integrate many people's efforts, various scientific disciplines, owners of variety resources, including knowledge resources (Дерябина 2014).

Collaborative business networks provide the following advantages:

– they permit to survive and thrive in a rapidly changing environment, since they are more flexible, work better in a changing demand (Miles, Snow 1992), to reduce the uncertainty of its constituent economic entities (Castells 2001);

– the economic efficiency of activities at the territorial and sectoral level is increased due to transaction costs reduction with the growth of the network size (Третьяк, Румянцева 2003), the optimization of the management model (Новиков 2003), the formation of social capital in the form of accumulated mutual obligations (Радаев 2008), trust and business reputation, access to partner resources and achieving the synergistic effect from their use (Юлдашева, Катенев, Полонский 2016). Firms involved in networks are able to coordinate an important part of the business without increasing in-house costs associated with the growth of the company (Шерешева 2014);

– innovation activity and efficiency of innovation activity on the territorial and at the industry level are growing due to access to external complementary resources, better coordination of the innovation process (Третьяк, Румянцева 2003), accelerating the incorporation of knowledge and using them in the most profitable market segments (Петропавлов 2007); the formation of a specific innovation space as a space of mutual understanding and consensus (Дерябина 2014). Networked organizational forms makes an economy's ability to self-development on the basis of continuous updates, ie make economic growth innovative-oriented and more sustainable (Смородинская 2015);

– they allow the product creation that has the highest possible and economically justified value for consumers by speeding up the response of enterprises to changing market conditions (Вертакова 2009) and the emergence of new opportunities found in the interaction with customers (Шерешева 2014).

Figure 1 presents factors and results of collaborative business networks development.

In this way, information and communication infrastructure is a prerequisite for networking and essential for innovative development. It includes hardware and software, telecommunications networks, as well as innovative resources.

There are different types of indexes, which are used for measuring the preparedness of nations for the networked world; among them are the Networked Readiness Index (NRI), the E-Government Development Index (EGDI) and the Information and Communication Technology (ICT) Development Index (IDI).

The research has shown (Слонимская 2016: 120) that every of the indexes which are used for measuring the preparedness of nations for the networked world closely correlate with the GCI. The highest correlation we can see between GCI and NRI (correlation coefficient is 0,929).

So we can conclude that ICT development is not only a prerequisite for networking and essential for innovative development, but is an important factor for global competitiveness. It is important to know what contribution individual components of NRI make to GCI in order to choose the priority directions of ICT development. This problem can be solved if the components of the NRI index are chosen as factors, and the result is GCI.

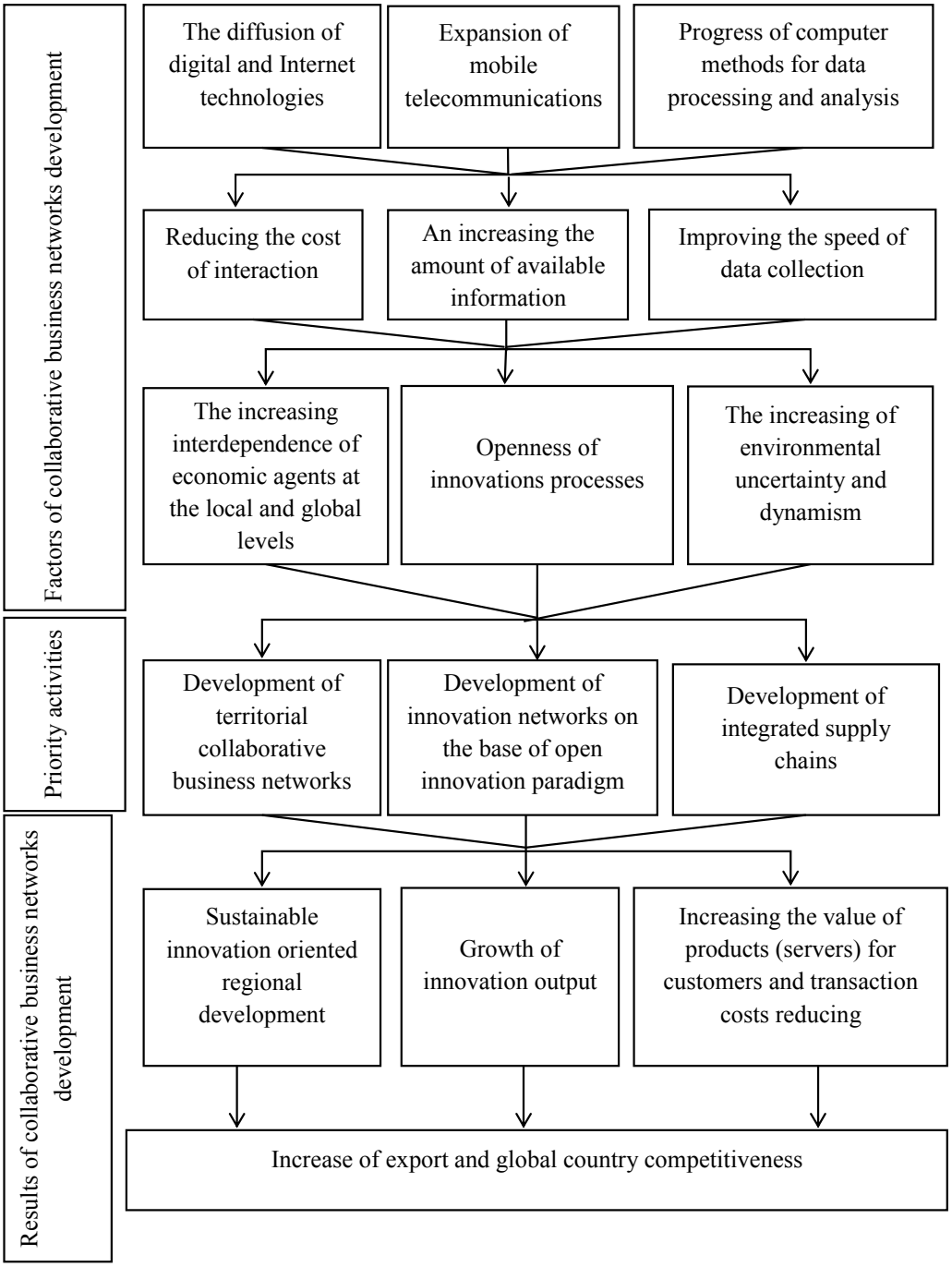

Figure 1 – Factors and results of collaborative business networks development
Source: Author's own elaboration

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ADVANCED COMMUNICATIONS TECHNOLOGIES AND SERVICES IN E-COMMERCE

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Key words: communication, information, a model, the Internet, a site, a consumer.
Abstract. A socially conditioned process of data communication and perception in terms of interpersonal and mass communication on different channels using a variety of communication tools is taken as the basis of communication.

The object of the research is the textile industry of the Belarusian State Concern for Production and Retailing of Light Industry Goods “Bellegprom”.

The objective of the present research is to analyse the quality of the website content and the level of the feedback from customers-visitors.

The study formulated the following criteria for the evaluation of the website:

– website quality assessment (content quality: modern, outdated, a simple site);

– feedback from site customers-visitors (elements of communication: a telephone, e-mail, Skype (Viber), social network, a consultant in the chat form, a consultant in the e-mail form, a consultant in the form of a telephone dialogue, a customer profile).

The textile industry of the Belarusian State Concern "Bellegprom", at the time of the research, is composed of 17 enterprises [5]. Only 14 of those have websites in working access, one website is under construction, two enterprises do not have any websites at all [6]-[20].

As a result of the evaluation of the website quality assessment it was revealed that 30 % of all enterprises have a modern structure of the site, 30 % of websites have an outdated structure, 40 % – have very simple sites with the "showcase-website" structure.

The sites were considered from the aspect of communication models – who is the initiator of communication:

– a push model of information delivery, in which consumers play a passive role and have only a limited choice of information channels;

– a pull model of information delivery, in which information is provided upon user request.

The allocation of communication models based on the initiator of communication:

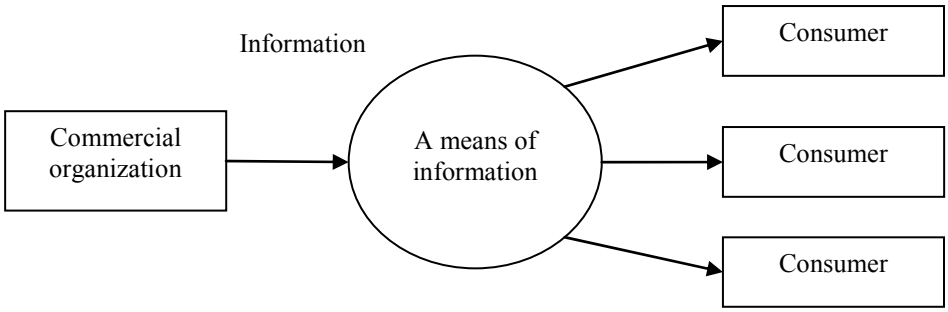

Figure 1 – A push model of information delivery

This model (Fig. 1) is common to the media and websites with a simple structure, where one can find a minimal set of communication options with information consumers on goods.

The Internet can follow this model by using push technology, where the user can only subscribe to the catalog for more information.

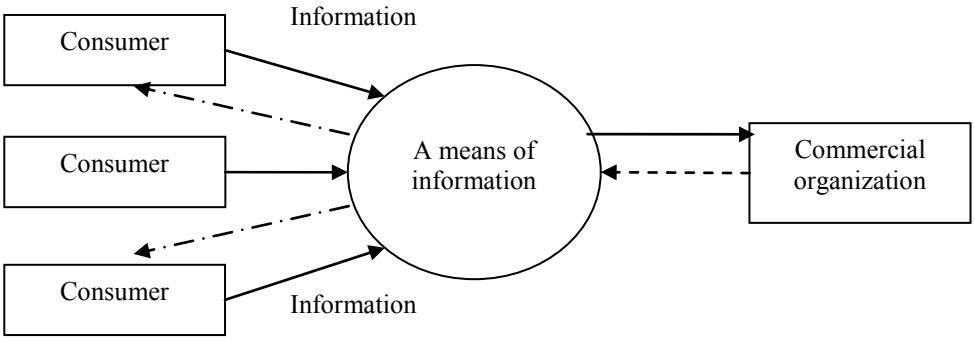

Figure 2 – A pull model of information delivery

In network pull-models (Fig. 2) the information delivery is performed upon user request. This feature of the Internet environment is linked to the active role of the consumers, determined by increased demands for information retrieval. The implementation of this model requires from enterprises greater attention to the structure and the content of the site.

After evaluating the feedback from website customers-visitors of the enterprises of the Belarusian State Concern "Bellegprom" the following results were obtained: 100% – use of telephone service; email and a consultant in the e-mail form; 21.43% of enterprises use Skype (Viber); 42.86% – social networks; 7.14% – a consultant in the chat form; 14.29% – a customer profile; 0% – a consultant in the form of a telephone dialogue.

The Internet has a huge impact on communication policies in e-commerce. Modern Internet technologies have an impact, both passive and active, on a customer. Adds, sales promotion, direct selling of goods can be considered as an additional resource of communication.

The dynamic development of electronic communication networks leads to an increase in the number of Internet users and increase in the number of online store visitors. Such situation places high demands on content and structure of enterprise websites. To communicate with potential visitors and buyers enterprises should use all possibilities of modern Internet communications. Further development and improvement of the work with buyers via the Internet system will be positive for the development of e-commerce in general.

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COMPUTER-AIDED ASSESSMENT OF LEARNING PROGRESS

АВТОМАТИЗИРОВАННЫЕ СИСТЕМЫ ОЦЕНКИ УСПЕВАЕМОСТИ

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Key words: computer-aided assessment, objective tests, question banks, optical mark reader, integrated learning system

Ключевые слова: автоматизированная система оценки, предметные тесты, банки вопросов, сканер отметок, комплексная учебная система

Abstract. The article discusses ways of applying computer systems and software packages in assessment of students progress. Advantages and disadvantages of computer-aided assessment are analyzed. Ways to improve assessment quality with the help of computer tests are presented.

Аннотация. В статье рассматриваются способы применения компьютерных систем и программного обеспечения для оценки успеваемости студентов. Проанализированы преимущества и недостатки автоматизированных систем оценки знаний. Представлены способы повышения качества оценки с помощью компьютерных тестов.

Increased numbers of students in higher education and the corresponding increase in time spent by staff on assessment has encouraged interest into how technology can assist in this area. Ensuring that the assessment methods adopted reflect both the aims and objectives of the course and any technical developments which have taken place is becoming increasingly important, especially as quality assurance procedures require departments to justify the assessment procedures adopted.

Technology can be used for assessment purposes at various levels ranging from the management of the assessment information to a fully automated assessment system. Using technology for the management of assessment information can enable information to be presented in different ways to meet the needs of different audiences

(such as teachers, students, course organisers and external examiners). Not only the quality of presentation of reports but more importantly the range and scope of their content can be improved by utilising technology for this purpose. At the other extreme, in a fully automated assessment system all aspects of the system from the assessment which the student completes to the processing and administration of the marks, including the overall management of assessment information, is technology-based.

There is growing interest and increasing practical experience in the use of computers to deliver objective tests. Objective testing is often taken to imply the use of multiple choice questions (MCQs). However, objective tests can incorporate a wide range of question styles in addition to standard multiple choice questions; for example multiple response, word entry, number entry, gapfill and free-format where student entry is compared to a correct solution using a keyword search. Objective tests, and MCQs in particular, are generally considered to be an efficient method of testing factual knowledge, enabling a wide syllabus to be examined in a relatively short time. It is, however, important for academic staff to be aware of the limitations of objective tests (especially MCQs), particularly in their inability to indicate higher level and process skills. Objective tests can be used for both formative and summative assessments, and a variety of scoring systems can be applied, tailored to the importance of discouraging students from guessing answers.

Computerised delivery of objective tests offers interesting possibilities not available within paper based systems:

Electronic delivery of tests need not be restricted to MCQs, and the results recorded need not only be whether a response is right or wrong.

Consider the situation where a question has been posed, but the student is unable to get started. In a traditional setting (for a summative test) this student would be forced to omit this question and try another. In an electronic setting it is possible to include an option to provide a hint for the student. Most computer based assessment packages can operate in a choice of modes, perhaps described as tutorial or exam mode. The exact number of modes available varies from package to package, but four modes is not uncommon, each offering a different level of detailed feedback for the student, to assist them in reaching the correct answer, or explaining why their response was not correct.

Questions can be split up into several stages, and marks can be awarded at interim stages before a final answer is determined. Marks can be deducted if hints have been provided. For students who have made a slip, the computer can identify an error and offer the possibility of going back, correcting an interim answer and hence enabling the student to successfully reach the final stages of a question.

In addition to using electronic packages to create unique tests, it is possible to use the computer to generate different tests automatically.

Question banks: Electronic selection of questions from a bank has already been mentioned as one possibility for the electronic generation of tests. The creation of a question bank is a demanding task for a single individual, however, where several

members of staff (possibly from different institutions) collaborate to share questions a large bank can be established relatively quickly. From this a huge number of different tests can be generated.

Randomisation of parameters: An alternative method of generating questions electronically is the use of parameters. The format of the question will be identical on every occasion, but one or more variables in the question is selected from a list of permitted values. These values may be entered when the question is created, or they may be generated by the computer, either randomly or according to some formula.

Perhaps the most immediately obvious and most easily accessible use of technology to assist the assessment process is in the recording, analysis, general storage and management of results. A wide range of spreadsheets, statistical packages and database packages are available, into which it is easy to enter data manually if results are not already in electronic form, though enormous care must be taken to avoid transcription errors when generating the data files. Most of these packages readily accept the transfer of electronically stored data from other applications, aiding data acquisition and increasing the potential data analysis that can be carried out.

The use of electronic methods to store and manipulate data becomes pointless if the integrity of the data cannot be guaranteed. The manual entry of marks is particularly susceptible to error, time consuming and costly to check thoroughly. The use of data capture devices, such as an Optical Mark Reader (OMR) connected to a computer, can vastly reduce input errors, particularly the problem of number transposition on data entry, e.g. typing 45 instead of 54.

Once the student answers have been stored for a test, the responses can not only be scored but can be analysed in a number of different ways, e.g. by individual question, groups of questions, all questions. Thus a variety of reports can be produced such as: the results of individual students; the results of groups of students including the mean, median and modal scores; graphs of results; analysis of each question including its reliability, facility value and discrimination factor.

One obstacle which can prevent teaching staff from utilising technological solutions to administer student assessment is the worry of security.

When considering delivering assessment on computer, it is possible to password protect the file containing the test and also to disallow access until after a particular date. To overcome the possibility of students copying from each other's visual display screens, the possible responses to each test question can be displayed in a different order. Also databanks of questions can be used which means that each student is sitting a comparable but not identical test.

Plagiarism should present no greater problem in an electronic environment than in a more traditional context. However, the "cut and paste" facility of word processors and information retrieval systems may tempt students to copy sections of text directly into their work. Students should be made aware of the law relating to copyright, especially when they are asked to compile portfolios or other multimedia presentations.

There are a number of examples of Integrated Learning Systems (ILS), where entire course structures, lecture, practical and assignment schedules and supplementary resources are held electronically and available for student consultation whenever needed. The management of assessment schedules is just one small part of an ILS, and an equivalent benefit is available through the use of other, less holistic tools.

For departments where electronic mail is available this offers both tutors and students an efficient and straightforward means of communication. One application is to use e-mail to remind students of impending deadlines. Even students who are absent when the message is first posted are certain to receive the message when they next access their mail. Similarly any changes, revisions to the assignment, or hints can be delivered to all students.

Assignments can be submitted electronically. For distant learners this avoids the need to rely on the speed of postal services, and for all students the date and time of delivery is automatically attached, so meeting deadlines can be monitored accurately.

Computers are an ideal tool to track attendance or achievement records, allowing monitoring of trends, for individuals and cohorts, comparison between years or classes and early identification of problems.

Examples exist of courses where seminars are presented electronically, rather than in a tutorial room as is conventional. The student leading the seminar prepares a paper and submits this by e-mail to the group for consideration. Some electronic discussion follows, prompted where necessary by the tutor. After a few weeks the student 'presenting' summarises the discussion, and presents a revised paper.

Management of such seminars does require skill from the tutor in judging just when to contribute a comment in order to keep discussion going. It also offers possibilities for peer group assessment and other less traditional methods.

Simulations have been in use for many years to assess likely performance in hostile environments, particularly, but not exclusively, as a formative assessment tool. A simulated environment can never be quite like "the real thing", as assumptions, simplifications and restrictions will have been programmed into any simulation - creating problems of realism. However, assessment problems associated with experiments in the real world, which sometimes behaving unpredictably, can be avoided in a simulated environment.

Electronic assessment tools are unlikely to reduce significantly the burden of assessment, but they can be used to promote deeper and more effective learning, by testing a range of skills, knowledge and understanding. Using computers in assessment does not have to mean more multiple choice testing to the exclusion of other assessment techniques. A wide range of innovative assessment methods lend themselves to computer based implementation.

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EXCHANGE RISK HEDGING

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Key words: *Hedging, derivative financial instruments, forward price, forward points.*

Abstract. The article analyses the problems caused by the establishment of a floating market exchange rate regime in the Republic of Belarus. The liberalization of the currency market makes it necessary to use the strategies of risk hedging due to unfavorable changes in the exchange rate dynamics.

Introduction

The transition of the National Bank to a more flexible FE (foreign exchange) mode as well as external shocks associated with significant fluctuations of prices for oil and world currency courses have brought up to date the issues of improving FE risk management system.

Since the beginning of 2015 the National Bank has pursued a policy of the flexible exchange rate of the Belarusian ruble.

The exchange rate is determined by the market, which is economically positive. At the same time, the volatility of the exchange rate has increased, which determines the need for currency risk insurance.

This necessitates the use of security policies and risk hedging of losses due to unfavorable changes in the exchange rate dynamics.

Research results

The goal of risk management is not to eliminate it but to achieve the optimal risk structure and to transform it into acceptable forms.

The result of the effective FE risk management is the reduction of losses from changes in world currency rates, the reduction of the uncertainty of future cash flows, providing a more efficient financial management and the reduction of income fluctuations.

The greatest stability of the currency market is provided by the participants who don’t seek additional revenue from exchange rate fluctuations.

First of all these are importers and exporters who use currency trading for goals that do not depend on short-term fluctuations of exchange rate differences.

One of the most common and effective ways of risk management in the field of currency market trading is the application of the approaches of technical and fundamental analysis of the dynamics of FE rates and the use of derivative financial instruments for currency risk hedging.

Hedging transactions (hedging) are forward sales or purchases of a foreign currency (or the execution of an option strategy) to reduce an exchange risk exposure connected with the assets or liabilities (or forecasted transactions) denominated in a foreign currency. They are not held for speculative purposes, but are carried out mainly to minimize the risk.

Hedging allows to effectively manage market risks even in conditions of increased instability inherent in the world economy due to the consequences of the financial

crisis, which leads to the impossibility of predicting the future behavior of market indicators, therefore, in the world practice, the use of various hedging instruments has long become an integral part of the economic activities of most companies. To be able to successfully compete in the international market, the subjects of management of the Republic of Belarus also need to learn how to work with hedging instruments.

The main purpose of hedging is the achievement of the optimal risk structure, that is, of a balance between hedging benefits and its cost.

The main constituents of the hedge are the following main derivative financial instruments (hereinafter – the DFIs):

– Forward: Actual exchange of currencies where settlement takes place more than two days after the trade at a fixed rate. The forward price is comprised of the spot rate plus the forward points.

– Currency futures: A transferable futures contract that specifies the price at which a currency can be bought or sold at a future date. Currency futures contracts are legally binding and counterparties that are still holding the contracts on the expiration date must trade the currency pair at a specified price on the specified delivery date.

– FX option: A contract that grants the buyer the right, but not the obligation, to buy or sell a specified currency at a specified exchange rate on or before a specified date. For this right, a premium is paid to the seller, the amount of which varies depending on the number of contracts if the option is bought on an exchange, or on the nominal amount of the option if it is done on the over-the-counter market.

– FX swap: Spot foreign exchange transaction simultaneously reversed by a forward contract. The difference in rates reflects interest rate differentials between the two currencies.

The world practice shows that the hedge is one of the main and the most popular ways of risk management and control.

According to experts FE market entities of the Republic of Belarus has gone out in a limb because of the current situation.

“Due to the fact that many companies in Belarus carry out export and import operations, are obliged to sell 30% of its currency revenue and have costs and revenues in different currencies, this kind of exchange rate fluctuations have a negative impact on them, increasing risk of potential losses due to unexpected leaps in exchange rate” – experts of the Research Center of the Research, Forecast and Monitoring and of the German Economic Team in Belarus believe.

Experts consider that such a situation poses Belarusian companies “the question of how to deal with this kind of currency risk and to protect their revenues from the volatility of the Belarusian ruble.

Economists estimated that a growing number of companies in the world hedge these risks. The authors of the research give data showing that Western companies prefer to hedge about 40% of FE risks.

It should be noted that in Belarus there are currency risk hedging instruments, however, they are not widespread yet because of the complexity of accounting of these transactions as well as some other problems.

Currently, in the Republic of Belarus derivatives market is immature both in terms of the Belarusian Currency and Stock Exchange and OTC market.

Regulatory barriers: for transactions with derivative financial instruments (including the concepts of “derivative financial instrument” and “derivative

security"), as a result there are problems with identifying and recording these types of instruments.

Accounting methodology: Insufficient methodology and practice of accounting of transactions with derivatives market instruments and, in particular, instruments of currency risk hedging.

As the chairman of the Belarusian Currency and Stock Exchange stated in 2015 the volume of futures transactions which make it possible to hedge currency risks amounted to only 16.6billion rubles in Belarus. "At present currency futures in Belarus are not widespread due to poor awareness of customers as well as unresolved taxation and accounting issues of these transactions", – the Chairman of the Exchange claimed.

Studies of economic features of financial instruments used in the world and now in the Republic of Belarus too, revealed significant differences in the essential characteristics of financial instruments, as well as in their quantitative parameters in various segments of the global monetary and financial market.

Conclusions and suggestions

The use of futures transactions of the financial market is a tool of insurance of one of the currency risks – the danger of loss of conversion of foreign money into the national one or vice versa.

Financial instruments should be used both for immobilization of idle cash for the needs of the national economy, control of inflation and for effective hedging of all risk groups aiming at minimizing the results of their impact on assets in place.

Hedging transactions (hedging) are term transactions concluded to prevent possible losses as a result of changes in prices and rates of commodity, currency and stock markets and exchanges. They are conducted not for speculative purposes, but are carried out, mainly, in order to minimize the risk.

On the basis of the considered characteristic differences of hedging derivatives on the OTC and exchange markets, taking into account the specifics of the main forward transactions, taking into account the dual nature of derivatives, the author defines concepts such as "hedge" – a derivative financial instrument is used to optimize the price risk of the underlying asset on commitments and the accepted planned with the greatest possible efficiency according to the developed and allows hedging strategy etc. its implementation (under certain conditions) to receive additional financial profits.

The definition of the concept of "hedging" – an independent kind of economic relations on the optimization of the price risk on the actions taken and planned commitments through the use of hedging instruments with the greatest possible efficiency.

Multivariance of risks when conducting transactions in the open market naturally requires both on the part of the central bank and on the part of other participants of the FE market using different combinations of ways to hedge risks.

The National Bank as a future single regulator should pay special attention to the development of this market.

Thus, in order to minimize exchange risks implementing currency transactions it is necessary to develop the uniform concepts and rules of practice for the application of all exchange risk security tools taking into account both world experience and the peculiarities of the national monetary and financial market functioning.

Based on the study of the world experience of hedging foreign exchange risks by non-financial organizations, it is possible to indicate the main factors constraining the use of hedging instruments (over-the-counter and exchange) in the Republic of Belarus:

– the lack of normative legal documents regulating and explaining the procedure for conducting and accounting for non-financial organizations of hedging transactions, as well as establishing the procedure for taxing income on hedging transactions of currency risks and accounting for arising expenses in taxation;

– low quality of corporate risk management in enterprises;

– there is no risk-taking in the currency market, which would be ready to assume positions on buying / selling currencies with forward execution dates;

– the lack of profitability in the benchmark market for long-term debt instruments, a repository.

Summary

The National Bank's transition to a more flexible exchange rate regime, as well as external shocks related to the significant fluctuations in world oil prices and world currency rates observed in recent years, was stimulated by non-financial organizations that perform settlements in foreign currencies for export-import transactions and liabilities on banking Loans, to hedging foreign exchange risks.

The result of effective currency risk management is a decrease in losses due to changes in the rates of world currencies, a reduction in the uncertainty of future financial flows, the provision of more efficient financial management, and a reduction in profit fluctuations.

One of the most common and effective methods of risk management in the field of operations in the foreign exchange market is the application of hedging methods of currency risks.

A key factor for the further progressive development of the domestic derivatives market, as well as its effective and reliable functioning, among other things, is the full-fledged market infrastructure for hedging in the Republic of Belarus.

It is considered appropriate to divide measures oriented to the development of the institution of hedging currency risks on conditionally two blocks of measures.

The first block of measures includes measures to develop corporate risk management, improve the infrastructure of the derivatives market.

The second block is the activities that lie in improving the system of regulating the derivatives market and the legal framework for the derivatives market.

Priority at this stage are measures to improve the mechanisms for regulating hedging transactions of currency risk in terms of their accounting in the accounting of non-financial organizations and determining the taxable hedging base, clarifying the procedure for disclosing the hedging strategy, developing a national methodology for calculating the benchmarks of profitability in Belarusian rubles for a period of 1 month Up to one year, the creation of a national system for collecting, processing and storing information on transactions performed on the OTC market.

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DEVELOPMENT OF INTEGRATION COMMUNICATIONS IN IMPROVING COMPETITIVENESS OF ENTERPRISES OF THE REPUBLIC OF BELARUS: THEORETICAL AND PRACTICAL ASPECTS

РАЗВИТИЕ ИНТЕГРАЦИОННЫХ СВЯЗЕЙ В ПОВЫШЕНИИ КОНКУРЕНТОСПОСОБНОСТИ ПРЕДПРИЯТИЙ РЕСПУБЛИКИ БЕЛАРУСЬ: ТЕОРЕТИЧЕСКИЕ И ПРАКТИЧЕСКИЕ АСПЕКТЫ

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Key words: *integration communications, competitiveness, efficiency, cluster structures, coopetition, stakeholders*
Ключевые слова: *интеграционные связи, конкурентоспособность, эффективность, кластерные структуры, коопетиция, стейкхолдеры*

Abstract. The relevance of development of integration communications for textile and clothing enterprises is proved in article. The assessment of integration

communications with stakeholders at the textile and clothing enterprises of the Vitebsk region is given. Methods of development of integration communications in factors of formation of competitiveness: education, innovations and marketing are offered for increase in competitiveness of the enterprises.

Аннотация. В статье обоснована актуальность развития интеграционных связей для предприятий текстильного и швейного производства. Дана оценка интеграционных связей со стейкхолдерами на предприятиях текстильного и швейного производства Витебского региона. В целях повышения конкурентоспособности предприятий предложены методы развития интеграционных связей в факторах формирования конкурентоспособности: образовании, инновациях и маркетинге.

The problem of increasing the competitiveness of enterprises is actualized by the problems of globalization and the strengthening of the influence of the institutional environment on the activities of enterprises, as well as the resulting increased competition in the domestic and foreign markets. Integration communications can be competitive advantage of subjects of managing in the conditions of globalization, intense competition in the market.

Integration communications at the enterprise are association, creation of communications, development of relationship between subjects of managing (interested parties) which is shown in various connection of their resources for realization of the purposes of effective joint cooperation and assumes voluntariness of this process based on business ethics.

The coopetition relations are new to the Belarusian economy. Coopetition is a type of horizontal communications, special level of economic integration of subjects which assumes competitive cooperation, i.e. includes both competition relations and cooperation relations [2, 3]. Developing integration communications, the enterprises will be able to increase the efficiency and competitiveness that is confirmed by foreign experience. The directions of formation the competitiveness of the network cooperation are the following: decrease in transaction expenses thanks to informal communications; activization of scientific research and production of competitive production thanks to programs of research and development joint with subjects of network cooperation; increase in export thanks to joint marketing programs; increase in sales, acceleration of a turn thanks to creation of chains of deliveries.

Decrease in the following indicators was revealed by the analysis of a condition of textile and clothing production during 2011-2015: specific weight of production in a total amount of industrial production from 3.4% to 2.8% [4]; specific weight of the shipped innovative production from 8.3% to 6.2% [4]; profitability of sales from 19.9% to 9.6% [4]; coefficient of the current liquidity from 201.5% to 131.0% [4]. Increase in specific weight of the unprofitable organizations in the total number of the organizations from 18.1% to 32.6% has turned out to be consequence of deterioration in economic indicators [4].

The assessment of integration communications with stakeholders at textile and clothing enterprises of the Vitebsk region was carried out according to the author's method [2]. The methodology assumes an assessment of the level of integration communications on a 5-point scale. Results of assessment of integration

communications of the enterprises of textile and clothing production of Republic of Belarus, average on experts, are presented in table 1.

Table 1 – Assessment of integration communications at the enterprises of textile and clothing production of the Vitebsk region

Criteria of development of integration communications	Average score
Among employees at the enterprise	3.68
Development of production cooperation of the enterprise with other enterprises and the organizations in production and sales of products	2.84
Cooperation of the enterprise with educational institutions	1.59
Cooperation with competitors	1.51
Cooperation with science and technology parks and business incubators	1.16
Cooperation with the centers of support of business, marketing centers (advertizing agencies, consulting agencies on carrying out market researches and others)	1.65
Cooperation with state bodies	3.51
Development of the informal relations of the enterprise with partners (without signing of the contracts and cooperation agreements)	2.03
Total score of the level of development of integration communications	17.97
Assessment of the level of development of integration communications on average in the directions	2.25

Source: own development by results of poll.

Apparently from data of table 1, average assessment of the level of development of integration communications at the enterprises of textile and clothing production makes 2.25 points from 5 maximum points that on a qualitative scale (table 1) demonstrates the insignificant level of development of cooperation and partnership at the enterprises of textile and clothing production of Republic of Belarus.

Methods of development of integration communications in factors of formation of competitiveness: education, innovations and marketing are offered for increase in competitiveness of the enterprises.

In the sphere of science and education creation of joint structures is offered:

1) Creation of representative offices of the vertically integrated holding at the regional universities through: creation of joint departments and joint research laboratories [1].

2) Creation of corporate training centers in management company of holding together with the regional universities.

3) Creation of scientific and technical backs-off of the enterprises. The innovative companies opened on the basis of the universities allow to turn results of researches

and opening into the qualitative samples of products with higher consumer, technological, technical, economic and other properties than existing and also provide yesterday's students with additional jobs.

Technological platforms are offered to be created for ensuring network cooperation and development of integration communications in the scientific and technical sphere. The technological platform has to combine efforts of representatives of holding, subjects of network interaction, science and the state. Objectives of the technological platforms are: coordination of research carried out at the pre-competitive stage, including in the emerging foresight system, which includes: the identification of technology packages, including the key technologies that can ensure sustainable competitiveness of the holding company in the world market; the definition of thematic areas of research of fundamental and applied problems whose solution is necessary for formation of appropriate technology packages; assessment of the necessary resource provision for research.

Cooperation in marketing is offered to be carried out in the following directions:

– use of joint branding, i.e. sharing of communication channels by several partners for development of a market niche at which the total effect exceeds results of use of the same channels by each of partners separately;

– carrying out joint market researches of the foreign markets;

– development of strategy of corporate social responsibility;

– joint programs of market segmentation and positioning of goods;

– joint programs of advance of goods in foreign market, including advertizing, sales promotion, holding commerce and industry trade fairs;

– creation of uniform information networks between participants of network interaction on the basis of CRM technologies.

Thus, the enterprises of the Republic of Belarus need to develop the strategy of formation of integration communications and mechanisms of her realization for ensuring innovative development. Development of integration communications will allow to establish such relationship between the enterprises (partners) which will provide long-term rapprochement of the general purposes of the integrating and integrated enterprises.

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THE STATE OF LABOUR MARKET INFORMATION SYSTEM (LMIS) IN BELARUS: PARTICIPANTS, INFORMATION RESOURCES, INTERACTIONS

СОСТОЯНИЕ ИНФОРМАЦИОННО-АНАЛИТИЧЕСКОЙ СИСТЕМЫ ТРУДА (ИАСРТ) В БЕЛАРУСИ: УЧАСТНИКИ, ИНФОРМАЦИОННЫЕ РЕСУРСЫ, ВЗАИМОДЕЙСТВИЯ

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Key words: *labour market informational system, skills anticipation.*
Ключевые слова: *информационно-аналитическая система рынка труда, прогнозирование навыков.*

Abstract. This article explaines how Belarus' labour market information system (LMIS) was organised, the reflections and changes of LMIS during 2016-2017 and the prospects for the future. Some awareness of problems related to the developing LMIS in Belarus was formulated. Main results of the work for construction LMIS in Belarus following ETF seminars and project in the context of Platform 2 are shown. Perspective development trends of LMIS formation in Belarus are: expansion of forecast methods (surveys, econometric and mathematical methods), diversity of LMIS products, upgrade of data collection and processing methods for labour market

information and that on personnel demand, use of Internet services, portals and platforms, development of public-private partnership during the creation of LMIS.

Аннотация. Статья содержит анализ организации информационно-аналитической системы рынка труда и прогнозирования навыков в Беларуси (ИАСРТ), направления ее изменений в течение 2016-2017 годов и перспективы на будущее. Выделены недостатки существующей системы. Показаны основные результаты работ по ее построению под влиянием семинаров и проекта ЕФО в рамках Программы II Восточного Партнерства. В качестве перспективных направлений развития ИАСРТ в Беларуси выделены: расширение используемых методов прогнозирования (опросы, ЭММ), разнообразие продуктов ИАСРТ, совершенствование методов сбора и обработки информации о рынке труда и потребности в кадрах, использование интернет технологий, порталов и платформ, развитие государственно-частного партнерства в построении ИАСРТ.

By 2016 year Republic of Belarus has a good institutional framework for LMIS. This framework includes:

Decree № 972 issued by the Council of Ministers of the Republic of Belarus on 19.07.2011 «On some issues of making the order for training of personnel»;

Decree № 62/68/125 issued by the Ministry of Economy, the Ministry of Labour and Social Protection and the Ministry of Education of the Republic of Belarus on 30.10.2015 ordered to summon 2 working groups:

– on ongoing planning of personnel training to work out enrollment plans for educational institutions;

– on improvement of medium- and long-term skills anticipation to identify general requirements to the information system and skills anticipation and to coordinate the work on its development and implementation.

The structural scheme of LMIS is developed which includes the following three modules: 1. Economy; 2. Labour market; 3. Professional education (table 1).

Table 1 – A fragment of the structural scheme of information system and skills anticipation

Module 1. Economy	Module 2. Labour market	Module 3. Professional education
The Ministry of Economy	The Ministry of Labour and Social Protection	The Ministry of Education
Demographic forecast. Manpower balance forecast (resource and distribution segments) – the employed and the unemployed. Forecast of the employed distribution among kinds of economic activities	Labour supply forecast. Unemployment forecast . Skills anticipation across professional and qualified groups. Development of workforce qualification reference guides and professional standards	Estimation of enrollment plans of educational institutions. Forecast of the number of trainees by levels of their training and graduation. Development of educational standards. Order for personnel training

In 2016 in Belarus a project "Labour market information system (LMIS) and skills anticipation: baseline study and capacity building" was realized. The project was done at the initiative of ETF to support the government improving the LMIS construction in Belarus.

The main source of information on labour market in Belarus is the National Statistical Committee. It accumulates the following information: demography (Annual Statistics and bulletins), population structure (Annual Statistics and bulletins), manpower balance (Bulletin of Statistics), Survey of households on employment matters (LFS, since 2012). Based on these data the Ministry of Economics makes demographic forecasts and manpower balance forecasts. The Ministry of Labour and Social Protection generates the following information: the number of those applied to employment agency, vacancies and the registered unemployed.

Surveys of households on employment matters (Labour Force Survey – LFS) are held quarterly since 2012), but results are not in open access. The first time selected results are published in Bulletin "Socio-Economic Situation of the Republic of Belarus, January 2017". According to selective surveys of households the employment level comprised 66.7 % in 2016 (68.1 % – in 2015), including working age population (male – 16-59 years old, female – 16-54 years old) – 80,9 % (82 % – in 2015). According to the sample survey of households the actual unemployment level comprised 5.8 % of economically active population in 2016. According to the Ministry of Labour and Social Protection the level of registered unemployment comprised 0.9 % of economically active population by the end of January 2017 (1.1 % – by the end of January 2016).

Conclusions:

1. The Republic of Belarus has an ample statistical database on the demographic situation, manpower, the employed across the types of economic activities, categories of personnel; however, there was no consistent methodical approach and statistics on the number of employed across professional and qualification groups;
2. Information on the number and structure of the unemployed is collected in two databases (based on the results household surveys and current data of the Ministry of Labour and Social Protection);
3. There is available information on the current demand for trades and positions and their supply, collected from agencies of labour, employment and social security, and the web-site of the Ministry of Labour and Social Protection;
4. Information on volume and structure of personnel training forecast by state agencies in accordance with specialities (fields, specializations) qualifications (trades, positions) is collected with the use of CAS "Goszakaz & Priyom" (Government Order and Enrollment) of the Ministry of Education, however not all companies participate in it;
5. Employers surveys are held regularly;
6. There are available surveys of current vacancies and resumes (on the web-site rabota.tut.by),

7. There is currently no available information on perspective demand for professional skills.

Progress in the development of labour market information system in Belarus during 2016 was discussed in March 2016, where the ETF held in Minsk workshop "Towards a Better Performing Labour Market Information System (LMIS)".

Topics of discussion on the workshop were:

– are all collected data used?

– is there any duplication in collecting the information by various ministries?

– what balance of quantitative and qualitative data and forecasts should be?

– who is key users of LMIS results?

– what directions to improve the forecast methodology are actual for Belarus?

– what should resulting products of LMIS be and how should they be presented to users in the national economy?

– perspectives of using Internet-resources and platforms for forecasting of labour market and economy's demand for personnel, etc.

It can formulate some awareness of problems related to the developing LMIS in Belarus:

lack of information, on professional skills in particular, aggregated method of presenting the labour market information (without micro-data);

limited access to a number of statistics for civil society;

data inconsistency for vacancies across professions and qualifications between those provided by government agencies and private agencies;

need for harmonization of professional and educational standards;

need of harmonization of the standards being used between system modules;

predominant orientation of the system to macro level and insufficiency of its products for population.

Main results of the work for construction LMIS in Belarus are:

1. Change in perception of LMIS as a multilevel system which includes various information sources, forecast methods, and is designed for various users.
2. Necessity to expand the set of forecast methods being used, participants, users and products of LMIS (short-term and long-term forecasts, tracking of graduates employment, economic and mathematical methods, surveys).
3. Harmonization of standards between system modules.
4. Refinement of problems and roles during interactions between key Ministries.
5. Expansion of partners network for development of on-line resources and platforms to forecast personnel supply.
6. Changes in requirements to statistics and labour market databases and those on demand for skills.
7. Refinement of further steps in development of LMIS.

Perspective development trends of LMIS formation in Belarus are the following: expansion of forecast methods (surveys, econometric and mathematical methods), diversity of LMIS products, upgrade of data collection and processing methods for labour market information and that on personnel demand, use of Internet services,

portals and platforms, development of public-private partnership during the creation of LMIS.

JEL code O31, O32

ADAPTIVE APPROACH TO FORMATION AN INNOVATIVE STRATEGY OF THE FIRM-DEVELOPER UNIQUE NEW TECHNIQUE

АДАПТИВНЫЙ ПОДХОД К ФОРМИРОВАНИЮ ИННОВАЦИОННОЙ СТРАТЕГИИ ФИРМЫ-РАЗРАБОТЧИКА УНИКАЛЬНОЙ НОВОЙ ТЕХНИКИ

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Key words: *high-tech innovation product, new product development, innovative strategy, forecasting, R&D management*
Ключевые слова: *высокотехнологичный инновационный продукт, разработка новых продуктов, инновационная стратегия, прогнозирование, управление НИОКР*

Abstract. The article deals with the problems of forming the strategy of innovative development of the firm-developer of unique new technique as a high-tech innovation product. An approach is proposed to construct an analytical tool designed to visualize the transition from a basic strategy to alternative options in case of failure of one or several major projects. With strategic planning, it is possible to replace risk projects from the R&D portfolio with standby projects from the innovation portfolio.

Аннотация. Рассмотрены проблемы формирования стратегии инновационного развития фирмы-разработчика уникальной новой техники как высокотехнологичного инновационного продукта. Предложен аналитический инструмент для визуализации перехода от базовой стратегии к альтернативным вариантам в случае неудачи одного или нескольких основных проектов. При стратегическом планировании предусматривается возможность замены рисковых проектов из портфеля НИОКР резервными проектами из портфеля инноваций.

Introduction. The key conditions for achieving the leading position in the high-tech markets is the ability to create complicated technical systems with a high level of novelty and enough competitiveness. This especially true for unique new technique (UNT) which are created to suit individual customer requirements and are manufactured in single copies or small-scale. For UNT need to take into account the increased risk of failure to reach the desired result, and other specifics of their

creation. Addressing these issues should be provided in the approach to formation strategy of R&D management of UNT firm-developer. This analytical tool is proposed as a method to build a transition options from basic strategy to alternative strategy on the consideration of possible changes to the initial forecast of the prospects of each UNT as high-tech innovation product (HIP) at life cycle various stages.

Literature Review. In cases of high complexity and novelty of the UNT, the beginning of the process of creation is characterized by high uncertainty (e. g. Ferioli, et. al., 2010). According to Reinertsen (Reinertsen, 1999) evaluating ideas at the early stage of design is an important and difficult because the final product or service cannot yet be entirely described and cannot be presented in its environment of use.

As noted by Mathews (Mathews, 2010), a different portfolio management process was required to bridge the gap between ideas and development-ready products – a strategic or innovation portfolio model. An innovation portfolio has a different objective than a project portfolio and differs in significant ways. Designing an innovation portfolio requires a foundational understanding of the behavior of the innovation process and how it differs from the new product development process (e. g. Sundbo 2002, Terwiesch and Ulrich 2008).

Using Mathews' consideration (Mathews, 2010) that "the complex interaction between the developing strategy and the nonlinear value trajectory of the concepts means that change in one aspect of the innovation portfolio produces a confounding effect on other areas. This in turn impacts the whole innovation portfolio".

Hypotheses. Hypothesis 1. During forming the base strategy of the UNT developers as an aggregate project portfolio it is appropriate to provide for the possibility of replacing it with a backup option as a rational method of reaction to changes in factors external and internal environment.

Hypothesis 2. Alternative strategies rationally formed by forecasting the need for replacement of failed major project backup project by portfolio innovations, which are estimated to be the most promising.

Hypothesis 3. The structure of the strategy of innovative development of UNT firm-developer should include two levels, of which the first level – the project portfolio is the main executable, and the second level – the innovation portfolio is a source of reserve projects.

Materials research and scientific results. Analytical tools of strategic planning in the first place should give an answer to the question of being able to perform tasks under certain conditions, to ensure the achievement of the strategic objectives of the development of UNT firm-developer. At the same time, according to the modern trends in innovation management, these instruments must take into account the likely need for changes of the adopted strategy. That is, in order to avoid financial losses, the strategy must have alternatives, ranging from the replacement of one of the project and up to the reorientation of the key activities.

In support of the allegations made, we look at a few innovative projects in aerospace engineering, design objects which had a breakthrough novelty and

developer expectations against them for various reasons were not justified. Among them, first of all, the US reusable transport space system Space Shuttle and the aerospace system Pegasus.

Thus, for the UNT-HIP increased risk, which is inherent in innovation high level of novelty, superimposed on the aforementioned industry-specific, which manifests itself in the long term and high cost to perform R&D. This explains the high price of mistakes in planning and commitment in any way to justify the money spent at least partially. The termination of the life cycle of HIPs is extremely difficult and responsible management decision, which should be supported by measures not only to compensate for the costs incurred, but in planned income compensation in order to achieve the project objectives.

Different combinations of goals, objectives and projects of resources lead to various embodiments of the innovative development of the company (corporate strategy options). The proposed approach provides a comprehensive analysis of possible options on the basis of which the most suitable (basic strategy) and provides a point of transition to alternatives (switching to backup strategy). The use of such tools, consider on the example of the model large-scale company specializing in the creation of aerospace engineering. Given the long duration of their design and high uncertainty in achieving the competitiveness, need to include not only the case of successful completion of R&D and launch on the market, when the inherent characteristics of the development of the object are provided on time and within the allocated funds, while HIP maintains competitiveness, but also other variants events, namely:

– Characteristics achieved lower than planned or necessary to ensure an acceptable level of competitiveness;

– The required characteristics is achieved, but the timing and/or financing exceeded that had a negative impact on the level of competitiveness of the HIP;

– At the time of removal of UNT-HIP to market its competitive position were lower than planned for reasons of changes in the external environment.

From the position of the change of strategy, all these events are reduced to the determination of the moment of reorientation to another HIP, which can compensate for the lose income in ensuring the achievement of planned growth rates. It should be understood that this is a period of time is significantly shorter than the duration of any stage of development. Thus in Fig. 1 points P1 and P2 show possible moments of decision-making, according to which instead of one of the main riskue projects must come one or more backup projects.

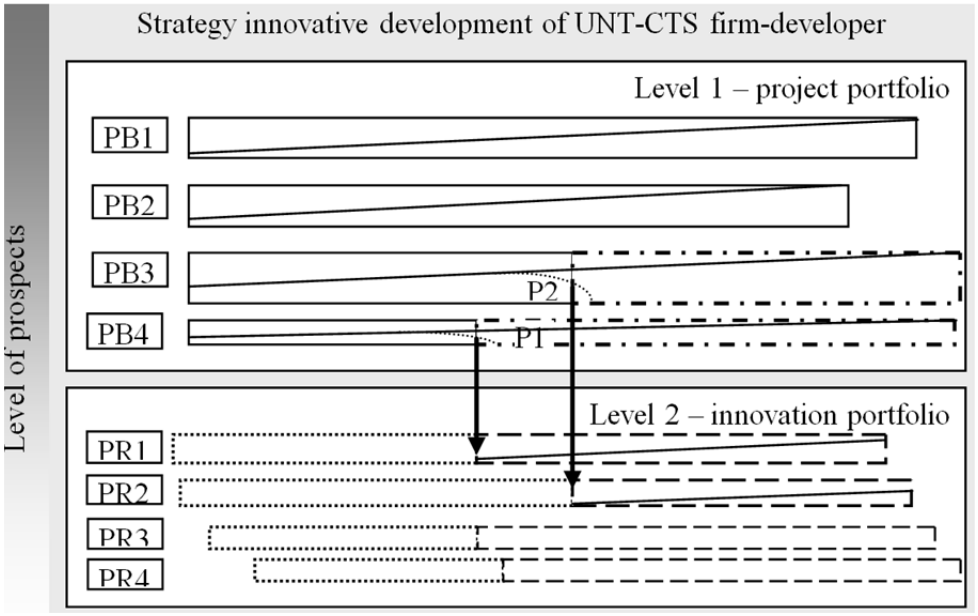

Figure 1 – Scheme of the backup projects by the change of the base strategy

We emphasize that the rational point change of basic strategy to replace the alternative set are basing on the valid opinion that the selected reserve projects at the final stage of R&D, will be able to compensate for failure of the timely locked risky projects. In support R&D of such conclusion is necessary to use special analytical apparatus predict market potential and competitiveness of the HIP, the development of which is the actual problem of future study.

Conclusion. The structure of the strategy of innovative development of HIP developer should include two levels, of which the first level – the project portfolio is the main executable, and the second level – the innovation portfolio is a source of reserve projects.

Alternative strategies rationally formed by forecasting the need for replacement the failed project in the project portfolio through the project into innovation portfolio, which are estimated to be the most promising.

Enhanced analytical database management decision-making through the use of patent parameters with high reliability and objectivity at the stage of preliminary study, is one of the efficient ways methodology improving of creation high-level technical and newness HIP.

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EVALUATION OF INFLUENCE OF ADVERTISING EXPENSES IN ORGANIZATIONS FOR PROMOTION OF TRAVEL SERVICES IN THE MARKET IN VITEBSK

ОЦЕНКА ВЛИЯНИЯ РЕКЛАМНЫХ РАСХОДОВ В ОРГАНИЗАЦИЯХ НА ПРОДВИЖЕНИЕ ТУРИСТИЧЕСКИХ УСЛУГ НА РЫНКЕ Г. ВИТЕБСКА

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Key words: advertising, advertising costs, tour prices, Spearman rank correlation coefficient.
Ключевые слова: реклама, расходы на рекламу, стоимость туров, коэффициент ранговой корреляции Спирмена.

Abstract. Using the statistical method of interrelation of socio-economic phenomena, an estimation of the influence of advertising expenses of ten tourist organizations of Vitebsk on the cost of tours paid at the territory of the Republic of Belarus during 2015-2016 was made. The calculations were made by comparing the parallel series and determining the rank correlation coefficient of Spearman.
Аннотация. С применением статистического метода взаимосвязи социально-экономических явлений, произведена оценка влияния рекламных расходов десяти туристических организаций г. Витебска на стоимость туров, оплаченных на территории Республики Беларусь за 2015-2016 гг. Расчеты произведены методом сравнения параллельных рядов и определения коэффициента ранговой корреляции Спирмена.

As the world practice testifies, the sphere of tourism is one of the largest advertisers. The experience of travel agencies shows that on average, 5-6% of revenues from their activities are used by them to advertise tourism services. Tourist advertising bears in itself the information presented in the condensed form. Emotionally colored, it contributes to the acquisition of tourist products and plays an important role in the implementation of the strategy of the tourist firm, the competitiveness of the organization. With the help of advertising travel agencies are

developing new markets. Advertising, which is a means of competition, contributes to improving the quality of tourist services. Advertising helps to increase sales, and in turn, the large-scale sales of tourist services provide the tourist company with revenue growth, improving the image of Belarus, as a tourist region, with decent staff salaries.

The purpose of the study is to assess the impact of spending on promotional activities of travel agencies in Vitebsk and the dynamics of the implementation of tourism services for the period 2015-2016. Ten tourist organizations were taken for the study. Table 1 shows data on advertising expenses and the cost of tours paid in the territory of the Republic of Belarus for 2015 in non-cashed Belarusian rubles (BYN). All monetary values are given in the article in the current monetary units (BYN) of the Republic of Belarus.

Table – 1 Advertising expenses, revenues of the tourist organizations in Vitebsk in 2015

The name of organization	The cost on advertising, thsd BYN, X	The cost of tour paid in Belarus, thsd BYN, Y	Расходы на рекламу, thsd BYN, X	The cost of tour, thsd BYN, Y	Rank on X	Rank on Y	d^2
Green Tour	5,00	49,00	0,089	3,70	1	1	0
Family Touristic	1,00	61,20	0,30	47,16	2	4	4
Bagira-Turism	1,50	42,78	0,55	61,72	3	7	16
Rosting	8,00	47,10	0,70	522,82	4	9	25
Vitar-Tour	6,50	63,09	1,00	61,20	5	6	1
Vit Orbis	0,55	61,72	1,50	42,78	6	2	16
Lis Tour	0,089	3,70	2,45	761,72	7	10	9
Alatan Tour	0,245	761,72	5,00	49,00	8	5	9
Lady Tour	0,30	47,16	6,50	63,09	9	8	1
Magazin Horoshego Otdyha	0,70	522,82	8,00	47,10	10	3	49
							Σd^2 =130

Source: compiled by the author on the basis of travel agencies

We will investigate the dependence of advertising costs and will find out: whether the amount of paid travel services depends on the amount of advertising expenses. We denote advertising costs: X is a sign, and the cost of tours: Y is the result. The method of comparing parallel series shows that with the increase in advertising costs, the cost of tours first increases, and then - decreases. More precisely, the direction

and closeness of the relations can be determined with the help of the rank correlation coefficient (Spearman), which determines the degree of closeness of the relations of the ordered characteristics, which in this case represent the ranks of the compared quantities. The results of calculations are substituted in the formula:

$$\rho = 1 - \frac{6\sum d^2}{n\left(n^2 - 1\right)}$$

ρ= 0,21

Thus, a positive result had obtained, which means that the relation is direct. Besides the relation between the amount of advertising costs and the cost of tours in 2015 in tourist organizations in the market of Vitebsk is weak (ρ <0.3) or none at all.

For a comparative assessment of the study parameters of tourism organizations, we will conduct a survey of indicators by state of 2016 (Table 2)

Table – 2 The advertising expenses, revenues of tourist organizations in Vitebsk in 2016

The name of organization	The cost on advertising, thsd BYN, X	The cost of tour paid in Belarus, thsd BYN, Y	Advertising costs, thsd BYN, X	The cost of tour, thsd BYN, Y	Rank on X	Rank on Y	d^2
Green Tour	5,00	60,00	0,081	3,20	1	1	0
Family Touristic	1,00	63,80	0,30	68,58	2	7	25
Bagira-Turism	1,50	35,96	0,42	45,95	3	3	0
Rosting	8,00	68,50	0,70	542,30	4	9	25
Vitar-Tour	6,50	76,12	1,00	63,80	5	5	0
Vit Orbis	0,42	45,95	1,50	35,96	6	2	16
Lis Tour	0,081	32,00	2,52	630,95	7	10	9
Alatan Tour	2,52	630,95	5,00	60,00	8	4	16
Lady Tour	0,30	68,58	6,50	76,12	9	8	1
Magazin Horoshego Otdyha	0,70	542,30	8,00	68,50	10	6	16
							Σd^2 =108

Source: It was compiled by the author on the basis data of travel agencies.

The method of comparing parallel series indicates an intermittent trend of the increase in the cost of tours due to an increase in spending on advertising by travel

agencies in 2016. For a more accurate assessment of the direction and closeness of the relation between X and Y, we are using the calculation of the Spearman rank correlation coefficient, substituting into the formula, we obtain the result:

$$\rho = 0.35,$$

i.e. the relationship between the cost of advertising and the cost of tours in 2016 is a direct and moderate (ρ 0.3-0.69) or close to a strong one.

Thus, the research shows that in 2015 the growth in advertising spending of tourist organizations in Vitebsk is not significantly affect on the growth in the cost of tours on the territory of the Republic of Belarus. Therefore it is necessary ti find other factors, possibly external, for example, the aggregate amount of income of the population. Based on the results of the assessment of the direction, nature and closeness of relations for 2016, the situation has changed, the growth of advertising costs, has a significant impact on the increase in the cost of tours, which is confirmed by investigation in the world practice.

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THE INFORMAL EMPLOYMENT IN BELARUS FROM THE DECENT WORK PERSPECTIVE

НЕФОРМАЛЬНАЯ ЗАНЯТОСТЬ В РЕСПУБЛИКЕ БЕЛАРУСЬ С ТОЧКИ ЗРЕНИЯ КОНЦЕПЦИИ ДОСТОЙНОГО ТРУДА

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Key words: *nonstandard work, decent work, informal employment*
Ключевые слова: *неформальная занятость, достойный труд, нестандартная занятость*

Abstract. The article is devoted to the role of the Decent Work concept in the evaluation of informal employment. In the article author assesses the scale of informal employment in the Republic of Belarus. Based on this assessment, the author identifies tasks to promote the concept of Decent Work, and proposes the

development and adoption of a Decent Work Program in Belarus aimed at effectively promoting the strategic objectives of Decent Work.

Аннотация. Статья посвящена роли концепции Достойного труда при оценке неформальной занятости. В статье проводится оценка масштабов неформальной занятости в Республике Беларусь, на основании которой выделяются задачи по продвижению концепции Достойного труда, а также предлагается разработка и принятие программы по Достойному труду в Беларуси, направленной на эффективное продвижение стратегических задач Достойного труда.

The formation of effective social and labor sphere is one of the fundamental factors of the innovative development of the Republic of Belarus. The Belarusian labor market is characterized by a number of unresolved problems: territorial and structural imbalance in the labor market; inefficient use of labor potential; low quality of workplaces; poverty of the working population; low social and legal protection of workers, especially workers in non-standard forms of employment.

A promising mechanism for the comprehensive solution of the above problems, meeting the challenges of new time and the principles of the social state, is the implementation of the concept of Decent Work, proposed in 1999 by the International Labor Organization (ILO). According to this concept Decent work is work that is productive and delivers a fair income, with a safe workplace and social protection, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men [1].

The concept of Decent Work encompasses four strategic directions: opportunities for employment and income, respect for rights at work, social protection and stronger social dialogue. Within these four directions, the Decent Work measure is carried out according to eleven groups of indicators, which include the indicator of informal employment.

In 2002 the International Labour Conference (ILC) engaged in a discussion on “Decent work and the informal economy”, which emphasized repeatedly the need for more and better statistics on the informal economy.

Informal employment refers to those jobs that generally lack basic social or legal protections or employment benefits (e.g. advance notice of dismissal, severance pay and paid annual or sick leave, among others). A large part of informal employment is in the informal sector, but informal employment also exists outside the informal sector, represented, for instance, by workers holding informal jobs in enterprises operating in the formal sector or in households [2, p.65].

There is no reliable statistics about informal employment in Belarus. Measuring informal employment is complicated by the fact that a significant part of labor relations is concentrated in small business, at individual enterprises, in informal sector, in farms.

In informal sector the employment relationships are often not legally enacted, it can cease any time, and duration of these employment relationships is not known in advance to either party. This greatly complicates the current statistical accounting.

According to the methodology of the National Statistical Committee of Belarus for the calculation of statistical indicators of economic activity and inactivity, informal employment is the work of persons employed in the informal sector, and persons working without formalizing employment relations in peasant farms or in other organizations (informal employment outside the informal sector).

An approximate estimate of the extent of informal employment in the Republic of Belarus in 2015 is presented in Table 1.

Table 1 – An approximate estimate of the extent of informal employment in the Republic of Belarus

Indicators	Thousands of people (2015)
Number of individual entrepreneurs	240.781
Persons engaged in craft activities	17.66
Persons engaged in agro-ecotourism	2.263
Persons employed by an individual entrepreneur	40.7
Persons engaged in personal subsidiary farming by the production (processing) of goods or services for the realization	8.268*
Total	309.7

** 2014.*

Source: The Data book «Small and medium-sized business in the Republic of Belarus», 2016; The Data book «Tourism and tourist resources in the Republic of Belarus», 2016; data on the number of individuals engaged in craft activities in the Republic of Belarus (http://www.belmarket.by/kolichestvo-remeslennikov-v-belarusi-prodolzhaet-rasti), Balance of labor for 2014.

As a result, even the approximate calculations show that informal employment is about 7% of the workforce.

The spread of informal employment leads to serious negative consequences for doing business, economic growth and development of the country as a whole. However, the consequences of informal employment are not so unambiguous, under certain conditions informal employment can have a positive impact. Therefore, measuring and regulating informal employment should consistent with the ILO Concept of Decent Work.

The introduction of the concept of Decent Work into social and economic practice in Belarus is just beginning. In these conditions, there are two tasks: 1) to develop a methodology for comprehensive research and monitoring of the regional labor sphere from the standpoint of the basic principles of the Decent Work concept; 2) substantiation of practical measures to implement the concept of Decent Work.

The implementation of the basic principles of the Decent Work concept can significantly accelerate the promotion of major national programs and strategies

aimed at modernizing the economy and moving to an innovative development model, increasing labor efficiency, and reducing the risks of informal employment.

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FEATURES OF CITY LOGISTICS REALIZATION

ОСОБЕННОСТИ РЕАЛИЗАЦИИ ГОРОДСКОЙ ЛОГИСТИКИ

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Key words: logistics, city, region, management, cargo transportations, directions of analysis, optimization.

Ключевые слова: логистика, город, регион, управление, грузовые перевозки, направления анализа, оптимизация.

Abstract. In the article features of city logistics and also a place of cargo transportations in it are considered. The problems and main directions of cargo transportation research in the city logistics system are determined. The directions of optimization of cargo transportation within the limits of city territories are offered.

Аннотация. В статье рассматриваются особенности городской логистики, а также место в ней системы грузовых перевозок. Определены проблемы и основные направления исследования грузовых перевозок в рамках системы городской логистики. Предложены направления оптимизации грузовых перевозок в пределах городских территорий.

The efficiency of management at the level of any economic entities: a region, a national economic complex or a specific enterprise is largely determined by the use of new methods of management. These methods, of course, include the methods of logistics management.

One of the ways of improving regional management improving is city logistics, the essence of which is defined as the optimization of various types of flows (commodity, transport, financial, human, etc.) at the level of urban areas. The management of these flows allows to increasing the efficiency of the work of

passenger and freight transport, industrial enterprises and trade organizations, municipal and social services. In addition, the problems of ecology are being solved, and a higher level of satisfaction of the population's needs is ensured. Thus, the interrelations of business entities of different industries and types of activities within urban areas are optimized.

Currently, in our domestic practice there are no systematic developments in the problems of city logistics, except for the research of individual scientific teams.

To ensure the functioning of the city logistics system, it is important to identify the specifics of the interaction of its main elements, identify ways of analysis and indicators for assessing the level of city logistics development and also the rationale for improving its efficiency.

A city logistics system should be viewed as the aggregate of the following interacting elements: suppliers of goods, transport firms and enterprises, which transport goods and passengers, consumers of goods, warehouses, road services, organizations which serve the city economy and also regional government organizations. The complexity of the functioning of this system is explained by the variety of the system's and the connections between them.

The management of freight flows has paramount importance because cities always have been the most important producers and consumers of these flows. In the city system of distribution of goods it is necessary to allocate the following supply chains:

– commodity supply of retail trade organizations;

– supply of food and other goods in the organization of public catering, hotels, social facilities;

– postal transport, including the delivery of goods in connection with the development of electronic commerce;

– delivery of raw materials, materials and other types of commodity-material assets to manufacturing enterprises;

– movement of goods in connection with the organization of urban construction;

– waste management as a result of urban activities.

In addition, due to the increase of the volume of economic activity and the expansion of the geography of supplies, within the framework of city logistics it should consider the management of intercity and international freight traffic. This is actually for regions located in close proximity to the main transport arteries, railway junctions, terminals, etc. At the same time, the optimization of such transportations poses the task of creating and developing of a logistics infrastructure: logistics centers, customs warehouses, modern transport infrastructure facilities. This is connected with the involvement of regional management bodies in the process of logistics management. In this regard, there is a need to significantly expand the scope of city logistics.

To improve the efficiency of the city (territory) functioning within the framework of city logistics, it is necessary the following studies:

– analysis of the dynamics and structure of domestic freight traffic along the directions and sections of the roads of the region;

– analysis of volumes and dynamics of the export-import cargo transportation;
– assessment of transit traffic in the region;
– estimating the carrying capacity of individual sections of roads;
– analysis of the volumes of interurban transportation in terms of cargo types, consumer organizations, city route network.
– analysis of transport costs.

At present, the solution of these problems is complicated due to the lack of a unified information support system. This is manifested in the absence of accounting and analysis of various indicators and parameters of transportation at the level of individual economic entities, the indicators of freight traffic at the city level, in aggregate estimates of indicators and performance characteristics of the transport sector at the regional level, which creates difficulties in justifying and implementing directions of improving the management of logistics flows.

The basic directions of freight traffic optimization in the sphere of city logistics, taking into account the proposed approaches to analysis are the following.

1. The ensuring the consolidation of goods at the level of the region (or city) and their subsequent distribution in the directions of cargo transportation and consignees. It is possible by creating a modern warehouse infrastructure and regional logistics centers.

2. The formation of optimal routes for the delivery of goods in order to reduce transportation costs, to eliminate inefficient counter transportations, to optimize the delivery time, to ensure rational utilization of certain sections of roads (streets, bridges, etc.)

3. The optimization of city transport planning and organization of efficient road maintenance.

4. The automation of information service processes in the urban logistics system in general and in the system of freight traffic in particular. This direction is connected with the using of automated systems for transmitting information in real time and the latest information and communication technologies.

Thus, the scale of the cargo flows distribution sets before cities and regions the task of their organization, and the development of city logistics ensures an increase in the efficiency of the functioning of economic entities and the region as a whole, the solution of certain social problems, the improvement of the environment, and also the formation of the image of region.

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