SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

Materials of the International Conference

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参与者的英文报告

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这些会议文集结合了会议的材料 – 研究论文和科学工作者的论文报告。 它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。

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These Conference Proceedings combine materials of the conference – research papers and thesis reports of scientific workers. They examines tecnical and sociological issues of research issues. Some articles deal with theoretical and methodological approaches and principles of research questions of personality professionalization.

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ECONOMICS

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Foreword

We thank all participants of our conference "Scientific research of the SCO countries: synergy and integration" for the interest shown, for your speeches and reports. Such a wide range of participants, representing all the countries that are members of the Shanghai Cooperation Organization, speaks about the necessity and importance of this event. The reports of the participants cover a wide range of topical scientific problems and our joint interaction will contribute to the further development of both theoretical and applied modern scientific research by scientists from different countries. The result of the conference was the participation of 56 authors from 7 countries (China, Russia, Uzbekistan, Kazakhstan, Azerbaijan, Tajikistan, Kyrgyzstan).

This conference was a result of the serious interest of the world academic community, the state authorities of China and the Chinese Communist Party to preserve and strengthen international cooperation in the field of science. We also thank our Russian partner Infinity Publishing House for assistance in organizing the conference, preparing and publishing the conference proceedings in Chinese Part and English Part.

I hope that the collection of this conference will be useful to a wide range of readers. It will help to consider issues, that would interest the public, under a new point of view. It will also allow to find contacts among scientists of common interests.

Fan Fukuan,
Chairman of the organizing committee of the conference
"Scientific research of the SCO countries: synergy and integration"
Full Professor, Doctor of Economic Sciences,
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前言

我们感谢所有参加本次会议的“上海合作组织国家的科学研究：协同作用和整合”，感谢您的演讲和报告。代表所有上海合作组织成员国的广泛参与者都谈到此次活动的必要性和重要性。参与者的报告涵盖了广泛的主题性科学问题，我们的联合互动将有助于不同国家的科学家进一步发展理论和应用的现代科学研究。会议结果是来自7个国家（中国，俄罗斯，乌兹别克斯坦，哈萨克斯坦，阿塞拜疆，塔吉克斯坦，吉尔吉斯斯坦）的83位作者的参与。

这次会议的召开，是学术界，中国国家权力机关和中国共产党对维护和加强科学领域国际合作的高度重视的结果。我们还要感谢我们的俄罗斯合作伙伴无限出版社协助组织会议，准备和发布中英文会议文集。

我希望会议的收集对广大读者有用，将有助于在新的观点下为读者提供有趣的问题，并且还将允许在共同利益的科学家中寻找联系。

范福宽，
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在进口替代战略框架内发展俄罗斯经济的主要部门
DEVELOPMENT OF THE LEADING SECTORS OF THE RUSSIAN ECONOMY IN THE FRAMEWORK OF IMPORT SUBSTITUTION STRATEGIES

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注解。制定和实施进口替代战略是俄罗斯经济关键部门对西方主要国家制裁压力的有力回应。事实上，实行制裁限制有助于确定进口国内产品的替代潜力的存在以及在俄罗斯经济的主要部门实现其可能性。与此同时，在每个经济部门制定进口替代战略的基础是基于其自身的一系列措施，旨在减少对进口产品和部件的依赖，或者完全取代国内生产的类似物。实施进口替代战略的一个明确条件是要求新型产品和可更换部件的质量不低于可能，并且如果可能的话，超过进口设备的质量。由于在俄罗斯经济的大多数主要部门实施了进口替代战略，已经发生了定性的基础设施变化，本文将以俄罗斯经济的若干部门为例简要介绍其动态。

关键词：俄罗斯经济，主导部门，制裁限制，替代潜力，进口替代战略，发展。

Annotation*. The development and implementation of import substitution strategies were the worthy response of key sectors of the Russian economy to the sanctions pressure of the leading Western countries. The introduction of sanctions restrictions, in fact, helped to identify the presence of the replacement potential of imported domestic products and the possibilities of its realization in the leading sectors of the Russian economy. At the same time, the basis for developing import substitution strategies in each sector of the economy was based on its own set of measures aimed at reducing dependence on imported products and components or their complete replacement by analogues of domestic production. One of the defining conditions for the implementation of import substitution strategies was*

the requirement that the quality of new types of products and replaceable components was not inferior, and if possible, surpassed those of imported equipment. As a result of the implementation of import substitution strategies in most of the leading sectors of the Russian economy, qualitative infrastructural changes have occurred, the dynamics of which will be briefly covered in this article on the example of several sectors of the Russian economy.

***Key words**: Russian economy, leading sectors, sanctions restrictions, replacement potential, import substitution strategy, development.*

Introduction

It is well-known, that the introduction of Western sanctions by Western countries was aimed at restraining the development of the Russian economy. To support its development at the state level, it was decided to conduct accelerated diversification of the domestic economy. The complex impact of these circumstances created the necessary prerequisites and favorable conditions for changing the main paradigm of Russia's economic development. The activity of industrial enterprises of the leading sectors of the Russian economy, which is largely related to ensuring the economic and military security of our country, for this reason was reoriented to develop and implement import substitution strategies for the supply of foreign equipment and components by replacing them with similar products of domestic production [2, 5, 8].

At the same time, it is necessary to take into account that the implementation of import substitution strategies in modern conditions is largely a necessary measure that will support the leading sectors of the Russian economy in the context of sanctions restrictions. In addition, the methods and tools for import substitution significantly limit the market conditions for the development of the Russian economy, since the lack of foreign-made equipment and components on the market significantly reduces the competitiveness of domestic producers. Under their influence, they may lose incentives to produce quality products at the level of world standards. Therefore, the successful implementation of import substitution strategies is possible only with ensuring the production of quality products at the level of world requirements or exceeding it [5, 11].

In the article, the example of individual leading sectors of the Russian economy will show the realization of the potential of import substitution for certain types of equipment and components, the dynamics and structural shifts in the production of domestic products as part of measures developed in terms of import substitution strategies.

Main part

1. The essence and purpose of import substitution strategies

Import substitution should be understood as a certain economic strategy that is implemented within the framework of industrial policy implemented by the state, which is aimed at developing the production of domestic products. It is carried

out by replacing foreign-made equipment and components with their counterparts produced by domestic industrial enterprises [2, 3]. At the same time, the main goal of the implementation of measures of import substitution strategy is to increase the competitiveness of domestic products and improve its quality indicators through the modernization of production technologies and the introduction of innovations.

The strategy of import substitution provides for the replacement of the mass production of outdated product lines to increase the output of science-intensive and high-tech products. For this, it is necessary to raise the level of development of production and significantly expand the practice of applying innovative technologies [5]. These conditions are particularly relevant for our country, since the level of development in certain leading sectors of the Russian economy is significantly lower than the level of development of production in countries that are our economic counterparties.

The basis for sustainable economic development of the Russian economy should be a significant increase in the use of domestic industrial enterprises of domestic resources and the volume of output of their own production. These factors are of paramount importance due to the increased instability of the global economy and the further restriction of the access of Russian enterprises to attracting foreign loans. In these conditions, it is important to understand that the main source of imparting growth to the Russian economy should be financial resources obtained in the form of revenues from the export of domestically produced products created as part of the implementation of import substitution strategies. To do this, domestic products must surpass foreign analogues in their quality indicators and be competitive at the global level in order to enjoy high demand in the domestic and foreign markets.

2. The level of import dependence of individual sectors of the Russian economy

Using a systematic approach to the analysis of activities in the framework of adopted programs and strategies for import substitution, taking into account the various measures of their financial support, we can get the expected performance estimates of their implementation by 2020 (see table) [7].

Table

Expected estimates of the effectiveness of the implementation of import substitution strategies

Sector	Import dependence in 2015	Reduce in import dependence by 2020
Aircraft for civil aviation	over 80%	40%
Heavy engineering	about 70%	35%
Oil and gas engineering	60%	40%
Power engineering	about 50%	30%
Engineering for agriculture (by product category)	from 50% to 90%	20%

With the successful implementation of import substitution strategies by 2020, it is possible to reduce the values of the indicator of dependence on imports in different industries from the current 70–90% to the expected 20–40%. It seems likely that in some industries it is possible to reach even lower values of the indicator of dependence on imports. At the same time, the reorientation of domestic enterprises to the production of import-substituting products will take at least 2-3 years [6].

3. Measures for the replacement of imported equipment in the sector of oil and gas engineering

In accordance with the adopted state program and strategy of import substitution, it is expected that dependence on imports in the oil and gas engineering sector will decrease by 2020 to 43% against 57% in 2014. In general, the potential impact of the oil and gas engineering sector on the development of domestic equipment and technologies for extraction and processing of oil and natural gas are insignificant. The indicator of dependence on imports in the field of oilfield services also remains high, its values for certain types of services reach 65-70% of the total volume of the Russian market. Moreover, only specialized foreign companies are engaged in the production of certain types of oilfield services.

In the oil and gas engineering sector, Russian oil and gas processing technologies are used mainly in the modification of some process technologies or in the improvement of structures for cracking plants of foreign production. At the same time, foreign manufacturers establish and strictly monitor the requirements of equipment compliance with international standards. As for the Russian equipment, so far only its insignificant part meets these requirements. For this reason, domestic enterprises are engaged in the production of less complex types of high-tech equipment and components, providing about 80% of the need for it. With more sophisticated equipment, such as tubing, domestic production is not doing so well, covering less than a third of the demand for it.

Considerable success has been achieved in the fields of oil refining and petrochemistry in terms of reducing the dependence of Russian production on imported catalysts. According to the Ministry of Energy of the Russian Federation, in less than two years, the share of foreign-made catalysts used at Russian refineries has decreased from 62.5 to 37%. During the same period, the share of foreign-made catalysts in the petrochemical industry decreased from 64 to 26.5%, while the share of using catalysts of domestic production increased to 83.5% [6]. In replacing foreign-made catalysts, the Ishimbay specialized catalyst plant played a key role. In a short time, this enterprise modernized the production of catalysts of hydroprocesses for motor fuels of class 5, put into operation its own facilities for regeneration and reactivation of catalysts, mastered the industrial production of supports for isomerization catalysts [4].

The examples presented above relate to the implementation of only a few

measures to reduce the dependence of the Russian sector of oil and gas engineering from foreign-made equipment and technologies. Currently, all extractive companies, hundreds of enterprises of the oil and gas engineering sector, industry research centers are working on the implementation of the whole range of activities.

4. Measures for the replacement of imported equipment in the military-industrial complex

The volume of deliveries of individual products, equipment and components of foreign production for the needs of the Russian military-industrial complex (MIC), in 2011-2013 was estimated at 75 million euros [1]. Only from the EU countries the annual import of dual-use products and technologies amounted to about 20 billion euros. The use of foreign-made products, equipment and components contributed to the reduction of the development time of new types of weapons and military equipment, and in some cases their cost reduction. Thus, the Armata tank platform, the BMP-3 infantry fighting vehicles, the Typhoon-K armored vehicles, certain types of warships, a number of samples of the latest aviation technology and many other systems were equipped with foreign-made products, equipment and components.

In modern conditions, ensuring the independence of the development of the domestic defense industry from products, equipment and components of foreign production becomes more urgent than ever. In recent years, industrial enterprises of the Russian defense industry have made significant progress in reducing the dependence of the production of the latest models of military equipment and weapons from foreign supplies. Currently, adopted programs and strategies of import substitution are being successfully implemented. Today, Russian-made products, equipment and components have completely replaced foreign analogues in more than 200 samples of weapons and military equipment, and in another 100 models of weapons and military equipment, products, equipment and accessories of Ukrainian production have been replaced by domestic ones.

Thus, the United Engine Corporation (UEC), which is part of the state corporation Rostec, produced 130 VK-2500 helicopter engines in 2018, and in 2019 completed the import substitution program for this equipment. The VK-2500 turboshaft engine is distinguished by increased reliability and efficiency, and it is managed by a modern digital system. The production of this engine allowed to modernize the line of medium combat helicopters of the Mi- and Ka- families. Compared with the basic TV3-117VMA engine, the VK-2500 engine has 15-20% more power, is equipped with a new digital system of automatic regulation and control, and is characterized by an increased operational resource [9].

By mid-2018, the United Shipbuilding Corporation (USC) in its entirety replaced the Russian-made gas turbine units (GTU) for some types of surface warships with Russian-made products. Moreover, starting in 2017, USC began to

create and manufacture the latest diesel power plants for other types of surface combat ships. Obviously, from 2019, the corporation will be able to produce the entire range of power plants for various types of warships on its own [8].

United Instrument-Making Corporation is a leading supplier of communication automation equipment and systems, telecommunications equipment for the Russian defense industry. The leaders in developing the latest information products and control systems are such well-known manufacturers as SAP, Oracle, IBM, Microsoft, as well as a number of other American, European and Asian companies. However, this situation cannot be considered acceptable for Russian defense-industrial systems produced by enterprises of the Russian MIC. It seems obvious that today all information in the Russian defense industry (regulatory, financial, design, production, military, etc.) must be reliably protected and inaccessible for any external threats, and the equipment and software used must guarantee the complete impossibility of external interference, exclude any the possibility of unauthorized removal or copying of information, to maintain a stable performance under all circumstances [10].

In recent years, the corporation has made significant progress in addressing the issues of "technical vision", database management systems, artificial intelligence. In particular, the technology of computer analysis and processing of large amounts of textual information of different levels of complexity has been developed. The uniqueness of this technology is achieved through the use of advanced capabilities of Big Data analysis systems, information processing using multi-format databases, system organization of workflow. Such technologies today can create world-class companies like Google or Facebook. For the instrument-making corporation, the creation of such a technology has become the realization of one of the measures of the import substitution strategy [4]. It should be noted that this technology is 100% Russian, created without any borrowing by the forces of domestic specialists of various profiles.

Today, one of the priority developments of the United Instrument-Making Corporation is the creation of a unified modular software platform for design and production. After the introduction of this product for enterprises of the Russian defense industrial complex, new opportunities will open up in terms of conducting a complete cycle of design and technological preparation of any production, from designing a three-dimensional model of a product to carrying out the necessary calculations and developing design documentation for mass production of finished samples. Like the previous one, this product is developed on the basis of Russian-only software, which can be used without restrictions at Russian defense industry enterprises.

Conclusion

In the course of the research some results were obtained, which served as the basis for drawing the following conclusions.

1. The essence and purpose of import substitution strategies for the successful development of the Russian economy and its leading industries are clarified. It is proved that the successful implementation of the strategy of import substitution will contribute to the emergence of a number of positive trends in the development of the Russian economy, including its steady growth. The determining condition for the consolidation of these trends should be an increase in the competitiveness of domestic products at the world level and its superiority over foreign analogues in their quality indicators.

2. It has been established that at present the level of import dependence of individual sectors of the Russian economy remains quite high. To get out of this situation, a set of measures was developed, and deadlines were set for achieving a significant reduction in the share of imported equipment and components in the main product range in most industries by 2020.

3. On the example of the sector of oil and gas engineering the dynamics and some structural changes, as well as prospects for reducing its dependence on foreign-made equipment and components are presented.

4. In recent years, industrial enterprises of the Russian defense industry have made significant progress in reducing the dependence of the production of the latest models of military equipment and weapons from foreign supplies. On the example of several corporations of the Russian defense industry complex, the dynamics and some structural shifts are shown, as well as the prospects for the successful implementation of adopted programs and strategies for import substitution.

Thanks

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通过实施进口替代战略，减少制裁限制的负面影响，确保俄罗斯经济的增长
REDUCING THE NEGATIVE IMPACT OF SANCTIONS RESTRICTIONS AND ENSURING THE GROWTH OF THE RUSSIAN ECONOMY THROUGH THE IMPLEMENTATION OF IMPORT SUBSTITUTION STRATEGIES

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注解。毫无疑问，制裁限制对俄罗斯经济的发展产生了负面影响。然而，它足够快就能够适应各种类型的这些限制，制定出一套对策以减少其负面影响，并在一些行业达到增长数字。这些成就的基础是制定了进口替代战略，吸引国内外投资的新机制，实际实施国内经济结构和技术现代化，创造增加智力资本的条件和提高管理机构的质量。实施包括在进口替代战略中的计划和方案的措施已成为俄罗斯对其经济实行制裁限制的有效回应。这些情况证实了这项研究的相关性。

关键词：俄罗斯经济，制裁限制，减少影响的机制，进口替代战略，发展，增长前景。

Annotation. *Sanctions restrictions, undoubtedly, had a negative impact on the development of the Russian economy. However, it quickly enough was able to adapt to various types of these restrictions, work out a set of countermeasures to reduce their negative impact, and in some industries reach the growth figures. The basis of these achievements were developed strategies for import substitution, new mechanisms for attracting domestic and foreign investment, the actual implementation of structural and technological modernization of the domestic economy, the creation of conditions for increasing intellectual capital and improving the quality of management institutions. The implementation of the measures of the plans and programs included in the strategy of import substitution has become Russia's effective response to the introduction of sanctions restrictions against its economy. These circumstances confirm the relevance of this study.*

Keywords*: Russian economy, sanctions restrictions, mechanisms to reduce influence, import substitution strategies, development, growth prospects.*

Introduction

For more than five years, the Russian economy has been functioning, experiencing the negative impact of sanctions restrictions, the introduction of which became a permanent procedure for the United States, EU countries and a number of other countries during 2014-2019. At the same time, the scope of the sanctions restrictions was very different, starting with limiting the time for attracting external sources of funding to their complete ban, continuing to introduce packages of targeted restrictions on key sectors of the Russian economy with their consistent prolongation and increasing tightening, and ending with the adoption of individual sanctions restrictions against specific physical persons prohibiting visits to initiating countries, as well as financial transactions and freezing foreign asset [13, 14].

Today, the range of sanctions imposed is so wide that at present there is a situation that is equivalent to declaring an economic war to our country. Under these conditions, the Government of Russia and sectoral Ministries promptly developed a set of strategies for import substitution and localization of the production of analogues of imported equipment and components by domestic enterprises in our country [3, p. 39; 5, p. 21]. Each of the sectoral strategies includes a number of priority measures aimed at supporting the financial condition and developing the production of Russian analogues of the most significant equipment and components replaced by products from leading industry enterprises [9, 11]. This article will justify the need to create conditions and identify key areas to minimize the negative impact of sanctions restrictions and ensure the growth of leading sectors of the Russian economy through the successful implementation of import substitution strategies.

Purpose of the study

The main purposes of this article were to assess the negative impact of sanctions restrictions on the development of the Russian economy, as well as the rationale for effective mechanisms to reduce it, ensuring the growth of its leading industries.

Materials and research methods

The global experience of applying the sanctions restriction tools against the economies of individual states clearly shows that, despite the place these countries occupy in the world economic system, the market structure of a particular country quickly adapts to new conditions through the process of reorienting interactions of economic entities, taking into account the negative impact of sanctions restrictions . The Russian economy is now in a similar situation. We will show its features and justify the possible ways to reduce the negative impact of sanctions restrictions on the development of the leading sectors of our economy.

The organizers planned to exert the most significant negative impact and the consequences of the imposition of sanctions restrictions on the Russian banking

system. The limitation of the terms for attracting foreign loans and the prohibition to conduct certain financial transactions have a significant negative impact on maintaining the liquidity of the entire banking system. At the same time, the negative impact of sanctions restrictions on the banking system in terms of attracting foreign credit resources can be significantly weakened provided that domestic banks and enterprises credited by them can reorient their policies in terms of obtaining loans to interact with the financial markets of those countries that have not introduced sanctions restrictions against Russia. With such an approach, the most promising option for the Russian banking system could be interaction with the financial markets of large countries in Asia and Latin America, primarily China, India, Brazil, etc. In addition, ahead of the introduction of new sanctions restrictions against its economy, Russia sold off April 2018, half of the existing **US Treasury** securities in the amount of $ 47.5 billion, retaining possession of debt obligations in the amount of $ 48.7 billion [12]. As a result, **investments in US Treasury securities almost halved**. The following month, Russia took away another $ 33.9 billion and withdrew from the list of the 30 largest holders of US debt [16]. Most likely, these actions were the response of the Central Bank of the Russian Federation (CBR) to new sanctions restrictions against the Russian economy, introduced by the United States in early April. The dynamics of Russian investments in US Treasury bonds for the period from 2007 to 2018 is shown in the table. From the data in the table it can be seen that, at present, the CBR's holdings of **US Treasury** securities are only 2 times higher than the historical minimum of 2007 - $ 7.4 billion - and make $ 14.6 billion at the end of October 2018 [16].

Table

Investments of the Central Bank of the Russian Federation in US Treasury Bonds, 2007-2018, billion dollars

	Dec	Nov	Oct	Sep	Aug	July	June	May	Apr	Mar	Feb	Jan
2018			14,6	14,4	14,1	14,9	14,9	14,9	48,7	96,1	93,8	96,9
2017	102,2	105,7	105,0	103,9	105,4	103,1	102,9	108,7	104,9	99,8	86,3	86,2
2016	86,1	86,6	74,6	76,5	87,5	88,2	90,9	88,2	82,5	86,0	87,6	96,9
2015	92,1	88,0	82,0	89,1	89,9	82,1	72,0	70,6	66,5	69,9	69,6	82,2
2014	86,0	108,1	108,9	117,7	118,1	114,5	113,9	111,4	116,4	100,4	126,2	131,8
2013	138,6	139,9	149,9	140,5	136,0	131,6	138,0	143,4	149,4	153,0	164,9	164,4
2012	161,5	166,2	171,1	163,5	162,9	156,2	163,8	156,3	155,4	151,1	144,8	145,7
2011	149,5	145,1	147,5	149,9	138,1	141,7	151,7	115,2	125,4	127,8	130,5	139,3
2010	151,0	167,3	176,3	173,3	173,7	175,7	168,2	126,8	113,1	120,1	120,2	124,2
2009	141,8	151,4	145,9	145,1	144,9	141,3	143,3	124,5	137,0	138,4	130,1	119,6
2008	116,4	108,0	110,8	99,6	104,2	104,0	95,2	63,7	60,2	42,4	38,4	35,2
2007	32,7	33,5	33,6	31,8	31,9	35,9	33,5	11,8	7,7	7,4	8,1	8,5

The effect of the negative impact of sanctions restrictions on raw materials, mining, processing and engineering industries of the Russian industry is characterized by a number of long-term factors, the real impact of which can affect after a rather long period of time. It seems obvious that everything will be reduced to the specific impact of sanctions restrictions on certain Russian industrial corporations and enterprises of leading industries that have difficulty in operating due to limited or complete lack of access to certain equipment, components and technologies. First of all, it affects the key sectors of the Russian mining industry - oil and gas. It is no secret to anyone that in the exploration and exploitation of deposits, Russian companies often resort to the services of foreign partners who supplied equipment and components for drilling and extracting hydrocarbon raw materials.

In 2019, the United States intends to introduce new sanctions against enterprises of the Russian MIC that sell military products on the international market. Unlike the previous ones, these sanctions are already aimed at the really important and painful points for the Russian MIC. As part of the new sanctions restrictions, the United States intends to ban the sale of Russian weapons and military technologies (WMT), as well as dual-use technologies to organizations and individuals supporting Russian MIC enterprises, with restrictions on the supply chain of components for their needs. At the same time, all types of activities of Russian MIC enterprises related to the development and production of all types of high-technology weapons are banned. The new sanctions will affect those organizations that the US deems to be participants in the sale, transfer for temporary use or otherwise provide components, services and dual-use technologies, as well as conducting significant transactions with any organizations and individuals involved in the activities of enterprises of the Russian MIC.

The new sanctions, first of all, will significantly restrict the renewal of the machine park, since our country still cannot produce a significant part of the machine equipment on its own. Before the imposition of sanctions restrictions, enterprises of the Russian MIC purchased machinery equipment manufactured in the United States and other countries, but using American technology and components. Therefore, the new sanctions restrictions are quite capable of creating a rather significant problem in terms of restricting access for Russian MIC enterprises to purchases of modern machine equipment [7].

Purchase of software can be another problem, since all modern production has long been using special software, produced mainly in the United States or other countries dependent on the United States. Naturally, companies in the United States and their dependent countries that have large shares in the software market, fearing the introduction of sanctions, would prefer to abandon the implementation of the developed software to Russian enterprises [10, p. 479].

Even such shallow analysis of the negative impact of the sanctions restrictions on the development of the Russian economy, taking into account its scale, allows us to conclude that it is impossible to isolate Russia from the system of international economic relations, since it has a significant raw material base and a number of strategic raw materials that are mined on its territory. However, the idea of developing a commodity economy has completely outlived itself, and the presence of significant volumes of raw materials has long ceased to be a determining factor in economic growth. Rather, on the contrary, the leaders of economic growth all over the world are mainly those countries whose reserves of their own resources are significantly limited or completely absent.

Research results and discussion

The powerful resource base that our country possesses can serve as an initial potential for the return of the Russian economy to the leading positions in the world [4, p. 14]. However, the practical implementation of this process is largely complicated due to the negative impact of sanctions restrictions. For the dynamic development and sustainable growth of the Russian economy, not only the availability of raw materials markets, but also the introduction of innovative technologies, which have become unavailable after the introduction of sanctions restrictions, acquires substantial significance. And if today these restrictions are not capable of slowing the output of our economy onto the trajectory of sustainable growth, in the long term, they may adversely affect the development of the Russian economy. In order to prevent the implementation of such a scenario at the state level, it is necessary to sufficiently quickly revise the model and key indicators of the development of the country's economy, paying close attention to the implementation of import substitution strategies [2].

At the moment, the MIC, the production of agricultural equipment and food products have become the leading growth points of the Russian economy.

Significant results were achieved by the Russian MIC . In fact, in two years, there has been a two-fold increase in the state defense order (SDO), which in 2016 was completed by 99% [8]. The greatest successes were achieved in the sector of the aviation industry, which in 2016 produced 30 civilian and 109 military aircrafts, as well as 22 civilian and 186 military helicopters. In addition, for the first time in the past few years, the shipbuilding industry produced six warships for one year [8]. It is no coincidence that by the end of 2016, sectors of the Russian economy related to the MIC showed stable growth. Thus, in the electronic industry it was 32%, in the production of special chemicals - 22.5%, in the shipbuilding industry - more than 16%, in the rocket and space industry - about 7.5%, and in the aviation industry - about 6% [6].

Among other industries, an increase in the production of Russian drugs by almost 25% should be noted. As part of the implementation of import substitution

strategies in the field of pharmaceuticals, the share of imported products decreased by 6.5%, and in the production of medical equipment - by 8%. In addition, in transport engineering it was possible to reduce the share of imported products to 6% [8]. Largely due to the implementation of the import substitution policy in the agro-industrial sector, over the past three years, food imports to Russia have almost halved - from 43 to 25 billion US dollars [1], while the production of main types of import-substituting food products in 2017-2018 steadily grew (more than 100%) on the 21st position with a slight reduction (less than 4.5%) on the 8th position [8].

The above figures show that certain sectors of the Russian economy in the annual interval of time managed to achieve significant results. However, with the expansion of the time interval, the overall situation becomes slightly different. Thus, according to the Center for Macroeconomic Analysis and Short-term Forecasting, the growth of sectoral production is characterized by pendulum dynamics. Analysis of the macroeconomic dynamics of industry growth in the framework of import substitution strategies confirms the presence of insignificant positive results. At the same time, they mainly fall on low-tech industries, such as fishing and fish farming, pulp and paper production, furniture production, woodworking, and chemical production. The implementation of import substitution strategies in the production of machinery and equipment, electronic components and equipment shows an increase in values at the level of statistical error. In some sectors of engineering there is a slight increase in imports. This refers to the production of bearings, gears, mechanical transmission components and drives, where import purchases increased by 5%, in the production of lifting and transport equipment their growth was 7%, and in the production of other general-purpose equipment - by 18% [15].

Taking into account these and some other circumstances, the importance of assessing the effectiveness of the activities of MIC enterprises for the purpose of its development as one of the leading sectors of the Russian economy becomes evident.

Summary

The results obtained in the course of the research allow us to formulate the following conclusions:

1. For more than five years, our economy has not only successfully resisted sanctions restrictions, but continues to grow. In the conditions of tough competition in international markets, many Russian enterprises have managed in recent years to strengthen their positions, despite the negative impact of sanctions restrictions.

2. To counteract the negative impact of new sanctions restrictions, increasing the efficiency of production activities of Russian enterprises in leading industries

in the framework of import substitution strategies, which can be considered as an effective mechanism for successful development and growth of key indicators of the Russian economy, is of particular importance.

Summarizing the above data, we can conclude that the current trends in industry growth in the framework of the implementation of import substitution strategies have enough grounds for optimism. It is based primarily on the successful modernization of a number of domestic industries at enterprises of leading sectors of the Russian economy and a gradual decrease in its dependence on purchases of imported goods, equipment and components. In addition, the successful implementation of import substitution strategies in leading industries creates new incentives to attract private business, entails opening new jobs and increasing employment in the country's working-age population.

Thanks

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在实施进口替代战略的框架内，俄罗斯石油和天然气部门具有竞争优势

COMPETITIVE ADVANTAGES OF THE RUSSIAN OIL AND GAS SECTOR WITHIN THE FRAMEWORK OF THE IMPLEMENTATION OF THE IMPORT SUBSTITUTION STRATEGY

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注解。 本文系统地阐述了制裁限制对整个俄罗斯经济发展的负面影响以及以石油和天然气部门为例的主要部门的后果。 没有取消制裁限制的前景，结论是，在目前情况下，俄罗斯经济的发展应基于最大限度地利用其现有的潜力，物质和财政资源，以及实现竞争优势。 进口替代战略框架中的主要部门。 同时，替换国外设备的部件和技术应具有不低于世界标准的质量，并超过其关键参数。

关键词：俄罗斯经济，制裁限制，负面影响，石油和天然气部门，进口替代战略，竞争优势。

Annotation. *This article systematizes the consequences of the negative impact of sanctions restrictions on the development of the Russian economy as a whole and its leading sectors using the example of the oil and gas sector. The absence of prospects for canceling sanctions restrictions is shown and the conclusion is made that under current conditions the development of the Russian economy should be based on maximum use of its existing potential, material and financial resources, as well as the realization of competitive advantages of leading sectors in the framework of the import substitution strategy. At the same time, components and technologies replacing foreign equipment should have a quality not lower than world standards, and exceed its key parameters.*

Keywords: *Russian economy, sanctions restrictions, negative impact, oil and gas sector, import substitution strategy, competitive advantages.*

Introduction

Starting in 2014, the list and focus of the sanctions restrictions imposed by the US against Russia are constantly expanding. In July 2017, the US Congress passed a new law on sanctions, which was signed on August 2 by President D. Trump. Its official name is the Act on Countering America's Adversaries through Sanctions No. 115-44 of August 2, 2017 [6]. The "adversaries" of the United States include three countries — Iran, Russia, and the Democratic People's Republic of Korea (DPRK). It is in this order, from which it follows that Iran is the main enemy of the United States. But in our country this state of affairs gives no "privileges." Rather, on the contrary, with respect to Russia, this Law not only tightens the existing sanctions restrictions, but also introduces new ones, extending their effect to enterprises of the transport and oil-producing industries, and besides, to support the construction of Russian export gas pipelines. In addition, since the signing of this Law, Russian companies can be credited abroad for a period not exceeding 14 days. The Law also contains a whole range of purely political "demands" for the actions of our country in the international arena.

However, already on August 27, 2018, a new package of US sanctions against Russia came into force, which was approved by a Directorate of the State Department and signed by US President D. Trump. It provides for a ban on the provision of any American assistance to Russia, stops issuing export licenses to Russian state-owned companies of dual-use products that can be used for military purposes. The only exceptions were the materials necessary for cooperation in the space industry and the field of space orbital launches. Also, this package does not apply to products necessary to ensure the safety of civil aviation.

Obviously, there is no reason to expect the lifting of sanctions restrictions in the foreseeable future. However, even the systematic expansion of sanctions restrictions does not ensure the achievement of their goals for the United States: Russia's political course does not change, and the Russian economy, while quite successfully coping with their negative consequences and, moreover, a number of industries are gradually taking a growth trajectory. At the same time, it will be possible to get real assessments of the negative impact of the sanctions restrictions on the development of the Russian economy only after a longer period of time. In this regard, it is rather interesting to analyze the economic essence of the sanctions restrictions and the experience of the development of the Iranian economy under their influence. Moreover, it is quite obvious that quantitative assessments of the impact of sanctions restrictions on the development of our country's economy will also be repeatedly revalued by experts and specialists as more detailed studies of the effects of sanctions restrictions directly cleared of the cumulative effect of a number of other factors appear.

Main part

Purpose of the study

The main objective of this study is to systematize the effects of the negative impact of sanctions restrictions in relation to the Russian economy as a whole and its oil and gas sector, as well as the rationale for the realization of its competitive advantages in the framework of import substitution strategy of foreign equipment and components on domestic counterparts while maintaining the quality of their production at the world standards.

Research materials

The economic development of the world community at all times was closely connected with the tools of political influence and the struggle for domination. Despite the fact that in the conditions of a market economy, leading theorists have long justified a lot of various economic methods of competitive struggle, many of the leading countries of the world do not give up on such clearly non-market and non-economic measures to maintain the competitiveness of their economies as sanctions restrictions. Moreover, throughout the history of the development of a market economy on a global scale, the leading economists of these countries have repeatedly tried to substantiate the economic essence of sanctions restrictions. As a rule, this happened during periods of intensified political struggle and financial and economic crises.

The frequency of implementation of sanctions restrictions as an instrument of political struggle increased steadily after the end of the Second World War. At the same time, it is surprising that the absolute leader in the introduction of sanctions and other restrictive measures (up to the ban) turned out to be the leading and economically most developed country in the whole world community - the United States of America. Since 1970, the United States has imposed various kinds of sanctions restrictions against the economies of many countries more than 100 times. So, for the period from 2014 to mid-2018, only in relation to Russia, the United States introduced more than 57 packages of various sanctions restrictions that were directed against specific enterprises and individuals, as well as against entire sectors and fields of the Russian economy. Since 1970, EU member states have initiated the introduction of 35 sanctions restrictions. In addition, sanctions were imposed on the initiative of the UN, but their number during the same time period was insignificant - only 16 cases [1, p. 57]. The former USSR and Russia resorted to imposing sanctions restrictions only 7 times. The most intensive sanctions restrictions were applied by different countries from 1991 to 1995 — during this period, there were 34 cases of the introduction of various sanctions restriction regimes [2, p. 283].

In recent years, sanctions restrictions have become less common, partly because many governments have long understood that the use of sanctions restric-

tions as an instrument of political struggle has one important feature. It manifests itself in a mutual negative impact on the development of economies for countries subject to sanctions restrictions, and for countries introducing these restrictions. However, today the US governing bodies, refusing to put up with the end of the era of unilateral domination in world politics and economics, as well as due to the absence of legitimate reasons, sharply intensified the practice of imposing sanctions restrictions. It is quite natural that the main object of prohibitions and restrictions has become the economy of our country. The State Department, the Senate and the US Congress do not even bother to search for real reasons for imposing sanctions restrictions. Currently, packages of sanctions restrictions are introduced or prolonged their action over time, which in most cases is announced in advance. Thus, the last package of sanctions restrictions against Russia was introduced at the end of August, and after the November elections to the US Congress the next package of even tougher sanctions will be introduced.

On this basis, it can be argued that the essence of sanctions restrictions has more political than economic nature, which is expressed in the targeted introduction of packages of restrictions and prohibitions, the purpose of which is to significantly slow down the country's economic development in order to change its policy on international level [5].

For our country, this situation is not unusual, since throughout the entire period of its existence, Russia has repeatedly and quite successfully resisted various restrictions and prohibitions, both political and economic in nature. Moreover, historical experience shows that in all cases of sanctions pressure our country did not change its policy in the international arena and almost always achieved its goals, although in some cases it had to overcome very serious difficulties.

However, Russia is not the only country against which sanctions restrictions were systematically imposed on a massive scale. A country like Iran has also been under sanctions imposed against it partly by UN resolutions, and for the most part by the decision of the governing bodies of the United States for a long period of time (over 30 years). At the same time, it is necessary to note the fact that even in such conditions, the Iranian economy almost annually showed growth, albeit insignificant in size.

Research methods and results

To date, most oil and gas companies have managed to adapt to the existing packages of sanctions restrictions and the macroeconomic conditions of doing business. Now they have focused on improving the efficiency of developing their activities and building up key assets in Russia, and to a lesser extent they are focused on finding opportunities for international expansion of their business. The sanctions restrictions had practically no effect on the traditional production of hydrocarbons in the main continental fields, and even contributed to the increase in

the volume of exploration. However, Russia does not yet have its own software necessary for processing geological exploration data and conducting supercomputer calculations. For the successful development of the oil and gas sector in terms of sanctions restrictions, this problem must be addressed first.

Nevertheless, the sanctions restrictions had a rather negative impact on certain areas of development of the oil and gas sector. For example, almost 90% of modern technologies for extracting hydrocarbons on the shelf belong to foreign developers. It was the problems of the limited use of foreign extraction technologies that became the primary cause of the temporary freezing of a number of projects by Russian oil and gas companies in this direction, and only then the reasons for the economic plan played a role. Among those temporarily suspended were the most significant projects of Rosneft and ExxonMobil on the Arctic shelf and in the Black Sea.

The impact of the sanctions restrictions will inevitably have a negative impact on the Russian oil and gas sector in the near future, since it will entail financial losses from a reduction in hydrocarbon production. Estimates of these losses in terms of volume and time vary and depend mainly on how large the reduction in production will be. According to a number of forecasts, in the long-term, hydrocarbon production is expected to decline in the range of 3-5%.

Assessing the negative aspects of the impact of the sanctions restrictions on the development of the oil and gas sector of the Russian economy, it is necessary to note its positive aspects [3, p. 77]. They mainly affected domestic oilfield service and machine-building enterprises, which, under the conditions of sanctions restrictions, became more active in import substitution, implement high-quality Russian developments and develop measures to support them. Since January 1, 2017, the Government of the Russian Federation introduced a 15% priority subject to purchases of goods and services of domestic production by Russian oil and gas companies. As a result of these measures, today there are already concrete examples of import substitution, both in terms of technologies and components. So, there has been a serious breakthrough in telemetry systems for inclined and horizontal drilling.

One of the most promising in the field of development of domestic technologies of import substitution is the project of Gazprom Neft to create a complex of domestic technologies and high-tech equipment for the development of reserves of the Bazhenov formation. It provides for the transition from foreign to the implementation of domestic technologies of import substitution by 2025. The cost of the project was estimated by the company at 7.5 billion rubles, of which 90% were its own funds. This project was developed by Gazprom Neft even before the imposition of sanctions restrictions, and for this, its implementation is proceeding as planned. With its successful introduction, the target level of production of

Gazprom Neft from the Bazhenov formation deposits by 2025 may be about 2.5 million tons annually [4].

The discussion of the results

Today it is impossible to deny the fact that the imposition of sanctions restrictions had a negative impact on the development of the Russian economy as a whole and its key sectors in particular. Some estimates of this influence in relation to the development of the oil and gas sector of the Russian economy are given in this article. Like the entire Russian economy, its oil and gas sector was able to overcome the main difficulties and, in a short time, minimize the consequences of the negative impact of sanctions restrictions and enter the trajectory of gradual growth. For this, it was necessary to formulate development strategies through import substitution, and in their structure to develop mechanisms for attracting domestic and foreign investments. In addition, effective ways were identified for conducting structural and technological modernization of domestic production in key sectors, as well as improving the quality of intellectual capital and management institutions.

Summary

Based on the above, we can draw the following conclusions.

1. Despite the negative impact of the sanctions restrictions, the current state of development of the Russian economy gives many reasons for optimism. This is due both to the successful modernization of domestic production in key sectors and the gradual decrease in the dependence of the Russian economy on not always reliable foreign counterparties.

2. Successful implementation of import substitution strategies and programs in key sectors, creating favorable conditions for attracting private business, increasing the number of new jobs and increasing employment of the working-age population of the country open up new opportunities for developing the Russian economy and realizing the competitive advantages of its leading sectors in the near future.

Thanks

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危机管理的合法性

LEGITIMACY OF THE CRISIS MANAGEMENT

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注解。 危机管理往往与公司利益相关者的利益相冲突。 控制问题是与利益相关者保持良好关系。 这是通过危机管理合法性的过程来完成的。 合法性的主要手段是组织沟通。

关键词：危机管理，组织合法性，危机应对措施的合法性，与利益相关者的沟通。

Annotation. *Crisis management is often in conflict with the interests of the company's stakeholders. The problem of control is to keep good relations with stakeholders. This is done through a process of the crisis management legitimacy. The main means of legitimacy are organizational communications.*

Keywords: *crisis management, organizational legitimacy, legitimation of crisis response measures, communications with stakeholders.*

Anti-crisis measures taken by a company rarely find the full support of its stakeholders. For example, such measures of crisis management (CM), such as the suspension of the payment of bonuses to employees, interest on loans or dividends are perceived by them extremely negatively, if this is done in an authoritarian way, without explaining the reasons and the timing of the decision. The reaction of the company's stakeholders to such measures, even rationally sound and economically verified, will be negative and the firm's crisis management will be perceived as "illegal", *illegitimate* actions. A different situation is also possible: the company's stakeholders refer to its CM measures with understanding, they are willing to accept temporary costs associated with a crisis that is fair, timely that is, *legitimate*. The question arises, under what conditions will the stakeholders evaluate the firm's CM as legitimate, or, in other words, what mechanisms exist for managing the CM legitimation process? Let's start the consideration of this problem with the definition of the legitimacy of the CM company.

Most researchers define the legitimacy of the CM as a result of recognition by internal and external stakeholders, the media, the public "correctness" of the com-

pany's behavior during the crisis and the company's actions aimed at acquiring such legitimacy - the legitimacy of the CM. For example, the American researcher M. Suchman defines the legitimacy of the CM firm as "a common perception or assumption that the actions of an organization are desired or suitable in some socially constructed system of norms, values, beliefs and definitions" [10, p. 574]. In contrast, illegitimacy means that the actions of a firm are "viewed as undesirable or violate social norms" [8, p. 293]. A firm experiences a "crisis of legitimacy" when adverse outcomes, such as the threat of bankruptcy or accidents are attributed to organizational action (or inaction).

During crisis situations, companies may experience a complete or partial loss of legitimacy if its actions no longer correspond to what society, government bodies and stakeholders consider to be the norm of behavior. It follows that the important function of the CM is to maintain the legitimacy of the company at all stages of the development of the crisis, i.e. managing the legitimization of a firm's actions, which can be defined as the process by which a firm is trying to gain, to maintain and in some cases return, the support of stakeholders to their own actions during a crisis.

Despite the growing volume of literature on crisis management, on organizational communications in a crisis and on organizational legitimacy, the relationship between crisis, communications and legitimacy is not completely clear. In this regard, M.M. Seeger, T. Sellnow and R. Ulmer argue that "serious research is required to clarify all aspects of the relationship between legitimacy, communication and successful crisis management" [9, 258].

To solve this problem, two types of legitimacy should be distinguished: strategic and institutional.

A strategic approach to CM legitimacy focuses on the ways in which organizations manipulate symbols through communication behavior to achieve legitimacy. Citing an example of a strategic approach, M. Papa, T. Daniels and B. Spiker argue that "the actions that must be taken to make the organization legitimate are of paramount importance" [7, p. 128]. The main thing here is building communication between the organizational strategy and the expectations of the organization's stakeholders.

Communications in this case are used primarily to inform the stakeholders that in the strategic plan, the CM measures correspond to the interests of both the organization and their own.

Institutional approach focuses on the cultural environment in which the firm exists and on the pressure that this environment exerts in order to legitimize its actions. Legitimacy in this tradition is defined as "the degree of cultural support of an organization" [2, p. 382], where culture is considered to be a shared belief system shared by a majority of the organization's members, supported and accepted by organizational stakeholders.

The institutional approach is compatible with the concept of "ritual communication" developed by G. Krug [6]. He proceeds from the fact that there are two alternative views on communication: *transmissional* and *ritual*. Transmissional view implies that communication, the signal to the stakeholders is a linear, one-way directional procedure for the information transfer (transmission), suggesting the presence of its passive recipient.

The difference between these two types of communication is similar to the difference between the concepts of monologue and dialogical communication proposed by M. Frey, C. Botan and G. Kreps, where the information transfer is equivalent to a monologue and the ritual - to dialogue. These authors argue that "a person who uses a monologue seeks to command, deter, manipulate, conquer, perplex, deceive and exploit ... The audience's response is needed only to advance the goals of the communicator. Dialogue communication, on the other hand, is characterized by such relations, in which both parties show empathy, strive to take into account each other's interests and not only satisfy their own needs "[3, p. 189].

Let us comment on this dichotomy as follows: the key difference between the monologue (transmission) view of communication and the dialogic (ritual) is that the first considers the recipients of information as the terminal of communication, while the second believes that feedback is a necessary condition of communication. From this we can conclude that the dialogic view of communication emphasizes the interdependent relations between organizations and their stakeholders and is a more effective tool for legitimization, including crisis management.

Decreasing organizational legitimacy in CM thus has two components. The first one is related to events that objectively "work" to reduce legitimacy. These can be, for example, employee deaths due to accidents, industrial emissions that cause environmental damage, serious accidents and other events leading to the opening of criminal cases or other administrative investigations of government bodies. Wide publicity of the fact that investigators are working in the organization, documentation is being seized, searches are being conducted, etc. can cause such reputational damage that a significant part of the stakeholders will decide to stop contacting with it. However, how large the part to make such a decision will be largely depends on the use of communications to transfer relevant information to them, which can prevent or at least slow down this process.

Another component of reducing legitimacy can be called "subjective," since it is determined by the mistakes, missteps and shortcomings of the CM leadership that have become known to stakeholders. However, given the fact that the boundary between the objective and the subjective is rather blurred, it would be in the interests of the organization to present the matter in such a way that it is more a "victim" of an unfavorable set of circumstances than a subject of making and implementing erroneous decisions with dire consequences. In this case, the communication aspect of the problem is to present the crisis situation to the stakeholders and the public so that objective factors of reducing legitimacy come to the fore, and subjective mixes are presented as insignificant circumstances.

The management of legitimacy or legitimation is a dynamic process that includes the conquest, preservation, and in some cases, the re-acquisition of legitimacy for the company. From the moment of its establishment, a company should make efforts to form legitimacy - that is, such an image in the eyes of stakeholders, the public and government bodies, which reflects the willingness to cooperate, to take into account the interest of all parties, in one way or another dealing with the company, business ethics.

However, this is not a simple matter, especially given the fact that organizations rarely start their activities “from scratch”: usually its founders, owners, shareholders, top managers are more or less known to the business community, the public and bring to the emerging organizational legitimacy a load of personal experience, which is especially sensitive if this experience was associated with the past experiencing a crisis or managing crisis situations. If such individuals, and, above all, top managers in the past have experience of positive crisis management, then the contribution they make to the legitimacy of the newly created organization will be positive. And, accordingly, vice versa.

But what happens if there is no such information? The American researcher T. Garbett argues that the stakeholders, in fact, have a rather negative view of newly created companies, since “people tend to attribute negative characteristics to the unknown” [4, p. 34]. Thus, legitimating or acquiring the legitimacy of CM is a set of proactive measures that work to pre-empt and include three main strategies: developing behavior that demonstrates obedience to social norms and expectations, taking care of the support of CM companies from key stakeholders and creating that is considered to be "legitimate" behavior.

If, as a result of the skillful application of these three strategies, a company managed to create its own image of legitimacy, then it should continue to work hard to keep it, especially by making efforts in the face of the threat of a crisis. However, there are two difficulties on this path. The first one is obvious: most organizations exist in a rapidly changing environment, an important element of which is a set of organizational stakeholders. Their body may change over time. The total vector of the attitude of the stakeholders to the organization also changes; therefore, corrective actions are necessary to compensate for the negative consequences of such changes.

The second difficulty can be described as “structural inertia”, well known from the literature on organizational change [1]. This means that the achieved level of legitimacy pushes the organization to adopt conservative, “protective” in nature decisions aimed at preserving the existing structures and processes. Such a desire for stability (in fact, the desire to consolidate and maintain a satisfactory level of legitimacy achieved so hard) can lead to an organization being less able to change in response to the demands of the environment, which reduces its chances of continuing “legitimate” existence.

In order to circumvent this difficulty, M. Suchman assumes the development of the following competencies among organizations: first, be proactive and anticipate the requirements of stakeholders and the environment, the discrepancy with which may jeopardize the legitimacy of the company, secondly, protect past achievements that have provided legitimacy and , thirdly, to generate goodwill, strictly adhere to the principles of social responsibility and business ethics [10, p. 577]. Restoring legitimacy is a task no less difficult than its creation.

On the path of legitimation, organizations have three strategies to choose from: first, the organization can restructure in such a way as to free itself from the "problem" subdivision, secondly, identify and neutralize the reason that reduced its legitimacy status, and third, distance its anti-crisis measures from some unsuccessful action, which led to its illegitimate status [10, p. 592].

In conclusion, we note that efforts to strengthen and maintain legitimacy at a sufficiently high level (that is, one that does not force stakeholders to change their attitude towards the company) should be part of a common anti-crisis strategy, and the communication system should be considered as the most important tool to legitimize CM firms.

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经济危机理论
THEORY OF THE ECONOMIC CRISES

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The author's earlier articles demonstrated that in order to describe the processes taking place within a country's economy this economy can be viewed as the volume of the economic shell. This article considers a country's GDP as the surface area of the economic shell [1].

GDP can be calculated by estimating the surface area S_{su}, which is affected by external forces P. To perform the calculation, we used four variables, i.e. S_{su} (GDP_{su}) = f(X1, X2, X3, X4). Here we have X1, X2, X3 and X4, the variables that influence the country's GDP.

It should immediately be noted that during calculation and plotting of construction drawings, the parameters of X1, X2, X3 and X4 could be constant values, increase or decrease by 10 times. On the basis of the calculations made, 81 graphics were built, which can be divided into the four following groups:

- variable values X1, X2, X3 and X4 increase and are constant;
- variable values X1, X2, X3 and X4 decrease and are constant;
- variable values X1, X2, X3 and X4 decrease and increase;
- variable values X1, X2, X3 and X4 are constant, they decrease and increase.

Figure 1 represents a two-dimensional graph of the dependence S_{su} (GDP_{su}), where X1 = X2 = X3 = 1 and X4 = 0,1…0,99, which shows that the initial values of S_{su} increase gradually from 14,58 to 23,77 in point 9, and then increase considerably to 102,86, i.e. more than three times 3,22. Figure 2 shows one 3D graph, which allows us to see the changes of S_{su} more clearly. In this case, it makes sense for us to have the values of the rightmost points, as at these values the value of S_{su} (GDP_{su}), i.e. GDP, will be at its maximum. Figure 2 is plotted with the use of variables X3 and X4, i.e. S_{su} (GDP_{su}) = f(X3, X4).

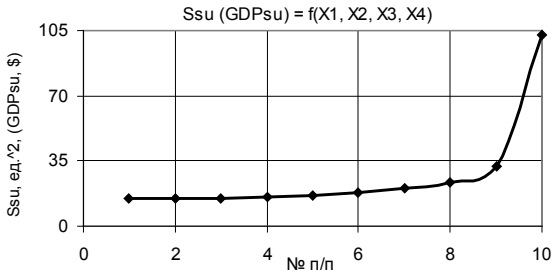


Figure 1. *S_{su} (GDP_{su}) = f(X1, X2, X3, X4) when X1 = X2 = X3 = 1, X4 = 0,1…0,99*

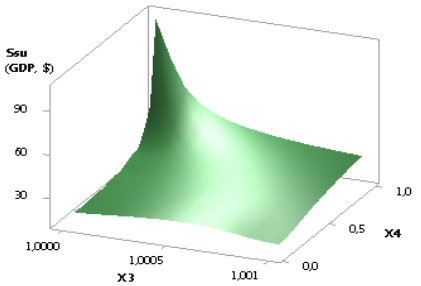


Figure 2. *3D graphic: S_{su} (GDP_{su}) = f(X3, X4) when X1 =X2 = X3 = 1, X4 =0,1…0,99*

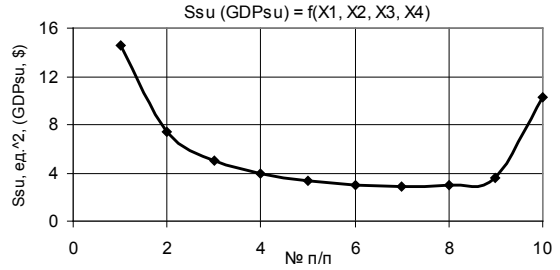


Figure 3. *S_{su} (GDP_{su}) = f(X1, X2, X3, X4) when X1 = X2 = 1, X3 = 1…10, X4 = 0,1…0,99*

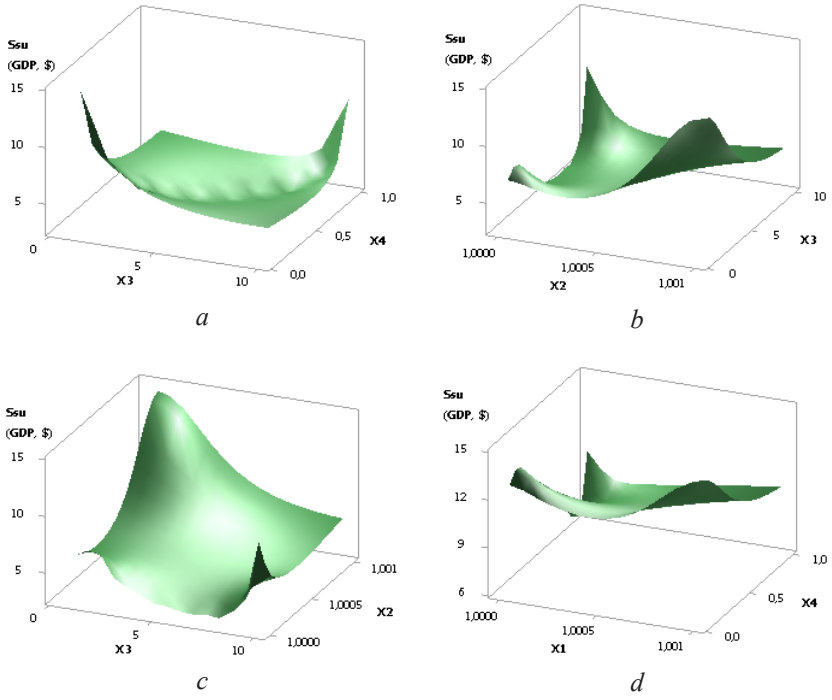


Figure 4. *3D graphics: a - S_{su} (GDP_{su}) = f(X3, X4); b - S_{su} (GDP_{su}) = f(X2, X3); c - S_{su} (GDP_{su}) = f (X3, X2); b - S_{su} (GDP_{su}) = f (X1, X4) when X1 = X2 = 1, X3 = 1...10, X4 = 0,1*

The following Fig. 3 shows that first, at X1 = X2 = 1, X3 = 1…10, X4 = 0, 1 …0,99, the plotted curve S_{su} decreases fivefold from 14,58 to the minimum of Ssumin = 2,88 in point 7, and then it drastically increases 3,4 times to 10,29. Figure 4 demonstrates four forms of this dependence as three-dimensional graphs. Here we must note that the form of the 3D graph depends on the choice of the applied axes sequence. For example, in Fig. 4*b* and 4*c* we can see 3D graphs with the same variables X2 and X3, but with different axes sequences. As we can see, these two graphs' appearances differ significantly. Based on Fig. 3, it makes sense for us to have the values of the extreme points, as at these values the value of Ssu (GDP_{su}) will be at its maximum.

The plotted curve in Fig. 5 demonstrates that here the values of Ssu (GDP_{su}) at X1 = X2 = 1…10, X3 = 1 and X4 = 0,99 are rather high, from 102,86 to 102861,38, i.e. they have increased more than 1000 times. Figure 6 shows the plotted 3D graph.

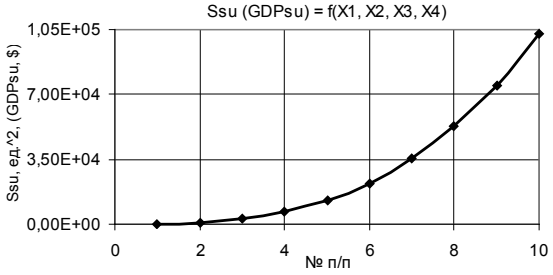


Figure 5. *S_{su} (GDP_{su}) = f(X1, X2, X3, X4) when X1 = X2 = 1…10, X3 = 1, X4 = 0,99*

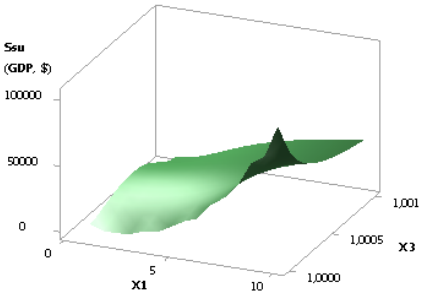


Figure 6. *3D graphic: S_{su} (GDP_{su}) = f(X1, X3); when X1 = X2 = 1…10, X3 = 1, X4 = 0,99*

Figure 7 demonstrates the dependence of S_{su} (GDP_{su}) at X1 = 1, X2 = X3 = 1…0,1 and X4 = 0,1…0,99. As we see from the Figure, at first the values of S_{su} (GDP_{su}) decrease according to the linear dependence from 14,58 to their minimum of 6,39 at point 9. Then they increase in steps up to 10,29. Figure 8 shows two 3D graphs S_{su} (GDP_{su}) = f(X2, X1) and S_{su} (GDP_{su}) = f(X1, X4) respectively. At the given values of the variables, it also makes sense to choose the extreme point values in Fig. 7, which allows us to have the maximum values of S_{su} (GDP_{su}).

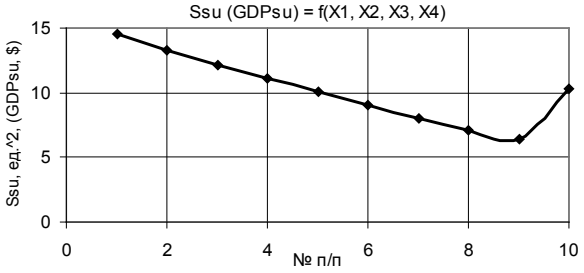
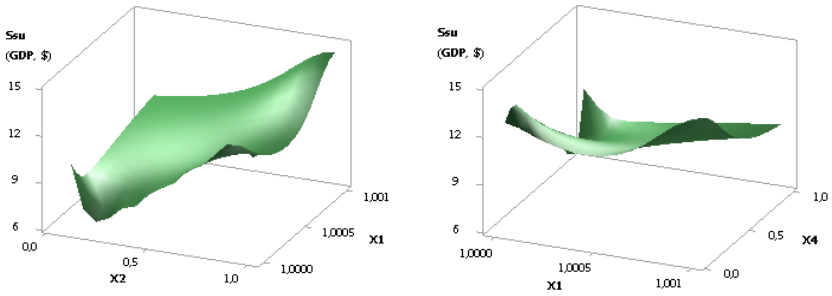


Figure 7. *S_{su} (GDP_{su}) = f(X1, X2, X3, X4) when X1 = 1, X2 = X3 = 1…0,1, X4 = 0,1…0,99*



a *b*

Figure 8. *3D graphics: a - S_{su} (GDP_{su}) = f(X2, X1); b - Ssu (GDPsu) = f(X1, X4) when X1 = 1, X2 = X3 = 1…0,1, X4 = 0,1…0,99*

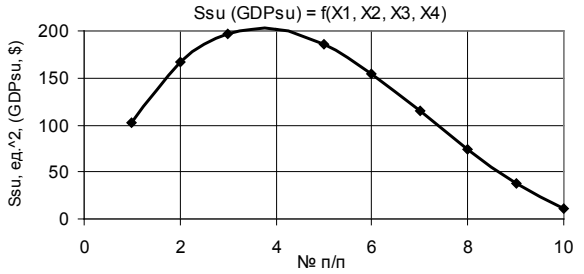


Figure 9. *S_{su} (GDP_{su}) = f(X1, X2, X3, X4) when X1 = 1…10, X2 = 1…0,1, X3 = 1, X4 = 0,99*

The following Fig. 9 shows that first the values of S_{su} here increase from 102,86 to their maximum of 201,64 in point 4, and then they gradually decrease to the value of 10,29, i.e. go down nineteenfold. Figure 10 represents three 3D graphs for S_{su} (GDP_{su}) = f(X2, X1), S_{su} (GDP_{su}) = f(X3, X1) and S_{su} (GDP_{su}) = f(X3, X2) respectively.

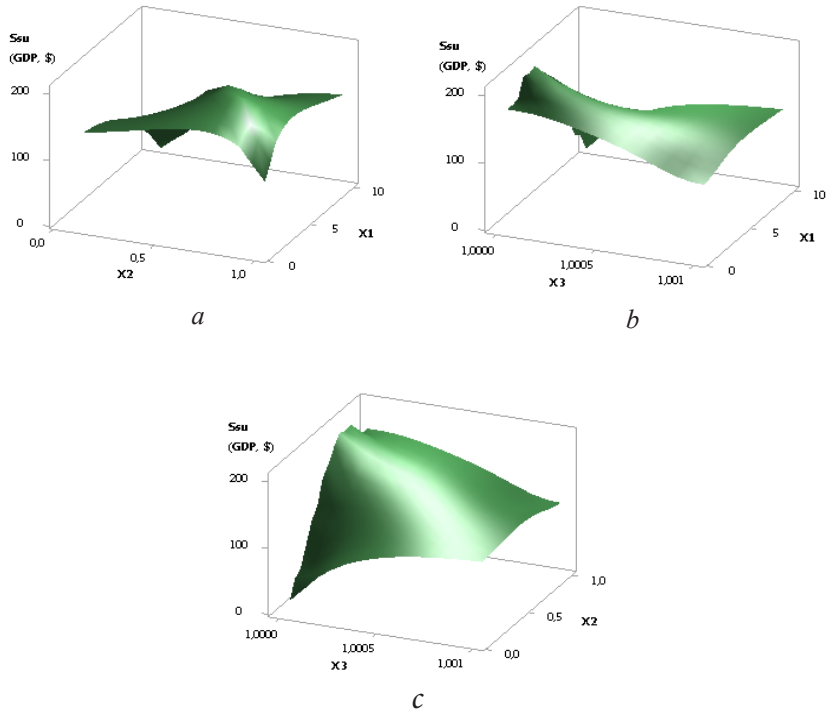


Figure 10. *3D graphics: a - S_{su} (GDP_{su}) = f(X2, X1); b - Ssu (GDP_{su}) = f(X3, X1); c - S_{su} (GDP_{su}) = f(X3, X2) when X1 = 1…10, X2 = 1…0,1, X3 = 1, X4 = 0,99*

In Fig. 11 we can see that the plotted curve S_{su} (GDP_{su}) increases gradually from the value of 102,86 to its maximum of S_{sumax} = 309,72 in point 7, and then it decreases 2,12 times to the value of 145,82. This Figure was plotted at the following values of the variables: X1 = 1…0,1, X2 = 1…10, X3 = 1, X4 = 0,99…0,1.

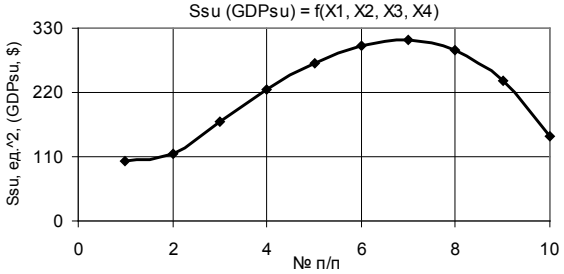


Figure 11. *S_{su} (GDP_{su}) = f(X1, X2, X3, X4) when X1 = 1…0,1, X2 = 1…10, X3 = 1, X4 = 0,99…0,1*

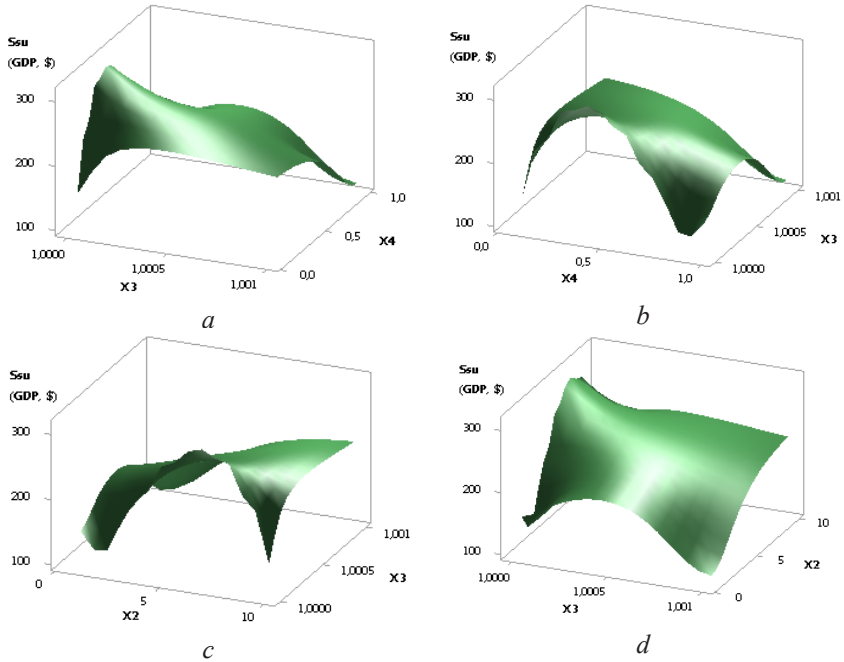


Figure 12. *3D graphics: a - S_{su} (GDPsu) = f(X3, X4); b - S_{su} (GDPsu) = f(X4, X3); c - S_{su} (GDPsu) = f(X2, X3); b - S_{su} (GDP_{su}) = f(X3, X2) when X1 = 1…0,1, X2 = 1…10, X3 = 1, X4 = 0,99…0,1*

For Fig. 9 and 11, it makes sense to choose the values of the variables that are close to their maximum points.

The last Fig. 12 represents four 3D graphs of S_{su} (GDP_{su}), and here Figures 12*a* and 12*b*, as well as 12*c* and 12*d* are plotted with the axes modified.

After the calculations were made, their results were gathered into a summary Table, which contains 95 lines despite the fact that 81 two-dimensional graphs were plotted. The reason for this is a number of plotted graphs having maximums and minimums.

This summary Table includes such ratios as:

- $S_{sub}…S_{suf}$, where S_{sub} is the initial value of the economic shell surface area, units2; S_{suf} is the final value of the economic shell surface area, units^2;
- S_{suf}/S_{sub} is the ratio of the final value of the economic shell surface area to the initial one.

The ratio of the final value of the economic shell surface area S_{suf} to the initial one S_{sub} shows what fold their values increased (decreased) as affected by various external forces. Thus, having these data we can choose the values of the variables X1, X2, X3 and X4 at which the economic shell surface area will stay unchanged or even increase under the influence of external forces. Thus, during the economic crisis, the selected variable values will allow preserving the country's GDP_{su} at the same level, or even increasing it.

After the summary Table with 95 lines was plotted, it was transformed the following way, and only the values where $S_{suf}/S_{sub} \geq 1$ were left. On the basis of this transformation, we obtained the final summary Table, which included 48 lines. Thus, we obtained 48 variants that allow countries to come out of yet another economic crisis. Below, you can see Table 1, which includes only a part of the summary Table with 22 lines. Here the ratios S_{suf}/S_{sub} in the last column are given in descending order.

Table 1 shows that there are two variants at which GDP of a country will not change in the time of an economic crisis, even if we change the variables. These lines are 21 and 22, where the ratios $S_{suf}/S_{sub} = 1$.

Table 1. *Statistics of theoretical relation S_{suf}/S_{sub} where $S_{suf}/S_{sub} \geq 1$*

No. in sequence	X1, unit	X2, unit	X3, unit	X4, unit	S_{sub} … S_{suf}, unit^2 (GDP_{sub}…GDP_{suf}), $	S_{suf}/S_{sub} (GDP_{suf}/GDP_{sub})
1.	1…10	1…10	1…0,1	0,1…0,99	14,58…1,029E+06	70539,88
2.	1…10	1…10	1…0,1	0,99	102,86…1,03E+06	10000,00
3.	1…10	1…10	1	0,1…0,99	14,58…1,03E+05	7053,99
4.	1	1…10	1…0,1	0,1…0,99	14,58…1,03E+05	7053,99
5.	1…10	1…10	1	0,99	102,86…1,03E+05	1000,00
6.	1	1…10	1…0,1	0,99	102,86…1,03E+05	1000,00
7.	1	1…10	1	0,1…0,99	14,58…10286,14	705,40
8.	1…10	1	1…0,1	0,99	102,86…10286,14	100,00
9.	1	1…10	1	0,99	102,86…10286,14	100,00
10.	1…10	1	1	0,1…0,99	14,58…1028,61	70,54
11.	1…0,1	1…10	1	0,1…0,99	14,58…1028,61	70,54
12.	1…10	1	1…0,1	0,99…0,1	71,02…1458,20	20,53
13.	1…0,1	1…10	1	0,99	102,86…2016,08	19,60
14.	1	1…10	1	0,99…0,1	102,86…1458,20	14,18
15.	1…10	1	1	0,99	102,86…1028,61	10,00
16.	1	1	1…0,1	0,99	102,86…1028,61	10,00
17.	1	1	1	0,1…0,99	14,58…102,82	7,05
18.	1	1	1…0,1	0,99…0,1	28,75…145,82	5,07
19.	1…10	1	1	0,99…0,1	63,92…145,82	2,28
20.	1…10	1…0,1	1	0,99	102,86…201,61	1,96
21.	1…10	1	1…10	0,99	102,86…102,86	1,00
22.	1…0,1	1	1…0,1	0,99	102,86…102,86	1,00

Now let us transform Table 1 into Table 2, and for this we will group the lines according to the number of variables they include. Thus, Table 2 includes the following four groups: with 1 variable; with 2 variables; with 3 variables and all the variables.

Table 2. *The statistics of constant parameters for Ssuf/Ssub in descending order*

No. in sequence	X1, unit	X2, unit	X3, unit	X4, unit	S_{sub} … S_{suf}, unit ^{2} (GDP_{sub}…GDP_{suf}), $	S_{suf} / S_{sub} (GDP_{suf} / GDP_{sub})
1 variable						
1.	1…10	1…10	1…0,1	0,99	102,86…1,03E+06	10000,00
2.	1…10	1…10	1	0,1…0,99	14,58…1,03E+05	7053,99
3.	1	1…10	1…0,1	0,1 …0,99	14,58…1,03E+05	7053,99
2 variables						
4.	1…10	1…10	1	0,99	102,86…1,03E+05	1000,00
5.	1	1…10	1…0,1	0,99	102,86…1,03E+05	1000,00
6.	1…0,1	1…10	1	0,1…0,99	14,58…1028,61	70,54
7.	1…10	1	1…0,1	0,99…0,1	71,02…1458,20	20,53
8.	1	1…10	1	0,1…0,99	14,58…10286,14	705,40
9.	1…10	1	1…0,1	0,99	102,86…10286,14	100,00
10.	1…10	1	1	0,1…0,99	14,58…1028,61	70,54
11.	1…0,1	1…10	1	0,99	102,86…2016,08	19,60
12.	1	1…10	1	0,99…0,1	102,86…1458,20	14,18
13.	1	1	1…0,1	0,99…0,1	28,75…145,82	5,07
14.	1…10	1	1	0,99…0,1	63,92…145,82	2,28
15.	1…10	1…0,1	1	0,99	102,86…201,61	1,96
16.	1…10	1	1…10	0,99	102,86…102,86	1,00
17.	1…0,1	1	1…0,1	0,99	102,86…102,86	1,00
3 variables						
18.	1	1…10	1	0,99	102,86…10286,14	100,00
19.	1…10	1	1	0,99	102,86…1028,61	10,00
20.	1	1	1…0,1	0,99	102,86…1028,61	10,00
21.	1	1	1	0,1…0,99	14,58…102,82	7,05
all the variables						
22.	1…10	1…10	1…0,1	0,1…0,99	14,58…1,029E+06	70539,88

The obtained Table 2 gives us a clear idea that it suffices to change even one variable out of four for the country to successfully come out of an economic crisis.

Thus, depending on the number of variables applied, Table 2 allows us to use a different number of variants:

- with 1 variable (3 variants);
- with 2 variables (14 variants);
- with 3 variables (4 variants);

- all the variables (1 variant).

As we can see, the largest number of variants is available for two variables. However, if we apply all the variables to come out of an economic crisis, in this case we will have the strongest economic effect.

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银行为金砖国家做出贡献
BANKS CONTRIBUTE TO BRICS

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抽象。 文章涉及国际经济关系中的重要问题，并展示了银行作为中介机构的作用，为客户提供金融工具，促进金砖国家的成功发展。
关键词：国际经济关系，银行，银行工具

***Abstract**. Article deals with important issues within the international economic relations and displays the role of banks as intermediaries that supply clients with financial instruments and contribute to successful development within BRICS*
***Keywords:** international economic relations, banks, banking instruments*

Actually, mutual economic development is the main goal of BRICS. Special role in this process is played by banks. There is no denying the fact, that effective banking strategy depends on accurate assessment of common problems and a search for mutual solutions to increase quality of life in member countries. From experience, fast liberation of financial-economic relationships leads to decline in some areas of economy, including strategically important ones, and to slowdown regulation of key industrial areas, which leads to bank speculations and high risks of national economy. To find the way in turbulence is the main task for BRICS governments that use different vehicles, intergovernmental measures including.

The theory of fiscal federalism identifies main functions for the public sector: macroeconomic stabilization, income distribution and resource allocation (Oates, 1999). The problem of fiscal decentralization in developing countries are carefully studied by Fukasaku and de Mello, Manor, Crook and Manor (1998 - 1999), that tried to give reason to the restructuring of government and market functions. Some scholars within the public choice school consider that decentralization tends to increase competition among jurisdictions (Brennan and Buchanan, 1980; Breton, 1989). Anyway, in globalized economy the mechanism of intergovernmental grants transfers is required by developing countries (Ahmad, 1997). Thus, the intergovernmental financial institutions can contribute to it, supplying the country-

members with unconditional, conditional and equalization grants (Brosio, 2000). There is no denying the fact, that only international experience can provide useful methods for policy makers (Bird and Vaillancourt 1998), but the approach of laissez-faire or market fundamentalism has a week potential to solve most economic and social problems (Stiglitz, 1998). Market fundamentalism was popularized by George Soros in "The Crisis of Global Capitalism" (1998) that trusts in a free market mechanism. That is a privilege of a genius, but practice has proved the approach of J. E. Stiglitz, who criticized the IMF, advocating a set of policies, which is generally referred to the market fundamentalism, "based on an incorrect understanding of economic theory and as an inadequate interpretation of the historical data."

The correct understanding means reasonable regulation and cooperation in solving mutual problems and meeting new challenges. There is an on-going process of reengineering international cooperation within globalized economic environment. The speed of cooperation depends on macro and microeconomic factors, as well as participation in the global market, supply of the products and political support. Mutual aims of any government are linked with economic and social developments, as well as successful production, safe banking, financial stability and effective debt management that is the main feature of globalization. The goals can be reached by BRICS cooperation in modern conditions of clustering the world economy and development of partnership of business entities, that are interested in cooperation.

Research proves that banks of emerging markets are in a race towards "fast profits" and cut down on traditional operations (project financing, loans, etc.). Vast amount of operations is attributable to expatriation of capital into offshore zones. According to the World Bank, absence of banking support for economic development in ex-USSR countries lead to manufacturing decline of 65%. However, in countries with government involvement and gradual market transformation - economy recovered faster (Belorussia, Kazakhstan, Uzbekistan). Use of reasonable government regulation of economy, as a whole, is a vital condition of development and formation of new approach to the realisation of commercial relationships and aids development of international banking. Effective cooperation between participants of BRICS countries is also influenced by the amount of government support given to economy during formation of market relationships. Under growing economic co-operation manufacturing feel pressure from their clients that require quality goods and services and from competition, which are able to offer better quality at a lower price. Sensible regulation of inter-state relationships encourage economic co-operation. In its tern, creation of common legislation base, which provides effective banking servicing of BRICS economy, will create stable foundation for collaboration. Establishment of essential condi-

tions for interaction between credit institutions requires time and political power. The analysis of current developments of emerging markets has proved, that banks are able to support economy sectors during growth of partnership by backing economic interest of countries and encouraging trade development, that increases cooperation. Banking support for the least protected market participants - SMEs, entrepreneurships – driver and buffer of any economy, will create favourable conditions for effective economic operations, creating employment, production of goods that are under market demand. Effective global cooperation of BRICS countries connected with necessary design of common banking support strategic developments. Consequently, creation of a reasonable international strategy is possible by using holistic analysis of economic demands of each member-country. Reality has shown that absence of economic forecasting in banking activity leads to negative consequences. For example, "tax holiday" policy, granted to banks by state of Brazil when dealing with foreign investors caused overproduction of cars, which created stagnation of number of economical segments. According to world practice, it is important to provide legal coverage for property of economic partners – a key business component taking into consideration specifics of each country. Formation of mutual economic strategy increases importance of banking intermediary, especially in the area of financial risk management, liquidity financing and management of financial capital. Country's economic development depends on the level of banking business involvement, attributable to customers and market partners. Rating of market demands of BRICS member countries shows that implementation of joint growth programme demands long-term financing, project financing, inclusive of syndicates and constant information flow in all segments of economy. Effective relationships between entities are built on foundation of common economic interests and governmental support. Expertise of many countries from Central and Eastern Europe has proved that public support and substantial banking activity desire to minimise change and promote progressive actions in restoration of economic ties.

During the formation of a mutual economic strategy, it is important to consider the experience of CEE countries, which overcome the consequences of market reforms in the economy, which showed that countries are not concerned with prospect of banking reform but how they are going to be implemented in reality. In this regard, presence of objectivity in progressive actions towards available financial resources is very important. Governments support of entrepreneurs who are dealing in area of international trade, unification of banking activity and policies will create favourable conditions for economic cooperation within BRICS. Growth of economic ties of member-countries based on common values and development goals suggests a long-term strategic alliance of private credit institutions in the field of international trade, taking into account customer flexibility.

Sound financial management, modernisation of banking technology will also contribute to the development of the BRICS market. Support of the balance of interests of public and private structures, growing capacity of joint investment financing, strengthening the legal framework and improving the legal support of business - processes contributes to the development of economic cooperation of economic entities. In addition, banks' activities supporting economic cooperation among BRICS countries should be transparent and accessible to the customer, regardless of the place of accreditation if their business activities executed in the economic environment of these countries. Currently, one of the important directions of banks - participants of international economic cooperation is a support programme of trade relations («Trade - Finance Promotion»), which assists customers in selecting contractors for International Cooperation. Currently, small and medium-sized enterprises of BRICS member- countries have to apply adverse cooperation schemes, including an advance payment for imports. In other cases, the completion of foreign trade contracts is prevented by excessive pricing conditions for underwriting and insurance payments. In this regard, using interstate status, a number of banks - members of the BRICS can help to achieve favourable agreements with banks - exporters to improve the conditions for international cooperation. One of the most important trends of banks is to provide payment guarantees to exporters, ensuring pre-export financing and cooperation with insurance companies. It seems appropriate for international banks of BRICS to move towards the development of special operations related primarily to export - import activities of economic entities and to provide customers and their counterparties a variety of banking services on the agreed "flexible" terms of cooperation, namely: provision of documentary operations, organisation of the bank syndicate to finance exporters / importers, financial market transactions, advising stakeholders during contract finalisation, assist clients in calculating the limits for dealings with exporters and importers, confirmation of letters of credit and guarantees, issuance of Guarantees and counter-guarantees, use of interstate opportunities, taking into account documentary instruments, promissory notes, drafts, etc. In order to maximise demand of member - countries, banks are expedient to: acceptance of drafts drawn by exporter / importer, finance exporters against documentary letters of credit issued by reputable banks, to provide the agreed overdrafts, to ensure the implementation of credit lines for exporters / importers, financing of drafts drawn by exporters or financing of documents against acceptance, financing of collection documents with recourse to the borrower, provide trade financing against contract documentation , accepted by the bank of the importer, financing of goods supply in the initial stage of the implementation of contracts (for up to 180 days), financing of importers/ exporters, financing of the fulfilment of contractual obligations, financing documents against acceptance, implement pre- export funding. Given currency specif-

ics of balance of payments of some member countries of the BRICS, banks need to provide specialised services to business entities in the national currencies of their countries, namely: payment services for clearing payments, maintain multicurrency account with the possibility of strengthening account liquidity in national currencies from the surplus balances on other accounts, manage clients' short-term liquidity in the national currencies of the BRICS countries, manage accounts in national currencies through telecommunication systems, maintain the "escrow" accounts. Considerable attention of the banks should be given to their corporate clients: advise on monetary and financial conditions and payment of export-import contracts in national currencies, currency regulation and currency control in the member countries of the BRICS, organisation of short and medium term financing of commercial transactions in national currencies , including syndicated loans, hedge currency risks, to carry out currency arbitrage, provide trust operations in national currencies and other currencies on behalf of their clients.

An important component of creating a common economic space of the BRICS countries is a presence of special interstate deal insurance programme with involvement of government agencies for export insurance and guarantee of international operations. Specialised agencies of the BRICS countries are able to promote multilateral cooperation for business partners effectively. Banks involvement in encouraging formation of joint leasing companies with the participation or support of the state will also promote cooperation. An important area of international cooperation is discounted (governments -sponsored) financing of innovative and knowledge-intensive projects, as well as socio - economic programmes: environmental protection, infrastructure development, energy – supply and health programmes, etc. At the same time, an important role of the banks is within a modernisation and engineering support, as well as in the opening of joint credit lines in order to ensure the economic benefits and enhance the living standards of countries - members of the BRICS. In turn, the formation of the multilateral clearing system can stimulate the formation of BRICS' payment system and monetary cooperation will contribute to amelioration of a global financial infrastructure. Assistance of banks in client's activity will also expand BRICS economic ties.

The results of the study provide a strong case for BRICS interbanking that should be taken into consideration while constructing economic and political approach to a global infrastructure. Economic needs and mutual interests are certainly a step in the right direction of cooperation. However the setting of needs depends on banking and finance. It is recommended to take into consideration the international experience and to introduce the required instruments to be successful for BRICS banking, taking into consideration, that mutual interests are affected by economic needs.

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质量管理问题

QUALITY MANAGEMENT PROBLEMS OF INBOUND TOURISM IN KAZAKHSTAN IN MODERN CONDITIONS

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摘要。 本文考察了现代条件下哈萨克斯坦入境旅游质量改善问题以及将国家变为新的国际旅游目的地的可能性。

关键词：旅游业，质量，国际旅游目的地

Summary. *This article considers the problems of quality improving of inbound tourism in Kazakhstan in modern conditions and the possibility of turning the country into a new international tourist destination.*

Key words: *tourism industry, quality, international tourist destination*

Formulation of the problem. The modern world is in constant motion, millions of people are moving with different goals around the globe. Huge contribution to the development of cultural, business interaction, just human communication makes tourism. Today, tourism is an entire industry, whose contribution to the development of the world economy is very significant in size. «Tourism is the largest global industry and makes a huge contribution to the economies of developed and developing countries, as it is a driver of economic development and diversification, an integral part of economic development policy at the local, regional and national levels» [1, p.411].

Analysis of recent research and publications. According to the World Tourism Organization in 2016, the share of tourism in the global GDP structure was 10%. At the same time, tourism creates every 10th job in the world.

In Kazakhstan, tourism has not been a priority for economic development for quite a long time, the country relied more on its fuel and raw materials. However, in the conditions of the Fourth Industrial Revolution, it is necessary to match its characteristics and in the strategy of the Republic of Kazakhstan begins to shift towards other sectors of the economy, more technological and innovative. Among them is the tourism industry, which can become a new driver of economic devel-

opment. Possessing a huge resource potential, tourism in Kazakhstan still plays a very modest role, so in 2016 its share in the country's GDP was only 1%.

The level of development and in particular the quality of tourist products and services does not correspond to the international one. In the 2015 Competition Rating in the Tourism and Travel Sector (Travel and Tourism Competitiveness Index), Kazakhstan ranked the 85th out of 141 countries [2].

This ranking summarizes the indicators of countries competitiveness on 14 key parameters. The Republic of Kazakhstan received the highest marks in the «health and hygiene» position – the 7th place. Average marks received: «HR and labor market» –the 37th place; «Business climate» – the 44th place; «Readiness of information and communication technologies» – the 48th place; «Price competitiveness» – the 49th place.

Kazakhstan got weaker positions in terms of «Safety and security –the 72nd place; «Air transport infrastructure» –the 76th place; «Tourist service infrastructure» – the 81st place; «Priority of tourism» –the 84th place and «Environmental sustainability» – the 91st place.

The position of Kazakhstan is the weakest in terms of such parameters as «Cultural resources and infrastructure for business tourism» – the 101st place; «Land and sea infrastructure» – the 102nd place; «Natural resources (not subsoil)» – the 111th place. At the 124th place, almost at the end of the rating, Kazakhstan is located on the parameter «International openness».

Emphasizing the previously unsolved parts of the common problem. As we can see, almost in all respects, tourism in Kazakhstan is practically uncompetitive in the international market. And, if the weakness of positions on «Natural and cultural resources» is explained by the low level of advertising and informational activities, the lack of recognizable domestic brands, which can be compensated through a competent PR policy. But the extremely low position on the parameter «International openness» is the most formidable obstacle in the development of the tourism industry in Kazakhstan and requires political decisions at the highest state level.

Many of the shortcomings and problems in the development of the tourism industry in Kazakhstan are closely related to the poor quality of the provision of services and products. Meanwhile, only quality can attract the consumer. G. Butnaru and A. Miller note: «Quality is a factor in improving competitiveness and introducing changes in the activities of organizations in the tourism sector» [3, p.376].

The purpose of the article. Improving the competitiveness of inbound tourism in Kazakhstan has serious prerequisites due to the diversity of climatic conditions, vast territories with untouched nature, rich cultural and historical heritage, which together allows us to develop many forms of tourism, from the traditional to the most innovative.

The presentation of the main material. The material and technical basis for locating products and objects of the tourist industry and the infrastructure sector have been created in Kazakhstan and are in many ways morally and physically obsolete, partially destroyed or changed their functions. The new wave of tourism development has a point character and occurs in the regions-donors of the republican budget or in the framework of projects of undoubted investment interest.

Kazakhstan has a vast territory, rich historical and cultural heritage, and in some regions - unspoiled, wild nature, which is a prerequisite for the development of various forms of tourism: summer and winter tourism; cultural and educational tourism; ecological tourism; hiking tourism; rural tourism; extreme tourism; hunting tourism; sports tourism, mountaineering and alpine skiing; business travel; health tourism; pilgrim tourism; recreational tourism; cross-border tourism (transit and cross-border tourism); youth tourism, incl. wedding; scientific tourism; nostalgic (ethnic) tourism. Meanwhile, the country uses its tourist potential with low efficiency.

SWOT analysis of the tourism industry of Kazakhstan is shown below.

Matrix SWOT-analysis of the tourism industry of the Republic of Kazakhstan

Strengths (S)	Opportunities (O)
-Political stability -Tolerant society -High level of peacefulness of the population (higher than in all CIS countries) -The presence of a variety of natural climatic zones and landscapes for a wide variety of leisure activities -Location in the center of Eurasia -All-season rest -Unique nomadic culture -Availability of cultural and historical monuments -Governmental support -Attracting foreign investment	-Rapid growth of the economy -Growing interest in the country from foreign tourists -State interest in supporting rapid growth of tourism -Stable socio-economic situation of the country -Growth of the private sector involved in tourism -Creation of tourist and cultural clusters -Improving the image and tourist attractiveness of the country -Development of the Kazakhstani tourist brand

Weaknesses (W)	Threats (T)
-Weak investment attractiveness -Lack of coordination between the subjects of tourism activities and authorities - Ecological situation -Low level of development of tourist infrastructure -Weak communication systems (communication, transportation) - Lack of direct international flights -Low quality of tourist products and services -Non-competitive prices -Lack of professional staff -Poor information support -Low diversity and weak customer orientation of tourist products -Lack of national tourist brand -Insufficient development of the visa regime	-Slowdown in economic growth - Low diversification of the economy -Extreme rate volatility - national currency -Sanctions threats due to close connection with the Russian economy - Increasing environmental problems - Price increase for services - Growth of business expenses (utilities, tax, development) - Inflation rate -Non-competitiveness of the transport and logistics complex -Administrative and bureaucratic obstacles, especially at the local level

SWOT analysis of the tourism industry of the Republic of Kazakhstan shows that weaknesses are primarily associated with the low quality of the tourist product and services, as well as quality management. Meanwhile, the competitiveness of the industry largely depends on the quality of services determined by consumer demand. Due to the fierce competition in the international market, a quick response to rapidly changing consumer demands, continuous introduction of innovations into the design of new services, their promotion and implementation can ensure a qualitatively new level of the tourism industry in Kazakhstan.

Analysis of tourism development indicators and the national competitiveness of the tourism industry of Kazakhstan revealed a significant relationship between competitiveness and the quality of the tourist product and services. Since the national competitiveness of tourism is a multifaceted concept, the successful development of the international Kazakhstan destination requires a systematic approach to the development of long-term development plans to improve competitiveness and ensure the sustainability of the tourism industry. The study revealed Kazakhstan's clearly lagging behind in the infrastructure of tourist services, transport, promotion of the country at international fairs and exhibitions, and some other parameters. Solving the problems outlined requires increased state support. The promotion of a tourist product under a national brand will favorably affect both the image and attractiveness of Kazakhstan, as an international tourist destination.

The state of the tourism industry in Kazakhstan is characterized by the following indicators. In 2016, there were 2,031 tourist organizations in the country. Totally 2,754 accommodation units with a capacity of 138,062 beds, over 62% were provided by hotels [4].

The main regions in which most tourist accommodation was concentrated (633%) were East Kazakhstan, Almaty, Akmola, Karaganda, South Kazakhstan regions and the capital of Kazakhstan, Astana. At the same time, there is a weak occupancy rate in beds in hotels in all areas - only 23.8%. In many ways, such low occupancy rate is associated with high prices for hotel services, especially in the 5 * segment. Often, hotel services are focused only on representatives of business tourism, the number of which is limited. Plus, the high cost of transport services - all this greatly reduces the price competitiveness in the international market.

For a number of years already, tourism in Kazakhstan has been considered as one of the new drivers of economic development. The state has included tourism among the priority sectors of the national economy; measures are being developed for state support of the tourism industry in the country. Today we can already talk about some results of the implementation of government events. Thus, in the first half of 2017, the number of inbound tourists reached 3.56 million people, 20.5% increase compared to 2016. There were a 16% increase in hotels, hotels and other tourist accommodation, compared to a year earlier, rooms and rooms ready to receive guests - by 15%. The volume of services was grown by 23%.

The exhibition EXPO-2017 has become an undoubted tourist magnet. So, only on holidays from August 28th to September 3rd, EXPO was visited by 398.3 thousand people, that is, an average of 56.9 people per day. A record number of visitors was registered on September 3rd: more than 75 thousand people. In total, from June 10th to September 3rd, 3.53 million people came to EXPO. The total number of man-visits, that is, the total number of visits to all objects of the exhibition during its work reached 29.14 million.

EXPO showed that the development of tourism has a positive multiplier effect. Thus, the exhibition had a positive impact on almost all sectors of the economy. Increased number of tourists in hotels and catering places. Due to this, the budget of the capital received additional funds. Jobs have been opened. 196 Kazakhstani companies took part in the construction of the exhibition complex - about 200 thousand people. Only in August 2017 about 21 thousand people worked at the exhibition.

According to the Concept, by 2023, we can expect an increase in the number of domestic visitors to 12 million people, entry visitors to 5.5 million people [4].

Most of the visitors are citizens of the Russian Federation, followed by tourists from the People's Republic of China, with a large gap, almost equal representation from the United States of America and the Republic of Turkey. In addition, visi-

tors from Germany, Italy and other countries participate in the inbound tourism in Kazakhstan.Over 80% of foreign tourists visited the country for business and professional purposes.

According to official data, the total number of all foreign residents who entered Kazakhstan in 2016 was 6,509.4 thousand people, which is 1.2% more than in 2015. The main reasons for the arrival were private visits (75.4%), while official visits amounted to (16.2%), with the purpose of tourism - less than 1% [4].

At the same time, most of the arrivals accounted for the post-Soviet countries - Russia, Uzbekistan and Kyrgyzstan.

Today, the need for quality development of the tourist industry in Kazakhstan is increasingly recognized. In this connection, the Concept of the development of the tourism industry of the Republic of Kazakhstan until 2023 was adopted in 2017, the purpose of which «is to create a highly efficient, competitive tourism industry integrated into the global tourism market» [4].

In the Concept, 10 tasks for the development of the tourism industry in Kazakhstan are formulated, including:

1) development of domestic and inbound tourism;

2) development of regional cultural and tourist clusters;

3) increase in the contribution of the tourism industry to the state economy, stimulating investment;

4) creation of jobs in the tourism industry and related industries;

5) entrepreneurship development, including SMEs in related sectors of the economy, and human potential, as a whole in the country and regions, including rural areas;

6) improving the quality of the tourist product and ensuring its competitiveness;

7) planning of tourist development, including in the field of specially protected natural territories;

8) ensuring the further development of the tourist infrastructure;

9) promotion of tourist destinations in the domestic and international markets;

10)formation of a single national tourist brand [4].

These tasks are designed to ensure the formation of a state strategy focused on the priority development of the tourism industry in the country through improving the quality and competitiveness of the domestic tourism product provided by a developed material, technical, transport and information and communication infrastructure, promotion of tourist destinations and the creation of a national brand.

For the implementation of the tasks, new approaches are being developed in the management of the quality of tourism at different territorial levels and using the cluster method.

It is planned to create six cultural and tourist clusters «Astana - the heart of

Eurasia» on the basis of the capital, «Almaty» - the free cultural zone of Kazakhstan» with the center in the southern capital; «Pearl of Altai», including the northern and eastern parts of the East Kazakhstan region; «Caspian Gates» - within the framework of the Mangystau and parts of the West Kazakhstan and Atyrau regions; «Revival of the Great Silk Road», in which the central and eastern parts of the Kyzylorda region, the south-eastern and north-western parts of the South Kazakhstan region, the south-western part of the Zhambyl region are combined; «Unity of nature and nomadic culture», including Akmola and Karaganda regions, the south-western part of North Kazakhstan and the western part of Pavlodar regions [4].

Thus, in six clusters all regions of the country are represented, various natural-climatic zones, historical and cultural centers, protected areas, allowing to develop all-season tourism, to provide various types and forms of tourist services.

In the Message of the President of the Republic of Kazakhstan N.A. Nazarbayev «The Third Modernization of Kazakhstan: Global Competitiveness» the government of the country was given instructions on the use of «Project Management».

The result of the execution of this order was the determination by the Government of the «Olympic Route», which includes 6 sectors of the economy. Among them is the tourism industry, which is designated as one of the main drivers for the diversification of the country's economy.

«Project management» in the tourism industry implies close linking of the efforts of the public and private sectors to implement the tasks of improving the competitiveness of the industry, successfully promoting the image and the national tourist brand of Kazakhstan. As a result, the synergistic effect of turning Kazakhstan into an international tourist destination should be achieved.

Meanwhile, the tourist market does not stand still, the emergence of new information and communication technologies and their wide distribution in tourism, lead to the emergence of new tourist destinations, new forms of receiving services. Thus, the growing use of the Internet reduces the costs of tourists and increases the number of trips through increased access for searching and purchasing tourist products, using various technological applications for smart phones, and GPS for cars.

Today, personalization has become one of the main trends in the global tourism industry. «Personalized» technical solutions for air carriers, hotels, travel agencies, obtained using modern technologies, help to improve quality and reduce costs for each particular tourist.

The annual growth in demand for mobile travel applications has led to the active implementation of mobile technologies by the practice of Kazakhstan companies. For example, Air Astana launched mobile boarding passes on all domestic

flights from Astana and Almaty. The online market has seen an increase in online sales of air and train tickets. There is a transformation of the market in which there is an increase in the share of online purchases of airline tickets [5].

Conclusions and offers. For the further growth of the Kazakhstani tourism industry and enhancing its competitiveness, it will be very effective to create a separate structure that closely interacts with the tourism business, quickly responding to new challenges and changes in the global market environment. Such a structure can be created by a professional organization for the management and marketing of destinations - Destination Marketing Organization (DMO), operating at the national level and having an extensive network of representative offices in the regions of Kazakhstan. In general, the creation of such a structure can improve the quality of management of the tourist brand of Kazakhstan and help promote the country as an international tourist destination.

There is a lot of work ahead, both from the state and from private business. Improving the quality of tourist services will contribute to the introduction of international standards for the management of the tourism industry, which is already in the plans of the government.

The Ministry of Tourism and Sports of the Republic of Kazakhstan has put forward a proposal to create a national tourist brand «Go to Kazakhstan», which includes the most prominent centers of attraction of tourist interest.

Measures are being planned to conduct a large-scale information campaign to attract foreign tourists, create safe and comfortable conditions for staying in the country, and form a policy of openness and a barrier-free environment.

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哈萨克斯坦近代入境旅游质量管理问题

NEW METHODS OF MONITORING AND CONTROLLING THE LEVEL OF STUDENTS' KNOWLEDGE USING MODULAR LEARNING TECHNOLOGIES

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注解。本文介绍了在教育过程中使用模块化培训技术作为多功能教育技术综合体的一部分时，确定监测和控制学生知识水平的方法的研究结果。在测试任务的形成和处理结果的基础上，实现学生知识水平控制的实施方法得到了证实。在多功能教育技术综合体的框架内，展示了在模块化学习技术应用条件下监控学生知识水平的组织特征。揭示了使用模块化学习技术时学生知识控制组织的实践方面。已经证实，控制学生知识水平的过程的组织应该基于特定学科的学科领域的标准教学内容与学生队伍的同化水平的比较。

关键词：学生知识水平，监控，模块化培训技术，多功能教育技术综合体。

Annotation. *The article presents the results of research in terms of identifying methods for monitoring and controlling the level of students' knowledge when using modular training technologies in the educational process as part of a multi-functional educational technology complex. The approach to the implementation of students' knowledge level control based on the use of software in the formation of test tasks and the processing of their results is substantiated. The features of the organization of monitoring the level of students' knowledge in the conditions of application of modular learning technologies within the framework of a multifunctional educational technological complex are shown. The practical aspects of the organization of students' knowledge control when using modular learning technologies are revealed. It has been substantiated that the organization of the*

process of controlling the level of students' knowledge should be based on a comparison of the standard didactic content of the subject area of a particular discipline with the level of its assimilation by a contingent of students.

***Keywords**: the level of students' knowledge, monitoring and control, modular technology of training, multifunctional educational technological complex.*

Introduction

The first two decades of the XXI century clearly showed that the development of the world community is increasingly determined by the rapid development of informatization of all spheres of its life and the formation on this basis of the knowledge economy. These circumstances have predetermined the need to develop a new paradigm for reforming the Russian educational system using the latest information technologies, innovative forms and methods of organizing learning processes, controlling the level of knowledge and training qualified specialists. To substantiate the expansion of the practice of informatization in the field of education, a complex of modern Federal State Educational Standards (FSES) has been developed, within which the composition of the requirements for information technologies and innovative forms and methods applied to the organization of all stages of the educational process has been substantiated.

Informatization of education has become a kind of impetus to the development and implementation of innovative forms, methods and technologies for the organization of the educational process in teaching practice. Compared with traditional approaches to learning, they have been more effective. They allowed to fundamentally change the organization of the educational process, starting from the forms and methods of presenting new knowledge in the form of training modules (TM) as part of modern electronic educational resources (EER), continuing to form from them modular learning technologies (MLT) with the transition to learning based on individual trajectories and ending with the development of new and adaptation of existing methods of monitoring and controlling the level of students' knowledge in the context of using MLT in the framework of a multifunctional educational technological complex (METC). These circumstances determine the relevance of this article in modern conditions.

Purpose of the study

The main purpose of this article is to justify the need to use new and adapt existing methods for monitoring and controlling the level of students' knowledge in the context of applying MLT within the METC in the organization of the educational process.

Research methods

Since the modern MLTs that are part of METC have a modular structure, it is convenient to use adaptive information models to formalize the process of control-

ling the level of students' knowledge. They make it possible to take into account the logical dependencies of the didactic content of individual TMs and its correspondence to the current level of knowledge of the students. Improving the effectiveness of students' knowledge control in organizing the educational process based on the use of MLT within the METC is achieved by dynamically adapting the structure and composition of the didactic content of each TM to changing the level of students' knowledge by changing its level of complexity. The practical implementation of this approach consists in the formal comparison of the real level of knowledge of the student with a certain reference level of knowledge corresponding to the level of complexity of the didactic content of each TM and also in the choice of rules for comparing the real and reference levels of knowledge of the students.

It is well-known, that the level of students' knowledge is determined depending on the degree of assimilation of certain amounts of new knowledge presented in each TM. Therefore, its control will be reduced, essentially, to an assessment of the assimilation degree of the didactic content of each TM by a contingent of students. On the other hand, the volume of knowledge in each TM is structured in the context of its constituent units that are directly related to the subject area of an educational discipline, studied as a part of the METC for each area of education and training of future professionals. On this basis, the control of the level of students' knowledge will be an assessment of their mastery of the many concepts of the subject area of a particular discipline, expressed in the form of didactic content in a certain way structured thematic units, which are TM.

For the convenience of monitoring and obtaining assessments of students' knowledge, let us present the knowledge model of the subject area of a particular discipline, expressed in TM in the form of a hierarchical logical structure or digraph $G_{\Delta} = (F, \Delta)$ of the relations of logical dependence of structured didactic content. It distinguishes subgraphs of thematic units in the form of connected subgraphs $G_{\Delta}(R)$ of the graph G_{Δ}, induced by the set $R \subseteq F$, having the largest (initial) and smallest (final) elements of didactic content with respect to Δ. As a rule, the TM contains many vertices with comprehensive information on a specific topic, as well as the initial vertex fB_R with a table of contents or an introductory part and the final vertex fE_R with summary information [4].

For each vertex in the TM, the corresponding thematic units are allocated, as subgraphs dependent on the graph of this TM. The thematic unit corresponding to the vertex v, - the subgraph Gv of the knowledge graph MO $G_{\Delta}(R)$ formed by the sets of vertices and arcs of all the transchains of this TM that belong to some vertex $v \in R$. A $G_{\Delta}(R)$ TM transchain is an arbitrary chain connecting its initial and final vertices. Substantially, TM includes vertices on which the “degree of study” of vertex v depends, and those, the study of which, in turn, depends on the “degree of learning” of the students of a given vertex v [5].

For a formal comparison of the characteristics of the reference amount of knowledge of the didactic content of a thematic TM unit and the level of knowledge of the student, we use its display as a set of values of the assimilation level of the concepts studied, measured on a scale of order. The scale of the order is represented by a finite ordered set of levels of learning $X = \langle null, x_1, ..., x_j, ..., x_{NX} \rangle$, where $i < j$, *then* $x_i < x_j$ for any $i, j \in \{1, ..., N_X\}$. An empty element is denoted by *null*, $null < x_j$ for any j.

Let U be the set of students, and D be the set of concepts of the subject area of the educational discipline $N_D = |D|$. Let us assign an expression σ, which compares each concept $d_n \in D$ with the reference knowledge level $r_{in} = r(u_l, d_n) = x_j$ and its degree of mastering by students $u_l, x_j \in X$. In a didactic way, we call the result of knowledge state an expression σ for monitoring and assessing the student's knowledge u_l: $\sigma_l = (r_{i1}, r_{i2}, ..., r_i N_D)$. The didactic image of the state of knowledge can be used as a single set of features to describe both the level of knowledge of the student and the reference level of knowledge presented in the TM. The set of all possible didactic forms of knowledge considered by the educational system is denoted by S. We define the expression τ: $F \rightarrow S \times S$ of the set of vertices F of all TMs on the set of pairs of didactic forms. By the learning action of the vertex $v_k \in F$, we call the element of the expression τ: $\tau(v_k) = \tau_k = (\tau_k^i, \tau_k^o)$, *where* $\tau_k^i = (\tau_{k1}^i, \tau_{k2}^i, ..., \tau_k N_D^i)$ - the presentation condition, $\tau_k^o = (\tau_{k1}^o, \tau_{k2}^o, ..., \tau_k N_D^o)$ - the result of studying a vertex, and r_{kn}^o, r_{kn}^i - the resultant and initial levels of studying the concept of d_n. The presentation condition characterizes the knowledge that is required for the transition to the study of the next vertex of the TM and the result of the study is the knowledge presented at the top of the TM.

Compliance criterion, which calculates the number of target concepts for which the level of learning increases, after studying the studied vertex, takes the form $\eta(v_k, \lambda_k) = \Sigma\varphi_m(v_k, \lambda_k)$ $m=1, ..., N_D$. The condition of correspondence of the vertex of the learning goalσ_a: $\eta(\tau_k, \lambda_k) \geq 1$. To select the vertex v' that most closely matches the current level of knowledge of the student, we use the didactic function of the form $\pi(\lambda_k) = \{v' \mid \eta(v', \lambda_k) = max\ \eta(v, \lambda_k)\}$, $v \in R$, $\lambda_k \in \Delta$.

Results and discussion

Currently, the educational system in Russia is in the process of reforming, which, in its essence, is connected with the transition from the paradigm of mass education to the paradigm of personality-oriented education. One of the key areas of reform is the modernization of the education sector through the introduction of innovative educational technologies into the educational process and the creation of an open adaptive information educational environment. At the same time, the basic component of the reforming of the educational process should be the reorientation of the activity of the contingent of students to the organization of independent study of educational disciplines with the help of the MLT in the frame-

work of the METC in the areas of education and training of qualified specialists.

From the point of view of the didactic capabilities of MLT as a part of METC for self-study, the main direction of its organization is not to improve individual components, but to create conditions that encourage students to high cognitive activity and self-study. The development of the individualization of the educational process occurs through the creation of conditions for the motivation of students to self-study based on the design of individual tasks adapted to their individual abilities and the level of acquired knowledge. At the same time, students receive not only real opportunities for the development of their creative abilities, taking into account individual abilities and a basic level of knowledge and skills, but also a steady motivation to evaluate them in relation to achieving the level of key professional competencies in the chosen field of study.

From a pedagogical point of view, an important factor in the regular assessment of the level of students' knowledge using computer testing programs, which are an integral part of the MLT, is the confidentiality of the results obtained. The use of computer-based testing programs opens up additional opportunities for students to independently regulate the educational process, thanks to the possibilities of recording control results, individual consultations, guidelines and recommendations for studying the didactic content of the subject area of specific educational disciplines [2].

The educational process in modern conditions can take place under the most varied schemes, but regardless of this, there is always and will be a need for operational monitoring and control of the quality of training and the level of knowledge of students, whose assessments most often serve as the most significant indicators of students learning a certain amount of new knowledge. That is why the issues of monitoring the level of students' knowledge and its assessment are becoming increasingly relevant in modern conditions.

For optimal control of the level of students' knowledge, it is advisable to use special software within individual TM, MLT and METC in the fields of study in general [3]. The formation of test tasks is based on the pedagogical principles of the development of TM as part of METC. Therefore, the TM program to support students' knowledge control should include two software subsystems almost independent of each other: generating test tasks and interpreting the correspondence of the students' answers within the didactic content of individual thematic units of the TM. These software subsystems should interact with each other on the basis of logical and structural links in the composition of the didactic content databases of the subject area of specific educational disciplines.

For the development and design of test tasks, nowadays there are various methods and software, convenient and visual standards for answers to various kinds of tasks, as well as powerful databases of didactic content of the subject area

of specific educational disciplines, sufficient to ensure the adjustment of tests in accordance with training programs using TM as part of METC. However, practice shows that when implementing software to control the level of students' knowledge using MLT, the most acceptable is the method of dialogue interaction as part of specially customized TM programs. This method is based on the development of control programs from a set of standard training script blanks, in which you can change not only their content with didactic content, but also the structure of its presentation in accordance with the level of students' knowledge [1].

The success of the implementation of the software for controlling the level of students' knowledge using MLT as part of METC depends mainly on the interaction of its developers and programmers with a fairly high level of qualification. Although in recent years the number of test programs has increased significantly, most of the instrumental software tools for controlling the level of students' knowledge have not yet fully complied with the system requirements established in the framework of MLT. At the same time, the direction of students' knowledge control software using MLT is currently one of the most promising in modern pedagogy.

Using the above-described adaptive information models for structuring the didactic content of the subject area of various disciplines allows us to build methodologically sound and consistent scenarios for studying it in relation to individual TMs as part of MLT, which, in turn, are integral parts of METC in each area of education and training of qualified specialists. In educational practice, this approach is used to develop training programs in individual disciplines. At the same time, the structuring of the didactic content of TM allows not only to significantly reduce the time spent on the preparation of training programs, but also to speed up the selection of various training scenarios depending on the level of knowledge of the contingent of students.

Summary

Thus, to control the level of students' knowledge and to manage the process of studying a particular discipline, it is necessary to structure the didactic content for its presentation in the TM, and for feedback to use models of hierarchical conceptual knowledge networks. At the same time, the choice of the method of formalized expression of the structure of didactic content is determined by the form of representation of the logical-semantic structure of TM based on determining the composition of criteria for assessing its complexity. The development of multiple invariant plans for the presentation of didactic content in the TM should be implemented before the start of studying. The most acceptable solution to this issue seems to us the graph form of structuring didactic content of TMs belonging to the MLT, which, in turn, are formed by METC in the fields of education and training of qualified specialists. The practical implementation of the above approach will contribute to a clearer organization of monitoring and control of the level of students' knowledge when using MLT as part of METC.

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多语言在多元文化教育中的作用
THE ROLE OF MULTILINGUALISM IN POLYCULTURAL EDUCATION

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注解。 文章揭示了多元文化主义和多元文化在教育中的本质。 给出了类别数据的比较分析。 本文侧重于多语言在多元文化教育中的作用。
关键词：多元文化，多元文化，多元文化教育，多语言

Annotation. The article reveals the essence of multiculturalism and polyculturalism in education. A comparative analysis of category data is given. The article focuses on role of multilingualism in polycultural education.

Keywords: multiculturalism, polyculturalism, polycultural education, multilingualism

The concept of "polyculturalism in education" is very popular, in great demand and often used in various sources. Globalization and integration, the expansion of intercultural dialogues, mass migration of population led to the need for polycultural education.

The first definition of the term “polycultural education” was given by the International Dictionary (1977), which stated that this concept is connected with the interaction of a student with a foreign culture. In the International Encyclopedia of Education (1994), polycultural education is considered as an important part of modern education, which “promotes students' learning of other cultures and clarifying what is common and particular in traditions, lifestyle, cultural values of peoples, and educating young people in the spirit of respecting other cultural systems” [1].

In the Big Encyclopedic Dictionary, the following definition is given: "polyculturalism in education is the construction of education on the principle of cul-

tural pluralism, recognition of equal rights of all ethnic and social groups that are part of this society, on the inadmissibility of discrimination against people according to national or religious affiliation, gender or age" [2].

The idea of polyculturalism, having a long history, has been actively studied since the second half of the 20th century by scientists from all over the world. Russian scientists (E. V. Bondarevskaya, V. P. Borisenkov, A. N. Dzhurinsky, G. D. Dmitriev, V. A. Ershov, G. M. Kodjaspirova, L. V. Kolobova, V. V. Makaev , V.I. Matis, L. L. Suprunova, E. F. Tarasov, V. A. Tishkov and others), Kazakhstani researchers (B. A. Zhetpisbaeva, K. Zh. Kozhakhmetova, Sh. M. Muhtarova, S. U. Naushabaeva, V. V. Sergeeva and others) and foreign scientists (M. Anber, J. Banks, G. Garcia, M. Gordon, P. Gorsky, J. Zandfuks, M. Kruger-Potratz, G. Pommerin, J. Poisson, H. Thomas, J. Schmidt, T. Erickson, and others) made a significant contribution to the development of theoretical and methodological basis of polycultural education.

In foreign sources there are no exact boundaries between the concepts of "polyculturalism" and "multiculturalism". M. Kruger-Pratratz emphasizes that "multicultural education is designed to help learners to navigate in the society in which the whole life is determined by ethnic, linguistic, religious and social heterogeneity, and this relationship will be even more clearly expressed in the future. It should teach them to handle this diversity and find their place in it" [3].

H. Thomas believes: "Multicultural education takes place when a certain person seeks to communicate with people of another culture to understand their specific system of perception, cognition, thinking, their system of values and actions, to integrate the new experience into their own cultural system and change it according to someone else's culture. Multicultural education encourages the analysis of the system of one's own culture along with the knowledge of a foreign culture"[4].

A more precise definition was given by the american scientist J. Banks. J. Banks designated multicultural education with such concepts as "pluralism", "equality" and "association". In the first case, it is about respecting and preserving cultural diversity, in the second - about supporting equal rights in education, in the third - about the formation of national political, economic, spiritual values. In multicultural education, tolerance is the beginning of respect for other cultures. It is followed by understanding, respect and active solidarity, interaction, interdependence, interchange [5].

The generalization of these interpretations leads to the following conclusion: multicultural education is aimed at shaping the values, knowledge and culture of a democratic and tolerant attitude to all ethnic groups, equality in education.

Each new research of scientists expands and clarifies the concept of "multicultural education." As in the educational space along with the category "multiculturalism",

the term "polyculturalism" is often used. Russian researcher O. V. Gukalenko shares these concepts and believes that it is necessary to distinguish between the terms "multicultural" and "polycultural". She also considers polycultural education as a process of forming and developing pupils' perceptions of the diversity of cultures in the world and their country, fostering a positive, tolerant attitude to cultural differences, developing skills and humane, productive interaction with carriers of other cultures [6],

G. D. Dmitriev defines polycultural education as a way to counter racism, prejudice, xenophobia, bias, ethnocentrism, hatred based on cultural differences" [7, p. 12].

N. B. Krylova gives the following definition: "polycultural education is the ability of education to express the diversity and manifoldness of culture, to reflect culture as a complex process of interaction of all types of local cultures; the ability to create the conditions for the formation of cultural tolerance" [8, p. 21].

According to G.V. Palatkina, "polycultural education is an idea, process and innovative movement in education that provides equal rights and opportunities in obtaining education for all racial, ethnic and social groups operating in society, by systematically changing the educational environment in such a way that it reflects their interests and needs, if they are not in conflict with the law. It is aimed at the preservation and development of the whole diversity of cultural values, norms, patterns and forms of activity existing in this community, and the transfer of this heritage, as well as innovative tumors to the younger generation "[9].

A more precise definition of the concept of "multiculturalism" was given by T.V.Zinovieva: "Multiculturalism is the value of cultural pluralism, the relevance and significance of the diversity and multiformity of cultural forms". In it, the "alien" is considered as "different"; this is the main characteristic of this concept [10, p. 66].

From the given definitions, we came to the conclusion that the phenomenon of polyculturalism and multiculturalism is revealed through cultural pluralism. Polyculturalism reflects the creation of a unified society by representatives of different cultures, multiculturalism considers the "alien" as "other", i.e. thus, representatives of any culture, living in one society, live in "their own world." Multicultural education does not imply finding a common or particular in ethnocultures, it gives equal opportunities and rights for the development of all ethnocultures of society.

Thus, if representatives of different cultures do not want to contact each other, keep themselves apart and do not intend to create a single, common society, then this, at best, will lead to multiculturalism, and at worst - to social discontent and various social cataclysms. Each person has his own culture and language. The idea of polycultural education involves the prevention of misunderstanding that arises when communicating different nationalities and is based on the dialogue of cultures, on the knowledge and respect for the culture and language of another person.

Kazakhstani researchers associate the terms: polycultural and multilingual education, and believe that a multilingual person is a polycultural person. In Kazakhstan's education, the question of connection between language and culture in a polycultural space deserves special attention. B.A. Zhetpisbaeva states that the basis of the formation of a polycultural personality is multilingualism. Multilingual can be called a person who speaks, understands and knows how to use foreign languages in various communication situations. Learning a foreign language doesn't mean getting education in the foreign language. One can speak about trilingual education when other academic disciplines are taught in the foreign language, for example, the literature of the studied language, regional geography, etc. [11].

The development of a polycultural and fully harmonious personality is one of the main goals of education of the Republic of Kazakhstan. The actual problem of the State educational program of the Republic of Kazakhstan for 2011–2020 is the fluency in three languages: Kazakh as the state language, Russian as the official language, and English as the language of international communication. As a result of the implementation of the state program, 100% of the population must speak Kazakh, 95% speak Russian, 25% speak English [12].

By forming trilingualism within the framework of general education, we get a multilingual personality with multilingual competence and possessing knowledge in the field of three ethnic cultures. Thus, expanding the boundaries of what they know in their native language, students form a different attitude to the world around them - they understand the world as a set of different, but equal and equally interesting languages and cultures.

According to its focus, goals and content, language education of the XXI century is focused on the free polycultural and multilingual development of the language personality. Multilingualism becomes a factor of social mobility and the reason for changing the goal of language education. The linguistic personality is the fertile field where contact and meeting of cultures and interaction of languages "germinate".

The phenomenon of polyculturalism and multiculturalism is revealed through cultural pluralism. Polycultural education is an important part of modern education, and its essence and content is the assimilation of knowledge about one's own culture and cultural values of other nations, and the upbringing of the younger generation with respect for foreign cultures from the standpoint of a polycultural approach. Polycultural personality is formed through multilingualism, as in polycultural education, representatives of different cultures enter into cultural and linguistic dialogue among themselves.

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培养学生心理和教育方向的能力

DEVELOPMENT OF THE ABILITY TO REFLECT IN STUDENTS OF PSYCHOLOGICAL AND PEDAGOGICAL DIRECTION OF TRAINING

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注解。本文介绍了实验解决教育空间学生构建反思行为问题的假设，材料和方法的内容，其中充满了选择，实施方案，不同活动的并行过程，形式和方法的变化。工作的。正是这个教育空间可以部分地模拟学生在现代互联网空间，数字经济空间，快速变化的技术空间中的行为。

根据这项研究，理论上认为将反思理解为与他人组织合作行动以促进发展的能力，调查问卷的内容得以发展，这可以解决学生在学习专业过程中组织自己的活动的主张。 ，组织教育活动的计划，作为学生选择目标的活动，在不同的教育条件下进行开发和测试，手段和材料转换。

关键词：反思，合作行动，教育空间，地位。

Annotation*. The article presents the content of the hypothesis, materials and methods for experimentally solving the problem of constructing a reflexive action by students in the educational space, which is filled with choices, options for its implementation, parallel processes of different activities, changing forms and methods of work. It is this educational space that can partly simulate the situation of a student's action in the modern Internet space, in the space of the digital economy, in the space of rapidly changing technologies.*

According to the study, it is theoretically justified to understand reflection as the ability to organize cooperative action with others for development, the content of the questionnaire is developed, which can fix students' claims about organizing their own activities in the process of learning a profession, programs for organizing educational activities as events for students to choose goals are developed and tested, means and material transformations in different educational conditions.

Keywords*: reflection, cooperative action, educational space, position.*

Introduction

Psychological and pedagogical education of students is especially closely related to the student's ability to organize cooperative action. A teacher of developmental education or a developmental psychologist is someone who professionally organizes joint action with others in order to set and solve their developmental tasks. This is a complex ability, which includes such functions as "analysis, synthesis, planning, reflection" [1]. We believe that the center-forming ability for self-organization and the organization of developing themselves and other people's actions is the ability to reflect.

The research question of this article is as follows: in what space of educational situations and actions can reflection and ability be built, manifested? It is important for us to fix a steady manifestation of reflection in changing conditions according to the will of the person.

Conceptual framework and research hypothesis

The concept of reflection, based on the works of N.G. Alekseev, is understood as an action on an action, consisting of "stopping the action, fixing (what is), objectification (what kind of action / phenomenon) and alienation" [2] in the sense of restructuring the situation, redesigning the action. G.P. Shchedrovitsky considers reflection "as a type of cooperation between individuals" and, therefore, "as a type of cooperation between different types of activity" [3]. T.M. Kovaleva says that individual educational action, self-organization requires a special "organization of educational space as an educational event," implies "the re-creation of an act of subjectivity", positioning a person in an "open, redundant and variable space" [4].

We believe that the positioning of a person is closely related to the ability to reflect, since taking a position means stopping your immediate reaction (stopping according to N. G. Alekseev), analyzing the real conditions and principles on which they are built, creating a scheme of your action in the data conditions and in accordance with his / her own principles (objectification according to N.G. Alekseev), implement the scheme of action in cooperation with others and analyze the process and results of implementation (alienation according to N.G. Alekseev). Such interaction of activities sets the "reflexive relation" (according to G.P. Schedrovitsky).

To form a reflective ability a special educational space is required. For the organization of open space, we consider the creation of conditions for the initiatives and proposals of students, the awareness of their resources, the formulation and solution of problems for their development, the variability is ensured by the choice of goals, material, funds, redundancy we understand as the task of many parallel-running processes with different goals at option.

To ensure openness to students of 1-2 years of psychological and pedagogical or psychological departments of IPPS SFU, the following was proposed:

1. The possibility of awareness of their interests and claims in the development of the profession through a special questionnaire, according to the results of which they were invited to participate in one of the two events of the department.

2. Development by a team of teachers, assistants and undergraduates of the department of the content of these events, so that the student could realize his/her interest and claims in action.

For those students who are, based on the questionnaires, focused on the development of samples, ready-made techniques and work tools in organized by others practices were invited to take part in the festival of psychological and pedagogical practices. The festival consisted of many sites developed by undergraduates and young professionals. The sites were divided by topics: “development”, “self-knowledge”, “useful techniques”. At these sites, undergraduates and young specialists demonstrated, and students could learn ready-made procedures/techniques of professional activities of a psychologist, a teacher of developmental education and a trainer. Each platform lasted for an hour and a half, at the same time three or two sites were held for the 1-2 year students at option. The festival was held for two days, none of the sites was repeated. Students - participants of the festival had to make a choice each time, which of the three sites they would attend. At the end of each day, an analysis of the participation experience at the sites was organized, where students discussed together with the hosts of the sites, how the activities were organized at each site, what was the host’s plan, what were the tools used by the host (means, ways of working), and what worked or didn't work on his intent.

Students who are, based on the questionnaires, focused on awareness of the problems and finding ways to solve them, acting in a situation of uncertainty in cooperation with others were invited to take part in a two-day activity organizing seminar where students could develop a pilot project with a view to their development for implementation. The seminar was organized as a change of stages: first and second year students first defined the notion of "development" themselves, received feedback from teachers and undergraduates, added and corrected the concept, then described possible development practices corresponding to their understanding of development, then developed a pilot project or training session (optional) that they could implement/conduct after the seminar as part of practice or as part of a reflexive seminar as a separate discipline in the curriculum.

Students were asked to choose the sites for participation and the way of their participation (the Festival) or the principles, directions, means and forms for developing a project of their development practices; methods and means of achieving the goal set by the student (activity organizing seminar). Anyway, in both cases, students could either remain in an unclear situation, not trying to figure out, and formally carry out the tasks set by others both at the festival and at the seminar, or, within the framework of the proposed event, realize their goals, look for means and material for their achievements, form the results.

Taking into account all the above, we formulated the following *experimental hypothesis*: if a student demonstrates a claim to a certain way of organizing interaction with others in the content and is able to realize it, changing for this the situation of their own and cooperative with others action, then we can talk about a formed ability to reflect.

Materials, research method and experimental data obtained

To check whether the student took a reflexive position, we developed questionnaires, the first of which (input) checked the student's claim to one of two actions: designing his own development practice or mastering ready-made professional practices, and the second (output) checking whether the student really accepted the task or built his own at a seminar or festival, or a student formally performed tasks.

To solve this problem we identified three criteria in the questionnaire (see the criteria later in the text). To test each of the criteria, sets of two questions were proposed: a basic question and a test question (see further examples of questions in the text). The basic question showed the student's idea of himself/herself, the test question showed the conformity of the student's actual actions with the idea of himself/herself. The answer was counted, when either the answers to the basic and the test question matched each other, or - if there was a discrepancy - the answer to the test question was counted. The output questionnaire contained a number of questions, in which an alternative was also proposed between the two options (about solving one's task or performing other people's tasks), but already after participating in events.

Let us consider in more details the content of one of the criteria and examples of the basic and verification questions of the questionnaire in accordance with it.

Criterion 1: choice of action within the framework of the proposed norm and rules // going beyond the norm and constructing an own norm in the learning process:

Basic. 1. I believe that the best student is one who can:

a) choose opportunities and resources from a variety of proposed

b) is able to set his own goals and objectives during the training, to look for the necessary resources.

Verification. 2. I would prefer:

a) to have a mentor as a real practitioner, assist him in solving problems and hone my skills with the help of his feedback

b) to have a mentor who could problematize my ideas about my future profession, broaden my perspective and set me tasks more difficult than I can solve.

Basic. 3. For the next year at the university, I would like:

a) to figure out which professions/approaches I could master at the university and what of this I am most interested in

b) to understand what exactly the meaning in working with people for me is and what I would like to change in the world and in myself.

Verification. 4. I believe that my professors of the relevant disciplines are:

a) experts in their field and each of them is a resource for my professional development

b) professionals with whom you can collaborate, negotiate and invite them to participate in my projects and ideas in the field of their professional interest.

According to the results of the survey, we identified four groups of students:

Group No. 1. The student declared the design of his/her development practice and came up with the formulation of his/her tasks and the formulation of ways to solve them in the project (12 students out of 38);

Group No. 2. The student declared the design of his/her development practice, but at the seminar he/she formally carried out the tasks that were offered to him/her by others (3 students out of 38);

Group number 3. The student declared mastering the ready-made professional practice, but at the festival he/she was engaged in building his/her own: problematization, setting goals and finding solutions (15 out of 38 students);

Group No. 4. The student declared mastering a ready-made professional practice, but at the festival he/she formally carried out tasks that others offered him/her (8 students out of 38).

Thus, it can be said that 32% of the students succeeded in taking and holding a reflexive position at the activity organizing seminar, 39% of the students succeeded in taking and holding a reflexive position at the festival, 29% of the students failed to take a reflexive position, of which 8% at the activity organizing seminar and 21 % at the festival.

With the help of qualitative analysis of reports and implemented projects, we were able to see how co-operative action was realized and organized by a student for the purpose of development: whether the basic concept is built, the action is aimed at, the task corresponds to the chosen work format, whether the procedure is adapted to the task (original), whether the student fixes the details during the work and whether there is an attempt to redesign after the completed action. The presence of these characteristics in reports and projects tells us that the student treats his action reflectively and is capable of organizing cooperative action with others for development.

According to the results of the qualitative analysis in the groups of students proposed above, we obtained the following data:

Group No. 1: 10 students out of 12 implemented a cooperative action for development.

Group No. 2: 1 student out of 3 implemented a qualitative cooperative action (four criteria out of six).

Group No. 3: 12 students out of 15 carried out high-quality cooperative action.

Group No. 4: none of the eight students carried out a high-quality cooperative action.

According to the results of the analysis of the obtained data, we got the results presented in Table 1.

Table 1. *The results of the construction of reflexive actions by students in educational situations*

	Students that managed to implement a cooperative action for development	**Students that didn't manage to implement a cooperative action for development**	**Total**
Students that managed to position themselves at the event	22	5	27
Students that didn't manage to position themselves at the event	1	10	11
Total	23	15	38

To check the statistical significance of the data, we process the data with an x-square criterion. The value of the $\chi 2$ criterion is 17.143. The critical value of $\chi 2$ at a significance level of p=0.01 is 6.635. Accordingly, the relationship between the factor and performance indicators is statistically significant.

Thus, we can assert that for 58% (22 students out of 38) of students we managed to create conditions for building their own reflexive, positional-cooperative, action with the goal of developing in different situations their actions within an open, variable and redundant educational space.

Summary

For effective action in a modern educational space with different types of resources, a person needs to be able to position and interact effectively with others in accordance with the position taken.

Reflexive attitude, which is understood by us as a meaningful positional-cooperative action of the person himself on different materials and in different situations of action, ensures the meaningfulness and productivity of the life of a modern person.

To organize the conditions for the construction of reflexive actions by students in the educational process, it is required:

- special organization of the material to identify students' claims by comparing their ideas, values, images and methods of action with the real action in educational practice;

- the organization of open, variable, redundant educational situations that allow students to test their claims in practice, to form emerging discrepancies in cooperative with other actions, to restructure their own actions “here and now” in order to produce a productive outcome and overcome the mismatch;

- support of the process of meaningful analysis of projects implemented by students and the process of their redesign for further development.

Approbation of these conditions showed that 58% of students can build a reflexive, cooperative positional, action in order to develop themselves and others.

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塔吉克斯坦共和国

INFORMATION TECHNOLOGIES AND REMOTE EDUCATION IN THE SPHERE OF MEDICINE IN THE REPUBLIC OF TAJIKISTAN

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抽象。 本文作者探讨了如何将远程教育引入教育过程，特别是在某个医学教育机构中，但为此必须创造条件并确保有效的远程医疗培训。

关键词：远程学习，互联网技术，讨论，联系，患者，资源。

Abstract. *The author in this article examines how distance education is being introduced into the educational process, especially in a certain medical educational institution, but for this it is necessary to create conditions and ensure effective remote medical training.*

Keywords: *distance learning, Internet technology, discussion, contact, patient, resources.*

Innovative approaches are introduced into the learning process and distance learning is used. What is distance learning? By distance learning is meant the interaction between a teacher and students at a distance, which reflects all parts of the educational process. It is implemented through Internet technology or an interactive learning tool [2]. Parts of the learning process include goals, content, methods, organizational forms and learning tools.

Remote educational technologies are used in the established order approved

by the Ministry of Education and Science of the Republic of Tajikistan (No. 3/1 of February 7, 2015). In an educational institution, distant educational technologies are used in accordance with established rules, in the implementation of basic and additional educational programs (elementary general, basic general, secondary general and vocational education). Distance learning is also widely used in advanced training courses. Children with disabilities also need DL.

In distance education, a large number of medical students are trained, the learning process is facilitated when teaching people with disabilities, which is a great learning advantage. DL is considered to be technological, as it uses modern software and hardware. DL compared to conventional training is cheaper, because less expenses for travel, living in another area, to organize courses.

However, the use of distance learning in medical schools is subject to discussion by specialists. Some medical workers believe that when using distance learning in the field of medicine, the assimilation of one or another practical skill becomes impossible [1]. But, we believe that medical schools need this form of education and it becomes necessary. Of course, when teaching doctors a certain practical skill, traditional face-to-face contact is required, but theoretical training and decision-making exercises take the form of distance learning.

For the correct distribution of training time for distance and traditional training, the curriculum is carefully processed. For example, Bokhtar State University named after Nosiri Khusrav provides correspondence courses. Correspondence courses of study are only departments of chemistry and biology of the university, although even there you can really successfully use the technology of distance learning.

The ideal and most optimal form of postgraduate training in advanced training is a distance education, since it solves some of the problems encountered by a specialist doctor. These problems include: various work shifts and a schedule of duties for trained specialists. Remote educational technologies can be applied by the students who study full-time, for example, when general theoretical courses are learned.

The information letter of the Ministry of Education and Science of the Republic of Tajikistan (June 19, 2017) "On the use of distance learning technologies in educational institutions of higher professional education" states that full-time education is organized only by an educational institution or its branch [2].

It should be noted that in medical education an important place is occupied by the relationship between the teacher and the medical student, the patient and the doctor. But in this case, the flexibility of distance learning. In distance learning, the following types are distinguished: in mastering the theoretical part of the subject, the teacher may be absent; in the case of practical and laboratory work, a partial presence of a teacher is possible.

In some cases, distance courses and traditional teaching methods are organized in parallel. Moreover, for DL sufficient minimum human and technical resources. These technologies are being introduced through trial courses through the efforts of a separate department of an educational institution, as well as a chemical department at a medical institution. Koshelev I.A. believes that distance learning and advanced training of medical personnel are based on the following: the organization of a distance lecture, a seminar after an in-depth study of previously delivered lecture materials; practical training on a specific method of diagnosis, treatment and surgery, as well as during individual telemedicine consultations.

Today, the most global issue is the shortage of teachers who develop and implement a cycle of distance learning courses. But for this they must be specially trained on methodological and technical issues. The developer correctly determines the course sequence, relates the distance part of the training with the traditional [3]. University teams do a lot to overcome the difficulties that arise. So, the teachers of the BSU named after Nosiri Khusrav are actively working with the aim of introducing distance learning technology into the learning process, the specialists of the Information Technology Department "Fundamentals of Distance Learning Technologies in Higher Education Institutions" are preparing materials and application programs for DL.

In conclusion, we can say that at the moment it is possible to create conditions and ensure effective remote medical training, improve the qualifications of the development of various areas of diagnosis, treatment of various diseases. We are sure that in the near future the pre-school education center will be introduced into the learning process and in the future medical schools will successfully use distance learning technologies.

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塔吉克斯坦共和国的技术技术专家

THE MODERN INFORMATION TECHNOLOGISTS AND REMOTE FORMATION WHEN PREPARING MASTER AND BACHELOR IN THE CONDITIONS OF THE REPUBLICS OF TAJIKISTAN

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抽象。 这篇文章分析了准备单身汉时远程形成的问题。
远程编队的教师使用不同的技术，考虑到训练的知识水平。 在教师扮演解决角色之前使用。
关键词：技术，流程，教育，教师，计算机，远程，单身汉。

Abstract. *This given article is analyzed the questions of the remote formation when preparing bachelor.*

The Teacher under remote formation uses different technology, considering level of the knowledge's trained. In use before teacher plays the solving role.

The keywords: *technology, process, education, teacher, computer, remote, bachelor.*

"The concept of creation and development of a unified distance education system in Tajikistan" gives distance education (DL) the following definition - it is a complex of educational services provided to a wide range of people in the country and abroad using a specialized educational environment based on the use of the latest information technologies that provide educational information at a distance (satellite television, computer communications, etc.) [6].

Bachelors of correspondence courses face problems related to the incompatibility of educational and methodological literature with the curriculum that corresponds to the State Standard. In addition, problems of educational and methodological nature, as well as organizational issues from teachers and students, require quick resolution. The main characteristic of DL, which allows to solve these problems, is a higher degree of interactivity associated with the use of network computer technologies [2].

In addition, it is unacceptable to mix the question of DL with the question of using a computer in the educational process, with the creation of an electronic version of the course. In the scientific and methodological literature, the main features of the DL technology for the correspondence form of education are:

- *interactive interaction of the teacher and the student in the dialogue mode, which is close in form to the interactions that occur in the process of traditional classroom learning [5];*
- *fast delivery of educational material in hosted Internet networks;*
- *testing knowledge in the mode before;*
- *passing a virtual laboratory workshop;*
- *implementation of remote network access to real laboratory equipment;*
- *creation of a "virtual group" (operational interaction between students).*

By organizing interactive interaction carried out by participants in the learning process, both in on-line mode and through communications, you can use various information technology tools, such as telephone, fax, interaction software, computer video conferencing, etc. In developing the training course, the teacher plans to apply several technologies in the course simultaneously. At the same time, in the scientific and methodological literature it is noted that the teacher considers the following principle as the main principle: if the didactic task can be accomplished using a simpler technology, then it should be given preference [3].

In this situation, more complex technologies will not bring the desired result, but may adversely affect the results of the educational process, since even with the intensive development of computer technology, the value of training materials presented in the form of printing does not decrease. Choosing the types, forms and methods of teaching, the teacher is guided by the basis of educational psychology and the features of the subject. When DL training course is based on self-study materials.

Given the students' self-education, the teacher creates a course based on a certain level of complexity. The main task of the teacher is the preparation of a distance learning course on the basis of each available source or the author's original development. The electronic version of the course can be created by IT specialists. Another important pedagogical task is to manage the student's cognitive work. This task is carried out through a direct pedagogical impact and has its own characteristics in the DL. The equivalent of such support in preschool education is instructional instructions. The teacher has a direct pedagogical impact both in on-line mode and off-line mode. The on-line mode is carried out in the form of group or individual lessons and consultations using the appropriate technology - on-line - newsgroups or video conferencing. For the most part, the student's learning and educational work, direct control can be carried out via on-line mode using e-mail [1].

It provides correspondence with several students or with an individual student. In both of these cases, an obligatory part of the educational process is carried out in the form of feedback, i.e. the dialogue between the teacher and the student [4]. Due to the fact that the DL course is being implemented is delayed and its developers often do not participate in it, the direct management of the students' learning and cognitive process requires the presence of a teacher-consultant.

The final task of the student is to observe the knowledge and skills of the students. In DL it is solved at the time when the test tasks are being developed with current and final control. In the organization of the DL the main tasks of the teacher is in this way:

- *developing training courses;*
- *development of training instructions;*
- *counseling and assistance to each student on the materials of the studied subject;*
- *monitoring learning outcomes.*

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现代条件下学前教育师资队伍形成与发展的特点
FEATURES OF THE FORMATION AND DEVELOPMENT OF TEACHERS OF PRESCHOOL EDUCATION IN MODERN CONDITIONS

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In determining the characteristics of the preparation of teachers of preschool education in modern conditions, they proceeded from two positions: the characteristics of modern childhood and the specifics of the preparation of teachers of preschool education based on the requirements of the project of the professional standard of the teacher.

In the modern world, the social space of the child's existence, the system of its relations has changed, the child has changed. Growing up of children occurs in new conditions, their experience is significantly different from the parent, the usual mechanisms of family education are changing. The modern family is given more opportunities to build a career, respectively, the parents do not have enough time to raise their children. The reduction of communication in the family, the lack of emotional heat lead to difficulties in the development of children of preschool age. Children receive less care, affection, parental love that does not fulfill their need to be recognized and successful.

Children today are objectively out of the system of constant contact with adults. If two or three decades ago the child developed in the conditions of a small society - a family, the closest environment, today it is in a fundamentally new situation, when already from preschool age it is in a developed social, including new knowledge space, where affects the chaotic flow of information from the TV, the Internet, blocking the knowledge gained from parents, teachers.

In the context of current, rapidly changing publicly available information, adults have ceased to be authoritative guides for children.

The above-mentioned problems in the upbringing of children of preschool age are also noted in the Decree of the President of the Republic of Uzbekistan Sh.M. Mirziyayev "On measures to fundamentally improve the management of the system of preschool education".

The primary element of the continuous educational system is the sphere of pre-school education, which is of paramount importance in shaping a healthy and comprehensively developed personality of the child, preparing him for school.

The analysis shows the lack of quality and results of the implemented measures of the preschool education system.

The existing material and technical base of preschool educational institutions does not meet modern requirements.

In the current system of preschool education, there are no variable programs, alternative, flexible educational models for preparing children for school are not sufficiently developed, and special state educational programs like the developed countries that provide for socially personal, emotional, speech, mathematical, physical and creative development are not introduced, familiarization with the outside world.

Most of the teaching staff of state pre-school educational institutions have specialized secondary education, which does not ensure proper preparation of children for school.

Studying the advanced experience of foreign countries shows that modern preschool educational institutions are characterized by the creation of such conditions for the development of preschoolers who open up opportunities for positive socialization of the child, his comprehensive personal, moral and cognitive development, the formation of creative abilities and proactive behavioral profile on the basis of appropriate preschool education. age of activities, cognitive dialogue contacts with adults and peers in the field re his age interests.

In this Decree, special attention is paid to the role of professionalism and high qualification of teachers of pre-school education at work.

In this context, the features of modern children of preschool age and the changed position of an adult in relation to a child are of great importance.

The main principles of the standard are: support for the specifics and development of childhood notions; preservation of the uniqueness and self-worth of childhood as an important stage in the overall human development; personality developmental and humanistic nature of the interaction of adults and children; respect for the child's personality as a mandatory requirement for all adult participants in educational activities; the implementation of educational activities in the forms.

Technology training future teachers of preschool education for professional activities include: ensuring adequate the nature of the process of preparing future teachers of preschool education to the specifics of solving professional and professional tasks by students in future activities and subjectivity determined by the inclusion of future teachers in the development of a motivational and personal attitude to this type of activity, as well as the conscious possession of them required

knowledge and skills through the actualization of their personal pedagogical experience; personality-oriented interaction of participants in the educational process, the variability of their role positions, the individualization of learning, the stimulation of independent activity and creativity. The ability to establish professionally personal contact with children and a humane relationship between participants in the pedagogical process, based on dialogue, emotional contact with children of preschool age.

The head of our state pays special attention to the development of pre-school education, which is the first and important link in the education system of the young generation.

Without the correct formation of the thinking of children from a very early age, the involvement of pedagogical staff in the process of raising children, applying an individual approach to each child, in the future it will be difficult for us to raise a harmoniously developed generation with high intellectual potential, knowledge and spirituality, said Shavkat Mirziyoyev.

The study conducted in this direction showed that in the next 3 years the system of preschool education will need more than 47.3 thousand teachers with higher education, including 28.3 thousand educators, defectologists, psychologists, music leaders. Therefore, from 2018/2019 school year, a system of three-year bachelor's degree in pre-school education of full-time education will be introduced in higher educational institutions. New curricula and programs will be developed based on international best practices, including those of leading universities in South Korea.

构建专业学生信息交际能力的方法

METHODS FOR FORMING INFORMATIONAL-COMMUNICATIVE COMPETENCE OF CONSTRUCTION SPECIALTIES STUDENTS

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抽象。 在文章中说，现在，在建筑领域的现代专家中，争取和独立搜索适当信息的能力，获取背景知识，这是专业活动的理论基础以及创造和 实施新的行为和专业活动策略。信息交流成分是建筑领域社会和专业活动专业培训结构中的主要内容之一。 本文考虑了信息交流能力形成的基本方法。

关键词：教育，信息交流能力的形成，计算机辅助设计（CAD），建筑领域的专业培训，项目活动。

Abstract. *It's saidin the article that now it becomes extremely important among modern specialists in the construction field the striving and the ability to an independent search of appropriate information,the acquisition of background knowledge which isthe theoretical basis of professional activity as well as the skills to create and implement new strategies of behavior and professional activity.Informational-communicative component is one of the main in the structure of specialist training to social and professional activities in the field of construction. Essential methods of informational-communicative competence formationare considered in this paper.*

Keywords: *education, formation of informational-communicative competence, Computer Assisted Design (CAD), professional training in the field of construction, project activity.*

The thematicjustification of our research is basedon the reforms in the system of higher professional education. The transition to the model of competency-based approach, the introduction and use of multi-level programs of higher professional education allow us to move away from the traditional cognitive model of education, when students work out and develop mainly the readiness to a reproductive activities. In Russian circumstances, the implementation of the competency-based approach is a way of maintaining anintegratedinformational, cultural-value and professed qualification space as well as a factor in the confluence with the world educational space. We support the opinion of modern scientists that the competence is a quality of a person who has got a certain level of education which isevident asthe ability and readiness (on the basis of education) to effective (productive, successful) activities, taking into account its social significance and social risks that can be associated with professional activities. Informational-communicative competence is an integrated, dynamic personal formation of a future specialist with broad information outlook, special competencies and a rational style of information and communication activities in the development of new information technologies and capable to master the basic educational program of higher professional education, free orientation in the information space, and creative activity in the system "man-information".

The development of modern society is marked withan ever-accelerating dynamism, a deeper knowledge of nature and effects of its laws, the transformation of social order. Desire and ability are very important foran independent searchof the necessary information,the acquisition of backgroundknowledge, which is the theoretical basis of professional activity,skills to create and implement new strategies of behavior and professional activity under new conditions. Informational-communicative component is one of the main in the structure of specialists training for social and professional activities. In this regard, the problemof informational-communicative competencies formation and expansion becomes one of the most relevant and basic requirements for university graduates [1].

As practice shows, the formation of informational-communicative competence of university students is the result of such training, which acts as the basis for building of education content in university and meets all innovation requirements for educational programs. At the same time, we came to a conclusion, that it is necessary to solve the following tasks:

- definition of the aggregate and sequence of forming universal and professional competences in the context of informational-communicative competence;
- definition of academic disciplines study sequence with an active adoption of information and communication technologies;
- making connections between informational-communicative competence of undergraduates and the content of academic disciplines providing the formation of professional and key competencies [2].

The organization of training,in the light ofthe features of informational- communicative competence underinnovation conditions of institutional training allows to provide a gradation of students from educationalinformational-communicative activities to the real scientific studiesofproduction specific problems, to certain innovative developments which can be implemented in the production process with the aim of its optimization, that will improve the level of graduates readiness for professional activity. The choice of specific teaching methods is conditionedby many factors: basic knowledge level of students, psychological and motivational attitude of a group mastering new knowledge, the nature of scientific matter perception, by external circumstances and many others [3].

The key targets,the solution of which shows directly the acceleration degree of scientific and technical development of society,are the improvementof operating efficiency of new products developers to a qualitatively new level, minimizationof project deadlines as well as a significant improvement in the quality of project development. The formation, development and implementation of CAD systems is based on a developed scientific and technical basis, which combines such components as modern production facilities and computer equipment complexes, innovative methods of processing and display of information, the development of new, better ways to solve emerging engineering problems as well as their optimization. CAD systems in construction, based on the latest achievements and discoveries made in the fundamental sciences, realize the opportunity to invent and improve new design methods and in addition, promote the balanced growth of mathematical theory in the field of complex aggregates and objects design. Tools and techniques were elaborated and applied by means of which you can automate such patterned everyday acts like graphics creating, converting and editing of drawings, preparation of text documentation, etc. at this stage of development.

The components of CAD, closely integrated into the structure of the design organization are subsystems, in which the solution of a logically combined set of CAD tasks in the construction operationsis carried outby means of highly specialized complexes. These subsystems due to their functional orientation are divided into the designing and servicing ones.Designing subsystems are based on an object-based orientation and at the stage of project development they perform either a set of closely related design tasks or perform a certain stage of design. A specific feature of the servicing systems is their system-wide application, which ensures highly productive work of the designing subsystems, as well as the rational formation, transmission and date display obtained as a result of the work of these designing subsystems.

The category of systems structural pieces also includes components of the followingservice types: software, information application, methodological, mathematical and linguistic support. The optimal operation of systems should be

achieved by using the results of mutually agreed development (coordination with purchased) of components, which are structural parts of systems. According to the developed classification CAD isdesignated to solve such important tasks:

- the creation of a consolidated formal description of the CAD in accordance with the accepted classification criteria;

- CAD marking created in organizations of different industries branches as well as in construction;

- planning of progressive increase of design automation level, greater complexity of construction automation and other CAD characteristics in the process of their development;

- modeling of conditions positively influencing on the development of technically based standards for ensuring the process of creation, operation and development of CAD by specialists, hardware and software, energy, information, financial and other resources.

Quality improvement and reduction of design terms is one of the top preconditions for the accelerating of scientific and technological development. A significant obstacle for quality improvement and reduction of the construction design terms is the increasing contradiction between the growing cohesion of construction projects on the one hand and formed methods and means of their design – on the other. The above-mentioned controversycannotbe solved by mathematical increase in the number of planning organizations and planners of different professions.

The CAD system has to possess for it the appropriate capabilities [4]:

1. Comprehensive comparison of competitive design alternatives and their tech-financial justificationat establishing a rational option:

2. Comprehensivereview of the task in planning at the definition of main design concept;

3. Maximum absolute accounting of social and financial, natural and climatic, functional, useful and aesthetic requirements for the organization of site and construction projects;

4. Continuous implementation of a single design process with continuous communication of architects and engineers with experts of neighboring fields of knowledge;

5. Maximum reduction of time for making design decisions and their further research taking into account all conditions and requirements considered in the context ;

6. Operational extraction of regulatory information according to the requests of designers in a form comfortable for the purpose of its immediate assimilation and use in the accelerated course of construction object design;

7. Online registration of accepted design reports and preparation of technical documentation in accordance with the terms of construction technology.

In recent years, a whole range of innovative teaching technologies, appropriate forms, means and methods, that have great opportunities in the development of informational-communicative culture of students wasworked outin pedagogics.

In our opinion, the leading interactive teaching methods are organizational and pragmatist games, clubs, support of teachers in the process of informational-communicative skills acquisition, knowledge, skills (interaction and cooperation of students with the teacher, assistance of teacher to students and at the same time improving their own informational-communicative culture), filling classes with creative and research methods of work.More overthe students attend special courses, which favor to the acquisition of theoretical and practical knowledge, skills and practical skills to carry out information and communication activities of professional competence. As a result, students of construction specialties obtain skills of organization and implementation of practical activities [5].

Project-oriented technology plays an important role in the achieving higher education goals, as it affectson all aspects of human life, especially on the research activity, which also includes training. The expansion and development of project-oriented technology application is directly related to the problem of improving the efficiency of training. In recent years, we can increasingly frequentlyobserve the tendency to the project activity. The results of university teachers survey confirm it clearly: about 90%of teachers believe that the involvement of students to informational-communicative activity is necessary; about 70% bachelors on technical profile training, interviewed during the survey, expressed a desire to engage in informational-communicative and design activity within studying the academic disciplines, and,moreover,the number of participants of scientific conferences is increased from year to year.The methodology of the projects is presented in the form of a flexible system of educational and research process organization, favorably affectingon the progress of observation and the desire to find correct and comprehensive answers to emerging questions, the ability to check the correctness of the answers in the process of research and experiments as well as on the basis of the obtained formation analysis. Within the framework of specialized trainingthe designing should be considered as the main type of cognitive and informative-communication activity of university studentseducation. The considerationof student cognitive activity structurecharacteristics inmastering and use of acquired knowledge is a starting point in the definition and development of effective ways and means of the training activitiesorganization and management. In conclusion, it is necessary tomention that therefore the process of students entering into an active cognitive activity is significantly activated. But at the same time, the analysis of presented student's works, their speeches and reports at conferences allows us to conclude that in the large majority of cases, the project work as a phenomenon is not completely independent. This situation is because students have no experience

in informative-communication and project activity. Students have to apply the proposed algorithm of work without prior training, not possessing the basic knowledge and skills that relate to informational-communicative and project activity, which in its turn leads to a lack of internal motivation for this type of activity [6].

Having selected from the whole set of teaching methods used for the purpose of formation of informative-communication competence of students, we grouped them as follows:

- agroup of innovative and activity methods, including new educational technologies: modeling, algorithmization, creative invariance, etc.;

- a group of training-actable methods, providing the development of individual and group experience as well as the correction of knowledge and professed activity in a specially givenconditions: training, business games, etc.;

- a group of reflexive methods based on individual experience, self-analysis and awareness of their own knowledge and skills in reality: self-assessment, self-analysis, etc.

If we are talking about the processes of understanding and assimilation of the main facts of the studied scientific brunch and related theoretical generalizations, it means the mastering of the factual side of knowledge. At the same time, it is equally important to master the subject matter and the ability to apply this knowledge in construction practice. That is why it is considered that any knowledge in one way or another has a practical aspect that allows it to be applied in various spheres of production, social and man'sintellectual activities. As a result, knowledge acquisition is directly linked with the development of know-how, their use in a variety of real life and educational and professional situations. The mastering of the factual side of knowledge and practical skills are accompanied by the brain building, memory, creative abilities of the student, the development of his scientific worldview, morality. That's to say, a great developing potential is in knowledge, which affects the intellectual, ideological and moral-aesthetic spheres of emergingindividual. All this indicates on the presence of a knowledge complex internal structure in general, the system of interconnected components that are essential for the process of mastering the studied material. Such components are the understanding of mastered knowledge, its memory retention; the ability to reproduce the factual material and the theoretical assimilation arising from this; the ability to apply knowledge into practice; the development of creative abilities in cognitive and practical activities; the development of worldview and beliefs.

As practice shows, the formation of informational-communicative competence of university students is the result of such training, which acts as the basis for building of educationcontent atuniversity and meets all the innovative requirements for educational programs. At the same time, we came to a conclusion that it is necessary to solve the following tasks:

- definition of the aggregate and sequence to form universal and professional competences in the context of informational-communicative competence;

- definition of the construction disciplines study sequence with an active inclusion of informational-communicative technologies;

- establishment of links between informational-communicative competence of university students and the content of academic disciplines, ensuring the formation of professional and key competencies.

Thus, the educational and development environment of the university should be designated for the effective formation of informational-communicative competence of students in the field of construction. It should be the specialist, capable of self-development and self-improvement; actively using existing knowledge in the informational-communicative sphere and critically conceiving new social demands for technical progress; able to solve problems creatively in the field of his future professional activity. There is another difficulty associated with the spiroid nature of the cognitive process. No matter how well the teaching material is offered, and no matter how much the students show their cognitive activity, the perception and understanding of the material does not provide its deep understanding. Further self-directededucational learning is necessary for the purpose of more detailed and full comprehension of knowledge (in psychology there are two types of perception and comprehension of studied material –the primary and subsequent). It is clear that the nature of such work is associated with the degree of complexity and the amount of material to be mastered. If the learning material is simple enough and not large in volume, so for its understanding is sometimes enough only a primary perception. But such material in university subjects (for example, theoretical mechanics) is just a little. In most cases, we can not go without further independent work for a better understanding of knowledge. Global changes in the world have caused a new look at the problem of personality formation in the world community. A number of scientists involved in the study of future specialists training point out the necessity ofyoung people involvement in informational-communicative activityhavinga great importance for the formation of personality and its entry into the world educational space. Summarizing the above mentioned we believe that the improvement of the methodology for the formation of informational-communicative competence is directly and closely related to the propaedeutic work with future specialists in the field of construction, which includes the following items:

- educational work focused on the formation of know-how complex in educational and informational-communicative work; revelation of all objective laws and methodological methods of perception and understanding of scientific-theoretical material; development and expansion of ideas that knowledge mastering on the assimilated scientific brunch is impossible without active mental activity, without the development of an individual approach to a detailed understanding of information;

- organization of student's individual work on the assimilation and understanding of lecture material, withobligatory self-control and self-analysis; formation of a strong belief that the strength and depth of students professional training depends largely on the proper organization of such individual work;

- teaching students how to plan extracurricular activities with the obligatory alternation of classes on other disciplines;

- organization of student's individual work in the course of mastering informational- communicative technologies.

Institutions of higher education are becoming the main source and the leading professional and resource base, thanks to which changes in the socio-economic structure of the country are formed. The emphasis on quality education in the developing society and high human potential are dominate in the implementation process of various directions of transformations. Adequate socio-economic policy both at the regional and especially at the federal level favors to the building capacity, concentration and effective application of scientific and educational potential of higher education institutions and society as a whole [7]. The given methodologies of informational-communicative competence formation of university students are the preconditions by means of which the personal agency in the educational process is formed as well as the preparation for the future of innovative professional activity is carried out.

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多元文化中的双语教育和CLIL技术
BILINGUAL EDUCATION AND CLIL TECHNOLOGY WITHIN MULTICULTURALISM (ON THE EXAMPLE OF THE UNIVERSITY OF ALCALA)

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Abstract *Recent researches concerning the problem of language teaching have shown that theory on bilingual education within multiculturalism should be formed through the integration of CLIL technology[1] specificity, methods of assessment and the prospects of the technology development within multiculturalism. The article discusses the importance of CLIL technology in teaching languages process, gives the example of the university of Alcala. Moreover the article focuses on analyzing the positions of the authors concerning the further prospects and the conditions necessary for the development of the idea of CLIL technology.*

Keywords. *Bilingual education, multiculturalism, CLIL technology in teaching.*

The authors of the current research have the aim to analyze the specificity of the bilingual education within multiculturalism and consider that it is a language-planning model for indigenous languages and culture in the education system (David Marsh, Do Coyle, etc.). The increasing role of both bilingual and multicultural

[1]CLIL: content and language integrated learning

education has led to the development of key policy instruments such. The paper analyzes the prospects of the CLIL technology in teaching languages at the University of Alcala in Spain.

The article has three major goals that describe the further ideas:

1. To demonstrate the importance and the role of CLIL technology in teaching bilingual teacher. It refers to situations where subjects, or parts of subjects, are taught through a foreign language with dual-focused aims, namely the learning of content and the simultaneous learning of a foreign language (David Marsh, Do Coyle, etc.)[1]. That helps to show the diversity of the prospects of this technology that exist in teaching students process and to analyze integrative views on foreign languages teaching at the university. The mechanism by which foreign language discipline is integrated in different disciplines will vary. Differing mechanism of integration are appropriate for different disciplines. It is necessary to select knowledge and content appropriate to the development of the new view and ideas within each subject area.

- To take into consideration the needs, interests and communication skills in order to accept an individual' cultural and communicative background while also appropriately handling conflicts and speech misunderstanding. This model is developed through bilingual communication. Thus, it is important to understand that teaching should work towards the decreasing mistakes stereotypes and reducing fear by encouraging interaction with other people.

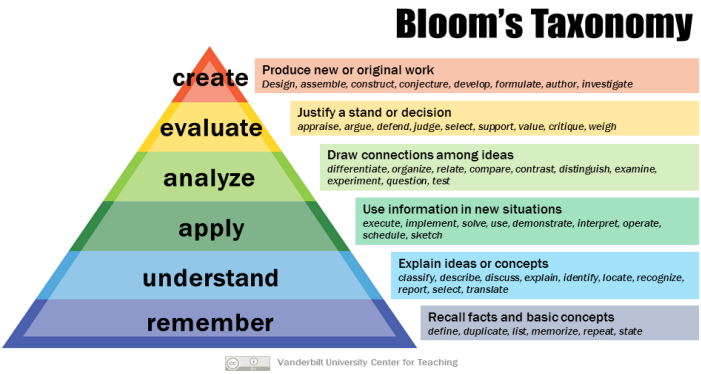
- To examine the link between assimilation and differences between similar languages. The goal here is to develop a curriculum focused on the language similarities by adding new and diverse teaching material concerning bilingual aspects in education.

- To analyze various cultural background in order to determine how bilingual education within multiculturalism might contribute to individual's tolerance development.

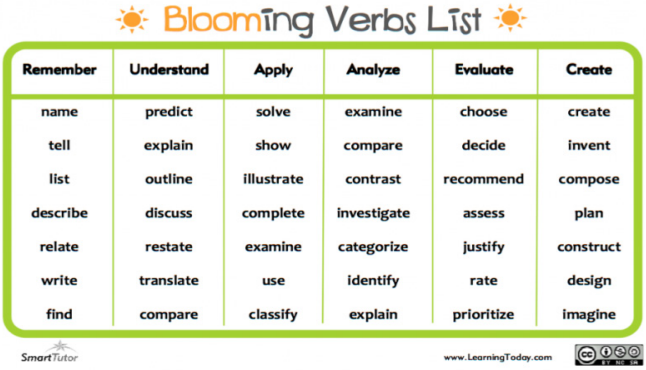
2. To analyze the example concerning CLIL technologies in bilingual teaching (on the example of the university de Alcala)

The current research analyzes the possibilities to use CLIL technology in teaching bilingual subjects. The research applies varying perspectives in order to promote greater creativity and non-problem-solving skills which might be important while teaching Didactics, modern technologies in teaching languages, Foreign literature etc. and to provide its assessments. Thus, the researchers must continue to examine students' levels of potential, ability and achievements in language studies and suggest 4Cs[2] program and Bloom Taxonomy [2]. These methodics help to classify the integrative language and assimilative and integrated skills from (LOTS – the lowest) to (HOTS – the highest) levels.

[2]4Cs: integration of content, communication, cognition and culture



Pic.1 *Bloom Taxonomy levels scale*



Pic 2. *Bloom Taxonomy verbs list*

[3] The second picture clearly demonstrates how the CLIL lesson is organized according to the Bloom's taxonomy and how it makes this type of lesson effective and productive for students.

Thus, we can demonstrate the example of CLIL technology in bilingual teaching on the example of the geography class (types of catastrophes):

1. ***Name*** different types of catastrophes**.**

2. ***Predict,*** what could lead to these catastrophes and compare it between each other.

3. ***Complete*** some theoretical descriptions using following words.

[3]https://www.english.com/blog/content-and-language-integrated-learning/

4. ***Categorize*** catastrophes into 3 categories.

5. ***Recommend*** ways to protect humanity.

6. ***Create*** the program to eliminate already existing catastrophes of various kinds.

Indeed, while creating these types of lessons the teacher can see the progress of each student and help them to reach educational goals. At the University of Alcala standard CLIL lessons and some of didactics lessons were considered. Students had to create lessons according to the schools' curriculum in that way, where each subject has a CLIL technology.

It is necessary to notice, that each school has their own opportunity to use CLIL in the curriculum. But it is important that we can speak about CLIL school only when these subjects take 50% from the total curriculum. According to that we can classify CLIL into 3 categories. Below we will give some examples.[4]

Table 1. *Types of CLIL*

Type of CLIL	Focus on	Percent of the curriculum	Definition	Addition
Soft CLIL	Language	1 hour a week	The teacher choses the topic from any subjects and teaches students in target language.	To orient only for language structures, not to the subject It is difficult to work with for the subject teacher. It requires the presence of a language teacher
Modular CLIL	Subject-oriental	One subject in a semester	The school choses 1 subject (history, art, theatre), which is teaching only in a target language	A subject teacher who speaks a foreign language is required (otherwise the assistant must attend at the lesson)
Hard CLIL	Subject as a goal	50% percent from the curriculum	The school chooses 50% of subjects which will be taught in a target language	Full immersion to the language environment Learned information can help students in other subjects. Information as may coincide with the information studied in the L1, as can create a new knowledge

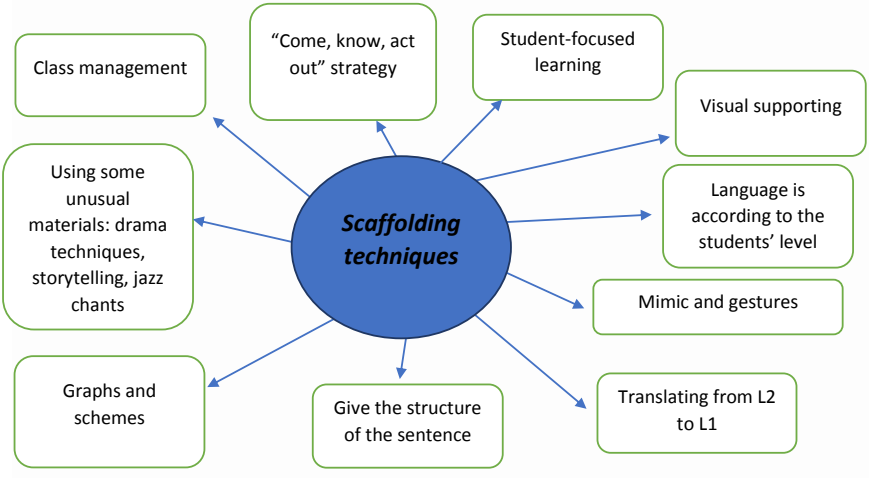
We use «target language», because CLIL means not only English learning methodology, but any language as well in a context of school program. Thus, the theory, CLIL suggests to full interaction 4Cs in any subject. One element influences on another, and we disable other elements of the mechanism if we except one of them.

To support this teacher must use some different techniques and to integrate them into the lesson. Here the authors think that is possible to use scaffolding, class management, m**ultimedia Learning (**Mayer, R. E, 2009)[4].

Scaffolding in that case is the bridge between the teacher and the student. As the language is for L2 student, the teacher should use supporting materials that facilitate the safe, fast and effective assimilation of the material to facilitate the perception of new information.

Below we give the possible examples of this method of work:

[4]Mayer, R.E.(2009). *Multimedia Learning*. Cambridge University Press.



Below you can find some exercises which can show some of the scaffolding techniques (on the example of the 6th grade form students in a bilingual school).

1. Class management: students are in 6 groups

2. Prediction: teacher asks the question, which can express the name of the topic

3. The first exercise in the group **(not teacher-centered education):** students read the text by groups (each group has its own text)

4. Scaffolding, that we can see on this paper:

-text (with new words in bold type)

-map with the picture of the continent, which can help students to understand the location

-interesting facts, which can expand students' knowledge of the topic

- it can help you: explanation of special vocabulary, which can help students to understand the text

Pic 3.1 *Exercise paper for geography lesson*

5. Then, students are divided into other groups, where each member is needed to **express** his previous group's material. And all together they complete the table.

Thus, the main 4 Cs and scaffolding were shown, namely:

✓**Content:** geography, continents

✓**Communication:** students communication in small groups

✓**Cognition:** analyzing, forecasting and structuring information skills

✓**Culture:** expanding knowledge about the world, analyzing the mother culture

Name	Map	Population	Area	Countries	Animals	Oceans	Interesting facts
North America							
South America							
Europe							
Asia							
Africa							
Australia							
Antarctica							

Pic 3.2 *Exercise paper for geography lesson*

3. To reflect the benefits of CLIL technology and its perspectives in the future

- CLIL contributes to the development of the multiculturalism of students and expands their knowledge and interests, thereby motivating them to learn. It can allow to diversify the methods and forms of teaching in the classroom

- All CLIL programs are new and experimental. They require a complete rethinking of the system of training teachers and changing educational programs. Thus this method is applicable to any language of the world, and therefore can be effective for any language needs.[3]

- The lack of CLIL teacher training programs suggests that the majority of teachers may not be sufficiently prepared for work. This will attract more partner universities to implement joint bilingual programs. That helps to increase the motivation to learn, when each lesson takes place in a positive atmosphere with an interesting technique.

In conclusion, we would like to note that CLIL is an efficient method of teaching languages. This training justifies students need and abilities with different mental and sociocultural background. However, this teaching has the aim to enrich the possibilities for learning languages and cultures.

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关于可变性和不可操作性，可计算性和不可计算性的数字
REGARDING CHANGEABILITY AND UNCHANGEABILITY, CALCULATABILITY AND UNCALCULATABILITY AS PER NUMBERS

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抽象。 给定的文章根据数字，可计算性和不可计算性提出了可变性和不可变性之间的相互关系。 在不同结构的语言中有两种表达单数或多数的方式（形态学和词汇具体化或规范。集体 – 语法类别的集体性（质量）占据形态和词汇具体化之间的临时位置。

关键词：复数tantum，singularia tantum，多变，不变的名词，可计算和不可计算的名词，语境集体类别

Abstract. *The given article presents the interconnection between changeability and unchangeability as per numbers, calculatability and uncalculatability. There are two ways of expressing singularity or plurality in languages of different structures (morphological and lexical concretisation or specification. A lexical-grammatical category of collectiveness (mass) occupies an interim position between morphological and lexical concretisation.*

Key words: *pluralia tantum, singularia tantum, changeable , unchangeable nouns, calculatable and uncalculatable nouns, contextual collectiveness category*

The aim of the present article is to analyse the interconnection between changeability and unchangeability as per numbers, calculatability and un-calculatability. All nouns with regard to the grammatical category of number traditionally are divided into changeable and unchangeable as per numbers which are used only in the plural or only in the singular. Though changeability and unchangeability as per numbers are closely connected with calculatability and uncalculatability without being identical but derived from those notions, since not only calculated nouns can be changeable as per numbers but also uncalculated nouns and on the contrary(some nouns denoting calculated notions are not changeable as per numbers). Calculatability is equivalent to concreteness and uncalculatability- to abstractness. As calculatability/uncalculatability don't have its morphological indicator, first of all, they are revealed in a particular context, therefore a word in

one meaning can be calculated and in another meaning – uncalculated. But such process isn't restricted by the explanation of mutual transitions of words of one class into another one (for instance, from calculatable nouns – into uncalculatable ones and on the contrary), as in opinion of some scholars (Shishakina) [1, p.73]. It's necessary to take into account the word polysemy since the phenomenon of simultaneous belonging of one word to two different lexical-grammatical classes is a regular consequence of polysemy.Thus we share the opinion of M.B. Dementiyeva that it's more expedient to say about not calculatable and uncalculatable nouns but regarding calculatable and uncalculatable meanings of those nouns [2, p.5]. Proceeding from the above mentioned fact it's unlikely to single out the lexical-grammatical class of calculatable and uncalculatable nouns as smaller subclasses of nouns using the same criteria (semantical, syntactical, morphological) which are applicable to the segregation of a part of speech in line with the opinion of M.Z. Tunitskaya [3, p.6].The majority of foreign, soviet and Russian linguists (Shakhmatov, Curme, Glisson, Hornby) used the traditional criterion of determining those categories as per which nouns changed as to numbers are calculatable and those unchanged as to numbers are uncalculatable [see: 4, Perelman, p.8]. But numerous facts of languages researches of different in its structure languages refute such an out of date postulate of practical grammars and in the works of recent time there are many cases of formation of the forms of plural number from the so-called unchangeable (abstract, material nouns which make up the morphological types of Singularia and Pluralia tantum (see: 5,Voronov, p. 12). Thus in modern languages both calculatable and uncalculatable nouns tend to be used in the form of the plural number. According to the data of M.Z. Tunitskaya calculatability is identical to concretness and uncalculatability is identical to abstractness [ibid, p.3]. The ambiguous issue invoking contraversion is the issue of the criteria singling out these categories. It's possible to single out two ways of expressing singularity or plurality in languages of different structures (morphological and lexical specification/concretisation). Morphological specification is the affixal way of expressing plurality: a particular suffix is glued to a word when a few items are in the question [6, p.19). A kind of morphological concretisation is reduplication or reiteration. In order to render the idea of plurality in some languages (Korean, Itelmensky, Nivskhy, Chukotsky) a word root stem is reduplicated[see: 8, 9,10.11]. Lexical concretisation is manifested in the context: nouns are combined with such words which express quantitative meanings, thereby specifying usage of the category of singularity and plurality. A special status in the system of quantitative notions in the language has lexical-grammatical category of collectiveness (mass) which occupies an interim position between morphological and lexical concretisation. Collectiveness category is specific syncretism of those two ways of expressing quantity in the language. Collectiveness category is connected

with morphological concretisation on the basis of ability to form the plural number with help of special affixes as collectiveness category proceeds from the ancient type of expressing plurality. Lexical collectiveness category presents a collective meaning being expressed not morphologically but lexically, that is collectiveness category in a semantic structure of the word is its primary, formally non-motivated lexical meaning [12, p.11]. A kind of lexical collectiveness category is contextual collectiveness category (when a collective meaning is revealed within a particular context). For a long time in Russian grammatical science scholars practically didn't separate the forms of simple plural number from the nouns of Pluralia tantum (see:6, Yakubov, p. 4). Only V.V.Vinogradov following A.A.Shakhmatov separated them from the words of Pluralia tantum anf for the first time put forward the issue of the lexical meaning of the forms of plural number [7, p.159-166; 10, p. 4]. Among other problems of the grammatical category of number it's possible to name the problem of determining the structure of the category of number, the attitude towards various language and logical categories ; ways (modes) of its expression in languages with different structures. It's acknowledged that the grammatical category of number is inherent I n all nouns but not in all modern languages a logical quantity (the category of singularity and plurality) finds its adequate expression. There is a number of languages in which the grammatical category of number is weakly expressed in nouns or it's not expressed at all. However it doesn't mean that in them the notion of quantity (plurality) is not denoted at all. Conventionally it's possible to single out two ways of expressing singularity or plurality in languages with a different structure: morphological and lexical concretisation. Weak expression of the grammatical category of number is first of all revealed in the number inadequacy of a noun : the presence of notions of singularity and plurality, or singularity and collectiveness in the semantic structure of the grammatical meaning of one word. For instance, in Albanian, Iran, Paleoasian and Turkic languages a noun may express (lexically or grammatically) not only number meanings of singularity and plurality but also the notion of a general indifferentiated number (one integrity which forms the integrity of items (things)) [13, p.40; 14, p.65; 15, p.12]. Let's specify and sum up two notions: number and quantity. The first notion is referred to count separate items (objects) and is expressed by figure characters (number). The quantity covers mass objects including ones of innumerous quantity. Later the word "number" developed many new meanings. The meanings of an old word "quantity" gradually step by step comes into the notion regarding number. Mass and number are the most abstract notions regarding quantity and plurality (multitude) gradually oust very old concrete and image –like notions (nominations): these words are multitude and quantity [16, p.130].

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在区域电视大众中形成品味习惯和美食传统的主题
THE FORMATION OF THE CULINARY HABITS AND TRADITIONS ON A COOKING SHOW ON REGIONAL TELEVISION

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注解。　这篇文章讨论了区域电视大众的味觉习惯和美食传统形成的话题。我们从美食文化的角度考虑推广方法和提供信息的具体细节。

关键词：美食主题，烹饪传统，烹饪电视节目，区域电视。

Annotation. *The article deals with the topic of the formation of taste habits and gastronomic traditions among the mass audience of regional television. We consider the methods of popularization and the specifics of presenting information from the standpoint of gastronomic culture.* ***Key words****: gastronomy topic, culinary traditions, culinary television shows, regional television.*

The relevance of this study is determined by the fact that the increased demand for gastronomic topics among the media audience, resulting from the understanding of the peculiarities of the people's gastronomic culture, is one of the main trends not only in nutrition, philosophy, cultural studies, history, ethnology, but also in modern journalism, and the characteristics that form the gastronomic culture still remain a subject for discussion. At the same time, the influence of the media on the individual in the information space and in modern society as a whole is constantly growing, and the development of gastronomic habits and the food phenomenon as a source of information and entertainment have not been the subject of scientific research, which determines the scientific novelty of the paper.

The purpose of this paper is to analyze the degree of formation and development of taste preferences and traditions in the media on the example of TV shows on the channels broadcasting in the Republic of Bashkortostan (hereinafter: Bashkortostan), one of the subjects of the Russian Federation. Achieving this goal necessitated the formulation and solution of the following tasks: to analyze methods of popularizing gastronomic topics on culinary shows, in terms of features of the presentation of journalistic material, structural elements and the purpose of producing.

A huge number of culinary projects that have emerged over the past few years, allow us to draw conclusions about the growing popularity of this area. The cooking and consumption of food has ceased to be a mere satisfaction of needs for a person. Food is the largest industry that the media represents in a new aspect - culture and entertainment. At the same time, it is of interest both food cooking and consumption and "food consumption processes cease to be simply ways of satisfying biological necessity and become one of the important aspects of everyday life of a modern man" [1, 34–43]. Almost every TV channel, designed for a wide audience, acquires its own cooking show, and print and online media, allocate a special section which deals with food, culinary novelties and recipes in details. It can also appear in a show about travelling, fitness and medicine, culture, ethnicity and traditions, lifestyle [2, 245].

Regional television, as well as central, represents a greater variety of forms and genres of the gastronomy topic. For the study of gastronomic topics in television projects in the region, the following TV channels of the region were selected: "Bashkir satellite television", "All Ufa", "UTV", "MTVmix".

The "Təmle" show (translated from the Bashkir language as "Delicious") is a culinary talk show that has been broadcast since 2012 on the BST channel [3]. The language of broadcasting is national, Bashkir. Currently, the show is led by actor Vener Kamalov. The concept of "Təmle", as well as in other culinary shows of the talk show format, is tied to the collective cooking of dishes by the host and invited guest who, in the process of cooking, shares the latest news from his life or talks about himself. The heroes of the shows are famous artists, cultural figures, athletes, writers, politicians and businessmen, and even ordinary people who deserve the attention of a wide audience. Most often, in the studio recipes of home and national cuisine are cooked: simple, nutritious dishes with available ingredients. The process does not require much skill, so the conversation easily becomes central in the program. "Təmle" occupies its niche among the culinary shows of the region and has high ratings. The latest releases are regularly uploaded to the website and the Youtube channel.

The program "Tasty!" has been released since 2015 on the capital city TV channel "All Ufa" [4]. "Tasty!" - a culinary talk show in Russian, the new release of which appears on the TV channel twice a week in the evenings. The program has two hosts: A. Gaisin and D. Ganiyev. In each episode, one of them appears. The guests of the culinary show are famous people of the capital, among them: restaurateurs and high-level chefs, representatives of the media business, artists. The shooting is done in the studio kitchen, which is provided by the culinary school "Fork" and the "Center of Cookware". Unlike the Təmle show, there are no specific topics in the "Tasty!" episodes, the guest of the program chooses the recipe of the dish. The concept is standard: a guest arrives, the host presents him,

shows a short photo story, tells about the guest and his activities, then a collective cooking process, during which the host communicates with the guest. The channel "All Ufa" names this show the most "appetizing" of all projects. Guests make dishes of different cuisines and different complexity. For example, L. Yamansarova, the chef of the Shokoladnitsa coffee house, prepared a specialty of their restaurant - Caesar salad, B. Petrov, the host of the «Ufa gorodovoi» show on the All Ufa channel, made crab salad from the 90s, T. Kuramshin, director of the "De Janeiro"event agency, cooked amok - a dish from Cambodia. While cooking, the guest can talk about himself or tell interesting facts about the dish, its ingredients and cooking features. In one episode, food takes center stage, and in the other, it is secondary, yielding attention to the conversation.

The program “Culinary starts” on the TV channel “All Ufa” is a culinary family talk show, the author and host of which is R. Gabbasov. The idea of the project is that the guest comes to the show with his family, so sometimes even children participate in it. The main goal of the program is to unite “a culinary history, the promotion of family values and a healthy lifestyle” [5]. Both ordinary and well-known Ufa families can become guests of the show, for this it is necessary to leave an application for participation. Among the famous participants of the program were athletes, TV hosts, actors, musicians, politicians. The shooting was done in the home kitchen of the guests of the show or in the kitchen-studio. Families present their traditional dishes, talk about the ingredients, their hales or the characteristics of cooking for a particular dish, and name the stages of cooking. In some of the episodes, the show was attended by representatives of sponsoring companies, for example, “Indyushkin” - meat products, “Ak Yort” - a ski resort, “Aran” - a factory producing furniture for the kitchen. In other episodes, families consisting of one person took part or the host was alone, while the episode did not loose its interest and benefit, since in this case the host fully enlightened the viewer in matters of cooking. It is worth noting that guests of the program participated in the competition at a distance. Viewers were given the opportunity to vote for their beloved family, the host reported that in each episode. In the first season, the winning family received a family card to the fitness club as a gift .

The show “Eaters” has been released since 2013 on the capital city television channel «UTV» [6]. This show has a social orientation. The hosts S. Barhatov and A. Basyrov explore Ufa catering establishments. In addition, within the framework of a separate block, the hosts visited Kazan and Orenburg. The idea of the show is that in each episode the same dish is eaten by the hosts in places of different levels of service: from fast food kiosks to prestigious restaurants. And later by themselves or with the chef that tells how to cook this dish at home, as well as where to get the necessary ingredients for the recipe. The purpose of the program is to enlighten the viewer in the field of public catering, to help with the choice of an institution and to provide an opportunity to choose a place that is suitable for

each wallet. Each episode is thematic, in one of them there are new places in the center of the city, in the other - Asian cuisine, in the third - street food. The hosts consider the whole place: from the location and interior, ending with a bill.

The program "Family Kitchen" has been broadcast from 2015 on the TV channel "MTVmix". "Family Cuisine" is a culinary talk show. Like the "Culinary Starts", which appeared earlier, the show positions itself as a family one, in order to present its traditions. In each episode, new guests compete for the title of "Best Family of the Season". They prepare a signature family meal. The host L. Savitskaya does not participate in the cooking process, her task is to look at the guests and talk with them. Sh ow participants are chosen by online voting. At the end of the season, the winning family gets a TV set [7].

The "Bauyrsak" show has been broadcast since 2012 on the "Tamyr" TV channel [3]. "Bauyrsak" is a culinary show in the Bashkir language. The name of the show is identical to the name of the national Bashkir dish of unleavened dough, fried in deep fat. The guests of the program are children. The presenter Laysan Apai enlightens young viewers in matters of nutrition, talks about the healthy and harmful properties of certain foods and dishes, and also prepares simple national dishes with the guys in the studio kitchen. Children can take part in the program by sending the recipe of their dish to the post office.

Summary. As a result of the study, we came to the conclusion that food can symbolize belonging to a particular nationality, social group, while at the same time emphasizing individual differences. Based on the analysis of culinary television projects, the common features inherent in this type of shows are highlighted. Each of these projects not only entertains the viewer, but allows him, in varying degrees, to acquire new application skills, which he can easily apply in everyday life. In the center of the show there can be both food and the host, in the first case the host serves only as a repeater and a cover for presenting information. If we talk about the differences, we can distinguish the following: in some shows there are several hosts or there are a large number of people participating in the shooting, which makes a variety of information; in some shows, conversations and analytical elements prevail, in others emphasis is placed on visualization and a minimum of dialogues, in another, the basis is the game and the competitive element. Shows differ in decorations and background, which affects both the content component and the visual one.

Summarizing, we can say that a separate study of the phenomenon of food, gastronomic journalism in general and individual culinary shows helps determine the relationship between food culture and mass communication systems, as well as highlight entertainment elements that interact with elements of journalism. Culinary projects have become an integral part of the modern media sphere, in the future it will develop even more actively, therefore its subsequent study from the point of view of science will be required.

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心理诊断制动力调节器的实际问题阻碍了人类的神经系统
ACTUAL PROBLEMS OF PSYCHO-DIAGNOSTICS BRAKING FORCE REGULATOR BLOCK THE HUMAN NERVOUS SYSTEM

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抽象。 根据V.D.的陈述 Nebylitsyn对阻滞中枢神经系统功率调节器的个体差异，试图研究高级管理中制动力的心理表现或自主神经平衡的恢复率。

结果表明，在国家组织结构单元的头部专业活动中取得最大成功的主要因素之一是气质人制动力调节器块的生理特征的优势，导致抑制能力　在保持与人交往过程中的效率的同时，在极端条件下做出最佳决策。

关键词：神经系统调节单位，激发强度，抑制力，痛苦，自我调节能力。

Abstract. *Based on the representations V.D. Nebylitsyn of individual differences in the power regulator of the central nervous system of the block, was an attempt to study the psychological manifestations of the braking force or the rate of recovery of autonomic balance in senior management.*

The results showed that one of the main factors to achieve maximum success in the professional activity of the head of the structural unit of the state organization is the predominance of the physiological profile of temperament man braking force regulator block, resulting in the ability to inhibit the distress while maintaining efficiency in the process of interaction with people and make the best decisions in extreme conditions.

Keywords: *Regulatory unit of the nervous system, the strength of excitation,*

strength of inhibition, distress, the ability to self-regulation.

Over the past 20 years, success in the use of tomographic methods to study brain mechanisms of subjective processes and states at the neural and molecular level have revived scientific interest in the biological mechanisms of human personality, or in the theory of the basic properties of the human nervous system. [3.5]

Currently, there is every reason to believe that concept of basic properties of the nervous system is the most productive of all the proposed so far typological theories of psychological personality. In 80-ies V. D. Nebylitsyn, discussing the search for a solution to the problem of partiality to manifest properties of the nervous system, was forced to admit that "one of the most significant, but at the same time, and undeveloped aspects of theories of the properties of the nervous system, is the problem of consistency between the indicators when the latter are somehow related to different segments of the central nervous system (zones, centers, areas of CNS)".[7, p. 321]]

Based on the obtained electrophysiological experimental data, V. D. Nebylitsyn suggested that when developing methods for determining general properties of the nervous system, it is necessary to take into account on the one hand the dynamics of nervous processes in the frontal and occipital lobes of the cortex, and the frontal cortex and subcortical formations on the other hand.

As V. D. Nebylitsyn noted, dynamic features of individual behavior, which are characterized by two main orthogonal parameters in the structure of human temperament (general activity and emotionality), have a neurophysiological basis in the form of two interacting subsystems of the anterior brain.[7]

One of these subsystems is related to the characteristics of activity and includes the structure of the frontal cortex, or regulatory block, together with the formations of the reticular formation of the middle brain and, perhaps, some subcortical nuclei, which together constitute a complex of brain structures, which can be conditionally designated as frontal-reticular.

Another subsystem includes, along with frontal parts, the structure of the frontal limbic brain, which, according to many authors [2,3,4,5,7], is a substrate of subjective emotional experiences.

The principle of their functioning seems to be common for both subsystems.

It can be assumed that in both cases, the primary generation of excitation corresponding to the biological modality is provided by the underlying structures of the reticular formation of the trunk and the formations of the old and ancient bark. The frontal link can act in functions of the modulator and is capable by means of system of the brake and positive activating feedbacks both to suppress, and to stimulate initial activity of the underlying links of both subsystems. The individual originality of the quality of this complex and subject to many influences, interaction leads to the formation of a certain final average level of excitation, or "rest mode", i.e. the balance of excitatory and inhibitory influences in the subsystem.

[7, p. 323, 333]]

The emergence of objective (tomographic) methods to study the activity of the brain in the event of stress allowed not only to confirm the assumption of V.D. Nebylitsyn about individual differences in the strength of the regulatory unit of the central nervous system (CNS), but also to explain the leading role of activating inhibitory neurons of the frontal-limbic complex in predicting the level of achievement (professional skills) in professions associated with high psychological stress of extreme nature.[2]

Daniel Golman, author and founder of the psycho-physiological theory of emotional intelligence, citing the research of Richard Davidson, Director of the laboratory of affective neuroscience at the University of Wisconsin state came to the conclusion that counter inhibition between the prefrontal lobes of the brain and the amygdala within the limbic structure of the brain, is the basis of many abilities to self-regulation. In particular, this ability manifests itself in conditions of stress, where self-control is necessary, the ability to adapt to changes and find peace in the face of the facts that make up the realities of working life: crisis, uncertainty and changing prospects. The ability of the prehospital lobes of the brain to suppress the outflow of information transmitted by the amygdala retains the clarity of the mind and keeps the subject's actions in the optimal mode for his psychological well-being. [4,p. 115, 116]]

In the research of N. A. Aminova and co-authors (1994) [2] they managed to show that the leading factor in predicting the ability of a teacher at different levels of professionalism (a school student of the pedagogical class, a student of the pedagogical University, a teacher and the winner of the contest "Teacher of the year"), to achieve the maximum level of their skills, is the manifestation of the teacher's ability to suppress distress in the process of pedagogical interaction.

Thus, the experimental data of D. Holman, N.Aminova and others give reason to assume the existence of individual differences in the properties of the braking force of the regulatory unit in the manifestations profile of the general properties of the CNS. In significant manifestation of braking force of the regulatory unit the phenomenon of restoring the balance "excitation-inhibition" when distress while maintaining performance is found.

In the present study, an attempt is made to study the psychological manifestations of the braking force, or the rate of recovery of the vegetative balance in senior managers.

The sample consisted of 331 persons aged 35 to 50 years and was divided into two groups according to career growth-"managers" and "job applicants".

Table. *Indicators factor structure of influence of existence scale on steady types of the personality on accordin to MMPI.*

1 factor	2 factor	3 factor
Psychological manifestations of the balance of the excitation force and the braking force, suppression of distress)	**Behavioral manifestations of imbalance of the braking force (state of aggression)**	**Behavioural manifestations of the excitation force imbalance (management of aggression)**
weight – 5,9 dispersion % – 42,0	weight – 2,0 dispersion % -14,6	weight – 1,1 dispersion % 8,2
1.The total index of life satisfaction (G) (970) 2.The Existentiality (E) (0,896) 3.Personality (P) (0,879) 4.Freedom (F) (0.819) 5.Liability (E) (0.786) 6.Self-transcendence (ST) (0.743) 7.Self-stimulation (SD) (0.733)	1. Impulsivity (4th scale MMPI) (0,803) 2.Anxiety (7-scale MMPI) (0,776) 3.Rigidity (6 scale MMPI) (0,659)	1.Correction (K-scale of MMPI) (0.795) 2. Introversion (0- scale of MMPI) (-0.693) 3. The accuracy (F-scale of MMPI) (-0,514)

Methods of research.

1. Scale of existence (SE test) A. Langle and K. Orgler. [6].
2. Standardized multi-factor method of personality investigation (SMIL) [8].
3. Luscher's colour test [1]

Thus, the development of methods of physiological diagnosis of the braking force of the regulatory unit and its psychological correlates in the process of training and professional development is currently the most promising task of developing the theory of professional selection and personnel management.

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1960年至2000年初的托木斯克地区戏剧剧院
THE BASIC DIRECTIONS OF ACTIVITY OF THE TOMSK REGIONAL DRAMA THEATER IN 1960-EARLY 2000-IES.

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注解。 如今，剧院是最具活力的文化领域之一。 强调艺术和文化的重点是省级剧院的活动，其中包括托木斯克地区戏剧剧院。 本文探讨了这一时期托木斯克地区戏剧剧院的主要发展方向； 影响戏剧艺术发展的因素。 本文在指定的时间段内检查了剧目剧院，并确定了戏剧制作内容的趋势。

关键词和短语：戏剧； 戏剧剧场； 托木斯克戏剧； 剧院发展的历史； 演出和曲目； 游览剧院。

Annotation. *Today the theater is one of the most dynamically developing fields of culture. Emphasis on art and culture is focused on the activities of the provincial theaters, among which the Tomsk regional drama theater takes place. The article examines the main directions of development of the Tomsk regional drama theater in this period of time; factors influencing the development of theatrical art. The article examines the repertory theaters in a indicated period of time and identifies trends in the content of theatrical productions.*

Keywords and phrases: *theater; drama theater; Tomsk drama; the history of the development of the theater; performances and repertoire; touring theaters.*

Currently, there is an interesting trend - the active development of provincial theaters, reflected in theatrical experiments, the dynamism of the repertoire, the originality of the interpretation of reality. Omsk, Yaroslavl, Novosibirsk, Yekaterinburg, Tara are cities famous for their theaters. A special place in the provincial

theater life belongs to Tomsk. Known as the scientific center in the second half of the XIX century Tomsk formed into the capital of the Siberian intellectuals. Tomsk Regional Drama Theater is one of the oldest in Siberia. It was created in the nineteenth century. A lot of performances were produced in the theater, which aroused the interest of spectators and critics, reviews of which were published in central publications and are kept in the State Archive of the Tomsk Region [SATR. F. R-1759. Op. 1. D. 259. L. 1].

The purpose of this article is to identify the main trends in the development of the Tomsk Regional Drama Theater in the 1960s – 1990s. The indicated period of time is marked by a rise in the creative activity of the Tomsk Regional Drama Theater.

The first attempt to study the history of the development of the Tomsk Regional Drama Theater was undertaken by the authors of the encyclopedia of the Tomsk Region [2, p. 940].

Sources for writing the work were the materials of the funds of the State Archive of Tomsk Region.

In the indicated period of time, the theater in its activities turned to the works of Russian and Soviet writers and playwrights. So, in the indicated years in the Tomsk Regional Drama Theater, works by A. Tolstoy "Tsar Fedor Ioanovich" (dir. I. Koltynyuk, 1960), A. Ostrovsky "Besprydannitsa" (dir. And Koltynyuk, 1981), N. Gogol "The Marriage" (dir. F. Grigorian, 1977), S. Zalygin "Salty Pad" (dir. F. Grigorian, 1977), A. Kopkova "Golden Elephant" (d. F. Grigorian , 1983), G. Gorin "Memorial Prayer" (dir. A. Permyakov, 1991), N. Erdman "Mandate" (dir. Y. Ilyin, 1997) were staged [SATR. F. P-1759. Op. 1. D. 352. L. 1-2]. It is easy to notice the thematic breadth and genre variety of theater productions. The performances of the Tomsk Regional Drama Theater reflected the most diverse aspects of human existence: life, the vicissitudes of fate, betrayal, lies, deception, love.

The repertoire of the drama theater in the 1950s – 1970s was traditional, it was distinguished by invariable references to the Siberian theme. The theater became a participant of festivals in Moscow, Berlin, Lyon, etc.

By the early 1980s the Tomsk Regional Drama Theater has received all-union recognition and fame. In particular, in 1984 the theater received the Order of the Red Banner of Labor. The main directors were G. I. Ivanov, M. B. Koltynyuk, M. A. Yufa, F. G. Grigorian, actors - D. A. Lyadov, A. M. Zatonsky, M. S. Stryapkina, N.N. Yurgens, etc.

In the late 1980s at the theaters of the country, attention to the individual, to a separate fate, began to grow. There was a multifaceted, serious flow in the drama of a large group of authors with a new sense of the world, social ideas of the time, sensitive to the true drama of human destiny. And not those who are always on the "crest of a wave" and out of habit, follow the progress, but those who lived in

anticipation of change and asserted it in their work, often not having any hope of being put on the stage [SATR. F. P-1645. Op. 2. D. 62. L. 184]. The pattern of this fits well with the content of theatrical art. It is known that the theater is closely connected with the life of society, the people, the national history and culture of the people. The rise or decline of the theater, the development in it of certain forms, trends, ideas, the very place of theater in the life of society and the nature of its relations with modernity are determined by the peculiarities of the social structure of society by its spiritual needs.

The capital's newspapers and magazines wrote a lot about the work of the Tomsk Drama Theater. Theatrical faculty of the interuniversity of arts, the Theater days for large industrial enterprises, research institutes, universities, and various forms of work with villagers and northerners have received general recognition.

Appeal to the person, the fate in the productions of the theater was closely connected with the changes in the socio-political sphere that took place at that time in the country, which was directly reflected in the cultural sphere. In theatrical productions of the Tomsk Regional Drama Theater, the period of addressing the plays began, the attitude to which in different years was quite ambiguous (for example, the play "The Mandate" by N. Edman).

In the early 1990s the Tomsk Regional Drama Theater has been on tour in various parts of the USSR and Russia. So, in 1990, on summer tours in Belarus, the following performances were presented to the audience's attention: "Moscow Choir" by L. Petrushevskaya, "Oh, Women ..." B. Shaw et al., "Atelier of Illusions" by A. Cason, " Marie, April, Paris" C. Magnet, "The Legend of Happiness Without End" by W. Plenzdorf, "George Dandin" by Moliere, "Difficult Parents" by J. Cocteau, "Dreams of Eugenia" by A. Kazantsev, "Mrs. Piper is investigating" J. Popplewell, "Well, the wolf!" By V. Orlov, "Investigation held by Kolobki" by E. Uspensky [SATR. F. P-1759. Op. 1. D. 255. L. 12].

In the early 1990s the practice of approving theater repertoires with special orders continued. So, one of such orders of the director of the Tomsk Regional Drama Theater is dated April 2, 1991, according to which the following repertoire of the theater was approved in connection with the theater tour from June 1 to June 30, 1991 in Irkutsk: "Memorial Prayer" by G. Gorin , "Atelier of Illusions" by A. Cason, "Difficult Parents" by J. Cocteau, "Georges Dandin, or a Fooled Husband" by J.-B. Moliere, "Women in the National Assembly" by Aristophanes, "Mrs. Piper is investigating" J. Popplewell, "Oh, women ..." B. Shaw, C. Fortunet, E. de Filippo, O. Henry, "Mousetrap" A. Christie, "Night Fun" by V. Merezhko, "Family dinner at half past one" by V. Pavlov, "Two Baba Yaga witches" by R. Stef, T. Karelina, "Snow White and the Seven Dwarfs" by O. Tabakov [SATR. F. P-1759. Op. 1. D. 264. L. 34].

The Tomsk Regional Drama Theater organized tours not only to major cities of

the USSR, but also to districts of the Tomsk Region. For example, in May 1990, theater performances were organized in settlements across the Ob and Vasyugan [SATR . F. P-1759. Op. 1. D. 255. L. 23]. Performances in rural areas ("theater days") were traditional for the Tomsk Regional Drama Theater since the Soviet times. One of the famous actors A. A. Arkin describes his impressions of the meeting with the rural audience of the theater: "... we are touched by the attention of the audience to our work. We feel that the viewer missed the performances, which assert humanity and kindness ... we felt the most important thing - the necessity of our work, the interested attention of the auditorium "[SATR . F. P-1645. Op. 2. D. 62. L. 95].

In the 1990s the Tomsk Regional Drama Theater repeatedly received diplomas from various All-Union and All-Russian festivals, toured in Moscow, Leningrad, Minsk, Kharkov and other major cities. So, on the tour of 1997 along the route "Tomsk - Strezhevoy" the theater presented the premieres of the season. In particular, the performances "I Believe", created after the stories of V. Shukshin, "The Cylinder" - according to the comedy of the Italian playwright E. de Filippo, "The Humpbacked Horse" after the tale of P. Ershov. These performances were staged by the main director of the theater Yu. Ilyin, and in the performances the leading actors were V. Varentsov, O. Maltseva, D. Kirzhemanov, E. Dolgashov and others. These performances received high marks from critics. Such opinions were expressed: "The heroes of the Shukshin stories are lonely for sadness, they lose the closest and beloved people, they think about death. And at the same time the performance is not gloomy and not dull - not at all. It is deep, serious, interesting. And it makes a very strong impression. " Here is another opinion: "At the center of the "Cylinder" play is a roaming story about the testing of a person with money, seduction with wealth. And the audience laughs merrily, recognizing eternal deceit for the sake of profit ... It is merrily and funny told about how easily a person slips onto the path of deception "[SATR. F. p-1759. Op. 1. D. 321. L. 1].

High ratings were awarded not only to productions of the Tomsk Regional Drama Theater, but also to theatrical activities of the actors and actresses themselves. It is known that the actor is a carrier of theatrical action. In the work of the actor the essence of the theater is embodied, that is, the ability to capture the audience with an artistic spectacle. So, the play of one of the most famous actresses of the theater, T.P. Lebedeva, was characterized by the following words: "The actress has manifested herself in a wide range of bright acting personality. The closest were sharply characters of comedy and social types. In the works there is faith, strong temperament, charm and contagious scenic nerve. She is purposeful, energetic, always striving to discover the role from the inside, which leads to stage discoveries" [SATR. F. P-1759. Op. 1. D. 356. L. 61].

In the mid-1990s Tomsk Regional Drama Theater has become one of the most

popular in Tomsk. In the early 1990s 37 thousand Tomsk citizens visited the regional drama, in 1996 - 112 thousand, and in 1997 already 150 thousand [SATR . F. P-1759. Op. 1.D. 308. L. 67].

However, in the 1990s due to limited financial resources, the geography of the theater tours has narrowed. Thus, according to the director of the Tomsk Regional Drama Theater, A. I. Zheravin in 1994, "lately we have never left farther than our region" [GATO. F. P-1759. Op. 1. D. 283. L. 27].

In 1999, A.I. Zheravin, who served 18 years as director of the theater, was replaced by M.Muchnik, who appointed the chief director one of the Honored Artist, State Prize laureate and the National Theater Award "Golden Mask" winner B.I. Tseitlin. His play "The Angel Comes to Babylon" was nominated for the "Golden Mask" and shown in Moscow. The theater took part in the international project "Schoolyard Stories", within the framework of which the play "Cuba is my love" by Bartenev was presented in Berlin and Lyon. Honored Artist of the RSFSR O. Afanasyev played the main roles in this play. In these and subsequent years, the theater showed its performances at the festivals "Siberian Transit", "The Real Theater", "All-Russian Festival of Contemporary Dramatic Art named after A. Vampilov", "Golden Lion" (Lviv), etc.

The performances are staged on two stable working stages - the main and the small one.

At the present time, People's artists of Russia V. V. Varentsov and D. D. Kirzhemanov, Honoured artists of Russia V. A. Beketova, E. M. Kozlovskaya, V. I. Kozlovsky, O. A. Maltseva, A. P. Permyakov, G. P. Polyakov, L. S. Popivanova, V. I. Tarasov, Honoured Artist of Ukraine T. V. Arkushenko work in the theater.

The Tomsk Drama Theater opened the 150th season in 2000 with a festival, where the best performances from Omsk, Novosibirsk, Irkutsk, Novokuznetsk, Yekaterinburg were presented. Also, the actors of the Belarusian Yanka Kupala Theater came on the anniversary .

In 2001, G. A. Sokurov was appointed director of the theater, and in 2002, Yu. A. Pakhomov was invited to the position of chief director of the theater, a branch of the Yekaterinburg Theater Institute was opened in Tomsk.

In 2005, the theater established an annual theater award named after the People's Artist of the Russian Federation, T.P. Lebedeva. As part of the annual theater festival Parade of Premieres, the laureates are awarded a prize, a diploma and a statuette-prize with the image of a golden cedar branch.

In recent years, Yury Pakhomov was awarded the prize for the best direction for the play "Vienna Chair", and the leading actor Tatyana Arkushenko won the prize for the best actress at the Third Open Theater Festival "Golden Horse" (Tyumen), and the young actress Olesya Kazantseva-Latypova won the fourth "Golden Horse", she also received the award "For the Best Actress" at the festival "Theater

Without Borders" (Magnitogorsk-2003). The theater received diplomas and valuable prizes at the "Siberian Transit" festivals in Irkutsk and Ulan-Ude. The jury and the press gave high marks to the performances of Tomsk drama at the "Golden Lion" International Festival in Lviv and at the Vampilovsky Festival in Irkutsk. Successfully went tours in Novosibirsk and Kemerovo. The theater constantly goes with performances and concerts in the village area. Benefit performances of leading actors are very successful.

Tomsk Drama Theater is one of the oldest in Siberia. In 2015, it celebrated the 165th anniversary. The first theater building was built in the city of merchants and artisans. Its opening was an important milestone in the development of the cultural life of Tomsk society. The opening of elementary schools, the first real school, the first free library in Siberia and the first university beyond the Urals stand in the same row in those years. The face of Tomsk drama has always been inextricably linked with the life and development of the city - the oldest university and cultural center of Siberia. This was reflected in the type of repertoire, and in the desire, despite the remoteness, to practice modern theatrical language. You can draw historical parallels in the role of drama theater in the cultural history of the city of Tomsk. The theater's contribution to the cultural and historical development of the city's life is invaluable. The theater remains the most important cultural component of social development. The Tomsk theater promoted cultural development and moral purification of the audience through empathy to the heroes, and also reflected the most important historical events with its performances and stage images.

Thus, like other provincial theaters, the Tomsk Regional Drama Theater is experiencing certain difficulties, which are mainly related to the economic situation. But this absolutely does not prevent it from discovering new horizons in theatrical life. The diversity of the repertoire, the acting troupe, the constant creative search, the contact with its audience, the sensitive reaction to the demands of modernity - all this makes the theater bright, original and constantly evolving. Theater festivals, in which the Tomsk Regional Drama Theater is a regular participant, show that the theater lives, sets new goals for itself for creative self-realization and, of course, is on the list of the strongest theaters in Russia. With its activity and long history, it perfectly reflects the words of the famous philosopher and writer Franz Kafka: "In order for the theater to influence life, it must be stronger, more intense than everyday life. When shooting, you need to aim higher than the target."

The Tomsk Regional Drama Theater has been successfully performing for more than 168 years the most important function of theater in a person's life - evolving. Theatrical practice is a popular way of self-development, a useful active leisure and just a pleasant pastime.

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在俄罗斯实现和支持业务的经验
EXPERIENCE OF REALIZATION AND SUPPORT OF BUSINESS IN RUSSIA

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注解。文章考虑了当前俄罗斯两千年来发展和支持商业的现代问题及其在俄罗斯社会中形成中产阶级的作用。国家在公民大规模参与小企业和平均企业结构中的作用和地点，改变消除行政障碍所需的监管框架，建立支持企业实施的企业举措的结构显示了国家对它的支持。激活国家对小企业和一般企业的发展支持以及国家关系对企业的动态变化，是俄罗斯社会变革的重要社会机制。重要的是要了解商人必须成为俄罗斯经济转型的主导力量，以创新的方式发展，以有效利用商人的潜力。在俄罗斯建立公民社会的成功直接取决于权力与中小企业的有目的的合作。

关键词：商人;经济，行政壁垒;国家的国家政策。

Annotation*. Article considers a current modern problem of development and support of business in Russia in two-thousand years and their role in formation of the middle class in the Russian society. The role and the place of the state in mass involvement of citizens in structures of small and average business, change of a regulatory framework necessary for removal of administrative barriers, with the creation of structures which is engaged in support of enterprise initiatives for implementation of the state support by it is shown. Activation of the state support for development of a segment of small and average business and change of dynamics of the state relations to business, acts as the important social mechanism of change of the Russian society. It is important to understand that businessmen have to become the leading force providing transition of economy of Russia to an innovative way of development for what it is necessary to use the potential of businessmen effectively. The success of creation of civil society in Russia directly depends on purposeful cooperation of the power and medium and small business.*

Keywords*: businessmen; economy, administrative barriers; state policy of the state.*

By the end of the nineties, business, despite the objective difficulties, showed a significant growth in the qualitative and quantitative level, as a new social group. A significant element of initiative, self-confident people who formed the middle class of the new Russia has been formed. Considering the further development of business in Russia in the 2000s, we can say that businessmen have become a notable economic and political elite of the country.

With the start of the 2000s, significant political and economic transformations took place in the country, the head of state changed, to replace B.N. Yeltsin a young and energetic president, Vladimir Putin, which marked a fundamental change in the vector of the state's foreign and home policy, came. Significant changes in state policy took place in relation to small and medium businesses. It can be stated that the 2000s became key in the development of small and medium-sized businesses, their numbers increased, new regulations were adopted, which significantly reduced the legislative gaps in the registration and regulation of businessmen, as adopted by the Federal Law of 08.08.2001 No. 129-FL "On State Registration of Legal Entities and Individual Entrepreneurs", Federal Law No. 127-FL "On Insolvency (Bankruptcy)" dated 10.26.2002, Federal Law dated 26.07.2006 No. 135-FL "Concerning the Protection of Competition", which defines the organizational and legal framework for the protection of competition, and on October 2, 2007, Federal Law No. 229-FL" On Enforcement Proceedings "is adopted, which establishes the basis for relations with debtor entrepreneurs. All this allows improving the safety of business entities and improving the market, as well as enables enterprises and entrepreneurs to reorganize their businesses and once again achieve financial stability.

In addition to solving administrative barriers with the help of legislation from the state, entrepreneurs themselves became more active by creating on September 18, 2002 the Russian Public Organization of Small and Medium-Sized Businesses «OPORA RUSSIA». A public organization uniting entrepreneurs and covered all regions of Russia, which made it possible to actively lobby the interests of the business community and introduce a dialogue with the current government.

The result of the change in the regulatory framework for supporting small and medium-sized businesses was the adoption of the law "On the Development of Small and Medium-Sized Businesses in the Russian Federation" dated July 24, 2007, where the main objectives of state policy in the field of entrepreneurship development in Russia were its support [1].

The Federal Law No. 294-FL dated December 26, 2008 "On the Protection of the Rights of Legal Entities and Individual Entrepreneurs in the Implementation of State Control (Supervision) and Municipal Control" is also acquiring great importance for business. Due to significant changes in the state policy of the state, the basic mechanisms of state regulation of the business environment are formed, which we can see in Figure 1.

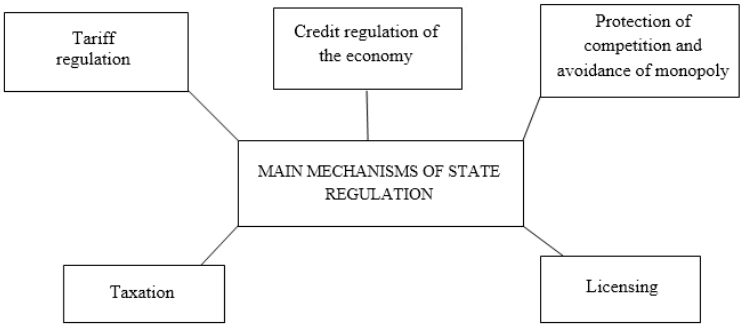

Figure 1 - *The main mechanisms of state regulation*

Considerable financial support for small and medium-sized businesses from the state budget is due to its high importance for the economic development of the country. All this allows us to create new and modernize existing jobs, increase competitiveness, and ensure the flow of funds to the budgets of all regions and levels.

The number of employees in the field of individual entrepreneurship filed by the Federal State Statistics Service amounted to 5682.4 thousand people, small enterprises 2770562 and average to 13346 enterprises [2].

It is precisely small companies that form a niche, which is impossible for a number of reasons to reach for large enterprises. Assistance to small and medium-sized businesses in the development and founding of the state is reflected in the creation of favorable conditions, taking into account accepted privileges and benefits, such as tax and supervisory holidays for entrepreneurs. All this significantly reduces the number of planned and unscheduled inspections of small and medium businesses, reduces administrative pressure from the state inspection bodies. In addition, the state, in relation to entrepreneurs, makes the following assignments, such as a reduction in rent, a grace period for the payment of purchased materials, assistance in acquiring licensed software for computers and the necessary equipment. Experts believe that the business climate has significantly improved in recent years in Russia. The foundations of state support for small and medium businesses were created - simplified taxation, a system of grants, microloans, guarantees, loans on concessional terms, expanded access to government procurement. But the business itself is still developing slowly, and for the most part is represented by individual entrepreneurs and micro-enterprises. Despite measures of support from the authorities, there are still no optimal conditions for the development of small business in Russia. At the same time, the government believes that the support measures for the next six years should ensure that the contribution of small

and medium-sized businesses to the country's GDP will first exceed the rate at 30 percent and then to 40 percent (now, it is around 20%) . In this sector, nearly six million additional job places are to be created, and the export potential of small enterprises and companies will be significantly strengthened. The past years under the conditions of sanctions are not characterized by any radical changes or steps in the state economic policy, which, on the one hand, can be assessed positively, because it creates stability, so demanded by the business community, and, on the other, means a lull amid significant business issues. At the same time, the role of the state as a regulator has not changed significantly, but its importance as the largest economic entity in the Russian economy has increased significantly.

The development of business is one of the most accurate indicators of the economic and social health of the state and society. Thus, President Vladimir Putin at a meeting of the State Council for the Development of Small and Medium Businesses said that - "We need comprehensive measures affecting all medium and small businesses that can provide real support and encourage private business initiative." It is important to establish the values of business in society, understanding the special role of such labor as one of the most important development resources of the country [3].

Despite serious pressure from external factors, the inclusion in the sanctions lists of businessmen from Russia, financial restrictions on the provision of loans to Russian companies, economic and political measures from European partners, this did not bring serious damage to small and medium businesses, since they all concerned only large business. At the same time, greater pressure on the business, despite assurances from government officials, carries increased tax and administrative pressure. Entrepreneurs are becoming one of the significant taxpayers in the regions against the background of the closure of large enterprises and one of the real employers with employment opportunities for the local population. All this seriously changes the attitude to private business from the view of society. A study by the All-Russian Public Opinion Research Center (February 2017) shows that the vast majority of citizens (93%) are positive about business (compared with 2009, there is a significant positive trend), the share of negative is only 5% (against 13% in 2009) [4].

The study confirms the widespread opinion that young people are particularly interested in the desire to create their own business, especially related to information technologies in the field of IT-technologies, trade, provision of services, including catering. The introduction of effective mechanisms for the commercialization of innovative business projects, improving the quality of training for young businessmen themselves with the creation of small innovative enterprises in educational institutions will help grow the necessary human resources and determine the future vector of the entrepreneurial movement. Young people, as a rule, are characterized by non-standard thinking, which should positively affect entrepreneurial activity and the competitiveness of business as a whole. The state is already taking a number of

measures in this direction, as the "You are a businessman" program is being taken, the development and creation of new business incubators and technology parks is being stimulated to support, including youth business. The traditional ways of developing business in Russia have not been as effective at the current time; a transition to an innovative path is required, which implies supporting talented and active young people, creating opportunities for creativity and personal self-realization. But, this is a joint task of the state and the population itself, which must make special demands on themselves, changing the worldview, raising the educated level, constant self-improvement of their professional qualifications, changing attitudes to work, ability to work in a team and, at the same time, developing leadership qualities, including young people, as well as the development of entrepreneurial abilities themselves. If all this can be carried out, one can confidently state that support for small and medium-sized businesses is becoming a priority direction of the state's internal policy, and for further development and formation of a civil society it is necessary to form a stable socially active element of owners that will form the general direction of movement of the whole country.

The development of small and medium-sized businesses in Russia by 2018, although it is difficult, but a variety of ways to alleviate the tax and administrative burden are a good start for modern businessmen. Creating favorable conditions in the regions will allow attracting wider segments of the population to small and medium businesses that will create new jobs and solve the issue of creating a middle class, and thus the issue of social stability in the country. The economic and political development of the country directly depends on goal-oriented, independent citizens, who constitute the majority of our businessmen and the stability of relations and onward movement depends on their dialogue with the authorities.

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彼得格勒苏维埃当局在其成立期间的关系（根据A. V. Khrulev的传记）
RELATIONSHIPS OF THE SOVIET AUTHORITIES IN THE PETROGRAD IN THE PERIOD OF THEIR FORMATION (BASED ON THE BIOGRAPHY OF A. V. KHRULEV)

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抽象。苏维埃政权在其成立时期的各种结构之间的关系问题首次出现在文章中。到目前为止，研究人员先验地认为，在这一时期的斗争是阶级（资产阶级 - 无产阶级，土地所有者 - 农民）或政党（布尔什维克 - 孟什维克;布尔什维克 - 左派社会革命党等）。 ）。矛盾的问题，甚至苏维埃政权机关在史学中的反对问题尚未得到研究。我们建议以Porokhovsky地区当局之间的关系为例来考虑这个问题：他们之间以及彼得格勒的中央作品。分析了波罗霍夫斯基区苏联当局的矛盾和冲突：彼得格勒的革命卫队，工人和士兵代表苏维埃执行委员会和军事委员会。为了解决上述问题，我们采取了圣彼得堡中央国家档案馆和中央国家历史和政治文件档案馆的材料，由安德烈•瓦西里耶维奇•赫鲁列夫（Andrew Vasilyevich Khrulev）人员统一（在此期间，革命卫队指挥官） ，从1919年 - 波罗希霍夫斯基区民兵团长）。在文章中提供了关于离开A. V. Khrulev在红军服役的时间的新数据，这是因为革命卫队（民兵）未能就卫兵和红军人的地位达成协议。档案材料描绘了苏维埃政府机关之间关系的复杂图景，特别是权力结构。作者用具体的例子说明了矛盾和冲突的主要内容：与苏维埃执行委员会和RCP（b）的结构（人事问题）;中央司令部办公室（缺乏维护部门利益的明确性;不正确的案件管理等）;与军事委员会谈论革命卫队的权力和卫兵的地位。作为研究的结果，作者得出的结论是，冲突局势的原因与许多因素有关：权力结构状态的不确定性，权力结构功能的重合，缺乏管理经验，武器的存在以及用武力解决问题的倾向。

关键词：革命卫队，彼得格勒，波罗霍夫斯基区，A。V. Khrulev，军事委员会，苏维埃政权

Abstract. *The problem of the relationship between the various structures of Soviet power in the period of its formation for the first time raises in the article. Until now, researchers a priori proceeded from the fact that the struggle during this period was or class (a bourgeoisie — a proletariat; a landowners — a peasants) or party (the Bolsheviks — the Mensheviks; the Bolsheviks — the Left Social Revolutionaries and*

etc.). The question of the contradictions, and even the opposition of the organs of Soviet power in historiography has not yet been researched. We propose to consider this problem on the example of relations between the authorities of the Porokhovsky district: as among themselves and as with the central authoryties of Petrograd. It was analyzes the contradictions and conflicts of the Soviet authorities of Porokhovsky District: the Revolutionary Guard of Petrograd, the Executive Committee of the Workers 'and Soldiers' Deputies Soviets and the Military Commissariat. For consideration of the stated problem, we take on materials from the Central State Archive of St. Petersburg and the Central State Archive of Historical and Political Documents, united by the person of Andrey Vasilyevich Khrulev (during this period, the Commandant of the Revolutionary Guard, from 1919 - Head of the Militia of Porokhovsky District). In article it was provided new data on the time of leaving A. V. Khrulev to serve in the Red Army, it was due to the fact that Revolutionary Guard (Militia) cannot reach agreement about status of Guardsman and Red Army man. Archival materials paint a complex picture of relations between the organs of the Soviet government, especially the power structures. The author illustrates with concrete examples the main tapes of contradictions and conflicts: with the Executive Committees of the Soviets and the structures of the RCP (b) (personnel issue); with the Central Commandant's Office (lack of clarity in upholding departmental interests; incorrect management of cases, etc.); with the Military Commissariat about the powers of the Revolutionary Guard and the status of guardsmen. As a result of the study, the author comes to the conclusion that the causes of conflict situations are associated with a number of factors: the uncertainty of the statuses of the power structures, the coincidence of the functions of the power structures, the lack of management experience, the presence of weapons and the tendency to solve problems by force.

Keywords: *Revolutionary Guards, Petrograd, Porokhovsky District, A. V. Khrulev, Military Commissariat, Soviet Power*

The result of the Great Russian Revolution was the establishment of the power of the Soviets and the creation of the Red Guard, the Workers 'and Peasants' Red Army, the Workers 'and Peasants' militia, the All-Russian Emergency Commission and other security agencies.

A special role in the formation of the power structures of the Soviet government was played by the ideas about the temporary nature of the state, formed by the socialist parties (including the Bolsheviks). V.I. Lenin in «The State and the Revolution» in the spring of 1917 wrote that although “the state is a product and manifestation of the irreconcilability of class contradictions,” but it can’t be abolished immediately. After the revolution the state of the exploiting classes will be replaced by the dictatorship of the proletariat, in which the majority (the working people) will make changes in the interests of the whole society [1, p. 4, 7].

After the transfer of power into the hands of the Soviets on October 25, 1917, the formation of power institutions went in two directions: 1) the elimination of the old ones; 2) the formation of the new - Soviet. During the revolution, the Bolsheviks created their own armed structures: the Red Guard. After the October Revolution, it is complemented by other formations — the Committee of the Revolutionary Guard of Petrograd [2, p. 192].

By the decree of the Central Executive Committee of the Council of Workers 'and Soldiers' Deputies of November 10, 1917, from December 3, all ranks and titles in the army were abolished: “Only the rank of the position is retained”. The People's Commissar for Military Affairs N. I. Podvoisky signed the decrees of the Council of People's Commissars “On the equation of all servicemen in rights” and “On the electoral beginning and the organization of power in the army” [3, p. 42]. In January 1918, the All-Army Congress was held to demobilize the old Russian army. Immediately after its completion on January 15 (28), 1918, the Decree on the establishment of the Workers 'and Peasants' Red Army was issued.

In the Historiography the question of the relationship between the structures of Soviet power was not considered. The researchers a priori believed that the struggle had either class (the bourgeoisie — the proletariat; the landowners — the peasants) or the party nature (the Bolsheviks — the Mensheviks; the Bolsheviks — the left Social Revolutionaries, etc.). The question of contradictions, and even opposition, of the organs of Soviet power in Historiography has not been raised yet.

We propose to consider them on the example of the authorities of Porokhovsky district: the Revolutionary Guard of Petrograd, the Executive Committee of the Soviets of Workers 'and Soldiers' Deputies and the Military Commissariat. For consideration of the stated problem, we have attracted materials from the Central State Archive and the Central State Archive of Historical and Political Documents of St. Petersburg, united by the personal of Andrei Vasilyevich Khrulev.

The revolutionary guard of Petrograd is formed after the liquidation of the militia of the Provisional Government. In 1918-1919 the organ had been changing its name until its structural subdivisions became the Departments and sections of the Petrograd workers' and peasant militia [6, fond R – 73, series 1, file 140, pp. 120, 140; 4, p. 125]. The body performed a number of tasks: keeping order; protection of citizens from violence and arbitrariness of various authorities; the fight against crime; control over the implementation of the policy of the Council of Peoples Commissars (CPC) of the RSFSR and the Petrograd Soviet; the placement of posts, the distribution of supervision of guards, vehicles and weapons, the compilation of accident reports and the submission of daily reports; preliminary inquiry, detention, control over the execution of part of court sentences (on fines, correctional labor), etc.

In the Central State Archive of St. Petersburg (hereinafter referred to as TsGA St. Petersburg), Revolutionary security documents are allocated to a separate fund

- P – 73. The personal file of Andrei Vasilyevich Khrulyov, the Commandant of the Revolutionary Guard of Porokhovsky District, was saved here. The date of A. V. Khrulyov's entry into the Revolutionary Guard is June 8, 1918, the basis is the recommendation of the "Communist Party" [6, found R – 73, series 3, file 267, pp. 108–113; series 2, file 183, pp. 316 Rev. – 317]. The materials draw a rather complex relationship between the organs of Soviet power among themselves.

The main types of contradictions can be described as:

1) with the Executive Committees of the Soviets and the structures of the RCP (b) (personnel issue);

2) with the Central Commandant's Office (lack of clarity in upholding departmental interests; incorrect management of cases, etc.);

3) with the Military Commissariat on the question of the powers of the Revolutionary protection and the status of guardsmen.

An illustration of the problems of the first and second types at the same time a memorandum by A. V. Khrulev of February 6, 1919 to the commandant of the Central Commandant's Office can serve. In the note, the Commandant of the Porokhovsky District points to dissatisfaction with the prepared Provision on the Revolutionary Guard and accuses the higher authority that it does not protect departmental interests. The main "stumbling block" is the personnel question: "Always decent people try to snatch the commandant's office and replace them with just anyone, regardless of their knowledge and honesty. The latter is the most important thing, since there are always a lot of different values in commandant's offices. Taking into account the struggle that has to be waged with district councils and district committees of the Russian Communist Party because of the employees of the Commandant's Office, I find it most necessary to ask the Central Commandant's Office, ask the Executive Committee of the Petrograd Council... that the Central Commandant's Office would manage those directly" [6, series 1, file 238, pp. 223–223 rev.].

The opinion of the Commandant Porokhovykh about professionalism and the presence of order in the higher instance is expressed in A. V. Khrulev's letter to the Central Commandant's Office "a month, according to the demanding statements, amounts were issued that did not coincide with the demanding statement, and therefore the person receiving the money and not presenting any information about the difference in the amount is in doubt." The former accountant of the Okhtensky plant of explosives, A. V. Khrulev, explains that "when there is a difference in demanding statements, these should be corrected in red ink with a reservation, but this is not practiced in the Central Commandant's Office, which may confuse monetary reporting in areas where there is no responsibility, and indeed with the party of workers who are well versed in the matter of monetary reporting" [6, found R – 73, series 1, file 231, pp. 672–682 rev.].

The question of the status of the Guard guards causes a great number of contradictions. "the Guardsmen of the Commandant's Office, as a fighting force, are on a par with the Red Army ... in no case they can be counted among the reserve troops." On this basis, he asks the Military Commissariat of the district to remove the Guardsmen from the military UMT and money and food allowances: "... the duties of the Guard guards include compulsory military training, 2 hours every day" [6, found R – 73, series 2, file 183, pp. 257–257 rev.].

An amazing picture of the relations of various levels of government is drawn by the report of A. V. Khrulev to the Central Commandant's Office about the incident in the National Theater on the night of September 29 to 30, 1918. The sequence of events is: Executive Committee member I. Pavlov summoned the Guard Guardsmen to the theater to arrest the strayed Red Army man. But the guards (6 people) and their commander (assistant commander DI Zach) did not dare to make an arrest, since the public supported the Red Army man. When one of the guardsmen (V. Vasiliev) nevertheless arrested a rowdy, he could not find his commander, DI Zach. The soldier was released and went home. But the annoyed members of the Executive Committee I. Pavlov, P. Efimov, I. Rakovsky met another guard (but deciding that these guards were in the theater and were guilty of not being able to arrest the Red Army man), threatening them with the guns, took away the rifles from the Guards, after that they beat them up. Andrei Vasilyevich, reporting about the incident to a higher instance, noted that the act of the members of the Executive Committee was "obscene for the communists", expressed doubt about the possibility of "making the guardsman with a fist serve faithfully to the Soviet government" higher authorities and insisted on the observance of subordination: to appeal against the actions of the lower divisions either to their immediate superiors or higher authorities. The document was crowned with a conclusion: "Of course, I regret very much that the guards did not shoot these gentlemen (highlighted by EAP), but they did it mostly out of cowardice and, besides, they know responsible employees in the region "[6, found R – 73, series 2, file 183, pp. 100–100 rev.].

The relationship of the power institutions of Soviet power can be considered by the way of example of the call Commandant of the Revolutionary Guard Porokhovsky district in the ranks of the Red Army. Biographers claim that A. V. Khrulyov joined the Red Army as a volunteer in August 1918. But the documents of the Central Directorate of St. Petersburg refute this. In the Foundation of the Commissariat for Military Affairs of Porokhovsky District of Petrograd, we identified "Lists of military service, accepted by the selection committee and not appearing to be sent", in which Andrey V. Khrulyov was included [7, p. 7; 6, found R – 5427, series 1, file 5, pp. 591 - 591 rev., 610; found R – 73, series 1, file 328, pp. 200, 201].

There was also saved the correspondence, from which it can be seen that the non-appearance was a result of contradictions between the security forces: the guards and security guards believed that they had the right to be fully released from service in the Red Army ("in the position of the Red Army soldiers"), and the Military Commissariat argued the opposite.

On December 9, 1918, the Accounting Department of the Military Commissariat of Porokhovsky District telephoned: "Based on the order of the Commissariat of Internal Affairs, Comrade. Petrovsky guard guards do not use any delays and privileges in the call for mobilization into the Red Army. " The mark on the document is: "Accepted: Khrulev." The same December 9, 1918, dated the request of A. V. Khrulev to the Central Commandant's Office, to "petition to leave" the Guardsmen "registered at the Commandant's Office" [6, found R – 5427, series 1, file 5, p. 520; found R – 73, series 2, file 183, pp. 278 –278 rev.].

December 13, 1918 dated letter No. 1112 on the letterhead of the Commandant's Office of the Revolutionary Guard of Porokhovsky District signed by Commandant A. V. Khrulev, in which he refers to the Minutes of the meeting of the Executive Committee of the Petrograd Soviet No. 9340 of November 22, 1918. Apparently, the guards and Revolutionary Guard officers got a deferment. The certificates of V. Nikitin and I. Sergeev signed by A. V. Khrulev testify to this indirectly: "... serves in the Revolutionary Protection of the Mountains. Petrograd in the Komendatur Porohovsky district as a guard and is in the position of the Red Army (highlighted E.A.P." [6, found R – 5427, series 1, file 5, p. 522; found R – 73, series 2, file 190, pp. 105, 106].

In the documents of the Central State Archive of Historical and Political Documents of St. Petersburg (TsGA IPD SPb) A. V. Khrulyov was called up to the ranks of the Red Army - October 1, 1919: in the "List of Communists on Mission from the Militia Management Team" paragraph 7 It means "Khrulev Andrey. South fr.". This is also evidenced by certificate No. 341 of October 2, 1919 [5, found R – 8, series 1, file 3, p. 94].

The materials of A. V. Khrulyov's biography paint a complex picture of relations between the organs of Soviet power, especially the power structures. The uncertainty of statuses, the coincidence of functionals, the lack of management experience, the presence of weapons and the tendency to solve problems by force are just a few reasons for the contradictions that arose.

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形成一个新的媒体表演空间的生产。 关键方面

FORMATION OF A NEW MEDIA PERFORMATIVE SPACE OF THE THEATRE PRODUCTION. KEY ASPECTS

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注解。由于数字技术，艺术家和导演能够创造新形式的“生产”，而不是“复制”。艺术视觉素养的技巧不再局限于掌握“材料”。它必须考虑到存在于计算机内部的移动的，可变的“宇宙”，以及存在于计算机条件下的“新世界”：互动艺术世界，令人信服的不真实，一个已达到新的互联性水平，以吸引观众完成艺术作品的过程。认为工作中表达的艺术概念只有在观众面前才能完全实现，Marcel Duchamp几乎无法想象到本世纪末艺术作品，例如互动电影或沉浸式表演，从字面上看取决于观众，他不仅给予他完整性，而且设定了开头并定义了它的内容。 “互动”的概念已成为艺术中最常用的术语，它出现在数字时代。通过与自动但“合理”的对象进行复杂的工作，艺术家或导演通过复杂的工作与机器进行交互，为观众设置交互情境，从而根据给定的算法，从个人设备感知艺术或修改它，它也可以根据观察者的命令或动作而变化。

关键词：戏剧，现代艺术，技术，现代戏剧，创新，数字，媒体艺术，多媒体。

Annotation. *Thanks to digital technology, artists and directors were able to create new forms of "production", rather than "reproduction." The skill of visual literacy in art is no longer limited to mastering the "material". It must take into account that mobile, changeable “universe” that exists inside a computer, and that “new world”, the existence of which is conditioned by computer: the interactive art world, convincing in its unreality, a world that has reached a new level of interconnectedness in order to attract the viewer to the process of completing a work of art. Arguing that the artistic concept expressed in the work can be fully realized only in the presence of the spectator, Marcel Duchamp could hardly have imagined that by the end of the century a work of art, for example, an interactive film or an immersive performance, would literally depend on the viewer, who not only gives him completeness, but sets the beginning and defines its content. The concept of "interactivity" has arisen as the most commonly used term for art, which appeared in the digital age. Interacting with the machine, through com-*

plex work with an automated, but "reasonable" object, the artist or director, in turn, sets the interaction situation for an audience that either perceives art from personal devices, or modifies it, following a given algorithm, which can also vary depending on the commands or movements of the viewer.

***Keywords**: theater, modern art, technology, modern theater, innovation, digital, media art, multimedia.*

The theater of our time is an experiment on the content and form of the performance. Today, it is hardly inferior to the primacy of cinema, the theater also significantly approaches the viewer with the help of innovative technologies and media ways by which it meets with the viewer in any geographical point of the globe, expands the horizons and continues to act as the main institution of ethics and moral , artistically expressing art. The media environment today is a means of obtaining extensive publicity for all types of human activity, expanding the boundaries of the public, drawing attention beyond the reach. The media environment is a means of informational cognition and interaction of a person with the social environment, virtuality, way of existence in this environment, and also one of the types of communication. The present-day theater no longer lags behind television and cinematography, and the stock of its receptions today contributes to its free maneuvering between space and time, forming a special atmosphere. For many people, theater is a stage where artists play their roles, according to memorized lyrics. However, the current generation of directors often creates their own world on the basis of their own imagination, taking advantage of access to a new media language and realizing the secrets of interacting with it, and for this, theatrical stage is no longer necessary. The theater has become performative, multimedia. Non-standard dramatic works need modern stage solutions. At the same time, the classics requires a high-quality and relevant presentation, also a new viewer is born. The authors stopped creating the themes of the classics, abandoned the unity of time, place and action, and acquired bright and grandiose possibilities. Erik Fischer-Lichte, a professor of theater science at the Free University in Berlin, in his book Aesthetics of Performativity[11], suggests examining the theater space by examining it in detail into sound, temporal and atmospheric aspects. Thus, today we have the possibility of a deeper understanding of the problem of working in the performative space, as well as putting the experience of media and technology on the basis proposed by Fisher-Lichte, we can easily expand it and describe key aspects of the formation of media reality in the theater space.

Atmospheric space

The performative space of the theater, among other things, is also an atmospheric space. Regardless of the place in which the action takes place, let it be a

[1]Fisher-Lichte E. Aesthetics performativity; [trans. with him. N. Kandinsky]; under total ed. D.V. Trubochkina. - Moscow: Play & Play: Canon Plus, 2014; P.- 137.

theater, or a tram depot, or a square - any of these spaces has a special atmosphere. The space becomes specific not only under the influence of how the actors and the audience use it, but also thanks to its special atmosphere. With the standard organization of space, when the stage is intended for actors, as a result of which it moves away from the audience, the atmosphere helps to create a specific space. The special atmosphere is not interconnected with any single component, even if certain elements of the interior attract attention. Most likely it is manifested due to the overall impression. The atmosphere begins to influence the audience immediately when they find themselves in theatrical space and continues to influence their perception in the continuation of the performance. According to Germut Böhme[22], atmospheres are not connected with a place. In this case, it can be argued that the atmosphere is spread in space. They do not belong to special objects, nor to people who seem to create them, nor to those who, upon entering the room, begin to physically feel their presence. The first thing that a spectator starts with is the perception of theater, this is the atmosphere, under the influence of which a specific perception of space appears. The occurrence of this sensation cannot be explained by studying different components separately, since the atmosphere does not appear because of individual components, but as a result of their interaction, which is usually thought out in detail in theatrical production.

In a literal sense, everything has significance and affects the viewer, who is the subject of perception: color, sound, smell, light, and, of course, form. In a sense, the harmonious interaction of the above initial and secondary properties of the atmosphere contributes to the emission of energy around the viewer. Smells and sounding are similar by their direct penetration directly into the body of the viewer, and the body is a true resonator, provoking some response fluctuations. The space acquires the character of heterogeneity, becomes a bit tense and charged, with a suggestive shade. G. Böhme designated the totality of these elements as "Ecstasy"[33] of things. The special atmosphere is perceived by a person physically with visual and auditory sensation and literally spreads in the performative space among objects and perceiving subjects. The space becomes performative and mobile, its properties begin to be felt and have an impact on the viewer and the actor.

Sound aspect

Currently, the integrity of the theater as a phenomenon of culture, history and society is largely associated with evolutionary processes and modernization of artistic expression with, first of all, theatrical sound design, the main functions of which are considered informative and the intensity of general emotional perception. The value of sound in the art of theater is really very great. The most complex forms of information of a sound nature, such as speech, noise and music, together

[2]Böhme. Atmosphäre. Essays zur neuen Ästhetik. - P.-33.

[3]Fisher-Lichte E. Aesthetics performativity; [trans. with him. N. Kandinsky]; under total ed. D.V. Trubochkina. - Moscow: Play & Play: Canon Plus, 2014; P.- 214.

with the actor's play and set design, create a unique audio-visual image of the performance, reveal its idea and creative intent, transform the moral qualities of the personality of the viewer. The semantic, aesthetic and emotional role of the sound of theatrical performances was established in the context of the theater culture at the earliest stages of its formation. According to P.N. Grunberg[44], the role of early recordings, which created a wide thematic range of phonograms, ranging from high art to political records and audio teaching aids, is very significant in changing the life of society. The phonograph record is a mirror that reflects the life and interests of a person outside the priorities of politics, is considered a valuable source in the historical everyday aspect.

The transience of the performance is more noticeable in its sound aspect. Emerging from silence, it is distributed in space, fills it and already at the next moment, it calms down and spreads again. Contrary to the fleeting nature, it is able to directly and often permanently influence the one who hears it. Due to the sound, the perceiving subject does not only have spatial perception, since the receptor acoustical apparatus and the sense of balance in the anatomical sense are closely interrelated. Theater space is always visual and sound at the same time. The sound layer of theatrical production has significance not by itself, but as a unique medium, as a result of which the language begins its sound. Music received a function of drama, the main task of which is the imperceptible transfer of the public from one state of mind to another. This sound space causes the expansion of the boundaries of the performative space.

Light aspect

Light design today has moved to the rank of professional-level light design (from English lighting design), which is a direction based on three main aspects of lighting: aesthetic perception; ergonomic aspect; energy efficiency

Each of the above aspects should be taken into account by the lighting designer, who, in terms of aesthetics, should highlight the attractiveness of the space that is lit, understand the interaction of the lighting object with its surroundings, whether it will merge with it or stand out against the general background, what kind of emotion the lighting will arouse. Light designer should increase the perception of the viewer, highlight the nuances of a dramatic nature. This is a fine work that needs to be felt. Architecture and light design can not be separately called science or art, it is a sphere, which is derived from them. A professional lighting designer needs not only a creative idea from the point of view of art, but also knowledge of the physical characteristics of the light and the principles of the action of light sources from the perspective of science. In everyday life, light is perceived as air and water, it is vital, for this reason, a person everywhere sur-

[4]Grunberg P.N., Yanin V.L. History of the beginning of phonograph recording in Russia. Catalog of vocal recordings of the Russian branch of the company "Gramophone". Moscow: Languages of Slavic Culture, 2002., p. - 650.

rounds himself with lighting. Bright lighting of houses, light installations and performances have become an important part of human life, and lighting as a means of exposure and a source of new impressions is used in a rapidly changing world. In professional light design, general lighting is not the ultimate goal, but only a means of orientation in space and a background for the greatest possible expansion of light. Accent lighting is beyond these frames and highlights the features of the space that surrounds us, creates a certain hierarchy of perception. Thanks to it, you can easily emphasize significant moments and shade, dissolve moments that are not important against the general background. Lighting can be used as the main approach in the design of architectural theater or performance space using light. Decorative lighting can be represented as a game of diamonds in the sun, which is pleasing to the eye and makes you want to look at it. It does not matter whether it is light patterns, dynamic light or something else, it is important that they have a common task - to immerse the viewer in the magic of light. Lighting directed towards the atmosphere immerses the observer into action, this is a sacred method designed to awaken a certain pro-meditative state in both actors and spectators. Because of working with lighting, the space acquires a fantastic "sound" in the light of lamps that effectively change the surrounding space. This position is significant, given the possible manipulation of the viewer with the help of light. Sometimes a lighting solution can be used to distract public attention from certain events, or to motivate them. For this reason, professionals who know how to make the public think and understand the author's intention are very significant in the art of lighting design.

Light designers use different research methods. Prototype research promotes the use of light with different types of materials, thereby creating new forms of the relationship of light with the object of illumination. The natural form of the study is interrelated with observations. In the process of working with the image of architecture in a complex space, an important condition is the understanding of the architectural image with light and without light. Given the characteristics of light, the artist is continuous analyst of what is happening. Light is a powerful means of manipulating the viewer. It is for this reason that it is important for the author to understand the essence and significance of the culture of light in space for the professional use of the whole range of possibilities in creating emotions. However, lighting design is also extremely important in terms of social culture and philosophy. Light is a full-fledged element of the stage and space, it also participates in the production, like other characters.

Time aspect

Time cannot be studied as a material category of the play, like physicality, aspects of space and sound. And yet, time is a condition necessary for the occurrence of the above aspects in space. The materiality of the production is not a definite

reality. Being an emergent phenomenon[55], it occurs during the performance, stabilizes for a while, and then disappears again. Ways of organizing time, focused on creating the conditions under which each component of the statement turns into an element of a causal relationship. Tempo - rhythm is an indicator of theatrical organization in space and time, the interaction of scenes of different levels of tension and inhibition. The tempo - rhythm allows the performance to acquire a holistic character: a rhythmically unorganized performance turns into a monotonous, amorphous and inexpressive action. The rhythm of the event is connected with the rhythm of the action of the participants of the performance. An event is always a struggle of rhythms, the more contrast the rhythms of certain actors acquire, the more rhythmic and diverse the production. The tempo of the performance is connected with the interaction of the rhythms of the events. Rhythmically alternating events, the author of the performance organizes the rhythmic score of the play. The sequence of scenes of varying degrees of tension is needed to continuously maintain the attention of the public and to give the most expressiveness to individual episodes. R. Wilson with the help of a tempo rhythm gets an effect similar to that manifested in the works of Cage due to the use of “time limits”. Each system of theatrical elements has its own personal rhythm: the light that changes over an instant, the movements of the performers in slow motion, music, voices, rustles and sounds, merging into a single “sound collage” with its own specific rhythm. Tempo - rhythm overcomes the hierarchy between these elements, separating them from each other. As a result, there is a feeling of incoherence, since, due to the rhythm, each component has its own personal temporal structure. This ensures the simultaneous perception of different time systems by the viewer. Due to the synchronous nature of his perception acquires the greatest sensitivity with respect to the individual components of the formulation and related processes.

Plasticity of the multimedia space

As mentioned earlier, directors and artists exploring the topic of multimedia find important such qualities of various media - video, various 3D spectra, sound design, like instantaneousness and immediacy. The cinema offers artistic processing of the material, while the video, on the contrary, allows you to see and capture the very passage of time. According to conceptual artist Dan Graham, “the video projects information about the environment directly onto it in real time. Cinema is meditative and contemplative, it creates a distance between reality and the beholder, turning it into an alienated spectator "[66]. Devices that are currently used in the multimedia industry in the theater and performance art make it possible to recreate the chaotic fading of images that compete for the attention of the viewer.

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Multimedia content of all the above aspects allows to achieve the degree of intimacy that is not typical for cinema. Whether it is a pre-planned situation or an artist's activity in a studio, the media has become an extension of the artistic gesture that essentially changes the quality of the space itself - it becomes absolutely plastic, "fluid" and easily amenable to the creator. The real size and scope of artistic projects increases, while the topics covered become more and more intimate and individual. Artists and directors now have the opportunity to create not only complex media installations, controlling not only the video image, but also the conditions in which the viewer finds himself, creating the entire environment, creating an atmosphere of "here and now", a certain immersive effect. As at the end of the XIX century, the system of artistic styles, such as classicism, romanticism, lost its descriptive power, so today any description of artistic practices that does not take into account the technological aspect will be untenable. The relationship between art and technology, not always amicable, gained maturity: world culture was inevitably computerized, and this process touched the artistic sphere. Digital art is a medium based on the work of machines, and the possibilities offered to them seem inexhaustible[77]. So American writer and curator George Fifield argues about this: "In a computer space, where neither friction nor the law of gravity acts, the artist can easily regroup and combine several images, filters and colors, feeling such freedom of creativity, which earlier could be only a dream "[88]. Digital technologies provided the development of computer art, net art, digital photography and digital video, experimental sculpture, almost all modern sound art, and many other practices with their history and corpus of authors. All these techniques organically form the basis of many modern theatrical and performative works.

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MORPHOLOGICAL FEATURES OF THE COLON MUCOSA REGENERATION IN PATIENTS WITH ULCERATIVE COLITIS AFTER TREATMENT WITH MESENCHYMAL STEM CELLS

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Annotation. *The autologous mesenchymal cultured stem cells eransplantation had a positive effect on the morpho-functional state of the colon mucose in patients with ulcerative colitis. 206 biopsy pieces from various colon sections were studied in 15 patients with ulcerative colitis before (control group) and 6 months after the transplantation (main group) at histological, immunohistochemical and ultrastructural levels. Despite a slight change in erosive-ulcerative defects, transplantation had a positive effect on the severity and density of inflammatory infiltration, an increase in the number of goblet cells, the number and length of crypts. Morphological data confirmed the complex mechanisms of the mesenchymal stem cells affection on the immune competent, microcirculatory, neurotrophic systems, cellular and non-cellular components of the colon mucosa stroma, which positively influenced the proliferation of the cambial epithelium of cryptae and the epithelium differentiation.*

Keywords*: ulcerative colitis, cell transplantation, morphology.*

Introduction

Currently, the treatment of difficult to treat ulcerative colitis (UC) has begun to include the treatment of mesenchymal stem stromal cells (MSC). According to the frequency of relapses, the inclusion of cell therapy in the combined treatment of UC contributed to the positive dynamics of inflammatory bowel disease, although more effective in Crohn's disease than in ulcerative colitis [1]. The concept sup-

ported by many authors about the belonging of these diseases to different forms of a single nonspecific colon inflammation [2] still gives hope for the positive impact of stem cell transplantation on the restoration of the mucous membrane of the large intestine (LIM) in patients with ulcerative colitis. In addition, therapy of ulcerative colitis with mesenchymal stem cells, the pathogenetic mechanisms of which are associated with immunological disorders, is, to a certain extent, pathogenetically substantiated, due to the immunomodulatory and immunosuppressive properties of MSCs. It is important to note that the assessment of histological remission of ulcerative colitis, as the "gold standard for the treatment of inflammatory bowel diseases," is still the subject of discussion and pessimistic views on its achievement [3,4]. Severe lesions of LIM in ulcerative colitis, which do not correspond to the clinical and endoscopic picture of improvement, are in dire need of modern and effective treatment methods. There is no doubt that the morphological studies of LIM in these patients during the treatment of MSC should be analyzed from the modern standpoint both of "stem cell niche", as well as the mechanisms of the regulation of regenerative processes with MSC in [5]. The attempted previously morphological study of light-optical and electron microscopic structure of the LIM in patients with ulcerative colitis before treatment it was observed that colonic superficial epithelium regeneration depends largely on the proliferative activity of stem crypt cells involved in the renewal of the superficial epithelium and of the state of immunocompetent, microcirculatory and connective tissue systems located in the lamina propria of the mucous membrane surrounding the crypts [6].

Aim of work.

To study the morpho-functional state of the colon mucosa in patients with ulcerative colitis after transplantation of mesenchymal stem cells.

Material and methods.

Transplantation of autologous mesenchymal bone marrow cells, precultivated for 4-5 weeks, was administered once, in an amount of 120-200 million cells in 200 ml of saline intravenously at a rate of 50 ml / h for 3 hours. Clinical and functional status of patients (age from 24 to 57 years, mostly men) with ulcerative colitis (UC) in the course of treatment was assessed by the modified classification of Truelove and Wiits, Mayo score and Rakhmilevich index, extraintestinal manifestations, hemoglobin level, ESR, CRP and fecal calprotectin. 206 biopsies from the transverse, descending, sigmoid colon and rectum, taken from 15 patients with intestine ulcer before (control group) and 6 months after MSC transplantation, (the same patients, main group) were subjected to optical examination (histological and semi-thin sections). Histological LIM sections were stained with hematoxylin and eosin. Histological evaluation of the activity of inflammatory bowel disease was carried out in points by K. Geboes et al. [7]. Immunohistochemical studies included the determination of the expression of markers CD4, CD68, CD31, CD34, CD8, lgG, Ki-67.

For electron microscopy, biopsy tissue pieces were fixed in a 2.5% solution of glutaraldehyde in Milligue's phosphate buffer with postfixation at 1% $0s0_4$ and carried out according to the standard technique. Semi-thin and ultra-thin sections were obtained on a «Leica» ultramicrotome (Austria). Semi-thin sections (PS), which allow high-resolution light-optical microscopy, were stained with methylene blue, azure II and basic fuchsin according to C. Humphrey and F. Pittman [8]. Ultrathin sections were contrasted with uranyl acetate and lead citrate according to Reynolds. Ultrathin sections were observed and captured using a Libra 120 electron microscope (C. Zeiss).

Results and discussion.

The clinical and laboratory picture in patients of the main group 6 months after the introduction of MSC improved or stabilized, and in the control group remained unchanged or worsened. The index of inflammatory activity of ulcerative colitis according to Rakhmilevich in the main group decreased from 6–9 to 4–5 points, remained unchanged in the control group, in one case even increased. The Mayo score in the main group also slightly decreased from 7 to 5-6 points, but remained unchanged or increased in the control group. According to Truelove and Wiits, the degree of inflammatory activity remained unchanged in both groups, which may be explained by the more generalized characteristics of this classification.

Histological and immunohistochemical studies of the LIM biopsy material in the main group of patients showed a decrease in the degree of inflammatory T-lymphocytic (CD4, CD8) and plasmacytic reactions from severe and moderate to moderate and weak (from 2-3 to 1-2 points). The density of inflammatory infiltrate decreased from 2–3 to 1 point (Fig. 1).

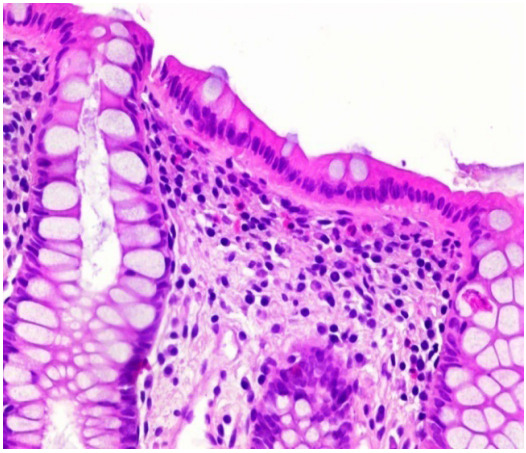

Fig.1. *Decrease in lymphoplasmacytic reaction and density of inflammatory infiltrate*

Histological section. Coloring with hematoxylin and eosin. Magnification x400.

Expansion of the cavities and degranulation of the endoplasmic reticulum cisterns of many plasma cells was noted by the method of electron microscopy, which was regarded as ultrastructural signs of a decrease in the functional activity of these cells.

The introduction of stem cells prevents the increase of immunoglobulins mediating the local humoral immune response in patients with inflammatory bowel diseases [9].

The number of macrophages sharply increased in some areas of the LIM. In the electron microscopic study, there was a high phagocytic and secretory activity of macrophages closely contacting with lymphocytes and plasma cells.

Macrophages are a key cell type involved in tissue remodeling in the event of damage, participating in antigen presentation and having polar phenotypes with pro-inflammatory and anti-inflammatory activity. It is possible that the secretory function of macrophages is also carried out through contacts with telocytes that are associated with almost all cellular elements of the connective tissue of LIM through the secretion of extracellular vesicles or nanocontacts corresponding to macromolecular interactions. The ubiquitous location of telocytes in the intestinal lamina propria (Fig. 2) confirms the assumption of their multifactor participation in the repair and regeneration of tissues, the three-dimensional organization of the extracellular matrix, the control of fibroblasts activity, myofibroblasts, mast cells, the formation of niche stem cells [10,11].

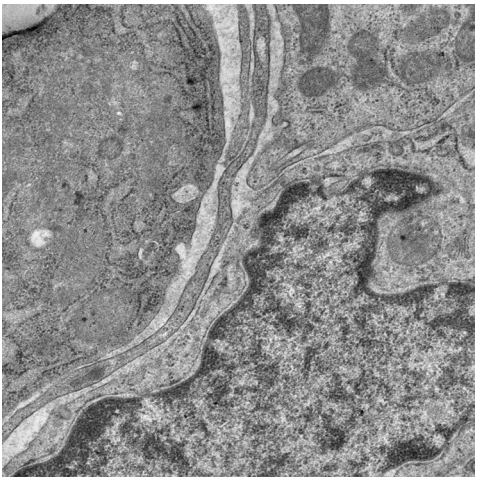

Fig.2. *A telocyte between a plasma cell, a lymphocyte and a macrophage. Electronnogram. Magnification x 6 500.*

Despite the fact that small vessels were numerous in LIM lamina propria and immunohistochemical indicators of the angiogenesis (CD4) remained as high as before the transplantation, the blood capillaries at the ultrastructural level were characterized by a significant increase in the "working" area and an increased function due to numerous luminal, basal surface outgrowths and pronounced vesiculation.

MSCs are known to produce angiogenic growth factors. Numerous non-myelinous terminal nerve endings with a large number of surrounded by Schwann's membrane small axons are also noted by electron microscopy, which is explained by the production of MSC neurotrophic factors that stimulate the growth and restoration of nerve endings. Despite the fact that the erosive-ulcerative defects of LIM (2-3 points) remained or changed slightly, the number of goblet cells and the number and length of crypts increased in the superficial and foveal epithelium (Fig. 3). The rate of the epithelium flattening decreased from 2 to 1 point, and the damage of crypts from 1-2 to 0-1 points.

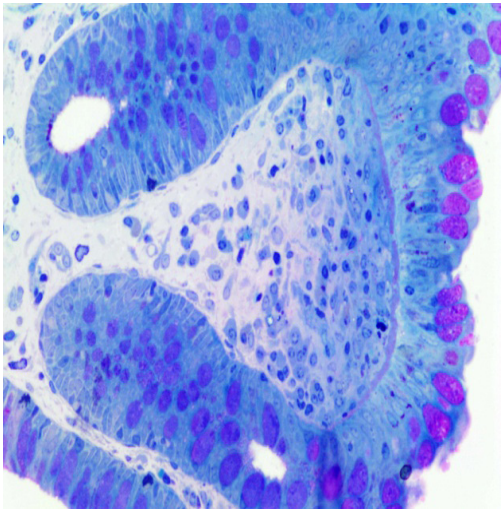

Fig.3. *Increase in the number of goblet cells in the superficial and foveal epithelium. Increasing the number and lengthening of crypts. Semi-thin section. Dyeing with methylene blue, azure 2 and basic fuchsin. Magnification x 400.*

The proliferative activity of the crypt epithelium was high, judging by the immunohistochemical marker Ki-67 and significant layers of the proliferating epithelium in the region of the crypt cervix. However, the morphological feature of this regeneration process, in contrast to the hyperregenerative reaction observed

before transplantation (the so-called hyperregenerative atrophy of the mucous membrane according to L.I. Aruin), was a high degree of the proliferating epithelium differentiation. A significant accumulation of glycogenic inclusions, the presence of developed cytoplasmic processes and the appearance of desmosomal contacts in the surface epithelium testified to the differentiation of cylindrical cells toward the flat epithelium, as the phylogenetically more ancient and stable. However, the metaplasia of the cylindrical cells of the epithelium was incomplete and did not exclude the presence of well-developed microvilli on the apical surface of the cytoplasm (Fig. 4).

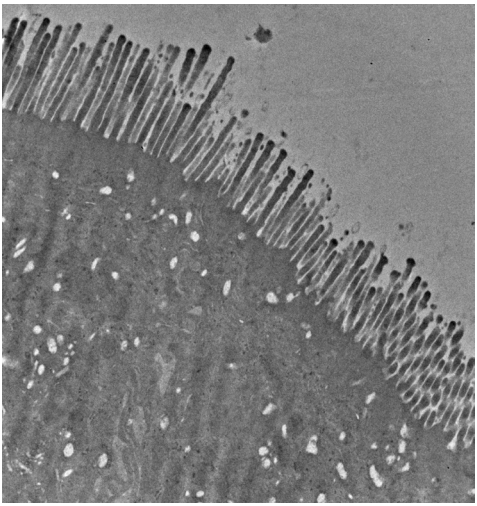

Fig. 4. *Microvilli of the apical surface of a cylindrical cell. Electronnogram. Increase x 7000*

The morpho-functional state of the goblet cells was active with a developed Golgi complex and a large number of secretory granules. The functional activity of serotonin-containing cells decreased, in the cytoplasm the destruction of the granular endoplasmic reticulum canaliculi and decrease in the secretory density of the granule were noted. Functionally associated with endocrine (capture of biogenic amines) mast cells located under the basal membrane of the epithelium were characterized by incomplete secretory granules. Directly under the basement membrane of the LIM lamina propria, on the semi-thin sections, the degree of fibrosis of the connective tissue decreased, which was electronically microscopically manifested by collagen fibrils fibroclasia. Reducing the degree of fibrosis contributed to the regeneration of the LIM epithelium.

Conclusion. Thus, despite the preservation of superficial epithelium ulcerative defects, a single transplantation of cultured MSCs in patients with ulcerative colitis after 6 months had a positive effect on the severity and density of inflammatory infiltration, restoration of the structure of the intestinal epithelium and epithelium of the colon crypt mucosa. Morphological data confirmed the complex mechanisms of the effect of MSCs secretion on the regulatory reactions of all systems located in the stromal tissue surrounding the surface and glandular components of the LIM "regenerative niche". Structural and functional changes in the immunocompetent, microcirculatory, neurotrophic, cellular and non-cellular components of the connective tissue systems had a positive effect on the cryptae cambial epithelium proliferation and differentiation of superficial epithelium.

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烟草对牙龈微循环的影响
TOBACCO SMOKING EFFECT ON GINGIVA MICROCIRCULATION

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抽象。 在15名年龄在17至22岁的吸烟男性中研究了口腔粘膜中的血液微循环状态。 对照组由40名同龄的非吸烟男性组成。 使用口腔粘膜中的激光多普勒血流计（LDF）和眼结膜中的生物显微镜。 研究结果证实吸烟者血液微循环的系统性变化：微循环血流减少和口腔粘膜和眼结膜灌注恶化。
关键词：血液微循环，LDF，牙龈，吸烟。

Abstract. *The state of blood microcirculation in the oral mucosa was studied in 15 tobacco smoking men aged 17 to 22 years. The control group consisted of 40 non-smoking men of the same age. Laser Doppler Flowmetry (LDF) in oral mucosa and biomicroscopy in eye conjunctiva were used. Study results confirm systemic changes in blood microcirculation in smokers: reduction of microcirculatory blood flow and deterioration of perfusion of oral mucosa and eye conjunctiva.*
Key words: *blood microcirculation, LDF, gingiva, tobacco smoking.*

Studying of tobacco smoking effect on microcirculatory vessels and tissue blood circulation in oral mucosa is of practical interest. Tobacco use results in chronic vascular constriction and endothelial damage [1,8,11]. In patients with decreased periodontium blood circulation it can lead to faster development of periodontium inflammation, damage of salivary glands and tartar deposits [7,9,10]. Nowadays studying periodontium microcirculation is a promising trend in diagnostics and treatment of dental illnesses [4,5].

Trial methods and organization

This trial included 55 healthy male patients from 17 to 22 years old. Control group included 40 young non-smoking men. 15 subjects were exposed to nicotine for >5 years as a result of tobacco smoking. Test subjects provided voluntary consent for participation.

Microcirculation was evaluated by means of biomicroscopy and laser doppler flowmetry (LDF). Target tissues included oral mucosa and eye conjunctiva.

LDF was used for evaluation of bloodflow in oral mucosa by laser bloodflow analyzer "LAKK-01" and "LAKK-OP" (NPP «Lazma», Russia) [3,6]. Patient was seated during examination. LDF was evaluated by means of mathematic Fourier apparatus. Microcirculation parameter (MP) – mean perfusion of tissue volume unit per time unit - was calculated; as well as mean square deviation (MSD) – mean amplitude of blood flux, measured in perfusion units. Analysis of slope spectrum of LDFs allowed calculation of contribution of the four most physiologically significant bloodflow fluctuations to the power of the total LDF specter. These fluctuations included very low frequency (VLF), low frequency (LF), high-frequency (HF) and pulse fluctuations (CF). Contribution of varying rhythm components was evaluated based on their spectrum power as a percentage from overall spectrum of flaxmotions. Total spectrum power was defined as the quadratic sum of amplitudes (A) of separate rhythmic constituents: $M = A_{VLF}^2 + A_{LF}^2 + A_{HF}^2 + A_{CF}^2$. The contribution of separate rhythmic components was calculated according to formula: $A^2/M \times 100\%$.

Interrelation between active modulations of skin bloodflow defined by myogenic and neurogenic mechanisms (LF), and additional effects (HF and CF) were calculated as flaxmotion index (FMI): $A_{LF} / (A_{HF} + A_{CF})$.

Biomicroscopy was used to evaluate microcirculation in eye conjunctiva [2]. Slit lamp (Carl Zeiss, Germany) was used for eye conjunctiva biomicroscopy. Algorithm for biomicroscopic evaluation of blood microcirculation included qualitative evaluation of microscopic vessels and bloodflow and semiquantitative analysis of 16 parameters of microscopic vessels hemodynamics, structural changes of microscopic vessels, rheological shifts and barrier function of microscopic vessels [2]. Every parameter was evaluated on the scale from 0 to 2. Index of microcirculation disorder (IMD) equals to sum of points for all evaluable parameters divided by 16 (where 16 is a number of parameters). Healthy test subjects have IMD of 0 – 0,1.

Findings were evaluated by ANOVA with Excel package.

Study results

LDF causes reduction of MP and MSD in smokers in various regions of maxillary and mandibular gingiva, which causes the reduction of microcirculation and dysfunction of periodontium tissue perfusion (Table 1). Thus, MP in the gingiva crest of frontal maxillar periodontium reduces to 16.8±1.05 pf units (by 34%), MSD reduces to 1.31±0.23 pf units (by 52%).

Table 1

Microcirculation of frontal maxillar periodontium in smokers and non-smokers

Microcirculation parameters	Group	Gingiva areas		
		Transitory fold	Attached gingiva	Gum crest
MP, perf. units	Non-smokers Smokers	26.2±1.63 17.3±1.01*	25.1±1.01 17.4±1.31*	25.2±1.55 16.8±1.05*
MSD, perf. units	Non-smokers Smokers	2.86±0.31 2.16±0.10	3.76±0.41 1.34±0.27*	3.03±0.31 1.31±0.23*
MFI, SU	Non-smokers Smokers	1.25±0.10 1.11±0.03	1.67±0.07 0.81±0.03*	1.60±0.06 0.91±0.06

*Note: * - significant parameter changes (P≤0.05).*

Slope analysis of LDF revealed impaired correlation between active low-frequency rhythms (VLF and LF) that characterize vasomotions, and passive rhythms [high-frequency (HF) and heart (CF)] in tobacco smokers. Summarized spectrum power of VLF and LF is reduced from 90% to 79-82% in smokers, and the contribution of HF fluctuations increases to 12.1%, while normally it is approximately 9.1%. The contribution of CF fluctuations increases to 8.1% (normal value – 1.0%).

Mucosa from right and left symmetric maxillary and mandibular regions was evaluated to find out the prevalence of microcirculation disorders. According to the test, microcirculation disorders were significant in these regions.

Table 2 contains summarized data on gingiva microscopic vessels in smokers and non-smokers.

Table 2

Microcirculation disorders in gingival mucosa in smokers

Signs of microcirculation disorders	Non-smokers	Smokers	Abnormality, %
MP, perf. units	26.1±1.01	17.4±1.31	-34
MSD, perf. units	2.76±0.41	1.34±0.27	-52
MFI, SU	1.67±0.07	0.80±0.03	-53

Therefore, regular tobacco smokers have blood microcirculation disorders in the oral mucosa. These disorders include structural changes of microscopic vessels and reduction of gingival capillary network density, as well as rheologic shifts caused both by reduction of erythrocyte speed in capillaries. Observed enhancement of passive mechanisms of microcirculation regulation (≥10-fold increase of heart fluctuations percentage) is mostly caused by reduction of sympathetic impact on bloodflow.

While changes in microcirculation system are systematic, there are significant microscopic vessels changes in smokers both in eye conjunctiva. Thus, significant narrowing of arteriolar microscopic vessels and regression of capillary bloodflow take place in eye conjunctiva. Bloodflow rate is reduced, it possesses grain structure, and postcapillary venules contain erythrocyte aggregates in a number of cases. Morphometric study has shown that the lumen of precapillary arterioles and capillaries is significantly reduced in eye conjunctiva in smokers ($p \leq 0.05$). Narrowing of large arterioles is insignificant and takes ≤10% from baseline values. Postcapillaries and venules are dilated, and erythrocyte aggregates appear in postcapillaries and venules of eye conjunctiva in 35.8% of cases due to congestion. The described changes indicate reduction of perfusion of eye conjunctiva because of smoking.

Conclusion. Study results confirm systemic changes in blood microcirculation in smokers: reduction of microcirculatory blood flow and deterioration of perfusion of oral mucosa and eye conjunctiva.

Microcirculatory disorders in smokers include hemodynamic and structural changes in microscopic vessels: abnormal correlation between arteriolar and venular diameters, spasm of arterioles and precapillary arterioles, dilation of postcapillary-venular vessels, reduction of the number of functioning capillaries. This is accompanied by rheology shifts including bloodflow slowing and appearance of tissue regions with insufficient blood perfusion. LDF provides opportunity to find out that reduction of oral mucosa perfusion is to a large extent due to reduction of active myogenic and neurogenic mechanisms of microcirculation regulation.

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南贝加尔湖腐殖质黑钙土的破坏分数
HEMODESTRUCTIONAL FRACTIONATION OF HUMUS CHERNOZEMS OF SOUTH BAYKAL

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抽象。 腐殖质决定了各种自然区域土壤的许多遗传和农艺特性。 在这方面，通过评估有机物组分之间的关系，研究腐殖质组分影响各种土壤类型对人为负荷的抵抗力，具有特殊的相关性。

为了表征代表土壤物质实用价值的有机农业土壤化合物的定性组成，开发了一种化学破坏性分馏方法（HDF），该方法可以确定各种腐殖质组分对氧化剂（重铬酸钾）的耐受性。。

关键词：化学破坏分馏方法，人为负荷，黑钙土，有机质组分，腐殖质组分，腐殖质重铬酸盐氧化

Abstract*. Humic substances determine many genetic and agronomical properties of soils in various natural zones. In this regard, the study of humus components effecting on the various soil types resistance to anthropogenic loads, by evaluating the relationships between the components of organic matter, acquires particular relevance.*

To characterize the qualitative composition of organic agro soils compounds, which represent the practical value of soil matter, a chemo-destructive fractionation method (HDF) was developed, which allows determining various humus fractions in dependence in resistance to the oxidizing agent (potassium bichromate).

Keywords*: method of chemo-destructional fractionation, anthropogenic loads, chernozem, components of organic matter, humus fractions, dichromate oxidation of humus.*

Introduction

The humus state of the soil is closely related to the conditions of soil formation, the nature and intensity of the elementary soil processes. The transformation of natural biogeocenoses into agrocenoses changes the humus formation conditions, which results new equilibrium level of the humus state**.** Further weakening or intensification of anthropogenic impact on the soil (depending on the nature of land use) breaks the balance out and causes following transformation of the humus state. (Popov, Tsyplenkov, 1994).

Involvement of soil in arable lands dramatically reduces the natural energy potential of the soil due to the active mineralization of organic matter, reducing the amount and reserves of humus. In this regard, the characteristics and assessment of the humus state, including humic acids, undisturbed soils, depending on their genesis, are important for establishing their environmental sustainability and monitoring the state of soil cover, fertility level during agricultural use (Kogut, Masyutenko, 1992).

In the process of agricultural use in arable soils compared to virgin ones, the content of non-cured organic matter is reduced by 2-2.4 times, total humus by 25-52% and labile humus substances by 33-50%, depending on the degree of erosion and location in the relief. The ratios between the components of organic matter change: the proportion of inert humus increases, the labile part decreases, and the unhumified organic substance decreases in it (Research Recommendations, 1984).

Objects and methods of research

The objects of study were ordinary chernozems (carbonate-dispersed) of the Southern Pre-Baikal, which are in virgin, agrogenic and postagrogenic state. The chernozem region is characterized by the development of meadow grassland and steppe vegetation formations, the root system of which serves as the main source of humus formation.

A specific feature that distinguishes them from European counterparts is the low thickness of the humus horizon, with a high content of humus in it, which is associated with the severity of the conditions of their formation (Kozlova, Makarova, 2012).

To characterize the qualitative composition of the organic soil material, reflecting the functioning of SOM (soil organic matter), a chemodestructional fractionalization method has been developed (HDF). It is based on the measurement of the components of SOM different in stability to the action of one oxidizing agent of potassium dichromate with the same concentration ($K_2Cr_2O_7$), but with a linearly increasing oxidizing ability, which is given by different amounts of sulfuric acid (the higher the oxidizing ability of the oxidizing solution, the higher the chemical destruction of organic material). The method allows the determination up to 11 fractions differed in oxidation resistance. However, it may be sufficient to de-

termine only three SOM fractions: easily oxidizable, moderately oxidizable and hardly oxidizable material. The content of these SOM fractions depends on the intensity of anthropogenic influence on the objects (Popov, Chyplenkov, 1994).

The labile forms of SOM are oxidized with solutions with a low oxidizing ability, and relatively stable ones with a higher one. On this basis, labile and stable parts of SOM are determined. Each fraction is expressed as a percentage of the carbon content of organic compounds (C total) in the soil. To obtain results in differential form, the previous one was subtracted from each subsequent result (the amount of oxidized organic material). Such discrete oxidative fractionation makes it possible to more accurately isolate the active and passive forms of humus, which allows determining the direction of transformation of soil organic matter.

Results and discussion

Researches by A.I. Popova and co-authors (1994, 2016) proved that the organic material of different types of the European part of Russia virgin soils (studied: gray-humus, dark-humus and light-humus horizons) contains equal amounts of easily and hardly oxidizable compounds. This indicates that the organic matter transformation processes in different climate are unidirectional, resulting in kinetically stable and balanced SOM composition formation.

Chemo-destructional analysis of the studied organic matter of virgin black soil showed that the easily oxidizable group was dominant over the entire profile, which is apparently due to the presence of natural vegetation, as a source of fresh organic substance, including the mobile forms.

The hardly oxidizable fraction noticeably changes along the virgin soil profile, the minimum amount of which is observed in the humus horizon, and the maximum in the middle horizon of the SOM. The values of the average oxidizable fraction remained approximately equal throughout the profile.

The agricultural use of chernozem led to a significant decrease in the amount of easily oxidizable fraction in humus compared to virgin soil, the values of the average oxidizable also decreased. Accordingly, the hardly oxidizable fraction in the humus composition has increased significantly, which seems to be associated with disturbances in the transformation of SOM or the changes in the physical state of humic substances, as colloidal systems, which indicates the predominance of destruction processes.

When converting chernozem to fallow mode, there is some recovery in the ratio of SOM groups in the newly formed turf horizon, due to an increase in the average oxidized fraction amount and a decrease in the hardly oxidizable. This may be due to an increase in the speed and intensity of biota activity, due to the overgrowth of former arable land by natural vegetation and the conversion of difficult-to-oxidable forms to a soluble state.

The ratio of humus fractions in the former arable layer, immediately beneath the turf, similar to the arable horizon of agrogenic soil. In the middle horizon of the BCA, there is a further decrease in the content of light and medium-oxidized forms and an increase in the proportion of hardly oxidizable. In horizon C, the number of moderately oxidized forms increases dramatically due to a decrease in the proportion of the easily oxidized SOM. Maintaining a deficit-free humus balance in soil is possible by regulating the processes of neoplasm and the decomposition of humus. Maintaining a deficit-free balance of humus in the soil is possible by regulating the processes of neoplasm and the decomposition of humus. In this regard, in solving the problem of preserving and enhancing soil fertility, it is of paramount importance to identify patterns of mineralization and humification of organic matter, depending on environmental conditions.

A.I. Popov and A.V. Rusakov (2016) suggested that values of the easily oxidizable part (EOP) be used as an indicator characterizing the qualitative composition of soil organic matter (SOM) and divided the soil into 3 groups:

1) if the proportion of EOP in the composition of SOM is low (no more than 25%), then this indicates that the soil is or was in good drainage conditions, the latter conditions lead to the predominance of oxidative and eluvial processes;

2) if the proportion of EOP is 25-50%, then this indicates that the soil is or was in conditions of moderate drainage, these conditions contribute to the establishment of such a dynamic equilibrium in which the oxidative and eluvial processes are balanced by humus formation;

3) if the proportion of EOP accounts for more than 50%, then this is due to the fact that the soil is or has been under conditions of predominance of reduction processes, these conditions contribute to humus formation and humus accumulation.

According to the indicator of the easily oxidized part of SOM of the upper horizons of studied soils, the virgin black soil can be attributed to the 3rd group, since the proportion of EOP in it was 74%. Agrogenic and postagrogenic chernozem belongs to the 2nd group, with a proportion of EOP 48%.

As a result of the soil desiccation, arising from both the natural features of the soil water regime and the active anthropogenic impact, humic substances, being colloids, appear to undergo a deep coagulation process, leading to the formation of voluminous rigid condensation structures. The latter are oxidized much more difficult than colloids.

Such studies serve as a necessary basis for a targeted impact on the process of humus formation and, therefore, on the level of soil fertility. The humus stabilization is possible when a sufficient amount of humus-forming agents enter the soil and create conditions for their fuller humification. In practice, this is achieved by rational tillage, the structure of sown areas optimization, the correct use of fertilizers.

Conclusion:

1. The most rich in humus content turned out to be virgin black soil, the maximum values of which were observed to a depth of 50 cm.

Some decrease in the amount of humus was observed in agrogenic chernozem associated with the openness of the biological circulation in plowed soils. In fallow soil, the maximum of humus falls on the topmost 5 cm horizon, where its content is the same as in virgin soil, immediately below it the amount of humus decreases more than 2 times.

2. The virgin black soil turned out to be enriched with an easily oxidizable SOM group, which, apparently, is due to the presence of natural vegetation. In the agrogenic soil, the proportion of the hardly oxidizable fraction has noticeably increased, which is most likely due to the predominance of destructive processes, as a result of the amplification of the temperature amplitude and moisture fluctuations. When converting chernozem to fallow mode, the ratio of the humus fractions obtained by the HDF method in the postagrogenic soil remains the same as in the agrogenic, i.e., its humus system has not yet been rebuilt and corresponds to the arable soil.

3. The study of the humus state and the hemodestructional fractionation of chernozem humus of showed that the method proposed is quite informative, and the most oxidative part of the SOM was the easily oxidizable fraction.

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在乌兹别克斯坦的新寄主植物上的白粉病真菌
POWDERY MILDEW FUNGI ON NEW HOST PLANTS IN UZBEKISTAN

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Introduction. Powdery mildew fungi are obligate parasites of plants. They belong to the family Erysiphaceae of the division Ascomycota. A total of 9 genera of the family Erysiphaceae, including 88 species and 334 forms, have been registered in Uzbekistan and adjacent areas. Significantly dominated by representatives of the two genera Erysiphe and Leveillula, which account for more than 70% of powdery mildew fungi [1].

Materials and Methods. Samples of microfungi were collected in 2010-2018 in different habitats of Nuratau nature reserve and Zomin national nature park. Specimens were examined with a light microscope and identified using the relevant literature Gaponenko et al. 1983, Vasjagina et al. 1961, Raximova et al. 2014 [1], [2], [3]. Names of fungi are given according to "mycobank" [5]. Names of host plant species are given according to "the plantlist" [5].

Results. In the analysis of herbarium materials, 17 species of powdery mildew fungi were found on new host plants in Uzbekistan. Below is a list of powdery mildew fungi and their new host plants with the location.

1. *Erysiphe horridula f. solenanthi* Jacz. Host – *Solenanthus stamineus* (Desf.) Wettst., Nuratau range (NR), Nuratau nature reserve (NNR), Parandaz mountain, 02.05.2011, IM086. E 66°43'14.66"B, N 40°34'27.28"C, E 66°42'53.23"B, N 40°34'19.43"C.

2. *Erysiphe communis f. alyssi* Jacz. Hosts – *Alyssum szovitsianum* Fisch. & C.A.Mey. (*A. marginatum*). NR, NNR, Tikchasoy valley, 66°46'32.10"B, 40°30'35.07"C 10.05.2010, on *Alyssum dasycarpum* Steph. NR, NNR, Qarisoy valley, 07.06.2012. E 66°46'15.04"B, N 40°29'53.02"C; E 66°46'24.13"B, N 40°29'59.69"C.

3. *Leveillula compositarum f. helichrysi* (Jacz.) Golovin. Host – *Helichrysum nuratavicum* Krash. NR, NNR, Fargun mountains, 24.07.2015, E 66°44'45.73"B, N 40°31'23.11"C; E 66°44'56.81"B, N 40°31'16.76"C.

Helichrysum nuratavicum is a endemic species. Occurs on stony and gravelly slopes and tops of watersheds at an altitude of 1300-2100 m, above sea level [6].

4. *Leveillula compositarum f. echinopis* Golovin. Host – *Echinops nuratavicus* A. Li. NR, NNR, on the Northern slopes of Hayotboshi mountain, 25.07.2015, E66°44'53.80"B, N40°30'19.12"C.

5. *Leveillula labiatarum f. scutellariae* (Jacz.) Golovin. Host – *Scutellaria ramosissima* M. Pop. NR, NNR, on the Northern slopes of Hayotboshi mountain, 10.08.2012, E66°44'19.06"B, N40°30'0.64"C.

6. *Leveillula labiatarum f. phlomidis* (Jacz.) Golovin. Host – *Phlomis nubilans* Zak. NR, NNR, Fargun mountains, 24.07.2015, E66°45'13.19"B, N40°31'16.96"C.

Phlomis nubilans is a endemic species of Nuratau range. Occurs on stony and gravelly slopes and tops of watersheds at an altitude of 1300-2100m, above sea level [6].

7. *Leveillula umbelliferarum f. seseli* Golovin. Host – *Seseli korovinii* Schischk. NR, NNR, on the Northern slopes of Hayotboshi mountain, 25.07.2015, E66°44'2.55"B, N40°29'58.07"C.

8. *Leveillula labiatarum f. dracocephali* Golovin. Host – *Dracocephalum nuratavicum* Adylov. NR, NNR, Andibaraut mountian, 24.07.2015, *Dracocephalum nuratavicum* is a endemic species of Nuratau range. Occurs on stony and gravelly slopes and tops of watersheds at an altitude of 1300-2100m, above sea level [6]. E66°46'19.72"B, N40°32'24.02"C.

9. *Leveillula* sp. Host – *Scariola orientalis* (Boiss.) Sojak. NR, NNR, on the Northern slopes of Hayotboshi mountain, 10.08.2012, E66°44'2.55"B, N40°29'58.07"C.

10. *Leveillula compositarum f. artemisiae* (Jacz.) Golovin. Host – *Artemisia sogdiana* Bunge, NR, NNR, Majrum valley, 24.07.2015, E66°42'0.93", N40°33'48.99"C.

11. *Trichocladia diffusa f. hedysari* Jacz. Host – *Hedysarum mogianicum* (B. Fedtsch) B. Fedtsch. NR, NNR, Majrum valley, 19.07.2011, E66°42'0.93", N40°33'48.99"C.

12. *Sphaerotheca fuliginea f. lophanthi* Jacz. Host – *Lophanthus schtschurowskianus* (Regel) Lipsky. NR, NNR, on the Northern slopes of Hayotboshi mountain, 25.07.2015, E66°44'5.45"B, N40°30'0.29"C.

13. *Sphaerotheca fuliginea f. sedi* Kalymb. - на *Pseudosedum lievenii* (Ledeb.) Berger (рис. 4). NR, NNR, Gurdara valley, 04.05.2012, E66°55'54.21"B, N40°31'45.49"C.

14. *Sphaerotheca fuliginea f. lophanthi* Jacz. Host – *Lophanthus schtschurowskianus* (Regel) Lipsky. NR, NNR, on the Northern slopes of Hayotboshi mountain, 25.07.2015, E66°43'57.95"B, N40°29'44.91"C. Zomin national nature park, Irgaylisoy, 30.07.2018.

15. *Sphaerotheca* sp. Host – *Orthurus kokanicus* Juz. (Fig.1). NR, NNR, on the Northern slopes of Hayotboshi mountain, 25.07.2015, E66°43'46.97"B, N40°29'45.42"C.

Sphaerotheca sp. first noted in Uzbekistan on representatives of the genus *Orthurus* L. It should be noted that *Sphaerotheca* sp. strongly affects *Orthurus kokanicus* and makes numerous ascocarps.

a b

Fig.1. Sphaerotheca sp. – Orthurus kokanicus:
a – affected leaves,
b – ascocarp and ascus of Sphaerotheca sp.

Sphaerotheca sp. first noted in Uzbekistan on representatives of the genus *Orthurus* L. It should be noted that *Sphaerotheca* sp. strongly affects *Orthurus kokanicus* and makes numerous ascocarps.

16. *Phyllactinia suffulta f. amygdali* Golov. Host – *Amygdalus spinosissima* Bunge NR, NNR, on the Northern slopes of Hayotboshi mountain, 17.09.2016, E66°44'22.92"B, N40°30'21.60"C. Zomin national nature park, Oriklisoy, 30.07.2018.

17. *Sawadaea bicornis* (Wallr.) Miyabe. Host – *Acer pentapomicum* Stewart ex Brandis (*Acer pubescens* Franch.) Boysun forestry farm, Amir Temur valley, 27.08.2016, E67°13'16.99"B, N38°27'46.82"C.

All collected specimens are stored in Tashkent Mycological herbarium (TASM) of the Institute of Botany Academy of Sciences of Uzbekistan.

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APPROXIMATION OF THE LANDWEBER ITERATION METHOD FOR A NETWORK EQUATION

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Abstract. *This article discusses the approach to numerical solution of inverse acoustic problem by iteration Landweber. This approach is as follows: to restore the unknown factor in the differential equation have a direct problem statement and additional information about the solution of the direct problem. We write the residual functional, we obtain the statement of the dual problem. Next, using the solution of direct and adjoint problem we obtain the gradient of the residual functional. Then for the numerical solution of the inverse problem of the formulation of the direct problem of transition to a problem that will be solved numerically on a computer.*

Keywords: *inverse problem, the problem of acoustics, Dalembert's formula, iteration Landweber, discrete analog, gradient, conjugate problem.*

1. Introduction*:* Consider the inverse problem of acoustics:

$$u_{tt} = u_{xx} - 2\frac{s'(x)}{s(x)}u_x, \quad t > x > 0$$

$$u_x|_{x=0} = 0, \quad t > 0,$$

$$u(x, x+0) = s(x), \quad x > 0,$$

$$u|_{x=+0} = g(t), \quad t > 0.$$

where for a given function g(t) find function required s(x).

Introduce the grid $x = ih$, $t = kh$, где $i = \overline{0, N}$, $k = \overline{i, 2N - i}$, N - mesh size, h = *l*/N - grid spacing. We introduce the following notation for grid functions.:

$$q(i,k) = (q_1[i,k], q_2[i], q_3[i]),$$
$$q_1(i,k) := q_1(ih, kh), \quad q_2(i) := q_2(ih), \quad q_3(i) := q_3(ih),$$
$$f(i,k) = (f_1[i,k], f_2[i], f_3[i]),$$
$$f_1(i,k) := f_1(ih, kh), \quad f_2(i) := f_2(ih), \quad f_3(i) := q_3(ih).$$

2. Objects and research methods:

The considered approach is as follows: to restore the unknown coefficient in a differential equation, we have the formulation of the direct problem and additional information about the solution of the direct problem. We write out the discrepancy functional, we get the formulation of the adjoint problem. Further, using the solutions of the direct and adjoint problems, we obtain the gradient of the residual functional. After that, for the numerical solution of the inverse problem, we proceed from the formulation of the direct problem to the problem, which we will solve numerically on a computer. Next, write the residual functional Φ[*p*], which approximates the functional residuals J[q], from the formulation of the adjoint problem $L_q^* \psi = 0$ go to the task $\widetilde{\Lambda}_p \phi = 0,$ where $\widetilde{\Lambda}_p$ - operator of the numerical solution of the adjoint problem, and the function ϕ is an approximation of a function ψ; we obtain a relation that approximates the expression of the residual functional gradient and then to produce a minimization sequence we use some kind of gradient method.

To describe the scheme, we use the method of mathematical induction. Set the initial approximation $q^0[i,k] = \left(q_1^0[i,k], q_2^0[i], q_3^0[i]\right)$.

Let's pretend that $q^n[i, k]$ already known, then we calculate the values

$$Aq^n[i,k]:$$

$$A_1 q^n[i,k] = q_1^n[i,k] - \frac{h}{4}\Big(q_3^n[0]\Big(q_1^n[0,k+i] + q_1^n[0,k-i]\Big) + 2q_3^n[i]q_1^n[i,k]\Big)$$
$$- \frac{1}{2}\sum_{j=1}^{i-1} q_3^n[j]\Big(q_1^n[j,k+i-j] + q_1^n[j,k-i+j]\Big)\Big)h,$$

$$A_2 q^n[i] = q_2^n[i] + \frac{h}{4}\Big(q_3^n[0]q_2^n[0] + q_3^n[i]q_2^n[i]\Big) + \frac{1}{2}\sum_{j=1}^{i-1} q_3^n[j]q_2^n[j]h,$$

$$A_3 q^n[i] = q_3^n[i] + \Big(0.5h\Big(q_3^n[0]q_2^n[0] + q_3^n[i]q_2^n[i]\Big) + \sum_{j=1}^{i-1} q_3^n[j]q_2^n[j]h$$

$$\times\left(0.5h\left(q_3^n[0]q_1^n[0,2i]+q_3^n[i]q_1^n[i,i]\right)+\sum_{j=1}^{i-1}q_3^n[j]q_1^n[j,2i-j]h-0.5\gamma f_3[i]\right)$$

$$+2/\gamma\left(0.5h\left(q_3^n[0]q_1^n[0,2i]+q_3^n[i]q_1^n[i,i]\right)+\sum_{j=1}^{i-1}q_3^n[j]q_1^n[j,2i-j]h\right).$$

Calculate the values of functionals

$$J_1(q^n)=\|r_1\|_{L_2}^2\left\|A_1q^n-f_1\right\|_{L_2}^2=\sum_{i=0}^{N}\sum_{k=i}^{2N-i}(A_1q^n[i,k]-f_1[i,k])^2h^2,$$

$$J_2(q^n)=\|r_2\|_{L_2}^2+\left\|A_2q^n-f_2\right\|_{L_2}^2=\sum_{i=0}^{N}(A_2q^n[i]-f_2[i])^2h,$$

$$J_3(q^n)=\|r_3\|_{L_2}^2=\left\|A_3q^n-f_3\right\|_{L_2}^2=\sum_{i=0}^{N}(A_3q^n[i]-f_3[i])^2h,$$

and if $J_1(q^n),J_2(q^n),J_3(q^n)$ are small enough, we stop the process by taking q^n for an approximate solution of the inverse problem.

If functionals $J_1(q^n),J_2(q^n),J_3(q^n)$ are not small enough, then we calculate the gradients of the functionals

$$J_1'(q^n)[i,k]=2[A_1'q^n]^*r[i,k]=r_1[i,k]-0.5q_3^n[i]\left(\sum_{j=i}^{(i+k)/2}r_1[j,k+i-j]h\right.$$

$$\left.+\sum_{j=1}^{N-(k-i)/2}r_1[j,k-i+j]h-2(B_2q[(k+i)/2]+1/\gamma)r_3[(k+i)/2]\right),$$

$$J_2'(q^n)[i]=2[A_2'q^n]^*r[i]=r_2[i]$$

$$+0.5q_3^n[i]\sum_{j=i}^{N}\{r_2[j]+2r_3[j](B_4q[j]-0.5\gamma f_3[j])\}h,$$

$$J_3'(q^n)[i]=2[A_3'q^n]^*r[i]=r_3[i]$$

$$-0.5\sum_{j=i}^{N}\left(\sum_{p=j}^{2N-j}(q_1^n[i,p+j-i]+q_1^n[i,p-j+i])r_1[j,p]h\right.$$

$$-q_2^n[i]r_2[j]-2q_2^n[i]r_3[j](B_4q[j]-0.5\gamma f_3[j])$$

$$-4q_1^n[i,2j-i](B_2q[j]+1/\gamma)r_3[j])h,$$

где $B_2q[i]=\frac{1}{2}\sum_{j=0}^{i}q_3^n[j]q_2^n[j]h$,

$$B_4q[i]=\sum_{j=0}^{i}q_3^n[j]q_1^n[j,2i-j]h.$$

3. Results and its discussion:

We calculate the following approximation q^{n+1}

$$q_1^{n+1}=q_1^n-\alpha_1J_1'(q^n)$$
$$q_2^{n+1}=q_2^n-\alpha_2J_2'(q^n)$$
$$q_3^{n+1}=q_3^n-\alpha_3J_3'(q^n)$$

где $\alpha_1,\alpha_2,\alpha_3\in\left(0,\left\|[A'q]^*\right\|^{-2}\right)$.

4. Findings: We carry out a finite difference approximation. We have a grid area Ω_h, in one way or another, we approximate the operator L_q - difference operator. Next, in one way or another, we approximate the operator A, difference operator A_h, and the corresponding adjoint problem $L_p^*\psi=0$ - replace with differential analog $\tilde{\Lambda}^*\psi_h=0$. From this scheme of calculations for obtaining an approximation of the adjoint problem, i.e. no guarantee that $\tilde{\Lambda}^*$ matches with $\tilde{\Lambda}^*$, if they do not coincide, the discrete analogue of the gradient will change as a result, i.e. $B\neq A_h$.

From the point of view of the theory of difference schemes, using an arbitrary choice of a finite approximation of the adjoint problem, we can choose an exact approximation of the adjoint problem so that the corresponding gradients match.

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擅长山地射击的强陡，半陡层发育系统研究的实现方法
METHODOLOGY OF REALIZATION OF RESEARCHES OF THE SYSTEMS OF DEVELOPMENT OF POWERFUL STEEP AND SEMI-STEEP LAYERS APT TO THE MOUNTAIN SHOTS

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注解。 本文讨论了库兹巴斯Prokopevsko-Kiselevsky区复杂采矿和地质条件下厚煤层的开发。 根据所开发的方法进行的研究，提出了关于次级开发，防止岩石爆破以及需要考虑岩体和煤的含水量的建议，这引起了浸渍时的发生。 地块。

关键词：方法，实施，研究，厚煤层开发系统，复杂山地条件。

Annotation. *The article discusses the development of thick seams in complex mining and geological conditions of the Prokopevsko-Kiselevsky district of Kuzbass. Based on the studies carried out according to the developed methodology, recommendations were given on the development of sublevels, the prevention of rock bumps and the need to take into account the moisture content of the rock mass and coal, which provokes its occurrences upon impregnation of the massif.*

Keywords*: methods, conducting, research, system of development of thick seams, complex mountain conditions.*

When developing thick steep and steeply inclined seams, two types of development systems are used: with excavation of seams at full capacity and with separation of the seam into layers [1].

The following mining systems with a full-seam extraction are used:

- mining systems with shield ceilings;
- chamber mining systems.

When mining a seam into layers we apply:

- layered mining systems;
- mining systems with flexible metal shields.

The use of chamber mining systems is minimized due to the fact that with an increase in the depth of mining, the loss of coal in the pillars significantly increased. These systems are dangerous in the mining of seams, prone to spontaneous combustion and rock bumps. The disadvantages of these systems also include the difficulty of airing and large dustiness. Therefore, chamber mining systems are classified as non-standard, used in exceptional cases [1, 2].

Mining systems with shield ceilings are mainly used on seams with a thickness of 2 to 8-10 m with slope angles of 55-90°. The mining seam must have sustained thickness, a constant slope angle and a small tectonic disturbance. Shields are used at a slope angle of up to 40°, however, the elements of the bed should be sustained in terms of thickness and slope angle.

Shield mining system is characterized by significant coal losses (up to 30%) and high fire hazard.

Layer mining systems (inclined and transversely inclined seams with the mined space laying) due to the lack of means of complex mechanization have low technical and economic indicators and therefore are used in a limited volume.

Mining systems with a flexible metal shield are used on seams with a capacity of more than 5 m in any geological conditions. The most laborious in mining systems are works on the excavation of the mounting seam and the installation of flexible shield.

They are characterized by considerable efficiency, high performance and can be used in difficult mining and geological conditions [1, 3].

Currently, the mining system with flexible metal shield is used instead of inefficient layered systems, and the highest technical and economic indicators are achieved for mining seams with a capacity of 12-15 m.

For the mechanization of work during the excavation of the first and subsequent seams of systems with flexible metal shield, complexes have been developed that have been tested in the mining of thick steeply inclined seams in Kuzbass and showed that the existing samples of coal-mining units require significant structural modifications [4-7].

The mechanization of work on systems with shield ceilings began with the use of scraper systems, but due to a number of shortcomings (low productivity, the inability to control the scraper stroke, dismantling and lowering coal at the ends of the shield manually, etc.), the performance of the stoping increased slightly.

It is supposed to conduct stoping works at seam mining systems with mechanized complexes that are under industrial inspection.

The difficulty of creating complexes for mechanized excavation of thick steep

and inclined seams lies in the complexity of the geological conditions of their occurrence. For this reason, traditional types of mechanized stoping were not successful. For example, tectonic disturbance of the seams of the Prokopievsko-Kiselevskoe deposit is the norm, and not disturbance is the exception.

With increasing depth of mining, the efficiency of mining systems with the collapse of host rocks decreases and this is primarily due to a number of specific features of mining of thick steeply inclined seams [4, 6, 8]:

- imperfect technological solutions (small excavation fields, short faces);
- breakthroughs of clay and pulp into existing minings;
- increased tendency of coal to spontaneous combustion;
- high coal losses;

The occurrence of dangerous phenomena due to high rock pressure.

Domestic and foreign experience in mining coal seams shows that a number of these issues can be solved when applying a fill, especially hardening, reduce losses due to the extraction of reserves in security pillars, reduce the number of underground fires to a minimum, increase the isolation of the open space, safely mine coal seams in areas dangerous for breakthrough clay slurry and clay, more effectively manage rock pressure

The mining of deeps of coal deposits in Kuzbass is associated with the solution of the problem of rock pressure and, in particular, with the solution of problems of preventing rock bumps [10]. The specificity of the occurrence of thick steep and sloping coal seams is that the host rocks are represented mainly by stable differences [8].

The movement of resistant side rocks occurs periodically and in large masses, and with the deepening of mining operations it leads to the occurrence of rock bumps.

An analysis of the occurrence of rock bumps in mines shows that almost all of them are fixed on seams with durable host rocks [11].

Under the existing geological conditions, the adopted technology of mining operations with the control of rock pressure through the collapse of enclosing rocks requires its improvement especially in seams prone to rock bumps.

Studies of periodic displacements of hard-to-destroy roofing rocks allowed to establish the parameters of subsurface seam mining (the length of the substage down to 25 m, anticipation of the upper substage mining of the next 50-80 m, leaving coal pillars as an exception).

In case of layered systems, it is necessary to suspend the stoping until stabilization of rock pressure and then carry out layered drifts and mine the layers.

For systems with shield ceilings, depending on the type of shield, we began to apply: advanced torpedoing of the host rocks, leaving the enlarged amounts of the pillars, or we recommend its replacement by pre-built concrete supports [8, 12] ..

A characteristic feature of the mining of steep and steeply inclined coal seams is the location of a large number of preparatory-rifled workings around the working faces, and the operation and maintenance of them with the deepening of mining operations requires additional economic costs and serve as the center of rock bumps.

The mining of a protective seam on thick impact coal seams with long pillars along the strike is associated with the possibility of rock bumps. The use of additional measures to eliminate the occurrence of rock bumps reduces the economic efficiency and the rate of mining of the protective layer, which is a deterrent for the excavation of the remaining coal mass, therefore, the regional bringing of the coal mass to a non-hazardous state is necessary.

Advance excavation of the protective seams (layers) with tight shield rocks does not have a positive effect when mining, and sometimes after the seam has been mined, the loads on the seam are restored and the seam becomes dangerous again.

Consequently, the study of issues related to the parameters of mining technology on thick steeply inclined seams with tight shields and the use of protective excavation of seams as special measures for the protection of mine workings is insufficient.

Expanding the scope of mining systems with a flexible metal shield with increasing depth of mining of thick steep and inclined coal seams, especially in difficult mining and geological conditions, is appropriate.

It is necessary to study the rational technology of coal extraction under flexible shield on steeply inclined seams, prone to the occurrence of rock bumps, with the establishment of rational parameters of regional moistening.

The occurrences of rock pressure in the mine were studied in accordance with the well-known methodology of All-Russian Research Institute of Mining Geomechanics ans Survey using paired and deep benchmarks, SUI-3 stoop and a flexible ruler of ARRIMGS.

The pair and deep benchmarks were used because the observations were carried out for a long time, and measuring stations in some cases were located near the place of blasting operations. For better analysis of the processes that occur in the rock mass when mining thick coal seams with the shield ceiling system strength and moisture of coal were measured.

Paired benchmarks one meter long were installed in the workings, passed from the hanging and lying sides of the seam. For this target perpendicular to the wall of the excavation bore-holes were drilled in which a benchmark was inserted and fixed with sand-cement mortar.

Measuring stations consisting of two benchmarks were set at the wall of the horizontal mining in the vertical plane, and in the wall of the inclined development - normal to the reservoir.

In horizontal workings, where possible, two stations were cast in opposite walls of the workings opposite each other. The number of measuring stations and the distance between them was established in each concrete case depending on the geological conditions. The frequency of measurements was taken depending on the progress of the stoping on excavation of the mounting and lower seams and was measured daily to 1-2 times a week.

When testing the measurement results, relative deformations were determined.

In the analysis of field observations, the change was considered as a function of time and multiplicity of work.

Determination of the strength of coal was carried out according to the method of prof. M.M. Protodyakonov every 10–20 m across all workings outside the zone of influence of the stopings, and then repeated strength tests were carried out with sampling of coal under the mounting seam using the thickness of the formation. At the points where the strength of coal was determined, its natural moisture was estimated by the method adopted at the mines.

The objectives of the experiments included: determination of the moisture content of coal before and after moisture;

- determination of the maximum hygroscopic moisture content of coal;
- evaluation of the effectiveness of moisture;
- assessment of the permeability of thick steeply inclined coal seams.

Determination of the natural moisture content of coal was carried out on samples taken at the ventilation drift, passed to the moment of moistening, as well as in the adjacent area, opened by preparatory workings. Samples were taken from the walls of workings from a depth of 0.3-0.4 m. A set of sample bottles was transferred to a laboratory, where moisture was determined according to GOST 11014-70. Samples were analyzed no later than 10 hours from the time they were collected.

Determination of the moisture content of coal after moistening was carried out on samples taken as preparatory workings were carried out at the hanging and lying sides of the seam.

Determination of the maximum hygroscopic capacity of coal was carried out on samples taken to determine its moisture, for which the dried samples were placed in a sealed vessel with water on a special stand. After four days, the moisture content of the coal was re-determined, which was the maximum hygroscopic moisture capacity of the coal.

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由于生态学和遗传学而培育欧洲荷斯坦牛的效率
EFFICIENCY OF THE EUROPEAN HOLSTEIN BREEDING DUE TO ECOLOGY AND GENETICS

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注解。总结了黑白荷斯坦牛多年繁殖工作的成果。已经确定了荷斯坦奶牛的生态起源和线性隶属关系对其终生产奶量，牛奶中脂肪和蛋白质含量以及经济使用条件的影响。终身生产力指标之间的高表型和基因型相关系数（r = + 0.92–0.98）表明任何特征的选择将对其他特征产生积极影响。显示了使用优质生产线制造商的可行性，这些生产线将高育种价值与女儿的生产力相结合，并改善其经济使用的持续时间。奶牛生产性质的遗传系数（h2 = 0.18–0.23），有理由认为基于终身生产力特征的选择将对奶牛育种的进展产生积极影响。然而，缩短工业技术中动物生产使用的时间应该成为深入研究和寻找解决这一问题的方法的动力。

关键词：奶牛，荷斯坦奶牛品种，育种背景，终生产奶量，乳脂和蛋白质，相关性，遗传力。

Annotation. *The results of many years of breeding work with black-and-white Holstein cattle are summarized. The influence of ecogenetic origin and linear affiliation of Holstein cows on the value of their lifetime milk yield, fat and protein content in milk, as well as terms of economic use has been established. High phenotypic and genotypic correlation coefficients between indicators of lifetime productivity (r=+0.92–0.98) indicate that the selection of any feature will have a positive effect on others. The*

feasibility of using manufacturers of outstanding lines, which combine a high breeding value on the productivity of daughters with an improving effect on the duration of their economic use, is shown. The coefficients of heredity of the productive qualities of cows (h2=0.18–0.23), give reason to believe that the selection based on the features of lifetime productivity will positively affect the progress in dairy cattle breeding. However, shortening the period of productive use of animals in industrial technology should serve as an incentive for in-depth study and finding ways to solve this problem.

***Keywords**: cows, Holstein breed, breeding background, lifetime milk yield, milk fat and protein, correlation, heritability.*

Introduction

In contrast to Western Europe and North America, where small family-cooperative farms traditionally dominate, Ukraine's dairy cattle breeding relies on the development of livestock industry [3, 5, 10]. Preference is given to the construction of high-tech dairy complexes, which provide for the loose keeping of a sufficiently large population of dairy cows. At the same time, there is a problem of completing such farms with highly productive animals, which, as a rule, is solved by importing the black-and-white Holstein breed from EU countries. However, in the new conditions, the adaptation of introduced animals is not always successful and is characterized by short periods of economic use [2, 4]. The premature retirement of dairy cows not only reduces the breeding resources of the breeds, but also causes economic damage to the industry as a whole. This leads to large economic losses in foreign currency, which do not always pay off due to the high productivity of animals [8]. It is important to search for effective breeding methods to increase the duration of economic use due to the selection of animals for important economically useful characteristics [6, 7, 9, 11].

The aim of the study was to analyze the productivity of Holstein cows of European breeding and their progeny of the first generation in the conditions of the Steppe of Ukraine. We have summarized the results of many years of breeding work with black-and-white Holstein cattle on a large industrial dairy complex.

Material and methods

We studied the productive longevity of Holstein cattle of Danish, German and Hungarian ecogenetic origin (import - IG) and the progeny obtained from it (first generation - FG) in the temperate continental climate of the center of Ukraine at the industrial dairy complex of PrJSC Agro-Soyuz. The data of the Orsek dairy cattle breeding management system was taken into account, which included lifetime milk yield, content (%) and yield (kg) of milk fat and protein, productive longevity (number of completed lactations). Groups of animals were formed according to the principles adopted in zootechnology [1], followed by mathematical processing in STATISTICA 10 (StatSoft, Inc., USA).

Results

Productive longevity of cows is a rather complex integral feature, which is determined by both genetic factors and environmental factors. The complexity of breeding on the basis of longevity is that the evaluation of the actual characteristics of these features is possible only after the departure of the cows from the herd, and, consequently, from the selection process. It was established that the average lifetime duration of the lactation period in FG compared with IG was reduced by 394 days - from 1441 to 1047 (P <0.001). At the same time, the lifetime yield was lower by 7167 kg (having decreased from 34245 to 27078 kg) or by 20.9% (P <0.01). In FG, the yield of milk fat and protein decreased by 758 and 229 kg or 23.0 and 24.1% (P <0.001) and its content in milk was 0.1%. The duration of economic use of FG decreased by 1.0 lactation (P <0.001), averaging 2.6 lactations (Table 1).

Table 1 - *Indicators of lifetime productivity of Holstein cows of different ecogenetic origin*

Group	n	Indicators of lifetime productivity				
		yield, tone	milk fat yield, tone	milk protein yield, tone	average content for all lactations,%	
					fat	protein
Danish origin						
Import	52	35.6±2.62	1.2±0.08	1.0±0.07	3.4±0.07	2.9±0.06
I generation	23	24.0±2.77	0.9±0.11	0.7±0.09	3.6±0.09	3.1±0.08
German origin						
Import	47	31.3±2.07	1.0±0.07	0.8±0.06	3.3±0.07	3.3±0.13
I generation	29	23.6±2.50	0.7±0.07	0.6±0.06	2.7±0.06	2.7±0.08
Hungarian origin						
Import	49	35.7±2.16	1.1±0.08	1.0±0.06	3.2±0.07	2.8±0.06
I generation	28	33.2±3.43	1.0±0.11	0.8±0.09	2.9±0.09	2.5±0.08
herd average						
Import	148	34.2±1.33	1.1±0.04	0.9±0.03	3.3±0.04	2.8±0.03
I generation	80	27.1±2.41	0.9±0.07	0.7±0.05	3.2±0.05	2.7±0.05

The differences in the value of the lifetime productivity depending on the origin and linearity of animals are revealed. Lifetime milk yield, IG of Danish origin exceeded the average herd by 1336 kg or 3.9%. By the amount of milk fat and protein by 73.4 and 60.7 kg or 6.5 and 9.5%, and by its content - by 0.1%.

However, in terms of industrial technology in FGs of Danish breeding, the lactation period was shortened by 514 days or by 34.7% (P <0.001), and the duration of productive use by 0.9 lactations (P <0.01). For lifetime milk production,

FG cows conceded the IGs by 11,556 kg or 32.5% (P <0.001). The yield of fat - by 321 kg (P <0.05) and protein by 268 kg (P <0.05) or 26.8 and 26.5%. Although the average content of these components in milk has slightly increased (by 0.2%).

The cows of the IG of the German selection for lifetime milk yield were lower than the average for the herd by 2969 kg (8.7%), the yield of milk fat by 85 kg (7.6%) and protein by 81 kg (11.3%). The lactation period was shorter by 47 days (3.3%), and the number of lactations was 0.2%. The FG of the German selection also showed a significant reduction in the lactation period by 436 days or 31.3% (P <0.01). Lifetime milk yield was lower by 7725 kg or 24.7% (P <0.05), fat yield by 295 kg or 28.4% (P <0.01) and protein - by 229 kg or 27.2% (P <0.01). Its content in milk has not changed. The period of productive use was reduced by 1 lactation (P <0.001).

The cows of the Hungarian selection for lifetime milk yield exceeded the average figure for the herd of IG by 1,429 kg (4.2%). They produced a little more milk fat (by 4.1 kg or 0.4%) and protein (by 39.4 kg or 4.1%). However, the fat content was lower - by 0.1%. The *maintenance* period of the IG cows exceeded the average value of the herd by 0.2 lactation. For lifetime milk yield, they conceded to IG by 2,435 kg (6.2%), to the amount of fat by 145 kg (12.9%) and protein by 174 kg (17.6%). The average fat and protein content in milk decreased by 0.3 (P <0.05). The lactation period of FG decreased by 246 days (17.1%), and the *maintenance* period - by 0.9 lactation (23.7%) (P <0.01).

However, among the cows of the Holstein breed, it was FGs of Hungarian origin that turned out to be more adapted to the conditions of the industrial complex, differing in relatively high productive longevity. Their lactation period was 228 and 238 days longer than in animals of Danish and German selection. For lifetime milk yield, they surpassed the cows of Danish and German selection by 9213 and 9688 kg or 38.3 and 41.1% (P <0.95). On the yield of milk fat - by 106 and 239 kg (12.2 and 32.1%) and milk protein - by 72 and 202 kg (9.7 and 32.9%). For productive longevity, advantage was 0.4 and 0.5 lactation.

Of great importance in the breeding of imported animals is the study of the heritability of economically useful traits in the progeny obtained from them. We have evaluated the productive qualities and heritability of individual economically useful traits in IG and FG in mother-daughter pairs. It was established that the productivity of the cow-daughter of FG in the industrial complex conditions was significantly inferior to the imported mothers. The value of lifetime milk yield - by 9711 kg or 26.4% (P <0.001); lifetime milk fat yield — by 351 kg or 28.8% (P <0.001); lifetime milk protein yield- by 294 kg or 28.9% (P≥0.001). At the same time, there was also a tendency to a decrease in the average content of fat and protein in milk - by 0.1%.

Despite the general trend in the reduction of indicators of lifetime productivity

of Holstein cattle, we identified significant intrabreed (ecogenetic) differences in individual traits. In particular, among cow daughters, FGs of Danish and German origin, the magnitude of lifetime milk yield compared with imported mothers was lower by 14405 and 11075 kg or 37.5 ($P < 0.01$) and 32.0% ($P < 0.01$), respectively . The lifetime yield of milk fat decreased by 434 and 420 kg or 33.1 ($P < 0.05$) and 36.1% ($P < 0.001$). On the yield of milk protein, they were inferior to their mothers by 343 and 325 kg or by 31.5 ($P < 0.05$) and 34.6% ($P < 0.01$), respectively. At the same time, in cows-daughters of Danish origin the content in fat and protein in milk increased by 0.1 and 0.2%.

In animals of the first generation of Hungarian origin, there was only a tendency to decrease in the indicators of lifetime productivity - milk yield by 4442 kg or 11.8%, and milk fat yield by 210 kg (17.6%) and protein - 222 kg (21.4%). The fat content in milk fell (0.2%). Hungarian FG exceeded Danish and German life expectancy by 38.3 ($P < 0.05$) and 41.1% ($P < 0.05$), milk fat yield by 12.2 and 32.1%, milk yield protein - by 9.7 and 32.9%. However, progeny of Danish selection turned out to have more fat and protein-milk yields. In terms of the average fat content for all lactations, they exceeded animals of the German and Hungarian selection by 0.3 ($P < 0.05$) and 0.7% ($P < 0.05$) and milk protein - by 0.4 ($P < 0$, 05) and 0.6% ($P < 0.05$), respectively.

Given the fact that heritability always appear in specific environmental conditions, it is very important to determine this very important parameter of population genetics directly in the economy. One-factor analysis of variation (ANOVA) showed that the heritability of economically useful traits in daughters of imported cows was rather low. The average index of heritability coefficient for cows has been as follows: in terms of lifetime milk yield - 0.09; lifetime yield of milk fat and protein - 0.11; the average fat and protein content for all lactations is only 0.005.

At the same time, we identified differences in the inheritance of these indicators depending on the origin of the cow mothers. So, cows-daughters of German and Danish-born FGs had a relatively highest heritability coefficient (h^2) for lifetime milk yield (0.17 and 0.18); the lifetime yield of milk fat (0.23 and 0.15) and the lifetime yield of milk protein are 0.19 and 0.15, respectively. At the same time, the average fat and protein content in milk was characterized by a very low index (h^2= 0.05–0,0001). It should be noted that cow daughters of Hungarian origin had a very low rate of heritability of all economically useful traits (h^2= 0.02–0.05) except the average protein content for all lactations, whose heritability on this basis was 0, 11 ($P < 0.05$).

It should be noted that in FG animals of German origin, the negative relationship between the value of life-long milk yield and the fat and protein content in milk increased compared to IG - to r=-0.30 ... -0.31. The FG of Hungarian origin was very low (r=-0.05 ... + 0.07), while the FG of Danish origin between the value of life-time milk yield and fat content correlation was positive r=+ 0.30.

The herd, formed from the IG imported from Europe by heifers, was represented by such lines of seed bulls: Ivanhoe 1189870.50; Bell 1667366.74; Valiant 1650414.73; Elevation 1491007.65; Chevalier 1620273.72; Starbuck 352790.79; Hanover 1629391.72 and Chifa 1427381.62. We have identified significant differences in productivity between the individual lines. The highest lifetime profit was at the Starbuck line, which exceeded its imported peers of other lines: Cavalier - by 2,818.7 kg or 8.2%; Bell - by 3404.5 kg or 10.1%; Valiant - by 5553.8 kg or 17.5%; Elevation - by 7368.9 kg or 24.6%; Chifa - by 5,500.5 kg or 17.3%.

Starbuck cows differed in their relatively high fat content in milk. They exceeded the Cavalier - by 0.5% ($P < 0.05$); Bell - 0.2%; Valiant - by 0.6% ($P < 0.05$); Elevation - 0.4% ($P < 0.01$); Chifa - by 0.2%. Bell's line of milk in protein content exceeded cows of the Cavalier line - by 0.2%; Starbuck - by 0.1%; Valiant - by 0.5%; Elevation - by 0.2% and Chifa - by 0.1%.

The productive longevity of cows (Table 2) averaged 3.1–3.9 lactations. Starbuck's daughters conceded Cavalier's daughters - by 0.1 or 2.6%; Bell - by 0.5 or 14.7%; Valiant - by 0.8 or 25.8%; Elevation - by 0.8 or 25.8%; Chifa - by 0.5 or 14.7%.

Table 2 - P*roductive longevity of Holstein cows of European breeding, lactation*

Line	Group					
	IG, n=119	Cv, %	FG, n=69	Cv, %	Reliability of difference	
					Ttest	*P*
Cavalier 1620273.72	3.8±0.52	45.7	-	-	-	-
Bell 1667366.74	3.4±0.40	42.2	3.2±0.50	51.9	0.36	>0.05
Valiant 1650414.73	3.1±0.36	41.1	2.7±0.26	36.6	1.07	>0.05
Elevation 1491007.65	3.1±0.21	39.3	2.3±0.56	67.8	1.31	>0.05
Starbuck 352790.79	3.9±0.36	42.8	2.4±0.36	52.9	2.94	<0.01
Chifa 1427381.62	3.4±0.24	40.6	2.4±0.29	49.1	2.43	<0.05

Only in cows of FG of the Valiant and Elevation lines there was a positive relation between life time milk yield and fat and protein content in milk (r=+ 0.17 ... + 0.40), which may indicate the possibility of carrying out selection work in the direction of improving these characteristics.

The influence of linear affiliation on the average content of milk fat and protein for all lactation was: in IG - 13.2 ($P < 0.01$) and 9.9% ($P < 0.05$), in FG animals - slightly higher - 23, 1 and 32.6% ($P < 0.01$), respectively. At the same time, it is appropriate to say about the influence of linear affiliation on lifetime milk yield only for animals of the first generation, the impact force of which was reliably 19.5% ($P < 0.05$). This indicates a weakening of the environmental factors in the conditions of year-round loose keeping and similar feeding.

Summary

1. In the studied herd, the coefficient of variation of productive indicators of purebred Holstein cows has a sufficient level for effective breeding work.

2. The obtained coefficients of heredity (h^2) features of lifetime productivity in Holstein cattle, give reason to believe that the selection on these grounds will have a positive impact on the progress in dairy cattle breeding.

3. High phenotypic and genotypic correlation coefficients between the duration of productive life show that selection of any of these features will have a positive effect on other features.

4. It is advisable to use manufacturers of outstanding lines that combine high breeding value for the productivity of daughters with an improving effect on the duration of their economic use.

5. In order to increase the genetic potential of the productivity of animals of the Holstein breed of domestic generation, producers and imported breeding stock should continue to be used in the selection work of Ukraine.

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功能性添加剂对小麦粉面包品质的影响
THE EFFECT OF FUNCTIONAL ADDITIVE ON THE QUALITY OF BREAD MADE FROM WHEAT FLOUR

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抽象。 研究了功能性添加剂对小麦面包品质的影响。 开发了一种新型配方，含有功能性添加剂作为旱金莲。 研究了面包样品的感官特性。 提出了使用旱金莲种子1%引入小麦面包的盈利能力的经济计算。

关键词：功能性添加剂，金莲花，直接面团法，揉面，烹饪，盈利性，成本。

Abstract. *A study of the effect of functional additives on the quality of wheat bread was undertaken. A new formulation with a functional additive as a nasturtium was developed. Studies on the organoleptic characteristics of the samples of bread were undertaken. The economic calculations on the profitability of the introduction of wheat bread using nasturtium seeds 1% are presented.*

Key words: *functional additive, nasturtium, straight dough method, kneading, cookiness, profitability, costs.*

In recent years, great attention has been paid to the treatment of various useful substances in the world. Therapeutic and prophylactic effect of the use of bakery products subject to the addition of the necessary additional components to the recipe, with the exception of unwanted, as well as changes in the technology of their preparation. Introduction to the formulation of the components, giving therapeutic and prophylactic properties, allows you to effectively solve the problems of prevention and treatment of various diseases associated with a deficiency of certain substances [1, 2].

This study is devoted to the development of technologies for the production of new functional wheat bread with the addition of nasturtium seeds (Tropaeolum).

Nasturtium is an unpretentious, perennial plant, but due to our weather conditions, cultivation occurs as an annual. Green mass and seeds. Table-top foods are rich in vitamins C, micro- and macro-elements, in which there are essential oils, in particular linoleic and linolenic acid. It has antiseptic, anti-sclerotic, anti-inflammatory, blood-purifying, antispasmodic and other properties.

To solve the problem, it is necessary to develop a recipe, to hold a plain wheat cake with the addition of crushed nasturtium seeds.

The quality of bakery products can be improved with the help of various types of products, using functional additives and non-traditional types of raw materials in the following areas: increasing the price of bakery products using high-protein products, new sugar substitutes; increasing the food value of bread through the use of non-traditional types of raw materials; intensification of the technological process of bread production and increasing its output; the use of new types of grain raw materials; the use of rye flour new grinding [3, 4].

In the experiment on the preparation of wheat bread, seeds were added in the form of a crushed video signal in proportions of 1% of the flour mass.

In the study, two samples of bread were baked: a control (without ground seeds of nasturtium) and bread with the addition of 1% of nasturtium seeds.

At the first stage, two additives were prepared to remove extraneous contaminants, 300 g and 1 weighed, crushed into powder, nasturtium seeds - 3 g. Then in 400 ml of water add 22 g of pressed live yeast, 12 g of salt and 18 g of sugar. Stir to a smooth consistency. In this case, the suspension is divided into two equal parts. Mass data processing does not require the use of machine installations [5]. The result was two dough pieces: the control one without adding nasturtium seeds and adding 3 g of nasturtium.

At the second stage of the practical part there was a proof and fermentation of dough. Used straight cooked method of making wheat bread. After the testing has been carried out, the testing has been carried out in order for the testing to undergo fermentation. This is an improved flavor and other optimized organoleptic properties. There was an alcohol and lactic fermentation caused by yeast cells and lactic acid bacteria. After 30 minutes with an increase in the volume of the test about 2 times, the first punch was made.

In the third stage, the dough pieces of 4 pieces for each mass an average of 119 g and placed in a form. After molding, there was a second proof lasting approximately 25 minutes. After filling in the dough form, it was baked. Approximately up to 20 minutes until golden brown.

In the organoleptic evaluation of wheat bread, the checked surface, shape and color of the crusts by the method of examination under daylight scattered light or with sufficient artificial. To determine the state of the ball, products for cutting and determine the porosity, promes and propechennost. The results of organoleptic indicators are presented in table 1. The definition of organoleptic indicators obtained according to GOST 31805-2012.

Table 1 - *Organoleptic characteristics of wheat bread*

Quality indicators	Control	With the addition of 1% crushed nasturtium seeds
The form	Correct, corresponds to the form in which the baking was carried out	Correct, corresponds to the form in which the baking was carried out
Surface	The crust is uneven, cracked, without breaks	The crust is uneven, cracked, without breaks
Crumb condition	Baked, not moist, with small voids, without seals, without lumps and no traces	Baked, unsaturated, with smaller voids, without seals, without lumps and traces of nephritis.
Colour	Light yellow, peculiar to the color of baked wheat bread	More saturated color, more improved look.
Smell	Peculiar to this type of bread, without odors	It has a peppery, peculiar, pleasant smell.
Taste	Peculiar to this type of bread, without foreign taste.	It has a peppery tint.

According to the results of table 1, it can be concluded that when crushed nasturtium seeds are added to wheat bread, a pleasant, specific flavor and odor appear, the appearance, compared to ordinary wheat bread, looks more improved. The superior color of the peel, smell, taste and texture are due to the fact that nasturtium seeds contain a large amount of essential oils that contribute to the improvement of baking qualities.

To obtain the best effect with the lowest cost, economically material, financial and human resources of the enterprise solve the issues of reducing the cost of production. Identification of reserves to reduce costs should be based on a full technical and economic analysis of the enterprise: the introduction of fixed assets and production capacity, materials and raw materials, a study of the organizational and technical level of production, economic relations and labor [6]. Total costs for the production of wheat bread are presented in Table. 2

Table 2 - *Total costs for the production of wheat bread*

Cost item	Wheat bread without the addition of crushed nasturtium seeds, 100 kg	Wheat bread with the addition of 1% crushed nasturtium seeds, 100 kg
Transportation costs, rub.	92,00	132,00
Costs for auxiliary materials, rub.	185,00	265,00
Energy costs	630,00	630,00
Salary, rub.	1650,00	1650,00
Deductions for social needs, rubles.	495,00	495,00
The cost of packaging, rub.	9,00	13,00
Total production costs, rub.	3061,00	3188,00
Raw material costs, rub.	1844,75	2644,75
Total cost, rub.	4905,75	5832,75

The total cost of the production of wheat bread amounted to 4905,75 rubles per 100 kg of flour, the cost of the production of wheat bread with the addition of 1% ground seeds of nasturtium – 5832,75 rubles. The increase in the cost of bread with nasturtium amounted to more than 900 rubles, which is associated with additional costs for auxiliary materials and transportation costs.

The calculation of the economic efficiency of the production of wheat bread is presented in table 3.

Table 3 - *Economic efficiency of production of wheat bread*

Name of the indicator	Wheat bread without the addition of crushed nasturtium seeds	Wheat bread with nasturtium seed use 1%
Выход изделий, кг	91,19	99,79
Production costs, rub.	4905,75	5832,75
The total cost of 1 kg of bread, rub.	49,05	58,32
Total cost, rub.	50,52	60,07
Selling price 1 kg, rub.	52	62
Profit per 1 kg of bread, rub.	1,48	1,98
Profitability %	2,9	3,2

An economic calculation showed that the total cost of wheat bread with the addition of 1% of seeds higher than the cost of wheat bread by 9 rubles / kg. The company can make a profit from the sale of new bread in the amount of 1,98 rubles for 1 kg of product, which is 0,5 rubles more than in the control sample. The price of selling new bread has increased, but only slightly. The quality of bread in all respects is higher, and the bread is also more nutritious.

Thus, the profitability of the new bread is more than in the control sample by 0,3% and amounted to 3,2%. The introduction of bakery products to the market with the introduction of 1% nasturtium seeds will allow to produce competitive products and take their place in the niche of the functional nutrition group. Nasturtium is rich in vitamins and a variety of useful elements necessary for man. When adding crushed nasturtium seeds in the production of wheat bread, the product not only becomes more useful, improves the organoleptic properties.

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动态策略中的博弈论问题陈述
GAME THEORY PROBLEM STATEMENT IN DYNAMIC STRATEGIES

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摘要。本文考虑了一种博弈论问题陈述的方法，该方法能够使用不同的策略评估获胜机会。 该研究引入了由两个值定义的动态策略：玩家Z的游戏时间分布密度和花费的资源。 在实际案例分析中获得的依赖关系可以提供有关系统行为，竞争对手行为等的更多信息。
关键词：博弈论，策略，随机过程，分布密度，概率论。

Abstract.*This article considers an approach to game theory problem statement, that enables evaluation of winning chances over time using different strategies. The research introduces a dynamic strategy defined by two values: player Z's gaming time distribution density and resources spent. The dependencies obtained in practical cases' analysis can provide more information about the behavior of the system, the actions of the competitors, etc.*
Keywords: *game theory, strategy, random process, distribution density, probability theory.*

Various practical problems require analyzing situations in which the interests of two or more competitors, pursuing opposite goals, collide, and it is important that the outcome of each strategy depends largely on the actions of the competitor. For example, when ensuring security, there are always at least two parties: the one being protected and the other one trying to violate the security policy by destroying first party's security system.

The need to analyze such situations (primarily when dealing with military conflicts or economic issues) gave rise to a special mathematical framework called "Game Theory" [1, 2], which, in fact, is a mathematical theory of conflict situations. The purpose of this theory is to develop recommendations for the rational way of competitors' action in conflict situations.

Strategy, which is one of the main concepts in game theory, is understood as a set of rules that uniquely determine the choice for each move of a given play-

er, depending on game situation. That is, in other words, strategy is a list of all possible situations that may occur during the game or decision-making for each situation. To analyze the game process, we need a payoff matrix, in which the rows correspond to the strategies of one player $A = \{A_1, A_2, ..., A_m\}$, and the columns include the strategies of the other one $B = \{B_1, B_2, ..., B_n\}$, their intersections record the wins of one player and the losses of the other: c_{ij}, $i = 1…m$, $j = 1…n$, where m, n correspond to the number of first and second players' strategies, respectively.

Antagonistic games are solved with the help of the minimax principle.

	B_1	B_2	…	B_j	…	B_n
A_1	c_{11}	c_{12}	…	c_{1j}	…	c_{1n}
A_2	c_{21}	c_{22}	…	c_{2j}	…	c_{2n}
…	…	…	…	…	…	…
A_i	c_{i1}	c_{i2}	…	c_{ij}	…	c_{in}
…	…	…	…	…	…	…
A_m	c_{n1}	c_{n2}	…	c_{mj}	…	c_{mn}

Game theory, regardless of the game type, describes the strategies statically, that is, the strategy does not depend on time. If the strategy undergoes temporary changes, then the payoff matrix should be restructured and, in general, a new solution to the game should be found. In some cases every possible strategy change should be reflected in the initial payoff matrix. In practice it is difficult or totally impossible, and therefore it is interesting to develop a mathematical tool that would allow us to overcome these difficulties.

According to the theory of differential (dynamic) games [3], the mathematical model of the game is determined by a vector system of ordinary differential equations describing the change in the parameters of the studied system.

Let the dynamic strategy be described by the following set of values:

$$S_i^Z = \left\{ f_i^Z(t), R_i^Z(t) \right\}$$

where $f_i^Z(t)$ is the distribution density of player Z's gaming time in the game with the strategy S_i (target shooting time, destructive factors' exposure time, etc.)

with $\int_0^\infty f_i^Z(t)dt = 1;$

$R_i^Z(t)$ is a function, describing the resources invested by the player *Z* in the game with the strategy S_i, with $\int_0^\infty R_i^Z(t)dt = R_i^Z$ being the total resources available to the player *Z* when applying the strategy S_i.

Then the strategies of players *A* and *B* will be given as follows:

$$S^A = \left\{\left\{f_1^A(t), R_1^A(t)\right\}, \left\{f_2^A(t), R_2^A(t)\right\}, \ldots, \left\{f_n^A(t), R_n^A(t)\right\}\right\}$$
$$S^B = \left\{\left\{f_1^B(t), R_1^B(t)\right\}, \left\{f_2^B(t), R_2^B(t)\right\}, \ldots, \left\{f_n^B(t), R_n^B(t)\right\}\right\} \quad (1)$$

It should be noted that $f_i^Z(t)$ in fact is a random process, determined by its distribution density.

The payoff matrix in this problem statement will take the following form:

	$S_1^B = \begin{Bmatrix} f_1^B(t), \\ R_1^B(t) \end{Bmatrix}$	$S_2^B = \begin{Bmatrix} f_2^B(t), \\ R_2^B(t) \end{Bmatrix}$	…	$S_j^B = \begin{Bmatrix} f_j^B(t), \\ R_j^B(t) \end{Bmatrix}$	…	$S_n^B = \begin{Bmatrix} f_n^B(t), \\ R_n^B(t) \end{Bmatrix}$
$S_1^A = \begin{Bmatrix} f_1^A(t), \\ R_1^A(t) \end{Bmatrix}$	$c_{11}(t)$	$c_{12}(t)$	…	$c_{1j}(t)$	…	$c_{1n}(t)$
$S_2^A = \begin{Bmatrix} f_2^A(t), \\ R_2^A(t) \end{Bmatrix}$	$c_{21}(t)$	$c_{22}(t)$	…	$c_{2j}(t)$	…	$c_{2n}(t)$
…	…	…	…	…	…	…
$S_i^A = \begin{Bmatrix} f_i^A(t), \\ R_i^A(t) \end{Bmatrix}$	$c_{i1}(t)$	$c_{i2}(t)$	…	$c_{ij}(t)$	…	$c_{in}(t)$
…	…	…	…	…	…	…
$S_m^A = \begin{Bmatrix} f_m^A(t), \\ R_m^A(t) \end{Bmatrix}$	$c_{m1}(t)$	$c_{m2}(t)$	…	$c_{mj}(t)$	…	$c_{mn}(t)$

The dependency $c_{ij}(t)$ will, in general, have a nonlinear form (fig. 1).

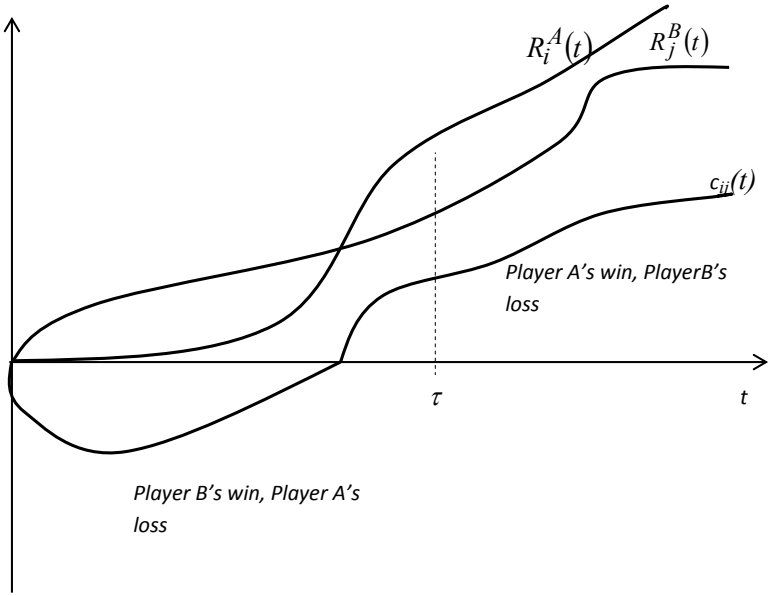

Fig. 1

Player *A*'s resources spent when applying the strategy S_i^A help to get by time τ some gain r_i^A, which, in general, will be determined by the resources spent by that time, i.e. $r_i^A(\tau) = \int_0^\tau R_i^A(t)dt$. Player *B* spends resources, while applying strategy S_j^B in order to compete with player *A*, at the same time the outcome of the conflict is determined by player *B's* resources: $r_j^B(\tau) = \int_0^\tau R_j^B(t)dt$. Thus, the final win of player *A*, in this case, without regard to the winning probability by time τ is determined by:

$$r_{ij}^A(\tau) = r_i^A(\tau) - r_j^B(\tau) = \int_0^\tau R_i^A(t)dt - \int_0^\tau R_j^B(t)dt$$

Player *A*'s wins by time τ with strategy S_i^A, and player *B*'s one with strategy S_j^B will be determined by the following dependency:

$$c_{ij}(\tau) = r_{ij}^A(\tau) p_{f_i^A(t)}(t = \tau), \quad (2)$$

where $p_{f_i^A(t)}(t = \tau)$ is probability that player *A* wins by time τ, that is, the random process $f_i^A(t)$ ends by this moment, and the random process $f_j^B(t)$ goes on;

$r_{ij}^A(\tau)$ – player *A*'s win with strategy S_i^A, and player *B*'s one with strategy S_j^B, by time τ.

Fig. 1 shows that player *A*'s win by time τ can be both positive and negative. This allows us to consider the necessity of strategy S_i^A during time τ and, consequently, to determine the minimum time period τ, during which this strategy is advisable.

Based on the above, a necessary condition for the strategy S_i^A is:

$$c_{ij}(\tau) > 0$$

Finding τ, corresponding to this condition can be a difficult task, given the nonlinear nature of the dependency $c_{ij}(t)$. In this regard, it seems appropriate to determine the total win of player *A* with strategy S_i^A, which can be calculated on the basis of the following considerations.

The probability that the process $f_i^A(t)$ will be finished exactly by time τ, and the random process $f_j^B(t)$ will go on is an element of probability [4]:

$$p_{f_i^A(t)}(t = \tau) = f_{i \mapsto j}(\tau) d\tau \quad (3)$$

Then, considering (2), player *A*'s gain by time τ is

$$c_{ij}(\tau) = r_{ij}^A(\tau) f_{i \mapsto j}(\tau) d\tau \quad (4)$$

By integrating the resulting expression on the interval $(0; \infty)$ we get player *A*'s total win with strategy S_i^A, and player *B*'s one with strategy S_j^B:

$$c_{ij} = \int_0^\infty r_{ij}^A(\tau) f_{i \mapsto j}(\tau) d\tau \quad (5)$$

Then we have to calculate the dependency $f_{i\mapsto j}(\tau)$.

If player *A* chooses strategy S_i^A, and player *B* prefers strategy S_j^B, two random processes determined by distribution densities $f_i^A(t)$ and $f_j^B(t)$, will "compete", while the essence of the competition cannot be determined uniquely in this case, as it depends on the situation in question.

Let 's consider that the first completed random process is the winning one, then it is necessary to determine the distribution density of the probability that process $f_i^A(t)$ has ended by time τ, and $f_j^B(t)$ continues: $f_{i\mapsto j}(\tau)$.

The distribution function of the probability that at least one random process of the competing ones has ended by time τ, can be determined as follows:

$$\Psi(\tau)=1-\left(1-F_i^A(\tau)\right)\left(1-F_j^B(\tau)\right) \tag{6}$$

The differential of this formula allows us to determine the distribution density of the probability that at least one process of the competing ones has ended by time τ:

$$\begin{aligned}\psi(\tau)&=\frac{d}{d\tau}\Psi(\tau)=\frac{d}{d\tau}\left[1-\left(1-F_i^A(\tau)\right)\left(1-F_j^B(\tau)\right)\right]=\\&=f_i^A(\tau)\left(1-F_j^B(\tau)\right)+f_j^B(\tau)\left(1-F_i^A(\tau)\right)\end{aligned} \tag{7}$$

Equation (7) is a weighted distribution density of the probability that the random process described by the density $f_i^A(t)$, is the first one to be finished by time τ, that is, from this moment it is waiting for the end of the process $f_j^B(t)$.

Density weight in this case is defined as the probability that the process $f_i^A(t)$ ends by this point in time, but $f_j^B(t)$ goes on. The probability that the process $f_i^A(t)$ will end exactly by time τ, is an element of probability [4]:

$$p_{f_i^A(t)}(t=\tau)=f_i^A(\tau)d\tau \tag{8}$$

The probability that the process $f_j^B(t)$ will go on is determined as follows:

$$p_{f_j^B(t)}(t>\tau)=1-F_j^B(\tau) \tag{9}$$

Since random processes in the considered case function independently, the following equation is valid:

$$p\left(t=\tau / f_i^A(t), t>\tau / f_j^B(t)\right)=p_{f_i^A(t)}(t=\tau)\cdot p_{f_j^B(t)}(t>\tau)= \quad (10)$$

$$=f_i^A(\tau)\left(1-F_j^B(\tau)\right)d\tau$$

Integration of the resulting equation in the interval $(0\div\infty)$ allows us to determine the probability that the process $f_i^A(t)$ has ended by time τ, and the process $f_j^B(t)$ goes on, that is, the weight (7) is:

$$p_i=\int_0^\infty f_i^A(\tau)\left(1-F_j^B(\tau)\right)d\tau \quad (11)$$

Thus, the distribution density of the probability that the process $f_i^A(t)$ ends first by time τ is as follows:

$$f_{i\mapsto j}(\tau)=\frac{f_i^A(\tau)\left(1-F_j^B(\tau)\right)+f_j^B(\tau)\left(1-F_i^A(\tau)\right)}{\int_0^\infty f_i^A(\tau)\left(1-F_j^B(\tau)\right)d\tau} \quad (12)$$

Thus, considering the equation (5), the total win of player *A* by time τ will be determined by the following expression:

$$c_j=\int_0^\infty r_j^A(\tau)\frac{f_i^A(\tau)\left(1-F_j^B(\tau)\right)+f_j^B(\tau)\left(1-F_i^A(\tau)\right)}{\int_0^\infty f_i^A(\tau)\left(1-F_j^B(\tau)\right)d\tau}d\tau \quad (13)$$

Equation (12) represents the distribution density of a random variable, for which, as for any random variable represented by the distribution density, initial and central moments can be found.

The mathematical expectation of the distribution law (12) is calculated as follows:

$$\tilde{\tau}=\int_0^\infty \tau f_{i\mapsto j}(\tau)d\tau=\int_0^\infty \tau\frac{f_i^A(\tau)\left(1-F_j^B(\tau)\right)+f_j^B(\tau)\left(1-F_i^A(\tau)\right)}{\int_0^\infty f_i^A(\tau)\left(1-F_j^B(\tau)\right)d\tau}d\tau \quad (14)$$

The resulting value will be the average time during which player A uses strategy S_i^A and player B uses strategy S_j^B.

Average time dispersion can be determined by the variance:

$$D_\tau = \int_0^\infty (\tau - \tilde{\tau})^2 f_{i \mapsto j}(\tau) d\tau =$$

$$= \int_0^\infty (\tau - \tilde{\tau})^2 \frac{f_i^A(\tau)\left(1 - F_j^B(\tau)\right) + f_j^B(\tau)\left(1 - F_i^A(\tau)\right)}{\int_0^\infty f_i^A(\tau)\left(1 - F_j^B(\tau)\right) d\tau} d\tau \quad (15)$$

Further solution of the game is considered to have two possible approaches.

Approach 1. Solving the game with full wins.

In this case it is necessary to use an estimate of the total win with each pair of strategies (1) of players *A* and *B*, which can be determined by (13), as a win. Thus, it is necessary to apply known game solving methods [1, 2], including the minimax principle to determine the upper and lower average cost of the game and the solution of the game with pure and mixed strategies.

This approach enables forecast of the possible win of each competitor with all the resources set by the strategies, but this solution will not give a complete picture of win chances over time, which may not always be convenient in practice, but this approach seems to be quite acceptable for a relatively quick assessment of the situation.

Approach 2. Game solution with minimal resources.

As noted above, game problem statement (1) gives an estimate of win chances over time. This allows us to calculate both the minimum time for the player *A*'s to use a strategy to get a non-zero win and the time period during which the strategy should be applied in order to get the maximum win c_{ij}.

Game theory problem statement proposed in the article enables finding the dependence of the win on time when applying various strategies, which in practical cases can be useful and provide more information about the system behavior, actions of the competitors, etc. Further development of the proposed approach requires analytical methods for solving the given problem, and in particular, of solving the problem with minimal resources.

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哈萨克斯坦共和国风能设备发展的背景和前景
BACKGROUND AND PROSPECTS OF DEVELOPMENT OF WIND ENERGY DEVICES IN THE REPUBLIC OF KAZAKHSTAN

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注解。在现阶段，非传统能源的效率将会提高。风电设备的发展是最重要的方向。有必要开发一种机制，用于将大气中的空气能量转换成装置中的高动能。确定能源装置的主要技术经济指标。证实引入有前景的风能设备的可能性。进行分析建模。对现有风力发电装置的效率进行了分析。介绍了年内特定风能产量减少的原因。分析了哈萨克斯坦共和国运行的风力发电站的结构和主要指标。考虑将大气中空气的低电势和低动能转换成有希望的装置的空气流的定向高动能的机制。给出了比功率的计算结果和通过扩散器出口的二次动能传递。通过在可变截面的通道中强制空气强化，存在功率增加的储备。这将加速燃料能源向可再生能源的转变。

关键词：风，动力学，空气动力学，扩散器，涡轮，能量，功率，效率。

Annotation. *At the present stage, the efficiency of non-traditional energy sources will increase. The development of wind power devices is the most important direction. It is necessary to develop a mechanism for converting the energy of air in the atmosphere into high-kinetic energy in the device. To determine the main technical and economic indicators of the energy device. To substantiate the possibility of the introduction of the practice of promising wind energy devices. To carry out analytical modeling. The analysis of efficiency of existing wind power devices is made. The reasons for the reduction of specific wind energy production during the year are presented. The structure and main indicators of the operating*

wind power station in the Republic of Kazakhstan are analyzed. The mechanism of conversion of low-potential and low-kinetic energy of air in the atmosphere into directed high-kinetic energy of the air flow of a promising device is considered. The results of calculations of specific power and second transfer of kinetic energy through the outlet of diffusers are presented. There are reserves of power increase, by forced air intensification in channels of variable cross-section. This will accelerate the transition of fuel energy to renewable energy.

Keywords: *wind, kinetics, aerodynamics, diffuser, turbine, energy, power, efficiency.*

With the rising prices of fossil fuels and the constraints of society aimed at protecting the environment, the efficiency of non-traditional energy sources will increase. And their creation is the most important direction of energy saving.

One of the main non – traditional energy source is wind. The known methods of converting the kinetic energy of the wind and the device for its implementation is that the air flow is captured by the blades, the wind wheel transmitting the torque through the transmission system to the shaft of the wind power plant producing electricity. Wind turbines are made up of these wind power devices, and wind power stations are equipped with them. Thus, Kazakhstan, like all other countries, is developing a power plant Park based on renewable energy sources. This is the imperative of the time and the main directions of energy saving policy. Thus, the first wind power station (WPP) in Kazakhstan was launched in Ermentau.

The total area of the WPP is 60 ha. 22 turbines of the company "Furlunder wind Technology" are installed in the wind farm, their capacity is 2.5 MW. At the same time, transformers with a capacity of 63,000 watts have been installed. At the same time, the construction site of The Ermentau auxiliary station stretched 4-kilometer 10-kW-Naya, from the system KEGOK 8-kilometer 220 kW-Naya distribution line. In the future, it is considered to increase its capacity to 300 MW. The total capacity of the first wind farm in Kazakhstan is 45mw.

Taking into account the fact that in the Republic the average power produced by one installation does not exceed 5 kW and the planned unit cost of acquisition at the level of 3000 dollars per 1 KW of installation power and the structure of the wind farm the above can be assumed:

- area occupied by one turbine 27300 m2;
- the number located in one turbine section of wind power devices 455 units;
- the area occupied by one wind power device 60 m2;
- the total number of wind power devices in the wind farm, located on our is 1000 units.

Then the estimated cost of only the energy part is determined as 45 thousand kW x 3000doll=135•106 dollars.

It follows that the cost of wind energy will be high. Thus, TV news "Khabar "from June 13, 2014 announced that according to the Ministry of" environment And natural resources": the cost of wind energy -22.64 Tg /kWh ; hydropower-16.71 Tg/ kWh in the current conditions it should be even higher.

The high cost of wind energy may be due to the fact that theoretically the efficiency factor (KPI) of air flow energy can be equal to 59.3% in practice, according to published data, the maximum KPI of wind energy in a real wind turbine is approximately 50%, however, this figure is achieved not at all speeds, but only at the optimal speed provided by the project. In addition, part of the energy of the air flow is lost when converting mechanical energy into electrical energy, which is carried out with an efficiency of usually 75...95%. Considering all these factors, the specific electric power given out by the real power unit, apparently makes 30 ... 40% of power of an air stream provided that this unit works steadily in the range of the speeds provided by the project. Given these factors, the specific production of electric energy during the year, apparently is 15...30% of wind energy or even less, depending on the location and parameters of the wind turbine, from the uneven distribution of wind energy resource in the main directions of wind regions of Kazakhstan and especially limited in geographically climatic zones with moderate wind energy.

Thus, increasing the degree of use of kinetic wind energy by the wind power device will reduce the deficit and increase the cost of energy to a competitive limit.

However, the existing methods of using the kinetic energy of the wind and the device of its implementation have exhausted their potentials.

Further development of the method. Therefore, the promising directions are the conversion of low-potential and low-kinetic energy of air in the atmosphere into high kinetic energy of the air flow, which is captured by the blades of the wind wheel of the wind power device.(2,3)

A method of using the kinetic energy of the wind (3) characterized in that the atmospheric air is a rigid tube current.The technical result from the use of the device is an increase in the head and an increase in the volume of air flow passed into the working chamber of the device, which leads to an increase in the power of the wind power plant.

The calculations show that depending on the change in the cross-sectional area of the inlet, at an equal air velocity, the air flow capacity increased from 0.508 to 50.78 kW t.e. in proportion to the cross-sectional area. If the degree increase at the inlet is taken as one, then in the critical section the increase was in the range of 574.7-581.2 times, and in the sections at the outlet of the diffuser 3356.1-3445.8 times (the theoretical maximum value).

The specific power in the cross sections along the rigid tube current referred to the area of the inlet increases with the removal of the section from the inlet and is in the range of 0.646-2108 kW/m2.At the same time, the second transfer of kinetic energy through the outlet holes of the diffusers varies from 2269.3 to 174739.2 kW (theoretical maximum value).The cost of wind energy can be reduced to 0.033 dollars or 13.3 Tg kW / h.

Summary

The studies confirm the presence of significant reserves in increasing the power of free-moving atmospheric air by forcing them to intensify in the channels of variable cross-section.The increase in the specific power of the air flow in the sections along the rigid current tube is proportional to the ratio of the areas of the inlet and outlet to their critical.

The low average annual wind speed in the climatic zones is not an obstacle limiting the use of atmospheric air flow in wind power plants. The installation, based on the proposed method, can serve as an Autonomous renewable energy source for remote oil and gas fields.

The introduction of the proposed method of using the kinetic energy of the wind and the device of its implementations to accelerate the transition of fuel energy to renewable wind, less costly and unlimited in time and reserve.

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有组织裂缝板裂缝抗力试验研究
EXPERIMENTAL RESEARCH OF CRACK RESISTANCE OF SLABS WITH ORGANIZED CRACKS

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注解。 该研究的结果可以评估预组织裂缝对空心楼板裂缝性质的影响程度，并具有短期载荷。 这些板坯是在没有预应力的情况下制造的 – 根据通常的技术，第二个 – 在制造过程中预先建立的裂缝。 对空心楼板P66.10-8A500SP的全尺寸结构进行了物理试验。 对理论破坏载荷进行了测试。 对传统制造的空心板P66.10-8A500SP的裂纹性质和预先设置的裂缝进行了对比分析。

关键词：空心板；预先组织的裂缝；抗裂性

Annotation. *The results of the study, which allow to assess the degree of influence of pre-organized cracks on the nature of cracking of hollow-core floor slabs, with a short-term load are presented. The slabs are made without prestressing - one according to the usual technology, the second one – with the pre-established cracks in the manufacturing process. A physical experiment was performed on full-scale structures of hollow-core floor slabs P66.10-8A500SP. Tests conducted to theoretical breaking load. A comparative analysis of the nature of the cracking of hollow-core slabs P66.10-8A500SP of conventional manufacturing and with pre-arranged cracks is presented.*

Keywords: *hollow-core slab; pre-organized cracks; crack resistance*

In modern world of innovation and fast construction, reinforced concrete hollow-core floor slabs are very popular, and in many cases, they become the preferred alternative to more traditional building materials. The advantages of this design are obvious: a relatively small weight, which provides savings on the transportation of material, in addition, such panels do not weigh down the building; profitability during production; good thermal insulation due to voids, which allows you to save money on space heating.

One of the main drawbacks of hollow-core slabs with a length of more than six meters is the earlier crack formation in the stretched zone. At designing hollow-core slabs (without prestressing the reinforcement), the calculation for the second group of limiting states, namely, the calculation of the structure deformation, which is affected by stiffness, is decisive for ensuring the safety and reliability of their operation.

In accordance with the applicable standards for calculating structures according to the method of limiting states in the operation stage, the presence of cracks in the bent structure of the second and third categories of crack resistance is allowed; only the width of their opening is limited.

In a number of papers [1-5], the dynamic nature of the formation of the first stochastic crack is substantiated, which greatly affects the stiffness of reinforced concrete bent elements. To eliminate or significantly reduce the dynamics of the formation of a stochastic crack, Professor V.M. Mitasov proposed to mitigate this process by organizing normal cracks during the manufacture of reinforced concrete structures. In the development of this direction, physical experiments were carried out with concrete and reinforced concrete beams and non-beam slabs with pre-arranged cracks [6-8].

The purpose of this study is to explore the effect of pre-organized cracks on the crack resistance of hollow-core slabs under the short-term load action.

The main task is to identify the features of the cracking process, to estimate the width of the crack opening in the aforementioned hollow-core slabs at different stages of the load application.

In accordance with the goal and objective of the research, 2 reinforced concrete hollow-core slabs were made and tested: one - of conventional fabrication and 5 plates were additionally placed in the other (simulating cracks), in the form of an aluminum plate 0.25 mm thick (Fig. 1.) To avoid corrosion of the reinforcement, the notches were larger than the diameter of the reinforcement and did not touch it. Both slabs were tested using identical technology. The initial data on the experiment program are given in Table 1, as a result of tests a comparative material was obtained on the slab cracking with different initial states.

Fig.1. *Aluminum plates*

All samples are made of fine concrete class B25. All plates were reinforced with five separate working rods Ø14, reinforcement class A500CП without prestressing. The reinforcement ratio is μ = 1.9%.

On the base sections, in l / 4 plate lengths, the reinforcement is set constructively, ⍰4 Bp500 with a pitch of 100mm integrating into frames (4 pieces on each side of the plate), we do not install transverse reinforcement in the middle part of the span. In the compressed zone we place a grid with cells of 200x250 mm made of wire Ø4Bp500, which serves to evenly distribute the effort over the entire area of the plate and during installation it is a working longitudinal reinforcement. The reinforcement scheme is shown in fig. 2

Pre-arranged cracks were made using aluminum plates 0.25 mm thick and 70 mm high. The height was less than 0.3h of the cross section, as studies have shown [9] that, at high altitude, favorable conditions are created for changing the direction of crack development from transverse to longitudinal, which can lead to punctures of a part of concrete slab bounded by cracks reinforced concrete element or lead to destruction.

The scheme of hinged-supported two-span beams loaded with a uniformly distributed load in the range of 0 ÷ 12.65 kN / m^2 was adopted as the calculation scheme for testing the plates. The plates were loaded with piece material (crosspieces 2PB13-1 with a mass of 0.5 kN) in steps of 1.27 kN/m^2. At each stage of loading, they were kept for 15 minutes, at this time the readings of the devices were recorded and the width of the crack opening was measured.

The scheme of testing and placement of mechanical devices on reinforced concrete hollow-core slabs is shown in fig. 3. To register the deflections of the beams, Aistov's defibomers were used, with a division value of 0.01 mm. The sediments of the supports and displacements were measured with the hour-type indicators of ICh with a division value of 0.01 mm. The width of crack opening was measured using a BCH-2 microscope.

Table 1. - Basic data

Code number of plates	Diagram of organized cracks	Longitudinal working armature, mm	Prism strength of concrete, MPa
		d_s / μ	R_{bn}
П66.10-8А500СП		5Ø14 1,9%	24,9
П66.10-8А500СП-Т5		5Ø14 1,9%	24,6

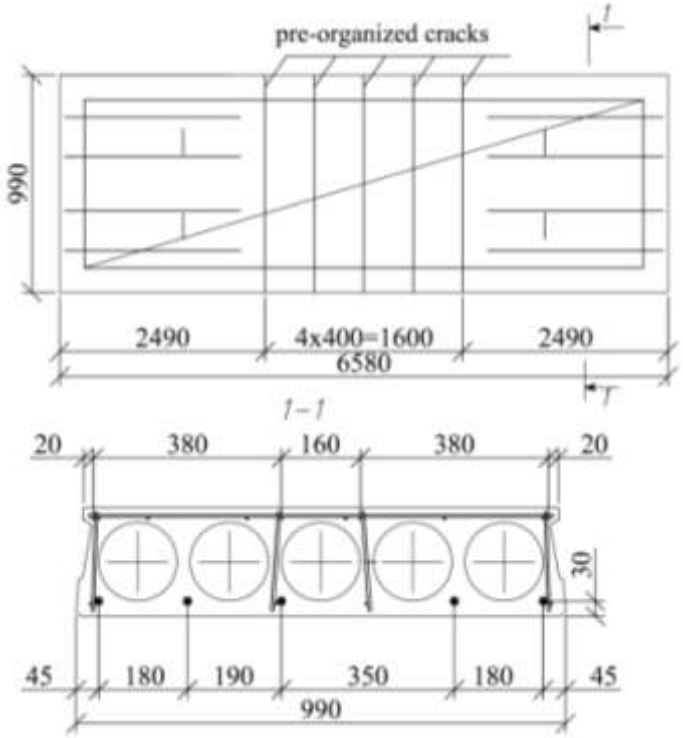

Fig.2. *The scheme of reinforcement of the hollow-core slab and the location of pre-organized cracks*

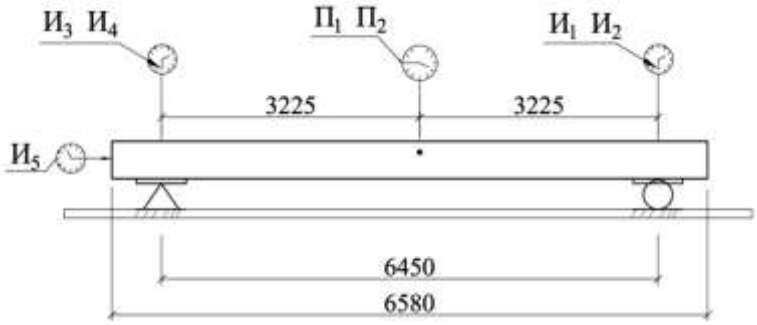

Fig.3. *General view of the installation for testing slabs*

Test results of hollow core slabs

The first visible cracks appeared at the 2nd loading stage (Fig. 4) in the zone of maximum moments. In plate P66.10-8A500SP of normal production, there were 7 of them, the height of the cracks was within h_{crc} = (0.35-0.83) h of the plate, with the maximum value h_{crc} = 165mm (0.83h of the plate) fixed in the middle span. The crack pitch was on average l_{crc} = 390mm, with the minimum distance between the cracks l_{crc} = 215mm, and the maximum l_{crc} = 505mm. In plate P66.10-8A500SP-T5 with pre-organized cracks, the number of cracks is twice as large, but the height of the cracks is within h_{crc} = (0.25-0.65) h of the plate, while the height increase of the organized cracks was not observed. The crack pitch was on average l_{crc} = 215mm, with the minimum distance between the cracks l_{crc} = 130mm, and the maximum lcrc = 432mm. The width of the crack opening did not exceed a_{crc} = 0.025 mm in both plates.

The further increase in load up to the 4th stage (F = 775kgs / m^2) of loading was accompanied by the rapid development of cracks in height and width, and the appearance of new cracks in the slab P66.10-8A500SP (Fig. 5a). The height of the cracks averaged h_{crc} = 0.7 h of the plate, with the maximum value of h_{crc} = 185 mm (0.83 h of the plate) recorded in the middle of the span. The crack pitch was on average l_{crc} = 270mm, with the minimum distance between the cracks l_{crc} = 140mm, and the maximum l_{crc} = 425mm. The maximum opening width is fixed in the middle of the span, a_{crc} = 0.15mm.

In the plate P66.10-8A500SP-T5 with pre-organized cracks, the number of cracks was 21 pieces, the height of the cracks did not exceed h_{crc} = 130 mm 0.65 h of the plate, while the growth of the width of crack opening was not observed (Fig. 5b). The crack pitch was on average l_{crc} = 175mm, with the minimum distance between the cracks l_{crc} = 80mm and the maximum l_{crc} = 385mm.

Further, as the load increases, the intensity of the development of cracks along the height slows down and almost ends when the loads are approximately 0.6 ... 0.8 of the breaking P66.10-8A500SP. The maximum height of normal cracks is (0.6 ... 0.93) h plates. The width of the crack opening in the middle of the span reaches 0.7 mm.

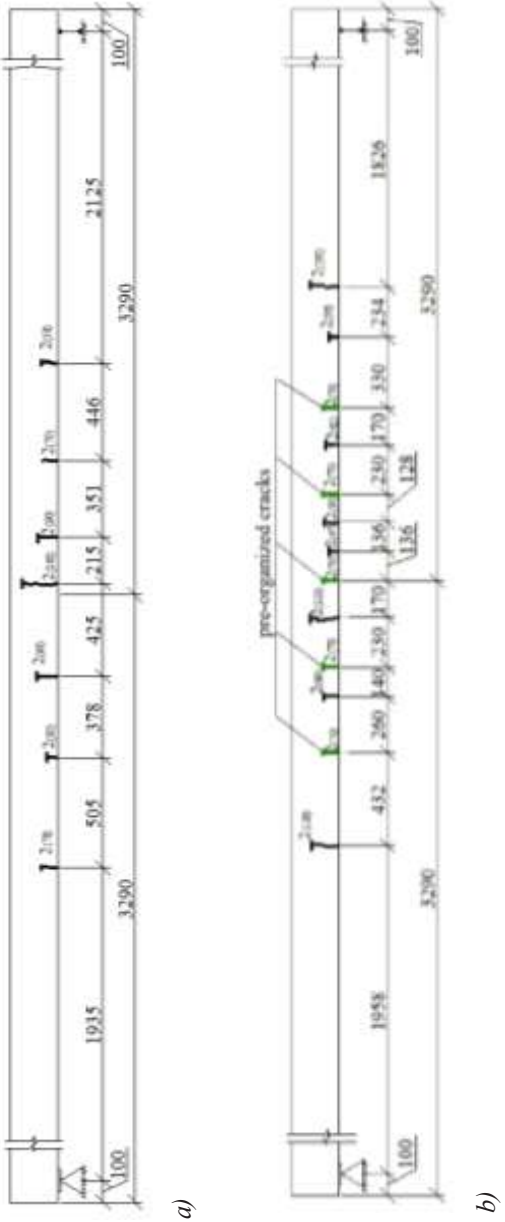

Fig.4. *Scheme of cracking in the second stage of loading*
a) In the plate P66.10-8A500SP; b) in the plate P66.10-8A500SP-T5 with organized cracks

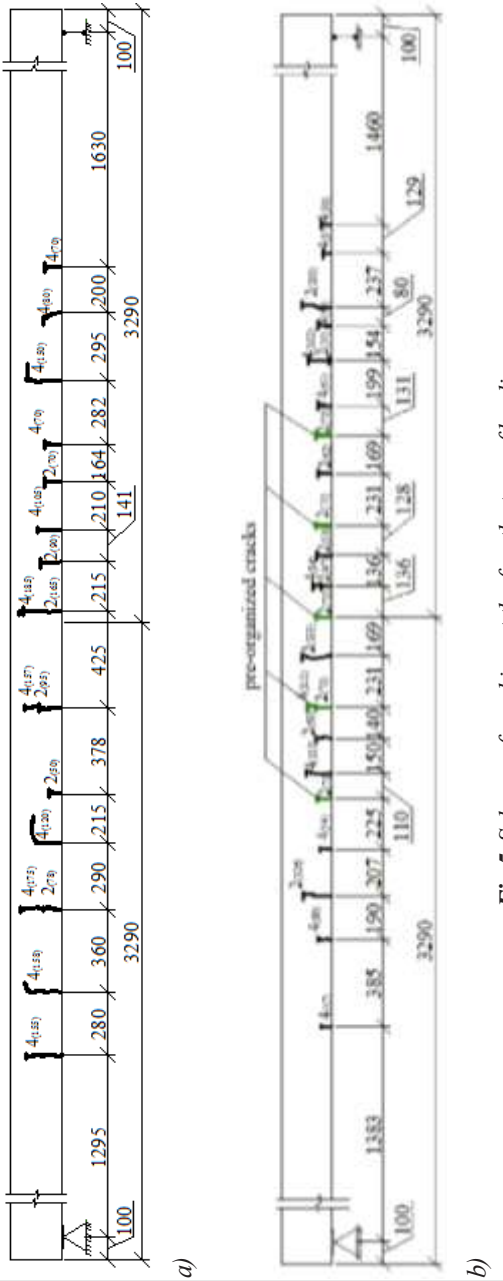

Fig.5. *Scheme of cracking at the fourth stage of loading*
a) in the plate P66.10-8A500SP; b) in the plate P66.10-8A500SP-T5 with organized cracks

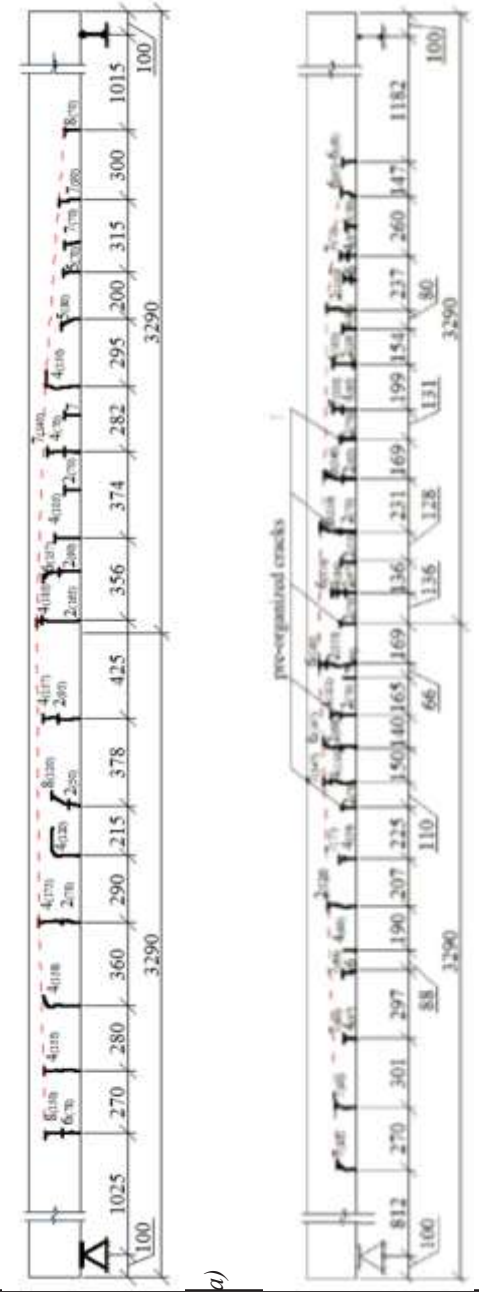

Fig. 7. *Scheme of crack formation at the eighth loading stage*

The number of cracks in the plate P66.10-8A500SP-T5 with pre-organized cracks increased, the height of the cracks did not exceed h_{crc} = 165 mm (0.83) h of the plate, and the crack opening width does not exceed 0.2 mm (Fig. 5b). Organized cracks have a minor opening on average a_{crc}, m = 0.05 ... 0.1 mm. The crack pitch was on average l_{crc} = 175 mm, with the minimum distance between the cracks l_{crc} = 66 mm, and the maximum l_{crc} = 300 mm. Schemes of the location of subsequent cracks are shown in Fig. 6, 7.

At the increasing in the load to (0.8-1) F_{ult} from the fracture in plate P66.10-8A500SP, the growth of cracks slows down and there is a noticeable opening up to 0.7 mm, and in the plate P66.10-8A500SP-T5, the growth of cracks stopped already under load (0.6-0.7) F_{ult}, while the number of new cracks grew, the width of crack opening did not exceed 0.1 mm.

Findings

1. At comparing the nature of the crack formation of the plates shown in Figures 4–7, it was revealed that pre-organized cracks qualitatively and quantitatively influence the nature of the development of cracks. In the plate P66.10-8A500SP-T5 with pre-organized cracks compared to the plate P66.10-8A500SP the number of cracks is three times higher, as a result, the pitch of cracks is less. There was no increase in height in advance of organized cracks, as well as the height of new cracks is smaller than that of a conventional slab.

2. The width of the cracks in the plates of conventional manufacturing reached 0.7 mm, but in the plates with pre-organized cracks did not exceed 0.1 mm, which is permissible according to normative-technical documents.

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根据隧道掘进工程精度准则优化调节器的分析施工

ANALYTICAL CONSTRUCTION OF OPTIMAL REGULATORS ACCORDING TO THE ACCURACY CRITERION FOR TUNNEL BORING COMPLEX

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抽象。根据隧道掘进机控制系统的切换功能，观察了解决最佳调节器精度分析建立问题的“物理”方法。从理论上讲，鲁棒控制问题的详尽解决方案是通过构建稳定且增益系数无限增加的系统的思想给出的。可持续性属性对于使用二次质量函数合成的最佳系统是有效的，该二次质量函数不明确地依赖于控制信号，并且对控制信号使用限制。这种方法允许您根据从节能到速度的精度标准简单地合成控制系统，并且调节误差在理论上严格为零，因此所有误差系数（位置，速度，加速度，加速度导数等）也等于在存在外部和内部干扰的情况下为零。

关键词：最佳调节器的分析建立，隧道掘进复合体，精度控制系统中的最优，切换功能，引导和跟踪。

Abstract. *The “physical” approach to the to solving the problem of analytical constraction of optimum regulators on accuracy based on switching function for the control systems of the tunnel-boring machine is observed. Theoretically, exhaustive solution of the problem of robust control is given by the idea of constructing systems that are stable with an unlimited increase of the gain coefficient. The sustainability properties are valid for optimal systems that were synthesized using quadratic quality functionals that do not explicitly depend on the control signal, and using a restriction on the control signal. This approach allows you to simply synthesize control systems according to accuracy criteria from energy saving to speed, and the regulation error is theoretically strictly zero, thus all error coefficients (of position, speed, acceleration, acceleration derivative, etc.) is also equal to zero in the presence of external and internal interferences.*

Keywords: *analytical constraction of optimum regulators, tunnel-boring complex, optimal in accuracy control systems, switching function, guidance and tracking.*

Optimal control is the control in which
achieved the highest level of control quality
Scientists SPbU, SGCT

Introduction

The ideological significance of the science of management and self-government processes, as A.A. Kolesnikov [1] is determined by the important circumstance that, according to scientists of St. Petersburg State University (SPbU), in his work “A sufficiently general control theory” (SGCT), "... any process in the Universe can be interpreted as a control process or self. For this reason, the conceptual and terminological apparatus of the control theory itself is generalizing, which makes it possible to use it to uniformly describe different processes: common natural, biological, technical ..." Add: and quality control. You can control anything or anyone, for example, even in such areas as the organization and control of entire states: the production of goods, economics, management, biology, military affairs, politics or the health of an individual, his successes.

In this article, we will narrow the range of tasks and confine ourselves to the consideration of questions of the theory of optimal control with reference to engineering and, in particular, to the executive body of the tunnel-boring complex (TBC).

Acceleration of construction building growth and development of underground space causes necessity to raise the accuracy of a tunnel boring and engineering communications layout in the conditions of dense urban areas. These demands to a large extent can be fulfilled by a cutting rotor TBC. It allows to safely bore tunnels on big distances under hills, sea gulfs and rivers, buildings. Hi-tech high-precision devices allow steering TBC to the target trajectory [2].

The principle of operation of a TBC is as follows: actuator twirls and destroys rock using its cutters. Destroyed rock gets through holes into the machine and then gets out of the bore-hole bottom using conveyors and trolleys. Advancement into the borehole occurs by the expense of pressure of hydraulic thrusters onto the rotor shield, and direction is defined by a combination of their operation. The axis of penetration is a curve in three-dimensional space. It can be represented as two two-dimensional trajectories, each of which will lie in the plane of its control channel, passing through the geometric center of the complex. Such trajectories are developed by surveyors in accordance with the point at which the tunnel complex should be at the end of its path, in accordance with the geological and geological characteristics of the area along which the tunnel will be laid, as well as the technical characteristics of the TPC itself.

Ways of control and organization of process in most cases assume manual control by the human taking into account readings of various devices and sensors.

Numerous works is offered to improve the accuracy of tunnel boring and to minimize the influence of human factor in control process. The majority of works is devoted to modernization of electronic components of positioning systems, steering and control. The small percent of works presents new principles and ways of construction and implementation of control systems. However, the methods presented in these works do not assume optimal accuracy control with zero-error in various rock hardness. The lack of scientifically based approaches of creation of high-precision control systems of movement of such TBC, allowing to provide required accuracy of a bored tunnel in rocks with various strength properties, does not allow to realize benefits of such machines. Besides that, complex schematic design hinders calculation and analysis of their properties; highly qualified specialists are required for their service.

The cardinal solution for the given problems is the theory of analytical construction of optimal regulators (ACOR) [3, 4] for tunnel boring complexes.

Formulation of the problem

A common feature of such quality criteria as an accuracy criterion is their independence in an explicit form from the control [4]:

$$J = \int_0^T F_0(\mathbf{X})dt\ ,\ F_0(\mathbf{X}) > 0\ , \tag{1}$$

where T is time and is not defined, and operation speed criterion is a special case of accuracy criterion at $F_0(\mathbf{X}) = 1$, or operation speed criterion is simultaneously acts as accuracy criterion [4]. It is possible to show [4] that the power saving criterion of "control signal" expense as part of the A.A. Krasovsky's criterion of generalized operation is a special case of common accuracy criterion (1) also.

It is known that accuracy criterion minimization is provided with ideal relay controls:

$$u(t) = -sign(\psi(\mathbf{X}))\ , \tag{2}$$

where $|u(t)| \le 1$, $\psi(\mathbf{X})$ - is required switching function, and $\psi(\mathbf{X}) = 0$ - is the switching surface that crosses the origin of co-ordinates $\psi(0) = 0$, $\dot{\mathbf{X}} = (\dot{x}_1, \dot{x}_2, ..., \dot{x}_n)^T$ is column vector of variable parameters (a phase vector or a state vector) of dynamic object, n — amount of parameters (an object order or amount of object's differential equations in the form of Cauchy).

For explanation simplicity, which does not influence the problem essence, we will discuss the object with one control action. The perturbed motion equation (A.M. Lyapunov's theory) is:

$$\dot{\mathbf{X}}(t) = \mathbf{A}(\mathbf{X}) + \mathbf{B}(\mathbf{X}) \cdot u(t)\ , \tag{3}$$

where $\dot{x}_i = dx_i / dt$, $i = 1, 2, ..., n$, $\mathbf{A}(\mathbf{X})$ - matrix-column with elements

$a_i(\mathbf{X}) \equiv a_i(x_1, x_2, \ldots, x_n)$, representing nonlinear single-valued functions; $\mathbf{B}(\mathbf{X}) = (b_1, b_2, \ldots, b_m)$, $b_1 = 0, b_2 = 0, \ldots, b_{m-1} = 0, b_m \neq 0$, m - amount of operating parameters (controls).

The standard solution assumes substitution of relay control (2) in R. Bellman's equation (method of dynamic programming) or in a Hamiltonian (the L.S. Pontryagin's principle of maximum), that leads to necessity to solve the nonlinear Bellman's equation in a partial derivatives or a nonlinear two-point boundary value problem for a given figure of merit. As such solutions present known mathematical difficulties and are not always clear to engineers, we will not seek for optimal control u, but seek for function ψ in control (2).

Methods and algorithm of the solution

The problem solution is based on usage of the basic functional equation related to required function of switching. We will find penetration rate [4] taking into account the equations of object (3) or, better to say, we will find the derivative:

$$\dot{\psi}(\mathbf{X}) = \frac{d\psi}{dt} = \frac{\partial\psi}{\partial x_1} \cdot \dot{x}_1 + \frac{\partial\psi}{\partial x_2} \cdot \dot{x}_2 + \ldots + \frac{\partial\psi}{\partial x_n} \cdot \dot{x}_n, \text{ or}$$

$$\dot{\psi}(\mathbf{X}) = \mathbf{G}\dot{\mathbf{X}} = \mathbf{GA} + \mathbf{GB}u.$$

Here $\mathbf{G} = (g_1, g_2, \ldots, g_n)$, $g_i = \partial\psi / \partial x_i \neq 0$ - is required unknown functions, and control u is defined by the formula (2). For abbreviation reasons let $f(\mathbf{X}) = \mathbf{GA}$ and $\varphi(\mathbf{X}) = \mathbf{GB}$:

$$\dot{\psi}(\mathbf{X}) = \mathbf{G}\dot{\mathbf{X}} = f(\mathbf{X}) + \varphi(\mathbf{X}) \cdot u. \quad (4)$$

The functional differential equation (4) is correct in entire phase space as it is the generalized equation of object (3), i.e. the equation (4) is equivalent to the equations (3) and sets relation between the equations (3), the required switching function, optimal control (2) and functions $f(\mathbf{X})$ and $\varphi(\mathbf{X})$ which are yet to determine. Note that the relation (4) was used in the works by many authors. For example: A.A. Krasovsky in analytical construction of regulators (ACR) by criterion of generalized operation to determine a condition of zero-overshoot response; J.Z. Tsypkin, E.A. Barbashin and V.I. Utkin in researches of zero-overshoot responses; A.A. Kolesnikov in synergetic control theory. A.A. Kolesnikov named the relation (4) as aggregated model or the generalized functional equation, and he proved the given name. The reason that the equation (4) is equivalent to the equations (3) is also possible to find in works of J.N. Pavlovsky and J.P. Petrov. From the physics of equivalent object (4) follows that control (2) will inevitably transfer the object (4) to the switching surface $\psi(\mathbf{X}) = 0$, and it means that the first interval of control (2) has ended.

Using the works of E.A. Barbashin and object (4) it is possible to show [4] that for the further control of object: to change the sign of penetration speed $\dot{\psi}(\mathbf{X})$ on the second interval, i.e. to hold the object on the switching surface (along it) $\psi(\mathbf{X}) = 0$, it is necessary to meet the condition of controllability (realizability) of relay system in the form of non-strict equality:

$$| f(\mathbf{X}) | \leq \varphi(\mathbf{X}), \tag{5}$$

which is easy to implement in the form of subordinated control, similar to the case of co-ordinates restriction. It is possible to show [4] that the condition (5) is simultaneously stands for the system motion stability condition on the second interval, and the condition for the zero-overshoot response. The more the condition (5) is closer to strict equality, then the faster control process will be on the second interval. In case of strict equality the speed of operation will be at it highest optimum on the second interval. However, another problem arises: mathematically using formula (2) the control on the second interval is impossible to determine, as $\psi(\mathbf{X}) = 0$ on this interval.

Using the works of V.I. Utkin it is possible to show that due to optimal control (2) on the second interval there is an equivalent (special) control. This follows from the equation (5):

$$u_2 = -f(\mathbf{X})/\varphi(\mathbf{X})$$

and it cannot be determined by modern mathematical methods. In real systems the characteristic of the relay are not ideal, as a result control changes its sign a bit later, than the sign of $\psi(\mathbf{X})$, therefore equivalent control on the second interval can be mathematically presented as follows:

$$u_2 = -(| f(\mathbf{X}) | / \varphi(\mathbf{X})) \cdot sign(f(\mathbf{X})), \tag{6}$$

at that $|u_2| \leq 1$, and function $f(\mathbf{X})$ plays a role of switching function of $\psi_2(\mathbf{X}) = f(\mathbf{X})$ at system moves on the second interval along the variety $\psi_1(\mathbf{X}) = \psi(\mathbf{X}) = 0$.

Let's solve last equation concerning the lowest co-ordinate x_1:

$$x_1 = \psi^*(x_2, x_3, \ldots, x_n),$$

also we will substitute last relationship in the equation (6). Using the works of A.A. Kolesnikov, we come to a conclusion about phase space compression in which there will be no x_1 co-ordinate anymore. Therefore, condition (5) can be referred as the condition for a phase space compression. Applying the condition (5) consecutive $(n-1)$ times, the phase space gradually compresses to one [4], at that $| u_n | < | u_{n-1} | < \ldots < | u_2 | < | u | = 1$, moreover, control on each of the n intervals:

$$u_i = -\frac{|f_{i-1}(x_i,\dots x_n)|}{\varphi_{i-1}(x_i,\dots x_n)} \cdot sign[\psi_i(x_i,\dots x_n)], \quad (7)$$

$i = 2,3,\dots,n$, and last switching function is $\psi_n(\mathbf{X}) = x_n$.

The functions $g_i(\mathbf{X}) \neq 0$ in the equation (4) and the condition (6) can be of any kind, in a specific case (for simplification of integration of function $\dot{\psi}(\mathbf{X})$) let's choose (for example, randomly) $g_i = const \neq 0$ (that represents the solution of a control problem with optimal accuracy by means of linear feedback).

In that specific case, at $g_i = const \neq 0$ (to simplify integration, we will look for a solution in the class of linear feedbacks) from the equation (4) required solution of a problem in deviations:

$$\psi(\mathbf{X}) = g_1 \cdot x_1 + g_2 \cdot x_2 + \dots + g_n \cdot x_n, \quad (8)$$

where $u = -sign(\psi(\mathbf{X}))$. It is necessary to substitute real co-ordinates $x_i \Rightarrow x_i - x_{itask}$ or $x_i \Rightarrow x_i - x_{idist}$ instead of deviations x_i. Here x_{itask} - is the given task (control task) on corresponding co-ordinate, x_{idist} - is disturbing influences or interferences (which can be seen as control tasks too but is unknown, they can be both harmful and useful for the sake of which the system is being designed, for example, the load moment which interferes with desired control task).

Synthesis of optimal accuracy regulator for tunnel boring complex

The equations of disturbed motion dynamics (3) of TBC's for one control channel, for example EPB S-441 made by Herrenknecht AG [2, 5]:

$$\dot{x}_1 = x_2\,,\ \dot{x}_2 = k_1 \cdot \sin(x_3)\,,\ \dot{x}_3 = x_4\,,\ \dot{x}_4 = k_2 \cdot u \quad (9)$$

at k_1 = 18.8; k_2 = 9.4.

The switching function of the first interval is:

$$\dot{\psi} = \dot{x}_1 + a \cdot \dot{x}_2 + b \cdot \dot{x}_3 + c \cdot \dot{x}_4 = x_2 + a \cdot k_1 \cdot \sin(x_3) + b \cdot x_4 + c \cdot k_2 \cdot u$$

Function of switching of the first interval:

$$\psi = x_1 + a \cdot x_2 + b \cdot x_3 + c \cdot x_4 \quad (10)$$

at constant values *a, b, c*.

The motion stability condition on the first interval while moving to the switching surface $\psi = 0$: $|x_2 + a \cdot k_1 \cdot \sin(x_3) + b \cdot x_4| \le c \cdot k_2$; $c > 0$ or

$$\frac{|x_2 + a \cdot k_1 \cdot \sin(x_3) + b \cdot x_4|}{c \cdot k_2} \le 1\ . \quad (11)$$

Let's find the motion stability condition while moving along the switching surface $\psi = 0$ (the stability condition in small). Substituting in equation $\psi = 0$ linearized equations of control object (8), replacing d / dt to p and dividing out on x_1, we will have the characteristic equation for system of the third order (since there was a phase space compression on one co-ordinate):

$$1 + a \cdot p + \frac{b}{k_1} \cdot p^2 + \frac{c}{k_1} \cdot p^3 = 0 .$$

Using, for example, Gurvits's stability criterion, we will have the stability condition of a motion along the switching surface $\psi = 0$: $a > 0$; $b > 0$; $c > 0$ and $a \cdot b > c$.

The switching function of the second interval:

$$\psi_2 = \frac{x_2 + a \cdot k_1 \cdot \sin(x_3) + b \cdot x_4}{c \cdot k_2} .$$

The functional equation of the second interval:

$$\dot{\psi}_2 = \frac{\dot{x}_2 + a \cdot k_1 \cdot \dot{x}_3 \cdot co\,s(x_3) + b \cdot \dot{x}_4}{c \cdot k_2} = \frac{k_1 \cdot \sin(x_3) + a \cdot k_1 \cdot x_4 \cdot co\,s(x_3) + b \cdot k_2 \cdot u}{c \cdot k_2}$$

The motion stability condition on the second interval while moving to the switching surface $\psi_2 = 0$: $| k_1 \cdot \sin(x_3) + a \cdot k_1 \cdot x_4 \cdot co\,s(x_3) | \le b \cdot k_2$ or

$$\frac{| k_1 \cdot \sin(x_3) + a \cdot k_1 \cdot x_4 \cdot co\,s(x_3) |}{b \cdot k_2} \le 1 \qquad (12)$$

For a stable motion along switching surfaces less than the third order, it is enough to have positive factors of the corresponding characteristic equations.

The switching function of the third interval:

$$\psi_3 = \frac{k_1 \cdot \sin(x_3) + a \cdot k_1 \cdot x_4 \cdot co\,s(x_3)}{b \cdot k_2}$$

The functional equation of the third interval:

$$\dot{\psi}_3 = \frac{k_1 \cdot \dot{x}_3 \cdot co\,s(x_3) + a \cdot k_1 \cdot \dot{x}_4 \cdot co\,s(x_3)}{c \cdot k_2} - \frac{a \cdot k_1 \cdot x_4 \cdot \dot{x}_3 \cdot \sin(x_3)}{c \cdot k_2} =$$

$$= \frac{k_1 \cdot x_4 \cdot co\,s(x_3) + a \cdot k_1 \cdot k_2 \cdot u \cdot co\,s(x_3)}{c \cdot k_2} - \frac{a \cdot k_1 \cdot x_4^2 \cdot \sin(x_3)}{c \cdot k_2} .$$

The motion condition stability on the third interval while moving to the switching surface $\psi_3 = 0$:

$$| k_1 \cdot x_4 \cdot co\,s(x_3) - a \cdot k_1 \cdot x_4^2 \cdot \sin(x_3) | \le a \cdot k_1 \cdot k_2 \cdot | co\,s(x_3) |$$ or

$$\frac{|x_4 - a \cdot x_4^2 \cdot tg(x_3)|}{a \cdot k_2} \le 1. \quad (13)$$

The switching function of the fourth interval: $\psi_4 = \frac{x_4 - a \cdot x_4^2 \cdot tg(x_3)}{a \cdot k_2}$.

From the switching surface equation of the third interval $\psi_3 = 0$ follows: $tg(x_3) = -a \cdot x_4$.

Substituting the last relation in the switching function of the fourth interval, we will have:

$$\psi_4 = \frac{x_4 \cdot (1 + a^2 \cdot x_4^2)}{a \cdot k_2}.$$

On the basis of formulas (11) – (13), entering the task on output co-ordinate x_i, the law of subordinated optimal accuracy control for the object (9):

$$u = sign(sign(sign(sign(x_{1task} - x_1 - \psi) - \psi_2) - \psi_3) - \psi_4) \quad (14)$$

The results of modeling of the subordinated control system (14) for control object (9) at boundary conditions (11) – (13) are shown on fig. 1.

From fig. 1 follows that ψ_3 and ψ_4 meat the boundary conditions, therefore the control (14) can be simplified:

$$u = sign(sign(x_{1task} - x_1 - \psi) - \psi_2). \quad (15)$$

The results of modeling of the subordinated control system (15) for control object (8) at boundary condition (10) are shown on fig. 1. The graphs (fig. 1) illustrate system stability and accuracy in task performance.

Conclusion

The offered method of analytical construction of optimum regulators gives the ability to develop control systems for tunnel boring complexes that are able to pass tunnels with maximum (optimal) accuracy, and the regulation error is theoretically strictly zero, thus all error coefficients is also equal to zero in the presence of external and internal interferences. In fact, the optimal accuracy control system is equivalent to a system with astatism of the n-th order: the regulator contains n serial connected integrators. Parameters of a control system of tunnel boring complexes are proved, such parameters provide high (optimal) accuracy of tunnel boring with various rock hardness. That has essential importance for mining while fulfilling strategic tasks.

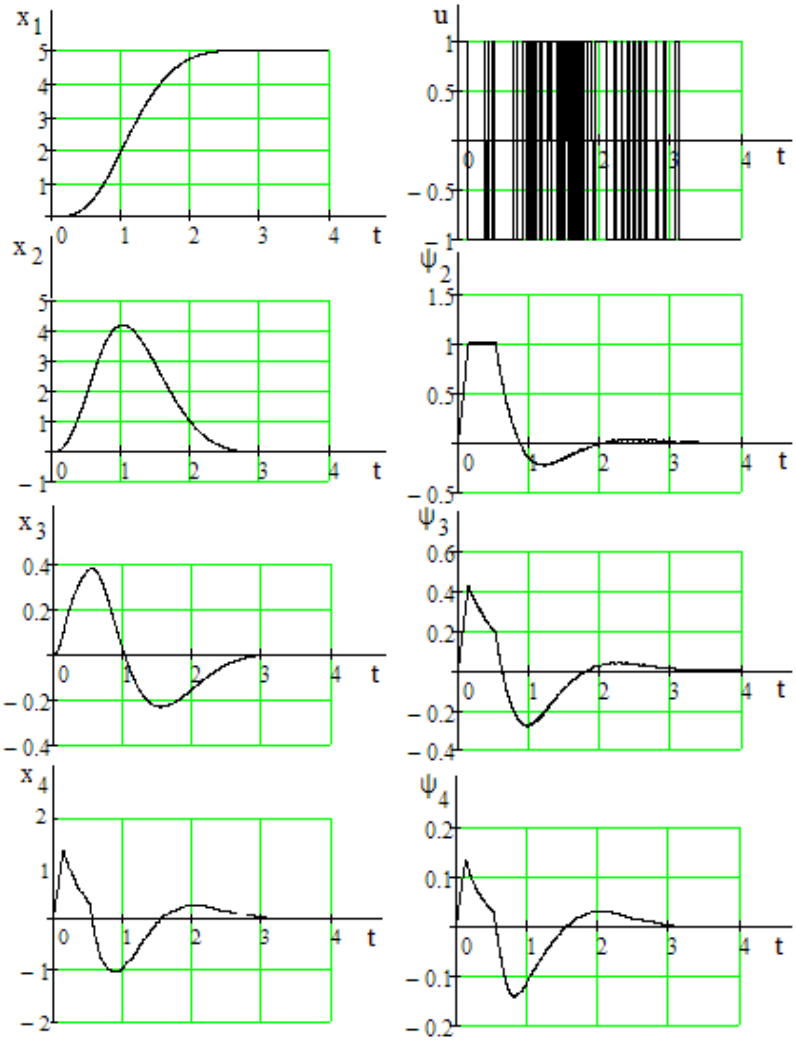

Fig. 1: *Results of modeling of control object (8) with the subordinated control (14) or (15) at a = 0.94, b = 6.4, c = 1.1*

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植物生物量臭氧化。 红外光谱研究木材中木质素的破坏

PLANT BIOMASS OZONATION. STUDY ON LIGNIN DESTRUCTION IN WOOD USING DIFFUSE REFLECTANCE INFRARED SPECTRA

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注解。 通过红外漫反射（DRIFT）光谱研究了臭氧对松木中木质素的降解作用。 用Lorentz组分进行DRIFT光谱的解卷积。 DRIFT光谱数据首先允许发现木质素破坏占主导地位的臭氧消耗范围。 数据与木质素含量测定一致。 还显示芳族羰基和羧基化合物的形成逐渐转化为生物质臭氧化的羰基和羧基脂族产物。

关键词：木材，木质素，臭氧化，红外光谱

Annotation. *Lignin degradation in pine wood under ozone impact was studied by means of infrared diffuse reflectance (DRIFT) spectra. Deconvolution of DRIFT spectra with Lorentz components was performed. DRIFT spectra data firstly allowed finding the ozone consumption range in which lignin destruction dominates. The data agree with the lignin content determination. It is also shown a formation of aromatic carbonyl and carboxyl compounds gradually transformed to carbonyl and carboxyl aliphatic products of biomass ozonation.*

Key words: *wood, lignin, ozonation, IR spectroscopy*

Lignocellulosic materials (LCM) mainly consist of cellulose, hemicellulose (HC), and lignin (LG). Cellulose is the most abundant biomaterial but its utilization is retarded LG. The removal of LG is a very important issue not only for the pulping industry but also for utilizing carbohydrates as a starting material to produce sugars and alcohols in an industrial scale to build up the renewable and sustainable systems [1, 2].

In the review [2], advantages and disadvantages of ozone delignification of LCM were analyzed. It was concluded that destruction of the LG using ozone at the pretreatment stage of sugars and bioethanol processing is a promising alternative delignification method. As an electrophilic agent, ozone reacts vigorously with aromatic LG structures, whereas cellulose and HC are relatively resistant to ozone.

It was shown that it is necessary a presence of water to conduct ozone delignification of a biomass efficiently; the role of water in the ozone treatment is discussed in [2-8]. The best ozonation efficiency was observed for aspen wood with 55 % moisture content (MC) [5]. For pine wood, 60-63 % MC was found to be the optimal one [6].

In optimal MC range, the specific ozone consumption is a governing factor for the LCM degree of delignification (DD) [3,4,7]. Determination of LG content in ozonated wood by common destructive method showed that 40-90% DD can be achieved under ozone impact [4, 5]. Ozone also reacts with LG ozonation products, such as formic, glyoxalic and oxalic acids [6].

In addition to destructive methods of biomass analysis, rapid nondestructive screening methods are of great importance. Infrared spectroscopy is one of them [3, 4, 6, 8-14]. Diffuse reflectance infrared technique (DRIFT) is nondestructive easy-handling method [15-18].

The aim of this research is to establish the optimal ozone consumption range in which lignin destruction dominates. To solve this task for the first time a dynamics of LG transformation in the pine wood under ozone impact is studied by means of DRIFT spectra.

Experimental

The sawdust of pine wood (*Pinus silvestris*) with a particle size of 0.315 – 0.63 mm and MC of 60-65% was used for the research. Wood samples preparation, ozone treatment procedure and specific ozone consumption (OC, mmol/g) calculation are described in [6]. Several experiments on variable ozonation time were carried out. After ozonation wood samples were washed to remove water-soluble ozonation products. Then the air-dried samples were analyzed by DRIFT spectra.

DRIFT spectra were recorded in Equinox 55/S (Bruker) spectrometer with a resolution of 4 cm^{-1} using diffuse reflection additional attachment Selector (Specac). Powder fraction of KBr (dried at 400°C) was used as a reference sample. Experimental reflection spectrum was transformed to Kubelka - Munk units; baseline correction was carried out by OPUS 6.0 (Bruker) software. The curve fitting (Lorentzian form) and peak area integration were performed using OPUS 6.0 (Bruker) software. The precise position and number of peak-components were estimated from the second derivative of the spectra.

Results and discussion

Specific ozone consumption curves of four ozonation experiments are presented in Fig.1. Markers show the OC values corresponding to the end of ozone treatment. Essentially, Fig. 1 represents the kinetic profile of ozone uptake. It can be seen that the ozone consumption rate (defined by a slope of the ozone consumption curve) in the course of ozonation decreases.This is due to a change in the composition of the LCM reactive groups available for reagent, and their ability to interact with ozone

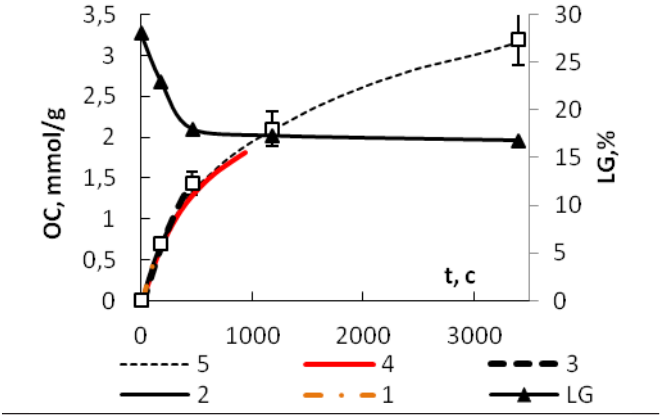

Fig.1. *Specific ozone consumption and lignin content [4] depending on ozonation time*

IR spectra of the original wood and ozonated samples are given in Figure 2. Spectra are normalized to the most intensive band of the spectrum (1128 cm^{-1}).

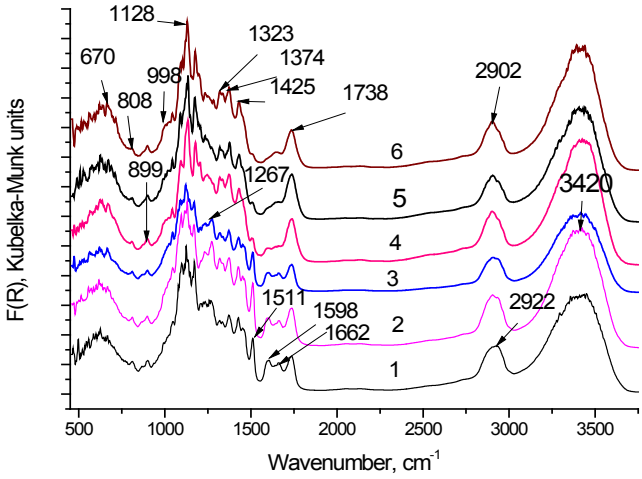

Fig.2. *DRIFT spectra of pine wood.*
OC (mmol/g): 0 (1), 0.3 (2), 0.7 (3), 1.5 (4), 2.0 (5),3.0 (6).

The spectra are presented in Kubelka–Munk (F(R)) units (analogue of absorbance unit in diffuse reflectance spectroscopy). The positions of the major bands of Fig. 2 presented in Table 1, coincides with the literature data on IR spectra of wood.

Table 1. *Assignment of the principle IR bands of wood.*

Band position	Assignment	Ref.
3420	O--H stretching vibration (bonded)	[16,17]
3000-2840	C-H stretching vibration in methine, methyl, methoxyl groups	[9,11,16,17]
1738	C=O stretching vibration (unconjugated) of ethers in lignin and hemicelluloses	[14,16, 17]
1635-1645	H---O--H deformation vibration of adsorbed water	[9-11]
1662	C=O stretching vibration conjugated to aromatics	[9,11,12]
1605-1590	Aromatic skeletal + C=O stretching	[9,16]
1511	Aromatic skeletal	[9,16,17]
1465	C--H deformation (asymmetric) and benzene vibration in lignin	[16,17]
1425	C--H deformation (asymmetric)	[10,17,18]
1373	C--H deformation (symmetric)	[10,16,17]
1325	C—H_2 wagging vibration in cellulose, Aromatic skeletal of S rings	[16,17]
1267	G ring plus C=O	[9,10]
1242	C-C plus C-O plus C=O stretch; G condensed >	[16,17]
1170	C--O--C asymmetric stretch vibration in cellulose and hemicellulose	[17]
1128	C –O stretching in secondary alcohols and esters + C-O-C ass. stretching	[11,17]
1080	C-O stretching in cellulose and hemicellulose	[17]
1041	C-O stretching	[16]
998	C-O stretching in cellulose and hemicellulose	[17]
899	C^1 group frequency in cellulose and hemicellulose	[9-11,16]
808	Due to glucomannan	[9,12]
670	COH out of plane bending in cellulose	[11,17]

It is seen from Fig. 2 that ozonation causes noticeable changes in the spectral range of aromatic structures and carboxyl- groups. Deconvolution with Loretzian peak components in the range of 1400-1800 cm^{-1} is presented in Fig. 3. The bands at 1511 cm^{-1} and doublet 1590/1605 cm^{-1} are assigned to skeletal aromatic ring vibrations. Both 1511 cm^{-1} and the doublet decrease with OC increasing.

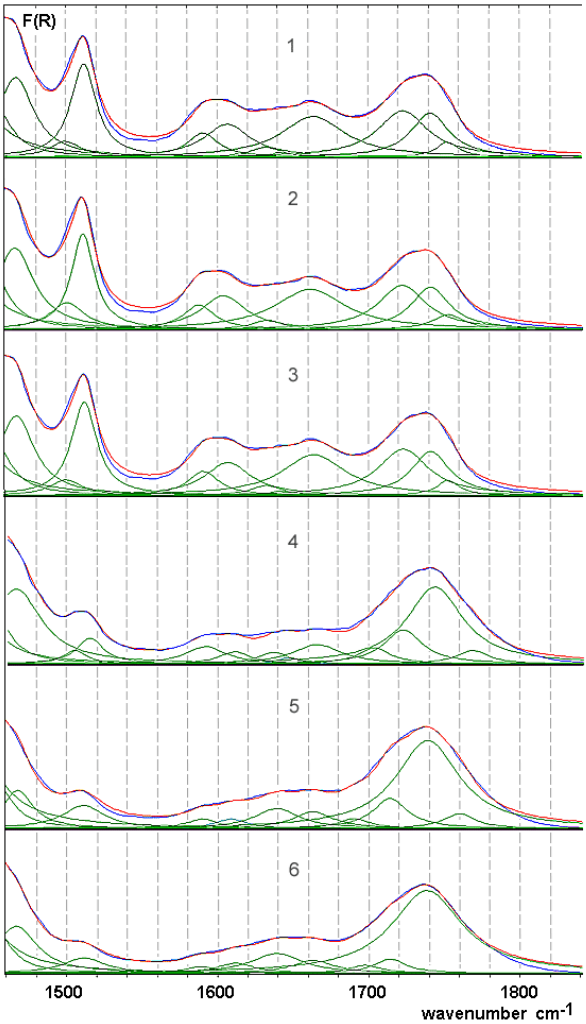

Fig.3. *Experimental IR spectra of wood (blue) and curve –fit data (red) with Lorentz components (green). OC, mmol/g: 1(0), 2 (0.3), 3(0.7), 4 (1.5), 5(2.0), 6 (3.0).*

The peak component at 1662 cm^{-1} is assigned to stretching vibrations of C=O, conjugated to aromatic ring [9, 11]. A number of authors believes that C=C vibrations are also observed at this wavenumber [19]. With OC increasing, the band intensity decreases markedly.

The deconvolution results show that the peaks at 1690-1700 cm $^{-11}$ (ν(C=O) in conjugated aldehydes and carboxylic groups with unsaturated or aromatic substituent [9,10,20]) appear in the spectra of ozonized wood (spectra #4,#5, #6). The band at 1630-1640 cm-1 of O-H deformation vibrations of adsorbed water is observed in all the spectra.

The destruction of the aromatics, mainly occurs for the OC ≤ 1.5 mmol/g; in the OC range of 1.5 - 3.0 mmol/g (spectra #4, #5, #6) increases the intensity of the bands at 1738-1740 cm-1 of unconjugated C=O groups, it is seen components at 1752 cm-1 and 1765 cm-1 that can be assigned to ν (C=O) in aliphatic esters with electro-negative substituents [20]. As can be seen from Fig. 2, in this OC interval the contour of C-H stretching vibrations (2850-3000 cm-1) changes; the band at 808 cm-1, attributed to glucomannan [9, 12] (Table 1) reduces. These data indicate that HC are also included in the transformation of the substrate at high OC. Evidences on cellulose transformation are not observed.

Stretching vibrations of hydrogen bonded OH groups are characterized by a maximum at 3420 cm^{-1}. As OC increasing, the position of the band does not change. The half-width of the band decreases from the 360 cm^{-1} to the 300 cm^{-1} (spectra #1 and #6 in Fig. 2). This fact shows a destruction of the origin hydrogen bonds network and a formation of new hydrogen bonds structure characterized by more uniform interaction. This effect indicates gradual degradation of wood matrix since it is a composite of cellulose, HC, and LG.

DRIFT spectra showed distinctly the OC range of the aromatic destruction dominating. At the same time, it was observed more minor process consisting in a formation of carbonyl- and carboxyl-containing aromatic structures. It should be noted that reactions of ozone with side substituents of aromatic ring and a formation of aromatic aldehydes and acids, in parallel to the aromatics destruction, were described in [21, 22] for model LG compounds, such as coniferyl alcohol and veratrol.

The analysis of the spectra correlates with the data on ozone absorption and lignin content in Fig.1. The main amount of LG is destroyed by absorbing the initial 1.5 mmol O_3/g with the LG ozonolysis products formation [4, 6]. This OC interval corresponds to linear sections of the OC and lignin content dependence on ozonation time obtained in [4] using destructive method of analysis. In the research, the ozone consumption range of the most efficient destruction of lignin in the wood is firstly established by DRIFT spectra. This result is of significance for ozone dose optimization in the biomass pretreatment by ozonation.

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