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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上合组织国家的科学研究：协同和一体化
国际会议

参与者的英文报告

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“Scientific research of the SCO countries: synergy and integration”

Part 2: Participants’ reports in English

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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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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,
member of the Chinese Academy of Sciences

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，
教授，经济科学博士，中国科学院院士，会议组委会主席“上合组织国家科学研究：协同与融合”

完善创新经济中服务机构实现经济可持续性的工具
PERFECTION OF TOOLS FOR ECONOMIC SUSTAINABILITY OF SERVICE ORGANIZATIONS IN AN INNOVATIVE ECONOMY

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抽象。本文通过强调创新强度的背景下的基本原理，阶段和指标，介绍了服务业组织的经济可持续性工具。

关键词：创新经济，经济可持续性工具，服务业，形成经济可持续性的过程，可持续发展的概念。

Abstract. *The article presents the tools of economic sustainability of service industry organizations by highlighting the basic principles, stages and indicators in the context of the intensity of innovation.*

Keywords: *innovative economy, tools for economic sustainability, the service sector, the process of forming economic sustainability, the concept of sustainable development.*

In modern conditions, when Russia has embarked on the path of developing an innovative economy based on a stream of innovations, on continuous technological improvement, there is a need to improve the tools for economic sustainability of service organizations.

The process of economic sustainability formation takes place by increasing the scientific and technical potential of service industry organizations and the intensity of innovation. The main conditions of this innovation process are:

- transformations allow the formation of promising markets based on the production of new goods and services;
- development acts as a tool for forecasting and planning, as well as formulate future needs;
- innovations allow expanding the limits of the functioning of service sector organizations, since innovative management is of a strategic nature.

By the economic sustainability of service enterprises in the context of innovation, we mean the ability of an enterprise to maintain a certain level of economic parameters, which will ensure its cost-effective functioning and stable development. It will also allow you to restore the original or take a new equilibrium state after the termination of the disturbances of the external and internal environments in the present and predicted future [1].

The tasks and the importance of developing and improving the toolbox of indicators of economic sustainability of service providers are an important component of the service sector. We formulate the principles of building the economic sustainability of service providers.

The first principle – reliability, its essence is in assessing economic sustainability based on only reliable sources.

The second principle – priority, its essence is in choosing the most important economic parameters.

The third principle – adequacy, its essence is in time efficiency in order to prevent a threat, and not to eliminate the consequences.

The fourth principle – security, its essence is in the fullness of resource support.

The fifth principle – reality, its essence is in the real reflection of sustainability through the coverage of all economic parameters of the enterprise.

The sixth principle – balance, its essence is in ranking by priority.

The seventh principle – sufficiency, its essence is to avoid the analysis procedure, not to use indicators that complement each other.

We will present the main stages of assessing the level of economic sustainability of service sector organizations (Figure 1).

The first stage - the goal of assessing the economic sustainability of the organization is formulated, its actual position in the market is clarified, and measures are being developed to maintain and preserve it. Next, an assessment of personnel management is highlighted, investments are attracted, partners are selected for joint projects, and an action program is drawn up to enter a new market.

The second stage – a system of indicators for assessing sustainability and regulation of the main types are formulated:

- managerial sustainability – establishing proportions in management, costing, marketing;
- marketing sustainability – obtaining information about demand, its elasticity, reducing risks, increasing capacities, increasing the rating;
- financial sustainability – ensuring solvency, efficient use of funds;
- investment sustainability – financing of expanded reproduction, own investments;
- industrial and technical sustainability – matching of the resources, their distribution;
- staff sustainability – staff stability, advanced training.

The third stage – gathering of information on the activities of the organization.

The fourth stage - developing a system of particular indicators and bringing them to a single measurement system, offering a method and methodology for calculating the integral indicator of the level of economic stability:

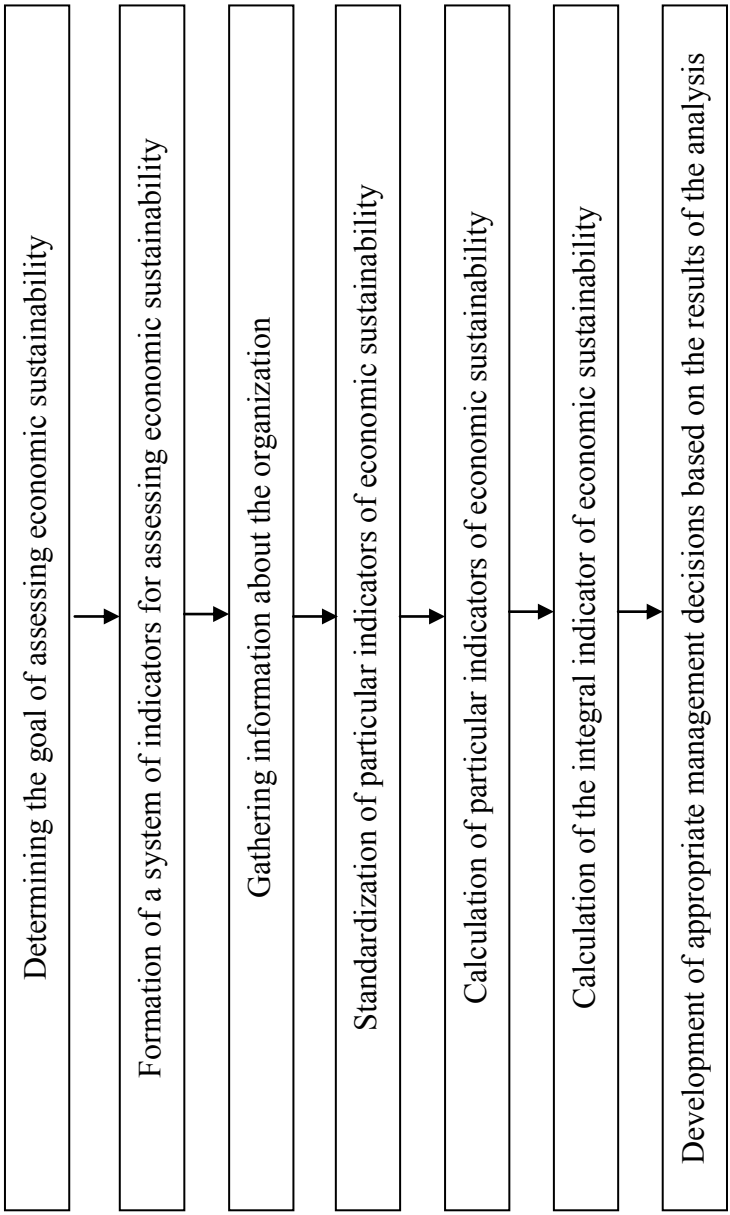

Figure 1. *Stages of assessing the level of economic sustainability*

- managerial sustainability – executive discipline of employees, conformity of education, creative activity, percentage of creative ideas for implementation;
- marketing sustainability – compliance with the price and quality of services, the share of management decisions based on the findings of marketing analysis in the total;
- financial sustainability – security with tangible current assets and sources of financing, coefficient of financial stability and financial autonomy;
- investment sustainability – expansion and updating of fixed assets, and employee awareness of the organization's investment policy;
- industrial and technical sustainability – mastery of technology, the intensity of equipment updates;
- staff sustainability – staff experience, staffing.

So, the integral indicator of the level of economic sustainability has the form [2]:

$$I_{ЭУ} = \frac{\sum_{i=1}^{n} W_i \times IK_i}{\sum W_i},$$

where IK_i - integral indicator of the i-th type of economic sustainability;
W_i - weigh (significance) of the i-th type of economic stability.

The fifth stage and sixth – contain the calculation of the integral indicator of the level of economic stability.

Seventh stage – involves the interpretation of an integrated indicator of the level of economic sustainability (Table 1)

Table 1

Interpretation of an integrated indicator of the level of economic sustainability

The value of the integral indicator	Characteristics of economic sustainability
$0 \le I_{ЭУ} \le 0{,}25$	Low level
$0{,}26 \le I_{ЭУ} \le 0{,}50$	Limit level
$0{,}51 \le I_{ЭУ} \le 0{,}75$	Average level
$0{,}76 \le I_{ЭУ} \le 1$	High level

According to the results of the introduction of a toolkit of indicators for assessing economic sustainability, the development of appropriate management decisions is carried out, they can vary significantly from the original purpose of the assessment. This is due to increasing or maintaining economic sustainability.

Thus, the necessary regulation of economic sustainability is due to the need to stimulate its increase and mitigate the negative effects of the market environment, and the advantages of the proposed indicators for calculating the level of economic sustainability of service providers are:

- staffing (economic sustainability is determined by factors of macro- and microenvironment);
- flexibility (the ability to take into account the conditions and features of the functioning of service providers);
- exclusion of subjectivity (due to reliable information);
- using the result for specific actions by the organization, maintaining it and increasing the economic sustainability of service providers.

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“绿色”经济增长条件下的人力资源管理
HUMAN RESOURCE MANAGEMENT IN THE CONDITIONS OF "GREEN" ECONOMIC GROWTH

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注解。本文探讨了人力资源管理的问题，这些问题是提高企业竞争力，经济增长和整体经济效率的决定因素。人力资源管理的理论和方法问题的发展仍然很复杂，并且研究不足。大多数可用资源都讨论了组织管理理论，这些理论强调了员工在实现组织目标中的作用。人力资源管理理论假设的实际应用问题在文献中很少反映。当前现有的科学著作仅揭示了人员管理领域的活动领域。因此，这个问题的紧迫性是在研究“绿色”背景下的人力资源发展趋势的基础上，确定影响企业和整个国家竞争力的最有效方法。经济增长。

关键词：创新，创新发展，人力资源，创新技术，竞争力，经济区，管理技术，绿色经济。

Annotation. *The article examines the issues of human resource management, which are a determining factor in increasing the competitiveness of enterprises, economic growth and the efficiency of the economy as a whole. The development of theoretical and methodological problems of human resource management remains complex and insufficiently studied. Most of the available sources discuss organization management theories, which highlight the role of staff in achieving organizational goals. Issues of the practical application of the postulates of theories of human resource management are little reflected in the literature. Currently existing scientific works reveal only areas of activity in the field of personnel management. Therefore, the urgency of the problem is to determine the most effective ways of their influence on increasing the competitiveness of enterprises and the country as a whole on the basis of a study of trends in the development of human resources in the context of “green” economy growth.*

Keywords: *innovation, innovative development, human resources, innovative technologies, competitiveness, economic zones, management technologies, green economy.*

A feature of the proposed concept of human resource management in the context of the transition to a “green” national economy is that human resources perform the so-called control function through the integrating function of personnel management of the organization. That is, the effectiveness of the organization is determined by the effectiveness of the human resource management process, not only economic, but also social.

The prospects for the development of the “green” sector of the Russian economy will affect the change in the quality level of the use of human resources, as well as the need to deepen labor and human potential [1].

First of all, this is due to a change in the factors of labor activity:

- under the conditions of the transition to "green" economy, human needs change (for example, moving up the Maslow's hierarchy of needs - from satisfying physiological needs to social ones - self-esteem and self-affirmation);
- the motives for the behavior of a socially oriented person are significantly different (for example, increasing the requirements for the quality of jobs - environmental friendliness and social significance of business);
- the value system of a socially oriented person transfers his/her interests from the sphere of economic efficiency to the social sphere (for example, the possibility of obtaining a high income in production, which implements a program to reduce energy intensity and reduce environmentally harmful emissions).

Changing factors of labor activity of labor determines the need to improve the mechanisms used to manage human resources.

The "green" economy of Russia is based on alternative sources of energy and fuel, clean production technologies, clean technologies in agriculture, green building, as well as programs for cleaning air, water and soil from pollution, processing and disposal of waste, etc.

The market for the introduction and financing of green projects in Russia is in its infancy. However, efforts to combat climate change can lead to the creation of a structure of employment and investment environment in which new "green" jobs will be created in many sectors of the economy.

"Green" jobs can reduce the negative impact of enterprises and industries on the environment and reduce ultimately this impact to an acceptable level. First of all, “green” jobs that help to preserve or restore the quality of the environment should be created in such branches as industry, services and management, providing decent work, which, while protecting the environment, helps to solve social problems such as unemployment, low wages, adverse working conditions and lack of access to any form of social protection [2].

The prospects for creating "green" jobs cover a wide range of professional activities and specialties.

Some of them are completely new types of work, but most are traditional professions, albeit with slight changes in the essence of the content and attitude to the work itself. This applies to both direct and indirect “green” jobs created in industry and related to supplies.

In new industries using new technologies, such as energy production using wind and solar, the supply chain consists mainly of traditional industries, namely the production of iron, steel and the manufacture of parts for various kinds of machines, that is, “brown” jobs .

As the “green” economy focuses on increasing sustainability, a change in employment will be associated with:

- the creation of additional jobs: for example, in the production of additional devices for controlling environmental pollution installed on existing production equipment;
- the replacement of jobs, for example, in the transition from fossil to renewable fuels, from the production of road freight transport to rail, from burial and incineration to waste processing;
- liquidation of jobs without direct replacement, for example, in the case of a ban on packaging materials and the termination of their production;
- transforming existing jobs: for example, changing everyday work skills and working methods (plumbers, electricians, fitters and builders).

The biggest and most common change in the transition to the "green" economy will be the redefinition of many jobs [3].

First of all, this will be manifested in a change in the content of the work, its execution and requirements for professional skills. Benefits from redefining jobs are fast, low-cost, and profitable: they do not require large investments in new technologies.

The newly created "green" jobs take the place of existing jobs and, thus, the net gain in employment is much less, than the planned number of proposed direct jobs. So, this happens when replacing jobs in the production of fossil fuels with jobs in renewable energy sources. Other types of work cease to exist due to a decrease in demand for goods or services with a high level of environmental impact.

The overall balance of available jobs will depend on the number of jobs created and reduced in the relevant sector, for example, energy, transport or construction, the balance of jobs in the sectors supplying raw materials to these sectors, as well as on the increase or decrease in employment throughout the economy associated with an increase or decrease in consumer spending.

Efficiency in the use of energy and raw materials, as well as renewable energy sources, can have a stimulating effect of employment.

The process of creating green jobs is very slow and cannot affect significantly the reduction of unemployment and part-time employment. Very few jobs are created specifically for those who need them in the first place: youth, women. It is extremely difficult to create decent jobs of good quality with a high level of self-employment and social inequality.

There is practically no specific and quantitative information about the transition to a "green" economy for enterprises and workers who will suffer damage as a result of this transition and who have to adapt their work and income to climate change conditions.

The biggest obstacles to "green" economies and jobs are unsustainable businesses that prevail and often remain more profitable.

Those who first switched to the use of "green" technologies are now experiencing tremendous pressure from financial institutions on quick money back issues, and from competing companies that attract consumers with low prices, but do not include environmental and social expenses in these prices.

The lack of qualifications and the lack of offers are a binding limitation for the transition to a "green" economy of the Russian Federation. A similar problem exists in many countries of the world: in renewable energy and environmental industries (Spain, Germany, India, Sri Lanka and the USA), in the biofuel industry (Germany, Brazil), as well as in the construction sector of Australia, China, Europe and South Africa.

Most architects and engineers in the world are aware of the materials, design, and construction technologies that can be used in energy efficient buildings. But so far they cannot apply them in their projects.

For example, the standards for homes with zero or even negative energy consumption, adopted in the UK, can not be applied in practice, because construction companies and workers are not able to adapt to these standards.

In China, the best technologies for the construction of new buildings cannot be applied due to the fact that the level of skill of construction workers is very low.

As long as all attention is focused on technology, the level of labor intensity that can be achieved will depend on the weakest link in the production chain - human resources.

Available technologies and means for investment cannot be used or the expected economic benefits for the environment cannot be obtained from them without well-trained entrepreneurs and skilled workers [4].

Efforts to eliminate the existing deficit of qualifications and forecast future needs are very important for the Russian Federation in the context of the transition to a “green” economy.

In recent years, higher education institutions in Russia have been focused on transforming themselves into a "green" economy. These universities carry out both

educational and scientific programs in almost all the main areas of socio-economic development. Having such institutes and departments as mining, metallurgy, engineering, oil and gas, energy, construction, along with ecology, economics and high technologies, they can train highly qualified specialists and carry out scientific research in all areas of the energy-ecological concept and the “green economy”.

Russian universities cooperate with many leading universities and centers from the USA, France, Italy, Germany, Spain, South Korea, Russia on the latest priorities of the "green" economy and "green" technologies..

Russia, building its own sustainable development strategy in a modern multi-problem world, offers its own ways out of the global crisis: creating a nuclear-free world; strengthening global security; expanding the dialogue of cultures and civilizations; implementation of the concepts of global energy and environmental development, including the "Green Bridge" initiative.

The analysis of innovative development, as well as the identification of the features of modern human resource management made it possible to identify prospects for the development of the green economy of Russia (tab. 1).

Table 1 - *Prospects for the development of the green economy of Russia*

Possibilities	Threats	Suggested solutions
Economic diversification	Dependence of the Russian economy on natural resources	RES development, support for green industry, construction and agriculture
Creation of green jobs in the medium and long term	Short-term guarantee of “brown” jobs in industry	Increase in the share of "green" jobs
RES development	Confusion with tariff level and return on investment guarantees	Competitive renewable energy tariffs and enhanced guarantees for investors
Solving environmental and social problems	Economic interest prevails over social and environmental	Implementing "green" economy principles

Note - Compiled on the basis of the analysis of the prospects for the development of the "green" economy of Russia

The most important in terms of environmental impact are sectors such as energy (in particular renewable energy sources), construction, transport, major industries, agriculture and forestry.

Only in the field of renewable energy in Russia 1,2 thousand new jobs can be created, and the growth potential in this sector is very significant. By 2030, employment in the field of alternative energy sources may increase to 1,1 thousand people in the field of wind energy use and up to 0,7 thousand people in the field of solar energy use. Renewable energy provides more jobs than fossil fuels.

Investments in the construction of energy-efficient buildings will create 50 thousand jobs, as well as make the existing 600 thousand jobs in the construction sector "greener".

In agriculture, in the field of energy production from biomass, as well as in related industries, up to 20 thousand jobs can be created.

Improving human resource management in the transition to a "green" economy is associated with the implementation of the following measures:

1) the introduction of a subsystem for monitoring the efficiency of use of human resources:

- observation;
- conversations;
- monitoring of measured indicators;

2) improving the recruitment process based on job planning taking into account changes in motives, incentives and expectations of socially oriented personnel

- development of a competency map of vacant posts;
- structuring interviews and developing a list of questions;
- determination of the main factors of candidate motivation;
- training of HRM managers on personnel selection technology;

3) the formation of motivation for highly productive labor based on individual results, taking into account changes in motives, incentives and expectations of socially oriented personnel:

- subsystem of material incentives (increasing the constant part of wages, raising the level of bonuses, developing a system of fines and bonuses)
- subsystem of non-material incentives (career planning, professional development and advanced training, maintaining a favorable psychological climate in the team, the formation and development of corporate culture);

6) stabilization of the team by taking into account the interests of socially oriented employees, the use of an individual approach for qualification growth:

- staff segmentation (individual approach to employees based on their personal inclinations and preferences);
- individual approach based on employee requests (taking into account the wishes of employees);
- individualization of benefits, bonuses and additional options (the employee selects those that best suit his/her needs);
- implementation of the rules for the performance of work (giving the employee relative freedom of action within the established limits, the employees themselves decide how to perform the work);

4) ranking of personnel according to the level of qualification and professionalism (the use of cards to assess the level of professionalism);

5) improvement of working conditions, taking into account changes in the requirements of socially oriented personnel:

- investing fonds;
- assessment of employee satisfaction with working conditions.

The transition from a raw material to a new "green" economy is associated with the use of innovative technologies that are based on energy efficiency, highly diversified production and employment, while polluting the environment less.

Based on the principle of high energy efficiency, not only industry and energy, but the entire services sector and infrastructure sector of the economy, where most of the working population is employed, should build their activities.

"Green principles" are applicable in the agricultural sector. It is necessary to export not agricultural raw materials, but repeatedly processed high-quality products of grain, meat, leather, cotton, vegetables and fruits, which will provide high employment and income for rural residents [5].

Thus, climate change, adaptation to this change and combating its consequences by reducing emissions will have long-term economic and social consequences in terms of production and consumption, and, therefore, for employment. "Green" jobs and "green" enterprises are sustainable, and as a result, they guarantee more stable employment and reliable income.

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Sukuk–传统债券的伊斯兰模仿：发展的特点和前景

SUKUK-ISLAMIC ANALOGUE OF TRADITIONAL BONDS: SPECIFICS AND PROSPECTS OF DEVELOPMENT

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抽象。 本文的主要目的是从经济实体融资的有效性的角度分析伊斯兰国家金融市场的现状。 作者特别注意诸如“ sukuk”之类的金融工具。 这种金融工具在伊斯兰世界和欧洲银行界中众所周知。

关键词：金融，银行，伊斯兰银行，回教债券，投资。

Abstract. *The main purpose of the article is to analyze the current state of the financial market of Islamic countries from the point of view of the effectiveness of financing of economic entities. The author pays special attention to such financial instrument as "sukuk". This financial instrument is widely known in the countries of the Islamic world and the European banking community.*

Keywords: *finance, banking, Islamic banking, sukuk, investments.*

In the XX - XXI centuries there is a gradual development of interest-free financial institutions. In the twentieth century. Islamic economists Naeem Siddiqi, Maulana Maududi, Muhammad Hamidullah recognized the need for commercial banks to place financial resources (the so-called "inevitable evil") [3]. For a more complete understanding of the functioning of the Islamic financial model in table. 1 shows the main types of operations of financial institutions.

The first modern sukuk was launched in Malaysia by Shell MDS in 1990, after which Malaysia led the development of the sukuk financial instrument - the interbank sukuk money market, certified in 2003. Thanks to the deliberate intervention of the Malaysian government to remain at the forefront of innovation in the global Islamic market, banks in this country have a clear advantage. It should be noted that Islamic banks are largely responsible for much of the modernization and economic development of Malaysia over the past twenty years.

The 2000s were the most important time in world Islamic banking. This is due to the emergence of sukuk and other structured Islamic financial assets that have emerged, along with the spread of a reliable capital market. Since 2005, Islamic banking has been introducing increasingly sophisticated Islamic financial instruments capable of greater flexibility and flexibility in managing liquidity.

Table 1.

Types of main financial operations in Muslim countries and their features (compiled by the author according to [3])

Types of operations	Features of operations
Karn hasan	An agreement according to which one party, on the basis of a contract, provides funds to the other party in the form of an interest-free loan on terms of repayment or for charity. When forming liabilities, the bank can use the balances on the current accounts of its customers without informing them of this and must return the amount or part of it upon the client's first request. The main advantage of making a demand deposit based on the Karn Hassan operation for Islamic banks is the ability to gain access to balances on savings accounts
Amana	Responsible storage of valuables. By charging a certain fee, a financial institution can only fulfill the power of attorney of the depositor regarding its funds or values, but does not have the right to dispose of the subject of storage. In addition, the financial institution has the right to cover at the expense of the owner the costs associated with the performance of his power of attorney
Mudaraba	An agreement according to which one party (the owner of the capital, for example, a bank or other financial institution) provided the other party - Mudaribu (that is, an enterprise with sufficient experience and reputation), to manage the funds. The profit from investing in a specific project is distributed by the parties to the agreement in the stipulated proportions. There is a "pure" and double mudaraba. The use of "pure" mudaraba deprives the investor of the right to intervene in project management. After the entry into force of the contract between the investor and the mudarib, the owner of the capital claims only his share of the profit. When using double mudaraba, a financial institution plays two roles: as a mudarib, attracting clients' money, and as an investor, directing these funds to various operations and projects authorized by the Sharia. At the same time, clients, as in the case of "pure" mudaraba, are not guaranteed a fixed income, but only a part of the profit
Vakala	The agreement, according to which the profit received from the investment of financial institution funds by vakil (vakil - commercial enterprise) in the project, is distributed in stipulated shares. The key difference between Vakala and Mudaraba is that Vakala legally acts as an investor agent, and money cannot become its property
Musharaka	General financing by a bank and a client of a specific project. Two or more investors can participate in the financing. Gains and losses incurred by the project are divided by the parties according to the share of financing. At the same time, management can be carried out by both parties on an equal footing, or separately
Sukuk	Issuance of medium-term interest-free bonds by relevant initiators in both Muslim and non-Muslim countries. The structure of their issue provides for the complicity of investors and issuers in the ownership of certain assets, that is, bonds that are secured by assets. In the most common variant, the issuer of bonds after their placement takes the bonds from investors for rent (and at the same time agrees to redeem them from the same investors at the end of their circulation period, paying the agreed rent)
Takaful	A specific type of insurance, according to which the insurance company does not take risks, and acts only as the manager of the fund, formed from the funds of participants

Islamic financial services expanded rapidly outside the GCC and Malaysia, and 2014 was a turning point as it marked the release of sukuk by the United Kingdom, the first sovereign sukuk issued by a non-OIC country. Great Britain was quickly followed by Luxembourg and South Africa.

The most recent data confirms that Malaysia maintains its position as a market leader, while other countries follow its experience. During January-November 2014, the share of Malaysia in the total debt of sukuk was more than 50%, while the group of other major players included Saudi Arabia, Indonesia, the United Arab Emirates, Qatar and Turkey 16%, 8%, 7%, 5% and 4%, respectively. It is noteworthy that there were also smaller players in the market with a total share of 7% over this period, while countries such as Bahrain, Pakistan, South Africa and the United Kingdom listed only a few. Both the latter and the former countries still have to prove the extent of their obligations, but the path to an alternative to Islamic finance, of course, has been paved.

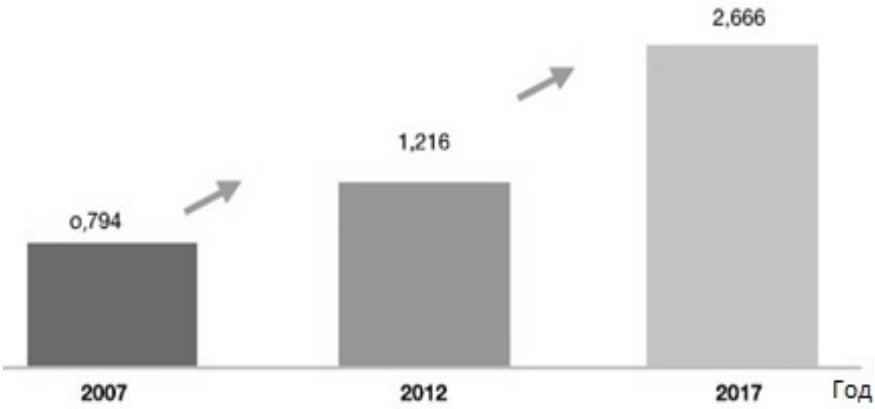

Fig. 1. *The growth of "sukuk" in Malaysia from 2007 to 2017 [4]*

The profitability and relative attractiveness of sukuk investments is reported in the Dow Jones Total Return Index report. It was launched on November 30, 2009 with a value of 114.3 and by October 31, 2014 it stood at 152.31 [cit. by 1]. The index is a composite measure of various types of bonds that have been rated both AAA, AA, A or BBB with short-term maturities and long-term. Thus, the index shows the yield on top-end securities. Its value displays periods of steady increase and decrease, but overall the sukuk works very well.

In addition, in July 2013, S&P Dow Jones announced the lanuch of MENA Sukuk index to track the movement of bonds in the MENA region. Although its growth is more obvious, its indicators are actually inferior to the previous indicator, since its fluctuations are more irregular, and its growth over the period is lower. However, their similarity lies in the fact that they both exhibit a linear type of growth. A linear trend line is shown to approximate this dependence. Thus, the main conclusion is that the overall MENA gain index and price index, tracked by S&P Dow Jones, do not show an exponentially growing trend [cit. by 2].

It should be noted that Islamic banking institutions focus primarily on the fight against poverty. For Russia, it is extremely important to develop not only the economic, but also the social sphere. Islamic banking is based on spiritual and humanistic goals, which are manifested in the financing of microenterprises, the provision of charitable loans and the development of social infrastructure in general.

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在俄中合作框架内落实确保经济安全的行政和法律机制
IMPLEMENTATION OF THE ADMINISTRATIVE AND LEGAL MECHANISM FOR ENSURING ECONOMIC SECURITY WITHIN THE FRAMEWORK OF RUSSIAN-CHINESE COOPERATION

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抽象。 本文通过强调创新强度的背景下的基本原理，阶段和指标，介绍了服务业组织的经济可持续性工具。

关键词：创新经济，经济可持续性工具，服务业，形成经济可持续性的过程，可持续发展的概念。

Abstract. *The article concerns the application of the mechanism of ensuring economic security on the example of the "SIBER" Holding of the State Corporation "Rostec" in the light of the expansion of Russian-Chinese cooperation.*

Keywords: *economic security, administrative and legal regime, international cooperation.*

The conceptual design of a modern international system for ensuring economic security in the world is of a certain complexity due to its multidimensional nature and involves the development of both theoretical and methodological issues, and the legal mechanism, the main directions, forms and methods of implementing the relevant innovations.

Noting the specifics of the content of the mechanism for ensuring economic security, the volume of the studied problems, it should be noted that a promising and appropriate way to solve it is to develop new foundations for ensuring economic security as an institutional transformation of the economy and to improve the complex administrative and legal regime for ensuring it on this platform.

Taking into account the economic and political realities of the time, the problem arose of analyzing the administrative-legal regime of economic security using a specific example at the State Corporation "Rostec" ("Rostec" SC), followed by possible consideration of this experience in various sectors of the economy and economic activity. The "Rostec" SC, proclaimed "development corporation," consolidated under its control most of the enterprises of the military-industrial

sector and machine building of the Russian Federation. The administrative and legal model of state corporations implies an increase in the independence of holding companies with the aim of forming, on their basis, self-sufficient and globally competitive industrial associations. In addition to the role of a shareholder, the corporate center can intervene in the activities of holding companies, including with the aim of controlling financial and market risks, corporate governance risks, security risks and criminal risks. To assess the extent of this intervention, a system of scientific criteria is used to analyze the criticality of these risks, and to increase the investment attractiveness of holding companies, a program of measures has been developed to control key risks and reduce (prevent, level) their negative consequences, which can significantly affect the outcome of measures. "SIBER" Holding of the "Rostec" SC solves the tasks of providing a range of security services for enterprises within this State Corporation.

The security system of "Rostec" SC is built on the basis of the following principles:

- Consistency, involving the analysis of the activities of all subsystems and accounting affecting the safety of "Rostec" SC, the use in this system of the activity of most employees, forces and means.

- Legality, while enforcing legislation, the local legal acts of "Rostec" SC, which should not contradict laws and by-laws, should be taken into account.

- The competence of employees and groups of employees, their high professional level and, in some cases, interchangeability.

- Planning activities based on comprehensive "Rostec" SC security programs, main security subprograms developed for implementation of "Rostec" SC units and individual employees' work plans.

- Economic feasibility, in which the price of financial security costs should be optimized in order to obtain benefits.

- The priority of preventive measures with the timely identification of the grounds for the occurrence of threats, preventive analysis, measures to prevent their occurrence.

- Preparedness for the use of forces and means of ensuring security. The organizational form of the integrated use of forces and means is the enterprise security program.

- The combination of publicity with privacy, which determines the amount of permissible limits for security measures, in which publicity should overlap with privacy measures.

- Coordination and interaction inside and outside of "Rostec" SC and in the "SIBER" Holding [1].

As part of its activities, "SIBER" "Rostec" SC has formed a mechanism for carrying out structural transformations included in the Holding of organizations

to streamline and expand their functions, as well as the development of additional business units, which helped form the basis for the development of a wide range of security competencies, including economic security.

The strategic focus of "SIBER" Holding is the access to international security services markets. Achieving this goal is carried out by concluding strategic partnership agreements and creating joint ventures with the largest security structures in the target regions and countries. This creates a unified, cross-border customer safety system. State policy aimed at reducing the excessive control functions of executive authorities in relation to business entities is focused on the gradual transfer of control in certain areas of activity to self-regulatory organizations (SRO). Holding's participation in the SROs created in such areas as ensuring economic security and security of activities will provide ample opportunities for participation in standard-setting activities and the development of regulations and standards. Combining these interrelated and interdependent factors into a single mechanism will allow us to achieve the greatest effect and effectiveness.

The presence of own international infrastructure for the protection of stationary objects and goods during their transportation will also make it possible to protect assets located abroad by the Holding and not by third-party organizations, which will significantly increase the level of protection of both the objects themselves and information about their composition.

The receipt of up-to-date operational information, in real time, is a critical element in ensuring security, as it allows to timely respond to emergency situations and minimize possible losses from them, on the basis of which it is planned to create a fully-functional situational center in the Holding. The availability of up-to-date operational information in real time will allow to respond as quickly as possible to emergency situations and minimize possible losses from them. To accomplish this task, a fully-functional situational center is being created on the basis of the "Rostec City" technopark [2].

The situation center organizes the monitoring of all security units, including foreign ones. The introduction of modern technical means and solutions will provide real-time information from all protected objects and technical systems, both the Corporation and external customers.

In the framework of economic security, a training sports and shooting center is being created to train domestic and foreign personnel in the Far East. Well-trained security specialists are a key element in ensuring reliable security, however, today the ability to conduct training using combat small arms and service weapons is prohibited in a number of countries, respectively, the main task of the center is to train foreign specialists in security skills using both service and combat small arms. In April 2018, "SIBER", the Chinese company "DeWe Group" and the autonomous non-profit organization "Far East Investment Promotion and Export

Support Agency" (ANO "IPA") signed a Memorandum on the construction of a training shooting center in Vladivostok. The center will also become the basis of the future tourism cluster. On September 12, 2018, "CIBER", "DeWe Group", the "Far East Investment Promotion and Export Support Agency", and "Primorskoye Kolk" shopping mall entered into an agreement on the implementation of the "Training Sports Rifle Complex" investment project in the Primorsky Territory. In order to implement the investment project, the parties created a joint venture. The total investment in the project will be about 10 million US dollars [3].

To increase competitiveness (taking into account Russia's entry into the WTO), there are various options for the Holding's cooperation with foreign strategic partners, which are leaders in the areas in which holding companies operate. The main goal of the strategic partnership is to build a highly effective world-class structure focused on providing a range of security services. As part of its development strategy, "SIBER" successfully cooperates with leading international companies from China, India, Singapore, Austria, France and South Africa [4].

The involvement of each partner will make it possible to adopt advanced managerial and technological experience and, as a result, will enhance the Holding's influence in new markets and segments, in which the participation of a foreign strategic partner will provide additional competitive advantages when entering the international market of security services.

Separately, the interaction of the Holding and interstate associations in the global and regional plan in the field of ensuring economic security should be highlighted. For example, about 50 countries have recently shown great interest in the Eurasian Economic Union [5]. The Eurasian Economic Union has reduced the international problem of ensuring economic security and has played an important role in developing the investment and innovative potential of Asian, European and North American countries.

Over the past few years, the Russian Federation has been actively cooperating with the PRC in the economic sphere, while ensuring the requirements of economic security and market relations. One of the directions of stimulating Russian-Chinese trade and economic relations is the revival of the Great Silk Road.

In March 2015, an action plan for the construction of the "Silk Road Economic Belt" and the "21st Century Sea Silk Road" was officially unveiled. Today, the monumental project “One Belt and One Way” (Zhenmin' Zhibao"), adhering to the principle of joint construction and sharing, is steadily moving forward. There is a significant difference between the countries along the Silk Road in the level of provision of natural resources and great economic complementarity, so the potential for cooperation is very huge.

Without going into the details of this large-scale project, we note that the implementation of the Great Silk Road program will lead to a complete reorientation

of the region's economy and strengthen cooperation in the economic and trade spheres in the future. Within the framework of this project, the Russian Federation is ready, together with other states, within the framework of existing bilateral and multilateral mechanisms for regional and subregional cooperation, to create domestic organizations, carry out exchanges and mutual business visits, and help to eliminate threats to economic security in the implementation of this strategic event.

Among the main tasks to ensure economic security in the framework of international cooperation, it is necessary to: develop new forms of trade, develop cross-border e-commerce and other new types of commercial activities, strengthen and expand traditional trade sectors, comprehensively develop the modern service industry, organically combine investments and trade, increase trade through investment, create and improve a system to facilitate trade in services, including the protection and safety of goods.

The main goals of interaction between specialized security holdings and Chinese partner organizations in the field of trade security include: the formation of an infrastructure to ensure the safety and security of property during the implementation of interstate projects of the Silk Road Economic Belt; identification of transport and energy infrastructure facilities, the procedure for ensuring the safety of goods during their transportation along the Silk Road; coordination of joint work in order to ensure the security of integration processes between Russia and China in the framework of projects to build the Silk Road Economic Belt, expanding trade and economic cooperation between China and the Eurasian Economic Union.

In October 2014, "SIBER" Holding signed bilateral agreements with Chinese companies "Huawei Security" and "DeWeGroup". In the future are - the creation of joint projects in the field of physical security, cargo escort, training and consulting [6].

On June 25, 2016, the Russian holding company signed the next Agreement with the Chinese "DeWeGroup" on cooperation in the field of business security, ensuring the safety of people and transported goods, as well as infrastructure located in the territory of the EAEU. In June 2016, "SIBER" introduced the joint Russian-Chinese security company "Hao Guard", which was created to ensure the safety of Chinese enterprises in Russia. In October 2017, "CIBER" signed a strategic partnership agreement with China Cityguard Security, the largest Chinese private security company. The document defines the main areas of cooperation between the parties, including joint work on ensuring the security of international projects as part of the implementation of the strategy "One belt - one way." In addition, the document provides for cooperation on the joint promotion of advanced Chinese technologies in the Russian market with the prospect of localizing production at facilities of SC "Rostec" [1].

In the future, the "SIBER" Holding of the "Rostec" State Corporation plans to deepen cooperation with representatives of the Asia-Pacific region and expand the geography of the countries participating in mutually beneficial partnerships. This cooperation seems to be extremely beneficial for foreign business with the expansion of protectionism measures in the Russian Federation, changing the procedure for admission of foreign products to public procurement. A ban on its purchase is supposed to be introduced in order to protect the defense and security of the country and in the framework of national projects, and in other cases apply the “odd man out” mechanism and price preferences. In connection with the introduction of a “prohibition regime” for the admission of foreign products to purchases on the basis of the “odd man out” principle in national projects and defense industry projects, joint agreements seem extremely promising, since "SIBER" Holding controls risks in ensuring the economic security of the state, society and the individual.

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俄罗斯和中国高等学校使用“教育技术”概念的比较分析
COMPARATIVE ANALYSIS OF THE USE OF THE CONCEPT «EDUCATIONAL TECHNOLOGY» AS APPLIED TO THE HIGHER SCHOOL OF RUSSIA AND CHINA

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抽象。许多发达国家的政府已经意识到高等教育系统现代化进程作为其在各个领域发展的主要动力的重要性，并且意识到了成为全球教育服务市场提供高素质专家的领导者的能力。　　。结果，人们对技术方法给予了高度关注，高等教育的技术化正成为改善教育过程的不可或缺的属性，它是其进步性和生产力的保证。研究表明，今天在俄罗斯和中国，都在大规模寻求教育过程技术发展的新方法和新方法。同时，这些国家的教育现代化既有相似之处，又有独特之处。在这一领域进行的比较分析旨在丰富这些国家的高等教育系统，并寻求进一步发展的最佳模式。

关键词：技术方法技术化；教育现代化；学习过程;教育体系;俄国;中国

Abstract. *The government of many developed countries is aware of the importance of the process of modernization of the higher education system as the main driving force for its development in various fields and the ability to become a leader in providing highly qualified specialists in the global educational services market. As a result, close attention is paid to the technological approach, and the technologization of higher education is becoming an integral attribute of improving the educational process, a guarantor of its progressiveness and productivity. As the study shows, today both in Russia and in China there is a large-scale search for new ways and methods of technological development of the educational process. At the same time, there are both similar and distinctive points in the modernization of education in these countries. A comparative analysis conducted in this area is aimed at enriching the higher education systems of these countries, and at searching for optimal models for its further development.*

Keywords: *technological approach; technologization; modernization of education; learning process; education system; Russia; China*

In the era of informatization, scientific and technological progress is rapidly gaining momentum, the integration of higher education and science is taking place, there is a tendency to the penetration of science and technology into the humanities, the processes of democratization and modernization of higher education as a whole are clearly traced. In this regard, the study and understanding of the processes occurring in the higher education system are becoming very relevant.

So, today, modernization in the field of education is one of the key values in the development structure of almost any state. It is the modernization of education that determines the level of economic, social, scientific development of the country as a whole. Therefore, all countries of the world turn their eyes to the innovative component of the educational process, which determines the competitiveness of a state both in the international educational market and in the world educational community. It is necessary to pay attention to the fact that in the modern world, subject to the general globalization of education, any educational reform not only can, but actually does affects the development of human society as a whole.

The process of cooperation between regional and local educational systems within an individual country, as well as between different countries, has a similar effect: studying the positive experience of each other in the field of innovative educational activities, adapting the positive experience of foreign partners in relation to their own conditions can not only enrich the pedagogical activity of a particular state but also contribute to the practical improvement of the educational sphere of neighboring countries, member countries community, etc.

In the educational process of successfully developing countries, increasing importance is given to the search for productive ways of personality development. Knowledge is becoming the most important source of economic growth, social development and, as a result, the ability to be highly competitive in the international knowledge market.

At the same time, the essence of the implemented higher education is often not able to satisfy the growing and constantly enriching needs of a modern person. In this regard, the transformation of all components of the educational process is required: targeted, substantive, technological, productive, changing the set of methodological approaches [2, p. 5]. Reforms and innovations in the higher education system are considered as the main driving force for creating a modern, high-quality and competitive education system in the world. One of the most significant innovations in the field of education today is the technological approach to training and education.

It is known that the technological revolution led to the penetration of technologicalization into the sphere of social processes and phenomena, gave rise to hope for the ability to manage complex social, in particular pedagogical processes and systems.

The term "technology" has Latin roots and is translated as "the science of art" (texno - art, skill; logos - word, teaching, knowledge), a set of methods and tools to achieve the desired result [1, p. 12].

Thus, educational technology involves the realization of the idea of complete controllability of the educational process, the key indicator of which is reproducibility, suggesting the possibility of applying it in other disciplines, educational institutions and with other subjects of the educational process. Therefore, to go to the technological level means to go to the operational level when the operations performed are scientifically justified to obtain a result [7, p. 6].

As an analysis of scientific research has shown, educational technology contains the answer to the question: "How to learn effectively?", And its essence reflects the following criteria:

- designation of learning objectives (why and for what to teach?);
- highlighting the structure of the content (what to learn?);
- the optimal acceptable organization of the educational process (how to teach?);
- methods, techniques and teaching aids (with what to learn?);
- control of the actual level of qualification of the teacher of the discipline (who teaches?);

Actual analysis (monitoring) of learning outcomes (is that so?).

In view of the foregoing, it can be stated that educational technology is nothing more than an algorithm of the teacher's activity in the established sequence, aimed at achieving a predetermined result.

As mentioned earlier, the process of modernization of the education system has affected all developed countries of the world. Unprecedented attention is paid to the process of development of educational technologies, which is considered as the main driving force for the development of education in any country.

The process of technological education, understood in this vein, did not pass by such major world powers as Russia and China. Modern Russia and China are dynamically developing countries, of course, world leaders in many areas of the economy, science and culture, and are capable of influencing world processes, including productive changes in the field of education. The fact that Russia and China have a long history of relations, have a common territorial border, and close ties at all levels of life is also significant.

So, in the 1980s of the last century in both countries there was an active reorganization of higher professional education. The tasks of modernization in this area were identical for Russia and China: the task was to improve the hierarchical model that was in force at that time and replace it with a model of developing evaluation [3, p. 94].

It should also be noted that there were differences in the dynamics, as well as in the substantive characteristics of the ongoing transformations. In particular, while in the Russian (Soviet) education system, modernization was in the nature of "shock therapy," in China the modernization process was carried out gradually, with a constant analysis of the mistakes made at each stage of the reform. Peking University Rector Professor Zhou Qifeng described this process as follows: "The long-term planning and development strategy of the university should focus on its historical mission - the accumulation of knowledge and access to it, the search and dissemination of universal values, that is, on a cultural perspective and basic values [5, p. 217].

At present, Russia is developing a new education system, reorganizing all educational processes taking into account modern pedagogical goals, methods and means. Moreover, as the study of special literature and observation of pedagogical practice shows, the technological approach in the system of higher education of the Russian Federation is given great importance. It is with the possibility of applying a technological approach that the nearest improvements in the system of domestic education are associated. Despite the variety of definitions and characteristics of educational technologies, all of them are united by the fact that "pedagogical technology" means a certain algorithm of actions leading to guaranteed achievement of goals in accordance with educational standards while minimizing time and economic costs [7, p. 21], which, in turn, is characterized by the following characteristics: conceptuality, integrity, controllability, reproducibility, efficiency.

Our analysis of Chinese scientific research on this issue also showed that in the framework of the global educational modernization implemented by the Chinese government, the leading role is played by the technological process of the educational process, as the main way to improve and the ability to achieve the highest quality transformations in the educational system. So, today it is educational technology that is the main research object in China's pedagogy. The Chinese government makes it a priority to introduce educational technologies in the educational process of higher education institutions, defining it as an important stage in the reorganization of educational reform and promoting the development of quality education in the country. The importance of the use of modern educational technologies in the higher education system is emphasized, as well as the urgent need for teachers to master modern educational technologies in order to improve the quality of national education [9].

It is known that the very definition of "technological approach" penetrates into China from abroad [9]. The earliest educational technologies in China are considered mainly the use of audio and video equipment, as well as the development and application of other technological tools in education, which we usually call e-learning tools. A form of distance education, based on broadcasting, television

and satellites, has caused some changes in the organization, ways and methods of training. In particular, in the late 1980s in China, not only the progress of computer network and communication, but also educational technologies began to be outlined.

The government and scientists in the field of pedagogy are beginning to give unprecedented attention to the development of educational technologies, considering them as a key driver of progressive changes in the field of national education, defining clear objectives: to significantly increase the level of educational technology and the level of computerization of education.

Minister Chen Zhili emphasized that: "It is necessary to immediately recognize the need and importance of the use of modern educational technologies in the educational process, as the only effective way of social development and qualitative reorganization of the educational process" [6].

It is also important that although the very concept of "educational technology" is in many respects similar to that in Russian pedagogical science, the following definition of educational technology is given in Chinese scientific pedagogical literature: "educational technology is a teacher's pedagogical activity in the design, development, implementation, management and assessment of learning processes" [8].

However, according to Chinese authors, the concept of technological development of the educational process is still part of e-learning. The goal is to achieve the best educational effect and to optimize education through the use of information technologies, technological training tools, thus contributing to the rapid development of information education, the massive growth of online learning.

Thus, the new theory of teaching requires students to switch from passive recipients of information to active students who can actively process the information they receive. Teachers should provide information resources and a comfortable learning environment, help and promote student self-development.

As previously noted, according to Chinese authors, the concept of technological development of the educational process is part of e-learning. The goal is to achieve the best educational effect and to optimize education. The characteristics, functions and methods of analysis and problem solving are also the same or similar. They use new scientific and technological achievements to develop new educational resources and introduce new theories and teaching methods to manage the educational process.

It is necessary to pay attention to the fact that currently educational technology still exists within the framework of e-learning, however, an increasing number of Chinese teachers agree that in terms of conceptual coverage, the volume of educational technologies is much wider than that of e-learning.

Thus, educational technology is used relative to all educational resources, including operational elements related to education, and audiovisual training refers only to audio and video information tools that are developed using new scientific and technological achievements. As a result, in the process of solving the problem, educational technology mainly uses a systematic approach, as the leading one. In a specific implementation process, it can be applied to various levels of the education system. This may be a macroeconomic problem in educational planning, a problem at the level of curriculum development, or a problem in a particular educational process in the classroom.

Although e-learning also uses systematic methods to address and solve the problem, it focuses on a small system of selection, combination and use of electronic media. Of course, e-learning is sometimes associated with a wide range of issues, but it is mainly used only to study the control and change the results of a small system. From this point of view, e-learning is part of educational technology and a product of a certain stage in the development of educational technologies. This is a phased educational technology focused on the development and use of modern media and is the narrow sense of educational technology. So, the researchers conclude that at the present stage of development of Chinese pedagogy, educational technology is the systematic application of scientific and other types of knowledge for practical purposes, and includes both material and intellectual technologies.

Based on the foregoing, it can be stated that the technological approach is leading and very promising in both the Russian and Chinese education systems. The governments of both countries are aware that the use of educational technologies improves educational efficiency and has great potential for the development of the education system as a whole. There is no doubt that the technological approach opens up new possibilities for the conceptual and design development of various fields and aspects of educational, pedagogical and social reality.

At the same time, historically, economically and culturally determined differences leave their mark on the process of reforming the education systems of these countries. It is necessary to pay attention to the fact that Chinese higher education is developing at a rapid pace, stubbornly moving towards modern world standards, and every year it only strengthens its leading position in the global educational services market.

On this basis, we can conclude that the comparative analysis of the development process of the education systems of Russia and China in terms of technologization can help improve the development and reorganization of the education systems of both countries, provide significant assistance in determining the most acceptable models for their further development, and contribute to strengthening positive dynamics in the study area.

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理工大学机器人教育技术应用的特点
FEATURES OF ROBOTIC EDUCATIONAL TECHNOLOGIES APPLICATION IN TECHNICAL UNIVERSITY

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抽象。 机器人教育技术的使用使我们能够组织大学学生的创造性研究工作，为解决现实问题创造知识，技能和外部资源应用的条件，并为将来从事各种有效工作的专家做好准备 未来的生活状况。

关键字：能力，机器人技术，乐高技术，信息技术，项目方法，主体间通信。

Abstract. *The use of robotic educational technologies allows us to organize creative and research work of students at the university, creates the conditions for the application of knowledge, skills and external resources in solving real-world problems, and prepares a future specialist for effective work in various life situations in the future.*

Keywords: *competence, robotics, LEGO-technology, information technology, project method, intersubject communications.*

The modern system of higher professional education is aimed at the formation of a holistic system of universal knowledge, skills, as well as the experience of independent activity and personal responsibility of students, that is, the formation of key competencies that determine the modern quality of educational content.

Currently, new professional training standards have a distinctive feature - focus on educational outcomes, which are considered on the basis of a system-activity approach.

The main result of this approach is the formation and training of a specialist who possesses design and research technology at the level of competence. As one of the solutions allowing to form the key competencies of students in the classroom, it is proposed to embed a robotics course in the educational activity.

The basis of this teaching technology is the use, both in educational and extracurricular activities, of robotic designers wich can be used not only in the course of such disciplines as information technology, mathematics, physics, but also in physical education classes with students of special groups and released for health reasons.

Today, LEGO educational robotic platforms occupy a fairly strong position.

The use of LEGO technologies in educational activities allows us to organize creative and research work of university students, creates the conditions for the application of knowledge, skills and external resources in solving real-world problems, thereby creating the prerequisites for the formation of key competencies, that is, readiness for effective work in various life situations in the future.

LEGO EDUCATION – is one of the most famous and widespread robotic systems in the world, widely using three-dimensional models of the real world and the subject-game learning and development environment. The prospect of using LEGO technology is determined by its high educational capabilities: multifunctionality, technical and aesthetic characteristics, use in various game and training areas. With the help of LEGO technologies, educational tasks of various levels are formed – a peculiar principle of "step by step" training, which is key for LEGO pedagogy. Each student can and should work at his own pace, moving from simple tasks to more complex.

LEGO-design with computer support allows you to implement information technology in extracurricular activities, master the elements of computer literacy, and form skills of students with modern technical means.

The effectiveness of the formation of professional competencies based on robotic design depends on the application of the following methods when organizing classes at a university:

1. Cognitive (students' perception, comprehension and memorization of new material with the involvement of observation of ready-made examples, modeling, study of illustrations, perception, analysis and generalization of demonstrated materials).

2. Project method (with the assimilation and creative application of skills in the process of developing their own models).

3. Systematizing (conversation on the topic, compiling systematizing tables, graphs, charts, etc.).

4. Group work (used in the joint assembly of models)

The main method used in the study of robotics is the project method. The project method is understood as the technology for organizing educational situations in which students set and solve their own problems, as well as the technology for supporting students' independent activities.

Project-oriented training is a systematic educational method that involves students in the process of acquiring knowledge and skills through extensive research based on complex, real-life questions and carefully designed assignments.

The uniqueness of projects based on robotic complexes is that the construction of device models allows university students to comprehend the relationship between different fields of knowledge, which contributes to the integration of teaching computer science, mathematics, physics, drawing, natural sciences with the development of engineering thinking through technical creativity [1, p. 43].

In the case of applying LEGO technologies in the course “Physical Education and Sport”, the use of the BiTronics NeuroLab PRO robotic platform in the classroom allows students to carry out design work in the following areas:

- Study of the dependence of the electromyogram parameters on the strength and speed of muscle contraction
- Study of changes in the work of the heart under the influence of physical activity
- Determination of the transit time of a nerve impulse through a reflex arc and reactions to external stimuli
- Determination of reaction time and time resolution of various sensor systems

The influence of various light and sound stimuli on the rhythms of the electroencephalogram

The BiTronics Lab robotic platform includes electromyogram electrocardiogram (EMG / ECG) sensors, electroencephalograms (EEG), photoplethysmography (pulse sensor) and skin-galvanic reaction (skin surface resistance, EDA), as well as special adapters for connecting additional modules to the kit (fig. 1).

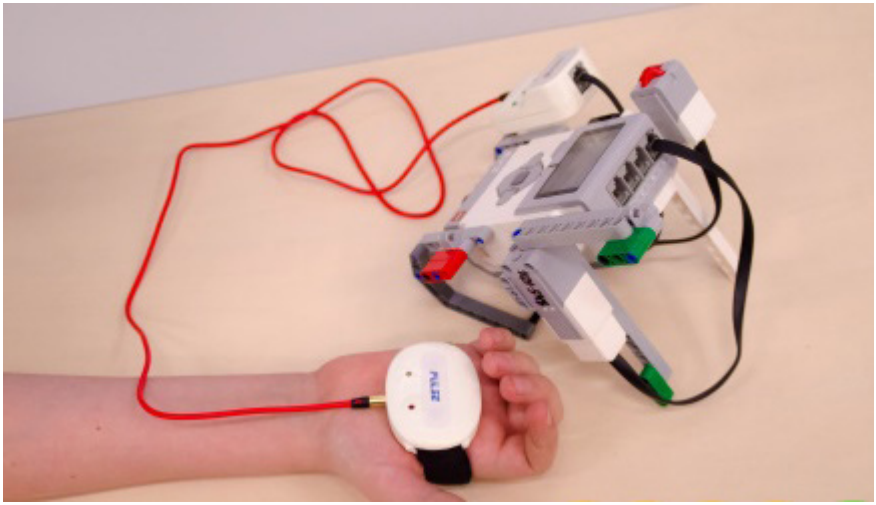

Fig. 1. *Electromyogram Sensor in BiTronics Lab*

The neurointerface is also able to read impulses of the cerebral cortex and give out values of the level of concentration of attention, meditation and blinking of the eyes in the range from 0 to 100%. The signal is transmitted wirelessly via Bluetooth to a computer, where all the information necessary for the project work of students is displayed.

As a result, the following interdisciplinary effects of the introduction of LEGO technologies are formed for students of a technical university:

- mastering the skills of independently acquiring new knowledge, organizing educational activities, setting goals, planning, self-monitoring and evaluating the results of one's activities, and the ability to anticipate the possible results of one's actions;
- understanding the differences between the initial facts and hypotheses to explain them, theoretical models and real objects, mastering universal educational actions using examples of hypotheses to explain known facts and experimental verification of hypotheses;
- gaining experience in independent search, analysis and selection of information using new information technologies to solve cognitive problems;
- mastering the methods of action in non-standard situations, mastering heuristic methods for solving problems [2, p.17].

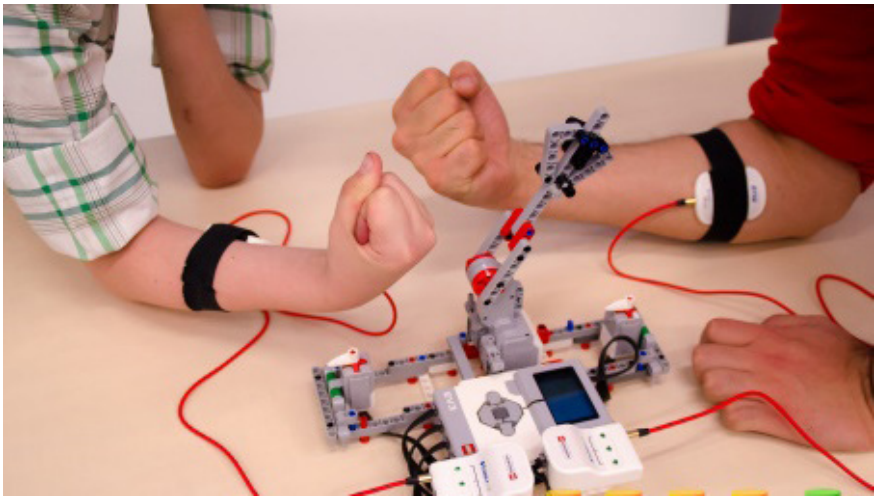

Fig. 2. *Study of changes in the heart under the influence of physical activity*

The use of the LEGO Education robotic platform in physical education classes with students allows them to model robotic systems controlled by biosignals, as well as create systems for recording and analyzing human biosignals, which provides a wide range of opportunities for deep immersion in the field of neurotechnologies and, undoubtedly, represents a large interest for students of various technical specialties (Fig. 2). Using graphical programming languages, students create tangible models and manage these models, use this arsenal to set and solve professional problems.

Thus, the use of robotic educational platforms in a technical university demonstrates the technology of the 21st century to students, develops communication skills and teamwork skills, independence in decision-making, and reveals their creative potential.

The use of educational technology based on robotics is a powerful tool for learning and self-learning. The integration of such elements into the educational space makes learning effective and productive for all participants in educational relations, and makes a modern university competitive.

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对音乐和计算机技术发展产生兴趣的基本条件
THE BASIC CONDITIONS FOR THE FORMATION OF INTEREST IN THE DEVELOPMENT OF MUSIC AND COMPUTER TECHNOLOGIES

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抽象。 随着数字技术的发展，音乐教育正处于重大变革的边缘，需要重新思考和评估已有数百年历史的传统。 音乐和计算机技术才刚刚开始获得广泛的公众认可。 至少有两种情况阻碍了它们在音乐和教学实践中的积极实施：1.需要与数字技术相关的特殊知识和技能； 2.大多数音乐家拒绝使用基于数字技术的工具。解决第二个问题的方法是，通过音乐数字技术来改变学生的意识和舆论。 在这方面至关重要的是对学生进行必要的动机教育。 本文考虑了其形成的特征。

关键字：音乐计算机技术，动机，动机，动机，兴趣，需求，目标，个性取向。

Abstract. *With the development of digital technology, music education is on the verge of major changes that require rethinking and evaluation of centuries-old traditions. Music and computer technology is just beginning its journey of widespread public recognition. At least two circumstances hinder their active implementation in musical and pedagogical practice: 1. the need for special knowledge and skills related to digital technologies and 2. the rejection by most musicians of tools based on digital technologies. The solution to the second problem is related to the restructuring of students' consciousness and public opinion in favor of musical digital technologies. Crucial in this area is the education of students with the necessary motivation. Features of its formation are considered in the article.*

Keywords*: Musical-computer technologies, motive, motivation, motivators, interest, needs, goals, personality orientation.*

Music and computer technology (MCT) – is not a tribute to the fashion trend. Their real opportunities in music education are not only huge, but also continue to grow rapidly. Now it is difficult to imagine the ways of further development of musical pedagogy, how far it will depart from its usual standards. Nevertheless, introducing students to the MCT is far from an easy process. It requires not

only knowledge and skills closely related to digital technologies, but also the fight against prejudices that are persistently promoted by professional musicians themselves: acoustic piano is good, digital is bad. Piano, violin, trumpet - good, synthesizer– bad. The symphony orchestra playing– live music, orchestral sounding using computer technology – dead music, etc. At the same time, the complete groundlessness of such comparisons remains aside. Say, a synthesizer does not replace, cannot and should not replace an acoustic piano. These are just different instruments and each one is capable of fulfilling its functions in musical activity.

Despite the loud approving slogans distributed to MCT at official meetings, the prejudices mentioned above exist in the music community, which, of course, complicates the task of introducing a wide range of students to MCT. The solution to such a problem cannot be based on command directive methods. This path in art is generally not very productive. Huge, very careful work is required to introduce MCT into the music education system. And it should be based, first of all, on a change in public consciousness in the musical community and on the formation of appropriate motivation for each student. But do we do that?

As is known, any activity begins with the birth of a motive. The latter may be based on coercion, or may be based on ***interest***. All social life experience shows how much more effective is the activity to which a person has an interest.

In psychology, interest is interpreted in different ways. In one case, it is not separable from knowledge. "Interest – is a need-based attitude or a motivational state that encourages cognitive activity that unfolds primarily in the internal plane."[1] One can easily guess the "primary sources" of this definition, which reflects interest as the most important condition for scientific research. Other psychologists limit the connection of interest not with cognitive activity as a whole, but with the study and knowledge of its goals and conditions. According to A. Maklakov: "Interest is a specific form of manifestation of cognitive needs, which ensures the orientation of the individual towards the realization of the goals of the activity and thereby contributes to the orientation of the personality in the surrounding reality."[2] Nevertheless, we are closer to the position expressed in the "Big Modern Encyclopedia" edited by E.S. Rapatsevich: "Interest is an active cognitive orientation of a person towards a particular subject or phenomenon of reality, usually associated with a positive emotionally colored attitude to cognition of an object or mastering one or another activity."[3]

So, we emphasize that interest is, first of all, the personal, emotional attitude of a person to a particular activity, to a particular subject. On the one hand, it acts as one

[1]Great psychological dictionary. – 4th ed., Extended / Com. and ed. B.G. Meshcheryakov, V.P. Zinchenko. – M.: AST: AST MOSCOW; SPb.: Prime-EUROSNAK, 2009, P. 247.

[2]Maklakov A.G. General Psychology. — SPb.: Peter, 2001, P. 511.

[3]Pedagogy. Big modern encyclopedia. / Comp. E.S, Rapatsevich – Minsk.: "The Modern Word", 2005, P.208.

of the properties that determine the orientation of the personality.[4] And then interest guides a person in the complex maze of life and selectively promotes his activities. On the other hand, it is also capable of being generated by external determinants. The activity started for various reasons can cause a person to have the most vivid emotional response, turn into a persistent interest that will actively contribute to solving problems that arise. But in any case, interest is based on human needs. The latter are the engines of human behavior and activity. It is the needs in their totality that should be taken into account in the organization of musical training based on the MCT, and their upbringing becomes its main task. What are these needs?

First of all, you need to point out the genetically preserved need for creativity. At all times, it aroused genuine interest in people. However, practice has shown that the attitude towards it in educational musical institutions is far from simple. On the one hand, both in the program documents of music schools and in the representations of the overwhelming majority of teachers, creativity is considered the most important reference point in learning. This aspiration can be traced even among the most orthodox teachers who focus on the mastery of the purely technological side of performance. Scrupulously engaged in the technical equipment of the musician, nevertheless, they emphasize the importance of creativity, strengthen the conviction in students mind that it is essential and necessary to be included in educational activities, but, just ... at later stages of instrumentalist education.

On the other hand, in the real educational process, the creative development of young musicians is clearly impaired. Contrary to the widespread principle in the theory of musical pedagogy, the principle of "unity of technical and artistic development with leading artistic", in pedagogical practice it becomes a kind of abstraction, a beautiful slogan that everyone agrees with, but few people fulfill. Someone leaves their creative activity "for later" when the basic technical skills have already been formed, someone believes that the main thing is to play well what is written in the notes, and leave all kinds of creative fantasies to the share of "great performers".

The lack of creativity in music education is emphasized by the content and logic of the educational process. Creative types of activity, such as composition, improvisation are present in training extremely occasionally and most often in the case when, for example, in a school for children, there is a student whose specific talent is manifested in a tendency to composition. And the creative element in performance is supplanted by the exorbitantly high "pre-professional" requirements imposed on students and their teachers today. This involuntarily provokes, in the name of fulfilling these very requirements, a reproductive type of training.

[4]The focus of the personality is understood as a stable system of motives that determine the activity of the personality and the selectivity of their relationship to reality, the features of human behavior and activity, regardless of the conditions of this (present) social environment (current situation). Psychology: textbook for university students; under the editorship of E.I. Rogova. — M.: Humanities, ed. Center VLADOS, 2005, P.160.

The aforesaid allows us to conclude: the creative development of students is not only not a priority, but is also shifted to secondary positions in the overall learning process. It becomes not a special purpose of the educational process, but a concomitant element that has little effect on its effectiveness.

Nevertheless, contrary to practice, it is creativity that is considered to be decisive in assessing the attractiveness of musical activities. According to many performance theorists, methodologists, its activation in the most positive way will affect the work of, say, Children's Art School, fill the learning process with life-giving juices, and make classes attractive and desirable.

At the same time, the picture so joyful for the heart of every musician is often overshadowed by harsh study practice. Experienced teachers are well aware of how difficult the process of introducing children to creativity can be. For some students, this is a journey into the fascinating world of musical images, amazing emotions and mesmerizing beauty of sounds. For others, there are clumsy attempts to "find something without knowing what." And the zeal often shown by them does not at all justify the hope, which, however, is understandable. But then, inevitably, the "seditious" assumption arises: will the total movement towards creativity turn out to be just as a difficult obstacle for students in music schools, like the recently introduced pre-professional programs? Could the appeal of creativity serve as a reason for its absolutization in the theory of musical pedagogy?

We are talking about the "burning eyes" of students aspiring to creativity. But for children who are just starting to study at a music school and have not yet been involved in this "magical" activity, their eyes also very often "burn" and they do it with pleasure. This suggests that creativity is not the only stimulator of learning activities. Say, some young musicians are delighted to be attached to such a "reproductive" occupation as "playing by ear". And what power is pushing young pianists, violinists, to learn how they like a piece of music, even if it presents them with considerable difficulty?

All this testifies to the fact that in music studies more than one creativity possesses attractive power. So, there are other ways to make them desirable. There are many similar tricks, and they are true not only for music schools. The most popular in this regard is the theory of the American psychologist Abraham Maslow, who compiled a hierarchy of needs. It includes: self-realization, cognitive and aesthetic needs, the need for respect, the need for attachment, the need for security, physiological needs. We mention only a few of them that are closest to the problems of musical instruction. These are groups of social, prestigious and spiritual needs.

Among social needs – first of all, participation in activities and joint activities. Visiting a music school, teaching in a classroom with a teacher, participating in a choir, orchestra, ensemble is far from a complete list of classes in which the need of a young musician may manifest.

Critical needs for the student are **prestigious needs**. These include self-esteem, respect from others, recognition of the teacher, school students, spectators, and finally society. Extremely high need for success, high appreciation (enthusiastic applause, universal approval and recognition of their work).

Finally – spiritual needs. They are largely related to the self-realization of man. This is a consistent desire for self-improvement and self-development, for cognition, a keen perception of works of art, a desire for creativity, for the upbringing and satisfaction of a sense of beauty, self-development through creativity.

Based on all these needs, interest is formed – one of the most important conditions for the effectiveness of any activity. Social, prestigious, spiritual needs provide tremendous opportunities for organizing highly effective interest-based learning in music schools. Moreover, attracting various needs as basic expands the possibilities of the educational process, opens up new horizons in the formation of a musician

Scientific research in this area promises very attractive prospects for musical pedagogy and makes up its far from used reserve. However, the purpose of this article does not include a detailed study of the above problems. Therefore, we will touch on the circumstances regarding the formation of interest in MCT based on the generated interest.

So, a motive cannot be formed from without. It is formed only when external circumstances acquire **personal meaning** for a person. These, sometimes numerous, circumstances, in fact, are various motivators that can cover all aspects of the future motive. And since the motive is a multi-component psychological formation, the subject must build it. ... "It is impossible to *form motives* from the outside in the process of upbringing, which many teachers rely on. You can only contribute to this process. ... Therefore, *motives are formed not from the outside, but by motivators.*[5]

In relation to training, motivators can be created in two ways: the first is the influence of the teacher within the educational work, and, second, the special organization of the educational process, which includes its participants in the necessary activities. Its conditions can also serve as motivators. To some extent, these two paths are described by A.K. Markova, who studied the formation of learning motivation at school age. The meaning of the first "consists in instilling in schoolchildren ideals, examples of what the motives of teaching should be". The second

[5]E. Ilyin identifies the following groups of motivators:
« — moral control (the presence of moral principles),
— preferences (interests, inclinations),
— external situation,
— own capabilities (knowledge, skills, qualities),
— own state at the moment,
— conditions for achieving the goal (effort and time),
— the consequences of their action, deed. " Ilyin E.P. Motivation and motives. – SPb: Peter, 2000, P. 86.

way is "that the child is included by adults in various real activities and thus gains practical experience of moral behavior."[6]

The first way - is fully linked with the concept of E. Ilyin on the external second-signal impact on the motivational process. Outwardly organized motivation involves the influence on the subject by another person or the media, etc. In our case, this is the influence of the teacher on the student. It is able to strengthen the motivational process, weaken it, and even stop.

The motivators that serve as the basis for educational work are the essence of external second-signal stimuli. They “may take the form of a request, a demand, advice, suggestion, a hint, etc., and take on the nature of informing, instructing, stimulating and prohibiting (interdition)”.[7] In turn, they are divided into two types: non-imperative and imperative direct forms of the external organization of the motivational process. The former include: request, suggestion (advice) and persuasion; the latter include orders, demands and coercion. E. Ilyin, in his monograph, gives detailed explanations of each type of impact, notes the conditions and features of their application. This material is of lasting value for practical pedagogy, and we refer the reader to it.

It should be noted that all these forms of influence, of course, are widely used in the educational activities of any educational institution. But are they always effective? Why, in one case, requests, beliefs, requirements achieve the desired result, and in the other not?

Much here is determined by the personality characteristics of the student and teacher, as well as the circumstances surrounding them. Educational work is the interaction of its participants. Here, such qualities of the learner’s personality as principle, suggestibility, level of conformity, etc. are very important. Therefore, the similar requirements presented, instructions can have completely different consequences depending on the individual characteristics of the subjects. For the effectiveness of the impact it is necessary to take into account the state in which they are: anxiety, apathy, fatigue, fear ... (E. Ilyin).

In addition, the susceptibility to various influences of the pupil is influenced by his *motivational sphere*, the level of formation of various motives, its components. In the absence of entrenched behavioral attitudes, a person is more susceptible to influences from outside. In particular, E. Ilyin cites an example when a student who does not have genuine, established beliefs, but "not used to obeying discipline, getting into a disciplined class, corrects his behavior, obeying the requirements of the collective."[8] Low degree of human awareness also facilitates external exposure.

[6]Markova A.K. Formation of motivation for learning at school age: A manual for teachers. – M., Enlightenment, 1983, P. 46.

[7]lyin E.P. Motivation and motives. – SPb., “Peter”, 2000, P. 89.

[8]Ilyin E.P. Motivation and motives. – St. SPb: "Peter", 2000, P. 259.

M. Olehnovich points to several factors that determine the effectiveness of external influences. The more options the student has for solving the problem, the less he takes the influence of the teacher. But the complexity of the tasks that arose, its creative nature, a high degree of uncertainty contributes to the greater impact of external factors, including the influence of the teacher, on the motivation process.[9]

The complexity of the pedagogical impact is growing immeasurably when we are dealing not with motivation, but ***with a change in already formed motives***. Here the usual tricks, most likely, will not have the desired effect. Moreover, any requests will be ignored, and instructions, orders - run up against resistance, the activity of which will extend from polite rejection to various forms of opposition. Here it is necessary not to "tweak" the motive, but to form a new one, starting from the very beginning.

Naturally, the effectiveness of motivation depends on another participant in the educational process - the teacher. If the teacher enjoys the respect of the student, his trust, backed by high personal qualities, the effectiveness of the work, then every word, remark will be taken very seriously by the vocalist and have a powerful effect on motivation. The credibility of a teacher is a prerequisite for training a vocalist. This is especially important with individual training.

The power of influence can increase with the help of the teacher's teaching technique. It is based on ***a deep study and understanding of the learner's personality and the ability to convince***. Each musician is a person with his own individual individual of character, worldview, ideas about his profession. Each has its own motivational sphere, which is much more difficult to act on than to form a motive. Therefore, to achieve educational goals, the teacher must have an idea of how the motive is formed, what is the motivational sphere of the ward, his character traits, his strengths and weaknesses. He is obliged to find those strings of "soul" that are best acted upon. An experienced teacher does not go into a "frontal attack" for an immediate change in the student's behavior or his attitude to classes, to completing the assignment. On the contrary, he relies on the student already has ideas so as not to cause rejection of his actions. And only having prepared the ground, does he introduce the necessary information into the consciousness.

If necessary, the teacher uses collective influence. With the help of other students, he creates the corresponding "public opinion", which will also act as a motivator. To this end, he organizes meetings with students of his class, where in the conditions of multilateral interaction he conducts educational work, initiates joint visits to concerts, followed by discussion of what he has heard. Arranges concerts of students of his class, after which, on a favorable emotional background, he will form motivational attitudes.

His pedagogical technique will also be manifested in communication skills. How well he will manage to create a friendly atmosphere of confidential communication, how easily and freely the student will feel with the teacher. A lot depends

[9]See. Olehnovich M.O. Hypothesis in the conditions of imposition. Ananiev readings – 99. Theses of the scientific-practical conference. SPb, 1999.

on the ability to clearly, logically, and therefore convincingly express oneself, state one's thoughts, requests, instructions, beliefs, use arguments, etc. Not the last role in this is played by the emotionality of the statement, which is able to "infect" the student, activate his imagination, and the desire to achieve certain goals.

Undoubtedly, a reasonable role of the teacher, discipline, clarity of instructions, and established control over the fulfillment of a given task have a significant role in the formation of motives. Ultimately, the educational impact of the mentor, acting in the form of various motivators, will have to turn into the personal beliefs of the vocalist and form the appropriate motives.

The second way to form the necessary motives – is a *special organization of the educational process*. Its advantage is that the student is actively "included" in educational activities, subject to its requirements. In turn, this inclusion contributes to the formation of a personal attitude to the relevant sides of the educational process. A training program, requirements for a musician, a system for monitoring the assimilation of knowledge and the development of skills, the organization of performing activities – all these are motivators.

In the same direction, the factor of including the young musician in the corresponding activity must be taken into account. Who was the first in the conservatories to master music editors, without waiting for the introduction of computer science courses in educational institutions? Of course, these were composers. And they did this not because they somehow "loved" MCT in a special way, but because music editors made their work easier. Composers now have the opportunity, by reducing time to perform various routine mechanical operations, to increase the time for creative activity.

Consequently, after the formation of the need for composer activity, for playing music, for performing activity, including solo and ensemble performances, corresponding motivators can naturally be formed, on the basis of which motives will be formed that provide MCT mastery activities.

Another part of the MCT, created by programmers, may concern new approaches to traditional musical pedagogy, which are essentially innovative for solving problems of musical education. In such a situation, the mastery of the MCT should be preceded by activities aimed at the development and mastering of such technologies. It should be noted that the task is an exceptional difficulty. Its solution will require the joint efforts of musicians, teachers, psychologists, and sociologists.

Naturally, the departure from traditional programs and teaching methods is a rather complicated phenomenon, not only in terms of execution technique, but also because of the stubborn rejection of innovations in musical art, which has a thousand-year history and strong traditions. Not to lose the value that has been accumulated over the centuries, and at the same time to take advantage of the capabilities of MCT - becomes the most urgent task of modern musical pedagogy.

V.G. Belinsky关于家庭教育(1811-1848)

V.G. BELINSKY ABOUT FAMILY EDUCATION (1811–1848)

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抽象。 本文介绍了俄罗斯哲学家V.G. Belinskiy在1811-1848年接受家庭教育； 个人发展的早期阶段； 家庭成员之间关系的质量及其必要的属性； 父母与子女之间的道德和道德关系是成功和生产性教育手段的基础。

关键词：早期个人发展，家庭教育，儿童，家庭，道德和伦理关系，家庭关系，精神发展，意识，道德，贝林斯基。

Abstract. *This article presents the views of Russian philosopher V.G. Belinskiy on family education in 1811-1848; the early stages of personal development; the qualities of relations among family members and their necessary attributes; moral and ethical relations between parents and their children as the ground of successful and productive means of education.*

Key words: *early personal development, family education, child, family, moral and ethical relations, family relations, spiritual development, awareness, moral, V. Belinsky.*

In the XIX century the most progressive ideas in education were developed in Russian pedagogical science. In this period the Russian educational system desperately needed some changes. It can be explained by the evolution of society and its demands to decrease the level of illiteracy among the Russian people and the necessity to develop primary education in the Russian Empire. So, in the second quarter of the XIX century the theory of early educational system was elaborating at quick pace.

At the same time, active disputes about goals, principles, and objectives of family education took place in the society. They showed differences between pro-West activists and Slavophiles, whose influence at the time penetrated all spheres

of social knowledge and philosophical thoughts, including family education and the ideology of the family institution.

The main point of the disagreement was the following. Slavophiles as opposite to Westernizers exclaimed that Russia had its original way of development in history and Russian culture required understanding through Byzantium religious heritage. Slavophiles rejected Western culture as useless and malefic one.

Vissarion Belinsky, the Russian publicist and philosopher, was a supporter of Westernizers, so child-parental relations and their issues he studied from their perspective. His model of family education based on humanism, an idea of freedom, denial all sorts of cruel methods of pressure as punishments, coercion, and severity. Also, he was determined that good relations among family members, genuine concern and infinite love are fundamental aspects of family education [1, c. 80].

The concept of upbringing «*a great human being*» is one of the core pedagogical ideas which Bilinskiy's considered as the most important in children's educational process. He was sure that a «great human being» is «…a reasonable and self- conscious person, a mechanism of existence…» [2, c. 298], in other words, the heart of human ideology.

The most important part in the educational process of a child, in Belinsky's point of view, is fostering a love for the country through dialogues with a kid, reading folk tales and children's books about native land, the country, in general, and about the lifestyle of Russian people [3, c. 542-543].

Despite the progressiveness of Belinsky's methods of education, they were not welcomed by the majority of his contemporaries for their democratic and even feminist contents which were too progressive for that period when a public way of thinking was still under the influence of conservatism [4, c. 364].

Bilinsky's pedagogical ideas were widely presented in his literary works. Among them, we can distinguish reviews of two tales by E. Hoffmann and «Tales of old Irenaios» [1, c. 80].

Also, pedagogical issues and the principles of upbringing are discussed in following works by Belinsky:

- An Article "A discourse. Good Education is the most Necessary thing for Young People "(1929), indicates the importance of family education for a young person who is born without ideas and values, but is curious enough to long cognition and to absorb the fundamental moral values introduced to him in the process of education;
- V.P. Buryanova 's "Library of Children 's stories and tales" review published in 1838 highlights the importance of the social environment in the early period of human education and its role in becoming a human being: «good or naughty» [5, c. 9, 10].

A play «Dmitry Kalinin» (1830) exposes the lack of moral principles in the educational process in peasant families.

V. Burnashov 's work review «Children 's Book for 1835» reveals all positive sides of the book: the author's attention to the moral and ethical problem of child-parental relations, to the importance of personal example in the educational process; how the author writes about love for pure kindness in human's character [5, c. 39].

In his works Vissarion Belinsky raised the problem of family education, expanding the child-parental relation model. In his article «A few words about upbringing and children's book» (1840), which is still up-to-date, the author found the perfect way to balance social and family influence where the society would bring a child up as a patriot and decent citizen and the family would be responsible for the moral aspects of a child's character [2, c.295].

According to Belinsky, the main goal of family education is to develop a sense of humaneness in a child [4, c. 93] and to raise him through its principals. In addition, he indicated parenthood as the basic element of the child's future [2, c.295].

Criticizing the common approach to the family education in various strata of the population, Belinsky drew attention to the fact that most parents loved their children instinctively since the moment they gave them birth [6, c. 261-272].

The author believes that the main aspects of the earliest period of character building are the following: infinite parental love and its spiritual and moral foundation; the attention to a child's natural particularities and parental responsibility for providing a decent future for a child according to his character. There are some key elements to build healthy relationships in a family such as the friendly atmosphere, the relations based on trust and respect for each other. Parents have to be very responsive to inner world of their child and quite considerate in the period of the first stages of a child's development, supervising him step by step in the way to adulthood.

A.A Gagaev and P.A Gagaev [7, c. 18] who analyzed several of Belinsky's works, said that the philosopher considered love as the foundation of a child's personality and related it to moral category which takes its roots from feelings and emotions.

Belinsky emphasized that parents can instill a sense of humanism to their child only through their example of love [8, c. 16].

In this way, the pure love of parents for their children was the most vital aspect of family education before, and nowadays the situation is the same. The upbringing of responsible and reasonable new generation which could be managed to make their own decisions is the main purpose of our society and the government.

So, as a result, parents are in charge of their child upbringing and it is the key value of family education. When we talk about pure love of parents for their children, we mean that parents are quite mindful about every decision they make in a process of their child's education, they are completely sure in every step they make for child's sake, considering his specific natural qualities.

As we can see, today the problem of parent's responsibility is rather relevant, because the number of orphans and children who suffer from lack of parental care in Russia is still very high.

Belinsky believed that another fundamental aspect of «child-parental» relation it is the atmosphere of trust because, in this case, a child could address any questions to his parents and always count for the help [2, c.292].

Moreover, Belinsky highlights that the positive example of parents' behavior is much better than monotonous sermons and punishments [2, c. 294].

The author was determined that the respectful attitude towards parents always comes from love, support, and help, the things that every parent should give to his child. [2, c. 293].

In one of his books, talking about the importance of developing child's potential, Belinsky compared a parent with a gardener, and a child with a seed [9, c. 83].

Another fundamental idea of the family education process is Belinsky's point of view on the early ages of a child when «The open soul of an infant... is a pure stream, reflecting a clear, cloudless sky...» [2, c. 293]. In this period, parents should treat their child carefully, be attentive to his inner world and particularities of this early development period and help him in every stage of his growing up time. The author compared the maturing period of human beings with harmonic development of nature, and emphasized that the speed-up of the growing up process of a baby can have negative consequences and defined such approach of parents and teachers as defilement [2, c. 299].

Belinsky had an argument with English philosopher and Professor John Locke whose statements used to be quite popular and some of these theses are still rather worth the attention. Unlike Locke, who compares all children with a blank paper, Belinsky was determined that every child is an individual who has unique abilities and innate talents, which should be revealed, developed and take into account in every specific phase of the growing up period [2, c. 297].

According to the philosopher, the basic principles of the upbringing of a child are the following: traditional family values and trusting and loving relations among members of the family, which parents have to maintain [10, c.10]. It helps to develop properly a young human being, to teach him to be sensitive to people around, to have sympathy and to be merciful towards everyone, to be respectful person, to feel sincere joy for other people's success, to be enough strong to forgive, to be wise in difficult situations and to have skills to analyze reasons and consequences of actions.

In the XIX century, Belinsky's views on family education had a significant influence on the pedagogical process and made contributions to the education of a new generation of teachers. Moreover, his new approach to parenting, his special attention to such qualities as patriotism and humanism in child's education, helped to find solutions to some serious pedagogical issues, as a result, to reconsider child-parental relations in crises of the family institution. All his ideas are still relevant in the situation when the state standard requires professionals working in a field of education to have special skills in socializing children in small groups on classical principals of family education [13, c. 209].

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开展课外活动以防止艾滋病毒/艾滋病在学生社区中传播的经验
EXPERIENCE IN IMPLEMENTING EXTRACURRICULAR ACTIVITIES TO PREVENT THE SPREAD OF HIV/AIDS IN THE STUDENT COMMUNITY

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December 1 is declared World AIDS Day by resolution of the UN. On this day, millions of people come together to confirm their willingness to take preventive measures and discuss the progress made in countering the spread of the disease.

HIV remains one of the main problems of global public health: today it has claimed more than 32 million human lives. In 2018, 770,000 people died from HIV-related causes worldwide [1].

The Sixty-ninth World Health Assembly endorsed the new Global Health Sector Strategy for the Elimination of HIV 2016–2021. The strategy includes five strategic directions that countries and WHO should guide in their priority actions over the next six years. One of the strategic directions is information for targeted actions (understanding the scale of the epidemic and combating it).

In addition, the Global AIDS Epidemic Monitoring 2019 document outlines the commitment to "Provide 90% of youth with the knowledge, skills and abilities needed to protect themselves from HIV infection, as well as access to sexual and reproductive health services until 2020," to reduce the number of new HIV infections among adolescent girls and young women to less than 100,000 per year "[2].

World AIDS Day provides a serious opportunity to increase public awareness of the problem of HIV/AIDS, the dissemination of preventive information in community groups, and to combat discrimination. It is extremely important here that the protection of human rights is a fundamental requirement for responding to the solution of a global problem, in which many opportunities for joint actions and efforts can affect the changing situation.

Extracurricular activities timed to World AIDS Day are held every year at the Institute of Education of the Immanuel Kant Baltic Federal University. They are held jointly with the Center for the Prevention and Control of AIDS and Infectious Diseases of the Infectious Diseases Hospital of the Kaliningrad Oblast, and perform two key functions: information and education.

The information function is the provision of complete reliable information on the prevention, diagnosis, treatment and rehabilitation of HIV/AIDS to a student audience (the work of an information tent, conducting an online flash mob #СТОПВИЧСПИД).

Participants of such extracurricular activities are:

- representatives of executive authorities (Agency for Youth Affairs of the Kaliningrad Oblast);
- media representatives;
- representatives of public and non-profit organizations
- and student associations (Youth All-Russian public organization «Russian student brigades», volunteer organizations, etc.);
- representatives of the educational organization of higher education (Institute of Education of the Immanuel Kant Baltic Federal University).

Activities in this area are organized as follows. During the operation of the information tent, music plays. Every half hour next to the information tent there are performances by creative teams and individual performers of the university, city or region. After each show segment, volunteers conduct individual quizzes in the form of a quiz.

with the gathered participants of the event.

The quiz consists of HIV prevention questions,

for correct answers, the participant can receive souvenirs. If the participant makes mistakes during the quiz, he can apply to an interactive panel (TV or laptop, where a presentation on a relevant topic can be played), where a presentation about HIV is shown, or to a consultant for additional information, after which a participant can again answer the quiz questions.

Within the framework of the Internet flash mob, a participant in events can download a thematic poster from the site stopwich speed.rf, take a photo with a poster in his hands and publish it on any social network using the hashtags #СтопВИЧСПИД and #СдайТестНаВИЧ.

Event photos and videos are published in thematic communities of social networks.

The educational function includes a roundtable discussion on the topic “Information. Fundraising. Motivation ”, foresight session“ Stop HIV: what needs to be done? ”, Educational quest.

In the framework of the foresight session “Stop HIV: what needs to be done?” Representatives of student associations are developing proposals for an action plan to prevent the spread of HIV in the student community. The foresight session is held with the participation of experts in the field of HIV prevention, implementing projects in the field of preventing the spread of HIV and supporting people with the status of HIV-positive.

Based on the results of the measures taken, a report is compiled, a sample of which is presented in Appendix 1.

All ongoing activities are in line with the proposed indicators for monitoring the implementation of the United Nations Political Declaration on combating the AIDS Epidemic [2], where young people aged 15-24 appear in a separate group.

This indicator is based on the answers to the following set of questions:

1. Is it possible to reduce the risk of HIV transmission by having sex with only one non-infected partner who has no other partners?

2. Is it possible to reduce the risk of HIV infection by using a condom every time they have sex?

3. Can a healthy-looking person have HIV?

4. Is it possible to get HIV through a mosquito bite??

5. Can I get infected with HIV if I eat with a person who is HIV positive??

This indicator is especially important because it makes it easy to track how much this knowledge improves over time. At the same time, this indicator plays an important role, since it can be used to test how successfully it is possible to maintain existing knowledge at a high level [4]. Therefore, such events should be carried out on a regular basis.

In conclusion, we note that HIV/AIDS awareness and education activities in educational institutions should be based on certain principles: adequacy, tolerance, reliability, prevention of manipulation of information, non-harm, consent to receive preventive information, neutrality in reporting information, multidimensionality, objectivity [3].

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Appendix 1

Sample report on the implementation of measures to prevent the spread of HIV/AIDS in the student community

The name of a department of a university

Information about the employee responsible for the implementation of activities

№	Full name of employee	Contact number	E-mail address

Information on events held

№	Name of event	Format (1 - round table; 2 - foresight session; 3 - information tent 4 - other)	the date of the event (in the format xx.xx.xxxx)	Location	Level (1 - municipal, 2 - regional, 3 - all-Russian, 4 - international)	Number of participants	Links to news publications on the Internet and social networks

Event Partner Information

№	Name of company	Type of organization (1 - public organization; 2 - AIDS Center; 3 - health care institution; 4 - the Ministry of Internal Affairs; 5 - commercial organization; 6 - educational organization of secondary education; 7 - educational organization of secondary vocational education; 9 - educational organization of higher professional education 10 - executive authority)

旅游反恐保护
ANTI-TERRORIST PROTECTION OF TOURISM

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抽象。利用技术进步和移民流动的现代恐怖主义已设法达到全球范围。它正在摧毁和残害无辜的人民，并在社会上散布恐惧，它正试图影响当局以实现其要求。旅游业以其恐怖袭击的规模和简单性正成为恐怖分子特别有吸引力的目标。

俄罗斯通过使用专门机构和执法机构，成功地实施了全国反恐计划。但是，反恐斗争的成功在很大程度上取决于公民的活动。大学毕业生在其中起着重要作用，他们担任经理和专家职务，以非军事方式为旅游业提供保护。

本文确定了恐怖主义对旅游业的负面影响的性质，并研究了大学毕业生准备通过非军事手段独立确保旅游设施安全的意愿。

关键词：恐怖主义对旅游业的影响，反恐培训水平，非军事反恐经验，确保设施安全，保护游客。

Abstract. *Modern terrorism, using technological advances and migration flows, has managed to reach global proportions. Destroying and crippling innocent people and spreading fear in society, it is trying to influence the authorities in order to fulfill its demands. Tourism is becoming a particularly attractive target for terrorists with its scale and simplicity of terrorist attacks.*

Russia successfully implements a nationwide counter-terrorism program through the use of special bodies and law enforcement agencies. However, the success of the anti-terrorist struggle largely depends on the activity of citizens. An important role in this is played by university graduates, who, while in the positions of managers and specialists, provide protection for the tourism industry in non-military ways.

This article determines the nature of the negative impact of terrorism on tourism and studies the readiness of university graduates to independently ensure the safety of tourist facilities by non-military means.

Keywords: *the impact of terrorism on tourism, the level of anti-terrorism training, the experience of non-military counter-terrorism, ensuring the safety of facilities, the protection of tourists.*

Introduction

In a message from President Putin V.V. to the Russian Parliament it was noted that "modern conditions provide ample opportunities for the spread of terrorism and make it difficult to control its international organizations [2, p.5]. In its scale, inhumanity and cruelty, terrorism is a global problem ", which requires indispensable resolution" [1, p. 3].

The relevance of this article is due to: an increase in the number of victims and destruction caused by terrorists in the tourism sector; the need to increase the role of university graduates in the fight against its manifestations and the desire to increase the effectiveness of prevention and counter-terrorism by non-military means through civil resistance.

The aim of the work is: on the basis of a study of student training and the practice of graduates to determine their readiness to counter terrorism in the positions of leaders and specialists in the tourism sector.

Based on this, the article attempts to solve the following problems: analyze the impact of terrorism on modern tourism; identify the limitations of preparing students for the prevention of criminal attacks; substantiate the ways of effective formation of graduates' readiness to counter terrorism by non-military means.

The object of the article is anti-terrorism protection in the field of tourism industry. The subject of the study – the formation of the readiness of graduates to counter the manifestations of terrorism in the professional sphere.

The scientific novelty of the article lies in the results of the analysis of the terrorist influence on tourism, in identifying limitations in the anti-terrorist training of students, in substantiating recommendations for improving the preparation of graduates for the prevention and combating terrorism of non-military means.

The applied value of the article is the possibility of using the materials presented in the process of studying and teaching anti-terrorism disciplines and in shaping the readiness of graduates to counter terrorism.

The impact of terrorism on tourism

For a long time it was believed that terrorism does not pose a threat to tourism, since it is aimed at achieving mass casualties, causing the greatest material damage, minimizing the costs of preparing a terrorist attack, spreading panic in many countries and putting pressure on their governments.

Small tourist flows of the last century did not meet the listed conditions [4, p. 3] and did not intensify terrorist aggression. But at the turn of the 20th - 21st

centuries, changes took place that made tourism attractive to terrorists due to its mass character, internationalism, progressive influence, the ability to influence the income of host countries, change tourist flows and spread panic around the world. These conditions were exacerbated by the lack of reliable security and the simplicity of terrorist attacks against travelers.

Analysis of statistics shows that the total share of victims among tourists is 1.5 - 2.0% of the total number of victims at the hands of terrorists [6, p. 4]. However, the terrorist influence in this area turned out to be rather painful [5, p. 3], since even minor terrorist attacks contributed to the rapid spread of panic and made it possible for them to dictate demands to the governments of many countries. This shows not so much the active as the passive influence of terrorism, when the result "arises not in the process of a terrorist attack, but in the course of disseminating information about it" [7, p. 415].

The passive influence of terrorism is demonstrated even by minor terrorist attacks. For example, against Israeli citizens in Mombasa (Kenya 2004-2006), in Djerba (Tunisia 2012-2014); Basque protests in Spain (2010 - 2017); Kurdish attacks on tourists in Turkey (2008 - 2013); demonstrations against American travelers in Bali (Indonesia 2002-2016).

The analysis shows that features of modern terrorism are robbery of tourists through piracy, smuggling, hostage trafficking, charging for "patronage", speculating in drugs and weapons, prostitution, price inflation, supporting the attractiveness of some countries and isolating others.

Terrorism in the sphere of spiritual culture, aimed at the destruction of world cultural monuments, historical values and beliefs, leading to a reduction in tourist flows, poses a huge danger. Only in 2015, Palestinian shelling of Israel reduced tourism by 4%; the destruction by the militants of the monuments of ancient architecture brought to naught cognitive tourism in Syria; the explosion of the Russian flight over the Sinai Peninsula reduced visits to Egyptian resorts by 13.4%; the terrorist attack in Suruc and the killing of the Russian ambassador reduced Turkey's tourist attractiveness by another 13.8%. A total statistical analysis showed that the terrorist attacks of 2018 reduced the total number of tourists in popular resorts by 33.8% [6, p. 5], which negatively affected not only the prestige of the host countries, but also the state of their economies.

After the attacks of 2015 - 2018 in Israel, Egypt, Turkey and Tunisia, the contribution of the tourism industry to the gross domestic product (GDP) of these countries decreased by 2–3%. Even in prosperous France, the contribution of tourism to GDP fell from 2.9% to 1.1%. As a result, the affected countries were forced to urgently invest significant funds to restore their tourist attractiveness.

Long-term observations show that terrorist attacks do not lead to the death of the tourism industry, but only reduce the flow of travelers to dangerous ar-

eas [7, p. 3]. This situation causes the so-called “compensation effect”, which is expressed in the fact that the tourist flow to the regions subjected to a one-time terrorist attack decreases for several months, and then quickly recovers. If the attacks become permanent, then the recovery is delayed until order is restored in the problem area. And tourists refuse to visit them and change their travel routes for a long time [10. c. 5].

Based on the foregoing, it can be argued that the impact of terrorism on tourism is negative, reducing or changing travel directions. Tourists are forced to become more choosy in choosing places to stay, to be more careful and vigilant. The same circumstances place increased demands on the training of managers and specialists in the tourism industry.

Study on the readiness of university graduates to counter terrorist threats

In accordance with the Federal Law "on Countering Terrorism ", the main functions of the fight against it are assigned to the army, special bodies and law enforcement agencies, counter-terrorism committees and operational headquarters. However, a significant role in the prevention of terrorism, the President noted, is assigned to civil society and its members [3, p. 3]. In this regard, it is difficult to overestimate the activities of university graduates in the prevention and combating of terrorist acts.

In 2018, on the basis of the A.N. Kosygin Russian State University and the Russian Open Academy of Transport (ROAT) a study of students' public opinion on terrorism and the readiness of graduates to counter it was conducted. The objectives of the study were: to identify the level of students' knowledge about the origin, nature and criminal character of terrorist activities; analysis of the compliance of curricula with the needs of anti-terrorist training, generalization of best practices and the discovery of deficiencies in training, substantiation of proposals for overcoming them and increasing the readiness of graduates to counter terrorist attacks.

The object of the study was the students' perception of terrorism as a phenomenon that negatively affects the life and work of the state and society and the need to combat it. The subject determined the level of training and the degree of readiness of graduates of humanitarian and technical universities to counter terrorism by non-military means.

The hypothesis was that, despite the fairly high awareness of modern students, their perception of the terrorist threat still does not correspond to the real level of danger. Overcoming shortcomings in the system of anti-terrorist education and upbringing in higher education will significantly increase the degree of readiness of graduates to improve the quality of prevention, counteraction and elimination of the consequences of terrorist threats.

The respondents were students of technical and humanitarian universities of part-time and correspondence courses, with experience in the specialty. An array of respondents was investigated in the amount of 212 people. (104 - ROAT and 108 - RSU). Because of this, the results of the study can be considered sociologically significant.

The main research methods were observation, interviewing, questioning, testing and solving situational problems. Tools used:

- conducting control tests on students' awareness of the origin and essence of modern terrorism;
- verification of quantitative and qualitative indicators of ongoing anti-terrorism training sessions;
- interviewing on technical issues of anti-terrorist protection of objects, assessment of its condition and opportunities for strengthening;
- survey of respondents to determine the degree of activity of the anti-terrorist position of graduates;
- solving situational tasks on the problems of preventing and countering terrorist threats;
- written work revealing the conviction of graduates in the inevitable victory over terrorism.

The study allowed to determine the following

1. Control testing on the origin, nature, concepts and consequences of modern terrorism.

- only 17% of students were able to reveal the essence and basic concepts related to terrorism as a dangerous international crime;
- 83% of the tested could not give the correct definitions of the concepts of “terror”, “terrorism”, “extremism”, “terrorist threat”, “terrorist act”;
- 22% of those tested could recall from two to three terrorist acts, 5% named from 4 to 5, more than 5 attacks could not be remembered by anyone;
- control testing showed a general assessment of the knowledge of RSU students - 2.95, ROAT - 3.05 points. The average score is 3 points out of 5 possible. Low results were demonstrated by the superficial knowledge of students on the problems of terrorism. 89% of students said that university programs pay insufficient attention to anti-terrorist training of students.

2. Verification of quantitative and qualitative indicators of ongoing anti-terrorism training classes at the university and at the place of work.

- 93% of respondents showed that for the entire period of study at the university there was no academic discipline aimed at studying terrorism and combating it. Only in the study of individual disciplines some issues of countering terrorism were indirectly touched upon;

★ verification of educational and methodological documents showed that until 2018, the curricula of universities did not provide for the study of anti-terrorism disciplines;

★ 85% of correspondence and evening students have shown that they are not instructed in the workplace on counterterrorism issues;

★ 55% of students confirmed that briefings are replaced by placement of printed materials at workplaces that reveal the staff's actions in the event of terrorist threats.

3. Interviews on technical issues of anti-terrorism security of production facilities at the place of work and assessment of its condition.

• 51% of respondents consider the level of security weak, making it easy to carry out a terrorist attack, 41% described it as completely surmountable, 8% found it reliable (banks, credit organizations, authorities);

• on issues of equipping workplaces with special means of technical control and notification, 57% of working students confirmed the presence of a framework at the entrance and a panic button on the watch. 43% of the tested stated that there were no means of warning and protection at the place of work;

• Students expressed particular concern about the inadequate protection of university premises. More than 90% believe that an explosive device or small arms can be freely carried into a university;

• ROAT consider called the most likely targets of terrorist attacks to be stations, locomotive depots, rolling stock, lines between stations, fuel depots, transformer substations and power lines. Students of RSU - buildings of governing bodies and authorities, urban transport, shopping, entertainment and business centers, communication centers, places of mass recreation for citizens;

• According to the general opinion, the possibilities of increasing the anti-terrorist protection of facilities are laid in the wider use of video surveillance (29%), tightening the access control (23%), improving the quality of security services (19%), developing communication systems, warning and alarm systems (11%) and others (8%) (creating systems to counter cyber attacks, improving the reliability of fencing, using drones and dog handlers, encouraging denunciations, conducting training and sudden checks, organizing helplines, strengthening control over the ownerless things and convenient places for laying explosive devices);

• as the analysis of the interviewees' proposals shows, most of them allow the possibility of partial or temporary restriction of the constitutional rights and freedoms of citizens in the interests of protecting objects and the population from terrorism.

4) An oral survey of respondents conducted to determine the level of anti-terrorist activity of graduates showed a number of dangerous opinions:

- 93% of students believe that they are not of interest to terrorists and cannot be their victims, thereby expressing an underestimation of terrorist threats and a lack of vigilance;
- 8% of respondents believe that they live in a democratic country and can be members of any parties and movements, forgetting that according to Russian law, participation in a number of organizations is a crime [8, p. 5];
- 6% could not mind raising funds to help victims of jihad;
- 5% consider it possible to participate in mass events of Muslim fundamentalists or nationalists.

5) To the question: "Does the circle of people sympathizing with terrorism expand?

➢ 100% of ROAT students answered negatively, expressing complete disagreement with this opinion. However, 10% of RSU students confirmed this fact and named the reasons for the traditionally-oriental way of family life, adherence to Islamic religion; desire for nationalist or religious false heroism; 89% of students confidently condemned terrorism as an extremely dangerous phenomenon for the state, society and citizens. At the same time, 3% of the respondents declared their right to attend university in hijabs and freely perform prayers;

➢ 10% of RSU students did not exclude the possibility of supporting terrorists based on personal sympathy for their individual members (3%), same religion (3%), migrant solidarity (2%), separatist inclinations (1%) and ideological attitudes (1%).

The content of such answers cannot but cause concern among the teaching staff and requires a concentration of efforts on strengthening the anti-terrorist training of students and the formation of graduates' readiness to counteract this phenomenon.

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思维是心理机制的系统组织
THINKING AS A SYSTEMIC ORGANIZATION OF MENTAL MECHANISMS

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抽象。人的创造性思维的教育因其本质的各种想法和评估中的矛盾而变得复杂。对这种现象的科学研究必须依赖于心理机制的系统组织的思想，在这种思想中，思想不是其他心理过程之一，而是组织者的“相互帮助”（P. Anokhin）。构成思考的心理过程具有系统的组织。以最普遍的形式进行思考与两项全局任务相关：认知和转变。在这种情况下，认知似乎是一个广泛的过程，其结果有助于一个人生活在这个世界上。转变一方面涵盖了所有类型的实践思维，另一方面涵盖了与科学和艺术创造力有关的所有问题。这是思考的最“主要”方面，因为创造力是我们作为思考生物而诞生的人类。在这种情况下，思考是人类对自身和世界的认知和转变的心理机制的系统组织。

关键词：思维，心理机制，系统组织，认知，转变，思维定义。

Abstract. *Education of creative thinking of the person is complicated by variety of ideas of his essence and contradictions in assessment. Scientific research of this phenomenon has to rely on idea of the system organization of mental mechanisms in which thinking is not one of mental processes among others, but the organizer their "mutually assistance" (P. Anokhin). The mental processes that make up thinking have a systemic organization. Thinking in its most generalized form is associated with two global tasks: cognition and transformation. Cognition, in such a context, appears as a broad process, the results of which help a person to live in this world. The transformation covers, on the one hand, all types of practical thinking, on the other hand, the whole range of issues related to scientific and artistic creativity. This is the most "main" aspect of thinking, for creativity is what we owe to the birth of man, as a thinking creature. In this case, thinking acts as a systemic organization of the human psychic mechanisms for cognition and transformation of oneself and the world.*

Keywords: *thinking, mental mechanisms, system organization, cognition, transformation, definitions of thinking.*

Cognition of human thinking is a task unique in its difficulty. It is determined not only by complexity, but also by a large number of approaches to understanding its essence. And in fact, thinking is studied by philosophy, formal logic, sociology, psychology, psycho-physiology. Definitions born in the process of scientific search reflect the diverse sides of this phenomenon. But their abundance involuntarily slows down the assessment of thinking as an integral phenomenon. This serves not only as a source of frequent discussions of psychologists, but also as an obstacle to the use of their findings as a methodological base by representatives of various specialties, including art. As a result, the latter are not always able to correctly orient themselves in understanding the creative processes, which are a system-forming element in the education of musicians, artists, as well as the most important condition for the formation of professional mastery of subjects of pedagogy of art. And, of course, the diversity of ideas about the essence of thinking makes it very difficult to scientifically comprehend this phenomenon, the need for which is becoming more and more obvious.

One of the characteristic features of various definitions created by psychologists is their relationship with concepts accepted in other scientific disciplines. In particular, the definition of "thinking" in psychology is highly related to the definitions of philosophers. We will mention a lot of the latter, the most "popular" ones, using well-known publications as an example: "Philosophical Encyclopedic Dictionary" and "Philosophical Encyclopedia". In them, thinking is defined as "the active process of reflection of the objective world in concepts, judgments, theories, etc., associated with the solution of certain problems, with generalization and methods of indirect knowledge of reality; the highest product of a specially organized matter - the brain. " [Philosophical Encyclopedic Dictionary, 1989] "Thinking is the process of reflecting objective reality, which constitutes the highest level of human cognition." [Philosophical Encyclopedia, 1964]

So, in philosophy, thinking is most often associated with ***cognition***. And this is quite natural. After all, it occupies a unique place in human life. From the first days of birth, the child begins the path of knowledge of the world, which lasts a lifetime. Summing it up, having risen to the heights of his life experience, from where countless new perspectives are visible, a man, following Socrates, exclaims: "I know that I know nothing."

Another thing is also clear. The exceptional role of cognition in human life has been noticed by psychologists. Based on generally accepted philosophical definitions, they direct all their forces to the study of thinking, which, with good reason, is associated with the process of cognition. So one of the leading psychologists of the 20th century, S. Rubinstein wrote: "Thinking is mediated - based on the disclosure of connections, relationships, mediations - and a generalized knowledge of objective reality." [Rubinstein, 2009, p. 310] In later works of psychologists,

thinking is referred to as "the process of the cognitive activity of the individual, characterized by a generalized and mediated reflection of reality." [Psychology, Dictionary, 1990, p. 223] In a textbook on psychology, published already in our time, thinking appears as: "the most generalized and indirect form of mental reflection, establishing connections and relationships between cognizable objects." [Stolyarenko, 2009, p. 123][1]

It must be said that researchers of musical psychology have also gone the way. Yu.A. Tsagarelli, in his textbook Psychology of Music Performing Activities, writes: “Musical thinking usually refers to the process of reflecting music, which is the highest degree of cognition”. [Tsagarelli, 2008, p. 106] A similar wording is given in another textbook, “Psychology of Musical Activities: Theory and Practice”: “Musical thinking is a complex emotional sensory-intellectual process of cognition and evaluation of a musical work”. [Psychology of musical activity, p. 217]

However, an attentive reader will immediately be puzzled by the apparent inconsistency of such definitions with real musical practice. Quite justifiably, questions arise: the composer composes the play, what kind of music does he reflect and, moreover, cognize? And if the listener receives the greatest pleasure from the perception of a musical work, and at the same time does not set the goal of “knowing and appreciating” it, can it be argued that this happens outside of musical thinking? Finally, is it possible to limit musical thinking only to the cognitive processes existing in musical activity?

But then the definitions of philosophers that go beyond the functions of cognition will become more promising. A convincing example of this is the Philosophical Encyclopedia, in which “thinking is defined as the highest form of active reflection of objective reality, consisting in a focused, mediated and generalized knowledge of the subject of existing connections and relations of objects and phenomena, *in the creative fabrication of new ideas, in predicting events and actions* ". [Philosophical Encyclopedia, p. 382-383] (Italics are mine - V.S.)

Similar contradictions appear in psychologists. On the one hand, their focus on the study of mental mechanisms of thought that provide knowledge is quite obvious. For example, thought processes and their properties are examined in detail in comparison with others, for example, differences in perception and thinking, which A. N. Leontiev wrote about: “The most significant, most important thing that distinguishes thinking from perception is the mediated nature of the result of cognitive process. ... In thinking, we find what is hidden from sensory perception by what is open to our sensuality. This mediation is the fundamental difference between the thought process and the process of perception. ” [Leontiev, 2001, p. 348]

[1]Similar formulations can go on and on. See the works of M. Gamezo and I. Domashenko, V. A. Krutetskiy, Psychology, ed. E.I. Rogova, etc.

However, the increased attention of researchers to the study of mental mechanisms associated with cognition led to the emergence of a contradiction. Its essence ***lies in the mismatch of many definitions of thinking with its functional properties*** described by the same scientists.

In the works of psychologists, various types of thinking are used that are employed by a person in his activities. This thinking is "verbal-logical, visual-figurative, visual-effective. They also distinguish theoretical and practical thinking, theoretical and empirical, logical (analytical) and intuitive, realistic and autistic (associated with avoiding reality in internal experiences), productive and reproductive, involuntary and arbitrary ". [Psychology. Dictionary, 1990, p. 223] There is also divergent and convergent thinking, creative thinking, as well as a whole group of properties of human thinking, reflecting the specifics of his professional activity: operator's thinking, musical and artistic thinking, engineering thinking, pedagogical thinking, dispatcher thinking, etc.

This list goes on and on. But it is important for us that *some of the functions of thinking fundamentally go beyond the framework of the cognitive process, which is emphasized in the definitions of psychologists.* Say, creative thinking, as well as practical, is, in fact, different from the processes of cognition. They are undoubtedly associated with other types of thinking, including those aimed at cognition, but cannot be reduced to them.

Similar contradictions were found by some psychologists. In particular, A.N. Leontyev, in his lectures, shrewdly outlined the ways of studying human thinking. They're also associated with the diversity of its various types. "Thinking," said A.N. Leontiev, "now stands before us as a process that proceeds in various forms, such as, for example, motor, motor actions, understanding, living images. Next is logical thinking, reasoning, discursive thinking. And all this variety of types of thinking is ... problems of a concrete science of psychology. " [Leontiev, 2001, p. 332]

An even more important conclusion for us was made by AN Leontiev when evaluating thinking from the perspective of his theory of activity: "When we talk about thinking as an operation, this is one system of tasks and problems; ... when we talk about cognitive actions, then this is another series of questions that are raised before us. But when we talk about the activity of thinking, here is a completely different problem. Now we call this issue creative. " [Leontiev, 2001, p. 344] Therefore, depending on the level of thought processes in the structure of activity, we can talk about different functions of thinking. But then it becomes completely incomprehensible that psychologists reduce their thinking only to cognitive processes. Indeed, according to Leontyev, "cognitive actions" are only part of thinking. But the other is – issues related to ***creativity***.

Many contradictions arising from the restriction of the functions of thinking to the scope of cognition in the definitions of psychologists are removed in the "Big Psychological Dictionary" by B. G. Meshcheryakov and V. P. Zinchenko. Thinking, psychologists say, is “a lot of different mental processes in terms of organization, level and means of psychology that solve problem *tasks* that arise both in everyday life and in the field of professional activity. The spectrum of tasks solved through thinking is immense, and therefore a huge number of functional characteristics of thinking are possible. (cognition, invention, search for a workaround, solving a *training problem*, forecast, *decision making*, etc.). Thinking can be an independent process with *intrinsic motivation*, but, as a rule, it is included in one or another *activity* that generates a mental task. ” [Big Psychological Dictionary, 2009, p. 376]

The fundamental definition of B.G. Meshcheryakov and V.P. Zinchenko opens up the possibility for professional psychologists, researchers, musicians, and teachers to come closer to understanding the thought processes that make up creativity. At the same time, the presence of numerous types of thinking helps to evaluate the specifics of any activity based on the allocation and analysis of the properties of thinking, which takes an active part in its implementation. In turn, this approach allows in the learning process to hone its necessary sides, including those responsible for the creative development of a person.

At the same time, this definition does not focus on an exceptionally important circumstance: on the ***principle of the organization of mental mechanisms*** associated with thinking. Since we are talking about many mechanisms, a natural question arises: which of them form thinking, to what extent is their participation manifested? Moreover, a certain difficulty in finding the right answer is introduced by the diversity of its types. And not only their quantity, but also by the fact that, “in a pure form”, they do not exist. This makes the analysis even more complex. The wide spectrum of interactions of psychic mechanisms does not facilitate the situation. In particular, A. Maklakov, describing the experiments of the Italian neuropsychologist E. L. Biziak, emphasizes: “figurative thinking is mediated by the same brain structures as perception”. [Maklakov, 2010, p. 302] But it is also mediated by other mental processes, in particular, memory and other.

And most importantly, it is incomprehensible: how do “many different mental processes in organization, level and means of psychic processes” that compose thinking relate to each other and to other processes, for example, such as memory or perception? Finally, how to evaluate the interaction of various mental processes, for example, memory and thinking, perception and thinking, etc.

Comprehension of such questions can be of great help in understanding many of the problems associated with the study of thinking. For this, of course, numerous studies are needed. And they need to start with the definition of **methodologi-**

cal positions that guide scientific thought. One of them is the idea of the ***systemic organization of mental mechanisms that make up thinking.*** It is this circumstance that has not been adequately emphasized in the generally very convincing interpretation of thinking formulated by B.G. Meshcheryakov and V.P. Zinchenko.

Often, the work of psychologists gives reason not to think about the systemic organization of mental processes. For example, a list of such phenomena as sensation, perception, understanding, memory, imagination, thinking, attention, will, etc., is generally accepted. Thinking in such a register is perceived as the most important, but, nevertheless, one of a number of other mental processes.[2]

In another case, thinking in its functions is equated with perception and imagination. So in "Psychology", published in 2005, thinking appears as a process of "reflecting in a person's mind the connections and relationships between objects or phenomena of reality, during which a person reflects the objective world differently than in the process of perception and imagination". [Psychology, 2005, p. 495] In other words, it turns out that a person is able to "reflect the objective world" in three different ways: using perception, or on the basis of imagination, or in a completely different way ("otherwise"), relying on thinking. Apparently, the authors of the definition believe that for this there are different (each with its own) mental mechanisms that specifically reflect reality. True, within the framework of this logic, it is not clear where the memory went, which could well lay claim to the fourth way of reflecting the surrounding world. Such reasoning is a direct consequence of ignoring the systematic approach in assessing mental phenomena.

There are also divisions of mental processes by levels. For example, A. Maklakov, describing the process of perception, notes: "In addition to sensations, the previous experience is involved in the process of perception, the processes of understanding what is perceived, that is, mental processes of an even higher level, such as memory and thinking, are included in the process of perception. " [Maklakov, 2010. p. 201] In general, agreeing with A. Maklakov on the essence of what was stated, we note that according to his description, among the mental processes there are also "higher levels". These include memory and thinking. Moreover, *memory* and *thinking* act as equal processes, in contrast to others.

Similar statements are not unique in psychology. Analyzing the " understanding" as a mental phenomenon, L. M. Wecker emphasizes that it can be considered as a link between perception and memory. In addition, it connects perception with

[2]Another thing is when phenomena of a higher level are considered, for example, the "mental sphere of the personality". Describing its properties A. Nikitin convincingly notes the general abilities: "Cognitive, which includes such abilities and properties as sensation, perception (duration, depth, scale, sensitivity, sensory standards), attention (stability, concentration, depth, volume, distribution, switching); memory (figuratively associative, emotional, motor, logical, tactile); thinking - convergent, divergent, practical intelligence (social and emotional intelligence); imagination (reproductive - productive; dream - realistic; plastic - emotional), fantasy. " [Nikitin, 2017, p. 35]

thinking. [See: Wecker, 1974] That is, now not only perception, but also understanding is associated with two processes of a "higher level" - memory and thinking. Does this mean that perception and understanding occupy a similar position in the hierarchy of mental processes?

But this is not the limit. Refining the functions of understanding, A. Maklakov notes: “Understanding is of great importance not only for the processes of memory or imagination - they are extremely important for all mental processes that provide cognitive activity of a person. The processes of perception, thinking, writing are always associated with understanding, as well as the memory that stores information and through which understanding are formed. ” [Maklakov, 2010, p. 235] But what is the place of understanding in the system of mental processes? If they are connected with imagination, and with memory, and with thinking, and with perception, can they also be considered a "high level"?

Summing up the above, we note that in the work of psychologists, thinking often acts as one of the mental processes along with many others, or at least in the “high level” group. But then the statement of the same AG Maklakov sounds like a serious discord: “... in practice, thinking as a separate mental process does not exist. Thinking is present in all other cognitive mental processes, including perception, attention, imagination, memory, speech. ” [Maklakov, 2010, p.303] A curious conflict arises: on the one hand, thinking is one of many mental processes, along with imagination, understanding, memory ... On the other hand, thinking, as a separate mental process, does not exist! But with the third, it is associated with all mental processes.

So what is thinking? If we take into account that it does not have such a localization as, say, the sensations presented in certain parts of the cerebral cortex, then it turns out that there is no thinking, just as there is no separate mental process called attention?

And on the other hand, what about the different types of thinking that a person actually encounters in his activities? How to understand why human memory “works” in a completely different way than computer memory? How to appreciate the fact that perception is formed on the basis of various sensations, but on the other hand, under the influence of internal mental processes in which thinking, as A. Maklakov rightly pointed out, plays a significant role. So, there still is thinking?

Perhaps the key to resolving the above contradictions lies in assessing psychic phenomena from the perspective of systems theory? According to this theory, a system consists of structural units that perform their functions. Moreover, the properties of the system components do not give their sum, but a new quality that is absent in other structural units.

If we consider the mental mechanisms that make up the mental activity of a person from these positions, then thinking has a special position. It is determined at least by the fact that, as A. Maklakov noted, “all the higher forms of these processes [read, perception, attention, imagination, memory, speech - V.S.] to a

certain extent, depending on the level of their development, are connected with thinking. " [Maklakov, 2010, p. 303] The characterization of the thought process, given, in due time, by L. S. Rubinshtein, also speaks in favor of such a view. “The real thought process, while preserving the specificity of thinking that essentially, qualitatively distinguishes it from all other mental processes, is at the same time always woven into the general fabric of a holistic mental life, it is really given in connection and interpenetration with all aspects of mental activity - with needs and feelings, with "strong-willed activity and determination, with visual images, understanding and with the verbal form of speech." [Rubinstein, 2009, p. 321] Therefore, there is every reason to believe that thinking is not one of their mental processes among others, but a ***system of mental mechanisms, which includes structural units that ensure the fulfillment of human mental activity.*** In other words, not memory, or understanding, and along with them thinking, coordinate thought processes, but ***thought itself, which includes numerous mental mechanisms, appears as an organizing force that turns individual mental processes into a single harmonious ensemble.***

Thus, the ***mental processes that make up thinking are not the sum of the various phenomena that ensure the psychic life of a person, but their systemic organization, where each takes its place and performs functions adequate to their capabilities.*** In this systemic organization, thinking has a special place. In the hierarchy of mental processes, it is *intended to combine them into a single whole*, capable of fulfilling the functions determined by human activity.

These functions in the most generalized form are connected with two global tasks facing each person and society as a whole. The first can be defined as knowledge, and the second as a ***transformation***. Cognition, in such a context, appears as a broad process, the results of which help a person to live in this world. And naturally, it involves a variety of mental mechanisms necessary to achieve goals.

But if the activity of thinking in the field of knowledge is in the zone of intense attention of psychologists, then the second - the mental processes associated with transformation, has been studied much less. And there are reasons for this, they are determined by the complexity of the tasks. On the one hand, this is an in-depth study of the mental mechanisms of thinking responsible for scientific or artistic creation, on the other hand, affecting the functioning of thinking in the zone of ensuring the practical activity of a person, in all its diversity. Thus, transformation is a broad multifaceted process aimed at effectively solving the practical problems facing society and man, at creating an efficiently functioning production, and institutions for organizing the life of society. The solution of such problems requires, first of all, the effective understanding of numerous problems, accessible only to developed thinking. Therefore, in this regard, the processes of scientific research fall into the zone of active attention of psychologists.

In addition, it is fundamentally important to encompass with these two global tasks the person himself, who not only creates the "second nature", but must also improve himself, and above all, develop his thinking, and with it the attitude to life. In psychology, an active study of personality subjectivity is underway (B.G. Ananyev, K.A. Abulkhanova-Slavskaya, A.V. Brushlinsky, E.N. Volkova, V.P. Zinchenko, O.A. Konopkin, V. .A. Petrovsky, V.I. Slobodchikov, V.A. Tatenko, etc.). This subjectivity, as a person's ability to go beyond the limits of external conditions and see them from personal positions (independence, initiative, creativity ...), is also determined by the thinking of a person in which various mental mechanisms interact in a specific way, and above all, related to human activity, with his motivational, worldview attitudes.[3]

Based on the foregoing, **THINKING** appears as a **SYSTEM ORGANIZATION** of the **MENTAL PSYCHIC MECHANISMS** for **KNOWING AND TRANSFORMING ONERSELF** and **THE WORLD**. When thinking is aimed at cognition, then everything that is said in psychology about the mental processes that support it will be true. The reflection of the outside world, the identification of the laws of development of nature and society, of man himself is far from a complete list of the goals facing thinking.

Other goals are associated with the transformation of man and the world. This affects, on the one hand, all types of practical thinking, as well as training a person, his preparation for various types of activities. On the other hand, the transformation refers to the whole range of issues related to scientific and artistic creativity. This is the most "main" aspect of thinking, for creativity is what we owe to the birth of man, as a thinking creature. Therefore, questions of creativity never lose their relevance, and with the development of society, they cause an ever-increasing interest.

[3]The desire to emphasize the uniqueness of the problems associated with subjectivity leads to attempts to separate the psychology of personality from general psychology. "The psychology of personality will never make friends with general psychology," writes A.Melik-Pashaev, "while it will consider it one of its sections and project onto the person - the owner and author of her mental body - the methods and criteria for studying this body itself, erasing the difference between "I" and "mine". It won't make friends if only because the psychology of the personality that exists in the spiritual and practical sphere, dealing with the non-derivative "inner activity of the soul", and therefore with the freedom of a particular person, even the most benign impersonal-objective knowledge can help little. "[Melik -Pashaev, 2013, p. 35] A look at the systemic nature of the psychic mechanisms that make up thinking can remove this contradiction.

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心理安全背景下对教育环境的满意度
SATISFACTION WITH THE EDUCATIONAL ENVIRONMENT IN THE CONTEXT OF PSYCHOLOGICAL SAFETY

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抽象。 本文介绍了对大学环境的心理安全状况进行全面研究的部分结果，尤其是对大学生教育环境满意度的动态研究，大学教育环境的重要特征的研究。并强调他们的满意度。 结论是，初中学生表现出“封闭的位置”，这表现为保持独立性和个人空间界限的渴望，高年级学生注重融合和互动，“开放的位置”的表现保证了必要的条件。 安全程度。

关键词：心理安全，大学教育环境，环境满意度

Abstract. *The article presents the results of part of a comprehensive study of the psychological safety conditions of the university environment, in particular, the study of the dynamics of satisfaction with the educational environment of the university students, the significant characteristics of the educational environment of the university and the degree of satisfaction with them are highlighted. It is concluded that junior students demonstrate a “closed position”, which is manifested in the desire to maintain independence and the boundaries of personal space, senior students are focused on integration and interaction, the manifestation of an “open position” that guarantees the necessary degree of security.*

Keywords: *psychological safety, educational environment of the university, satisfaction with the environment*

The problem of psychological safety of the environment is now becoming increasingly important. Changes rapidly occurring, primarily in socio-economic relations, are reflected in all spheres of human activity. On the one hand, a person is given the opportunity to choose a life strategy, to build prospects for his own development, both personally and professionally. On the other hand, this approach

requires taking responsibility for made decisions, as well as updating and mastering new standards of activity, searching for resources and tools for its successful implementation. The increase in the density and duration of information flows, as well as the inefficient use of time, unfortunately, do not contribute to resolving the indicated contradiction, and in some cases only exacerbate it, causing psychological tension, worsening the quality of life and psychological health of the individual.

All of the above actualizes the problem of psychological safety, which is understood as "human security, which presumes, along with external, internal security conditions, which include elements of the subject's experience, which add up to the ability and willingness to recognize, anticipate and evade dangers, at least possess relevant knowledge, skills, a certain level of development of perceptual, mnemonic, intellectual and other abilities, as well as a formed motivation for maintenance of life safety "[2]. The emphasis on the individual experience of the person, on the need to form appropriate competencies and cognitive skills suggests the special importance of the problem of psychological safety in the educational environment.

The psychological safety of the individual in the educational environment was studied by I. A. Baeva, I. O. Volya, O. I. Eremin, O. N. Istratova, T. I. Kolesnikova, L. D. Lebedeva, N. A. Lyz, S Yu. Maleeva, S. T. Posokhova, O. V. Suchkova, E. N. Chesnokova and others. In a number of studies, psychological safety is considered as a process that occurs when a person interacts with the social environment, has dynamic characteristics and is caused by changes that occur in social environment and surroundings. Another aspect of psychological safety associated with the presence of internal resources that provide resistance to destructive influences allows us to attribute this phenomenon to the category of mental properties of a person [4]. The most relevant is the approach to psychological safety as a mental state of a person, characterized by an individual experiencing his security, the ability to properly respond to the danger (I. A. Baeva, P. I. Belyaeva) [3].

The problem of understanding the psychological security of an individual can be considered within the framework of the "environmental approach" [5], which in a broad sense leads to the crowding theory, which in this context can be interpreted as stress caused by the subjective feeling of discomfort in the surrounding space, the environment in which the individual is located. In the theoretical concepts of crowding, a number of factors explaining the causes of this phenomenon should be distinguished:

1) overload due to the need for a short period to take a large number of decisions, leading to a decrease in the adaptive level of the individual;

2) the restriction of freedom of choice and freedom of action due to cultural norms, psychological and physical distance, which is characteristic of a particular community;

3) "overpopulation" and "underpopulation" (according to R. Barker), characterizing the mismatch of possible social roles to the real number of people;

4) loss of control over the environment, the formation of a subjective feeling of impossibility to change the situation (locus of control, which determines the attitude to the stress situation itself);

5) violation of personal boundaries, as well as environmental norms of its existence.

These circumstances, considered in the conditions of the educational environment, may be signs of threats that destabilize the state of psychological safety.

In modern studies, the educational environment is considered as a category that characterizes human development, which determines its purposeful and functional purpose in the context of the objectivity of the culture of society (V. I. Slobodchikov). In this regard, it is customary to distinguish the adaptive, syndicate and creative functions of the educational environment [7]. N. I. Isaeva defines the educational environment of a university as the totality of everything "that involves students in their activities and objectively contains the resources for the development and formation of personal and professional experience of all participants in the educational process" [6]. Moreover, the author notes that "the environment with which the student interacts is nothing but a sociocultural and socio-subject environment" [ibid.].

Understanding the psychological security of the educational environment will be largely determined by the impact that the university environment has on the student, as well as the characteristics of his perception and experience of this environment, its subjective significance and place in the value system of participants in the educational process. Thus, one of the parameters of psychological safety should be considered the satisfaction of participants in the educational process with the environment of the university.

As part of a comprehensive study of the conditions of psychological safety of the university environment, we conducted a study of the dynamics of student satisfaction with the educational environment of the university. For this purpose, the methodology of I. A. Baeva "Psychological safety of the educational environment of the school" was used, adapted to the reality of the educational process at the university [8].

We proceeded from the assumption that one of the main signs of a person's psychological safety is experiencing satisfaction with the nature of relations with the environment as a reflection of the ability to satisfy the most important needs, regardless of the nature of the situation.

The purpose of the study was to investigate students' perceptions of the educational environment of the university and establish its main characteristics, as well as to identify the degree of satisfaction of students with the university environment in terms of ensuring psychological safety.

The study involved 86 I-IV year students of the Faculty of Psychology of Astrakhan State University, studying in the areas of "Psychological and Pedagogical Education" (profile "Educational Psychology"), "Psychology", "Conflictology"

The results of the obtained satisfaction indices demonstrate a high level of satisfaction with the educational environment of the university with insignificant dynamics in the courses. The highest level of satisfaction with the environment is observed among first-year students (index - 4.34), a slight decrease (within the boundaries of a high level) is observed among second-year and third-year students (indices 4.03 and 4.06, respectively), which, in our opinion , may be due to the "mid-school crisis", and fourth-year students showed a slight increase in the indicator (index - 4.11).

Let us examine the subjects 'choice of those characteristics that, in the students' opinion, are determining, the most significant for the educational environment of the university. An analysis of the results showed that the dominant positions in all subjects are occupied by such characteristics as "Relations with teachers", "Relations with students" (93% and 73% of the total sample, respectively). The indicator "Emotional comfort" also confidently occupies the third position, which students of all courses prefer (65% of the sample as a whole). However, it should be noted that the indicator "Relations with students" in fourth-year graduates is inferior to indicators such as "The opportunity to express one's point of view" and "Emotional comfort". This is probably due to the fact that graduates are more likely to have an individual professional position that requires adoption in a social environment. This circumstance is fully consistent with the interpretation of the concept of "psychological security" proposed by E. Edmonson. Describing a psychologically safe working environment (and we tend to correlate the educational environment of a university with a professional, working environment), the author defines it as "in which employees feel safe to express ideas, willingly seek feedback, provide honest feedback, and collaborate , take risks and experiment ", and are also convinced that" no one will be punished or humiliated for expressing ideas, questions, problems or mistakes "[1]. Along the way, we note that among younger students, this indicator is on noticeably lower lines of the rating and averages 32% -33%.

Significant indicators are "Respectful attitude to oneself", "Ability to ask for help" and "Ability to take initiative and activity" (53%, 42% and 45% in the whole sample, respectively). We draw attention to the presence of a "failure" in relation to the position "Ability to take initiative, activity", noted among 3rd year students (only 28% and 8th rating line). We attribute this fact to the "mid-school crisis" at this stage of training. Junior courses, in our opinion, identify the possibility of manifesting initiative with participa-

tion in a variety of extracurricular activities (in projects of creative socialization, volunteer work, etc.), graduate students, on the contrary, associate the manifestation of initiative and activity with professional work (many in this period begin professional career, internships, etc.). In the third year, there is a certain reassessment of values, awareness of contradictions and "disappointments", which, in turn, is a prerequisite for personal and professional growth. An additional confirmation of this is the peak values of the "Accounting for personal problems and difficulties" indicator for the same third-year students (56% versus 20% and 15% for first and second year students, respectively, and against 28% in the sample as a whole). The crisis transition from the position of "student" to the position of "professional" is inevitably associated with a subjective experience of difficulties and the desire for the environment to take into account the personal difficulties and problems of the subject. For fourth-year students, the indicator "Accounting for personal problems and difficulties" divided the rating line with such characteristics as "Respectful attitude to yourself", "Ability to seek help" and "Attention to requests and suggestions" (31% each). In our opinion, this is very indicative, since it suggests a connection between problems and difficulties with a lack of experience and a level of professional competence. The consequence of this is the requirement for the environment as a professional community open to the provision of assistance and support. In such a characteristic as "Preservation of personal dignity", a gradual decrease in the significance of this indicator from junior to senior courses is noted, which, in our opinion, may be associated with an attempt to defend one's individuality as some kind of independence and limitation of communication and integration with the social environment, which is especially noticeable in freshmen. In senior courses, with the expansion of the boundaries of professional interaction, due, inter alia, to group dynamics, the need for isolation is minimized, and the preservation of personal dignity does not require declarative measures. The characteristic "Help in choosing one's own solution" occupies the lowest rating line (13% of the sample as a whole), which, in our opinion, provides information for reflection on possible shortcomings in the general system of organization of the educational environment of the university. The supporting and developing function of the educational environment of the university is, most often, actively stimulating in nature, which is expressed in clear guidelines, prescriptions, recommendations and prohibitions. The modern educational space should be determined by the goal of creating the conditions for the formation of a systematic critical thinking of a specialist, the development of his leadership qualities and strategic professional worldview.

Thus, the results obtained allow us to highlight significant characteristics of the educational environment of the university and the degree of satisfaction with them, to identify some dynamic trends. So, junior students, to a greater extent, strive to maintain independence and personal space, senior students are focused on integration and interaction. Within the framework of the studied psychological security problem, this may indicate the presence of a certain position ("conditionally closed" and "conditionally open"), which guarantees the necessary degree of security. The data obtained open up opportunities for further research, in particular, in identifying correlations with personality characteristics - indicators of a "psychologically safe personality", and are also of interest in prospective studies, including the comparative analysis of data obtained on another sample (for example, students of another profile of a professional orientation or another university).

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狄更斯（Charles Dickens）的小说《两个城市的故事》中的童话故事放大

FAIRY TALE AMPLIFICATIONS IN THE NOVEL BY CHARLES DICKENS “A TALE OF TWO CITIES”

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注解。在本文中，对童话故事的放大研究是作者创造性思维的一种现象，它使我们能够将文化和历史语境与C. Dickens创建的体裁和构图模型结合起来。研究使用放大机制作为复制结构或其一部分以扩大其含义的机制。放大由放大中心，超文本基础，超文本连接组成，它们与诸如童话随从，童话动机，童话图像之类的放大类型相连。在此研究的基础上，得出了有关放大的成分和语义作用的结论：童话随行者创造了时代的文化和历史背景，童话动机在文学作品的文本中定义了时间的流逝。 。

关键词：放大，文化和历史背景，体裁和构成模式，放大中心，放大基础，放大联系，童话随行，位置，动机。

Annotation. *In this article fairy tale amplifications are studied as a phenomenon of the author's creative mind, that allows us to combine cultural and historical context with the genre and the compositional models created by C. Dickens. The researches used amplification mechanism as a mechanism for duplicating constructions or its part to widen its meaning. Amplification consists of an amplification center, an extra-textual base, extra-textual connections, which are connected to such amplification types as fairy tale entourage, fairy tale motives, fairy tale images. On the basis of this research the conclusions about the compositional and the semantic role of amplifications were made: the fairytale entourage creates the cultural and the historical context of the epoch, the fairy tale motives define the course of time in the text of the literary work.*

Key words: *amplification, cultural and historical context, genre and compositional patterns, amplification centre, amplification basis, amplification connections, fairytale entourage, location, motives.*

Modern studies of Dickens' works are characterized by a wide range of research, the main areas of which are connected with the study of cultural and historical context in C. Dickens's literary works [2], the genre and compositional patterns [8], designed by the writer, the linguosemantic models [9], used by the classical English author of the 19 century.

The relevance of this research is defined by the fact that fairy tale amplifications are studied as a phenomenon of the author's creative consciousness, which allows to combine the cultural and the historical context and the genre and compositional patterns created by C. Dickens.

The scientific novelty of the research is in the attempt to specify the definition of a fairy tale amplification and systematize it concerning the material of a certain literary work.

The literary work by C. Dickens 'The Tale of Two Cities' contains a plenty of fairy tale amplifications, which have the compositional and semantic roles in the text composition.

The works of V.Y. Propp «The Morphology of a Fairy Tale» [7], E.M. Meletynsky «A Character of a Fairy Tale» [4], E.V. Pomerantseva «Russian Faity Tales' Destiny» [6] and etc. were used as a theoretical and methodological basis of the research. The used methods of the research contain structural-semantic analysis, metaphoric analysis, holistic analysis, synthesis, description of the results.

A fairy tale as a genre of oral folk art was widely used by C. Dickens. The author's interest in this genre organization of the material wasn't raised up by chance. «The Great Victorian» (P. Aykroyd), with the help of the prose of his epoch, discovered the humanity's patterns of development, moral and ethical foundations of the society.

Fairy tale motives, images, plots are reflected in the works of C. Dickens both as separate compositional patterns and as additional ones, duplicating, developing, correcting the main plot of the novel, creating vertical context.

This phenomenon was named 'a fairy tale amplification'. Amplification is a multidisciplinary term, used in modern molecular biology, psychology, rhetoric, linguistics, literature. Amplification (from the French, *Amplification* — «enlargement») is a «unique mechanism, lying in repeating construction or its parts» [6, p. 345], this repeat allows to widen the field of study and specify its meaning.

Amplification is a complicated structure which consists of an amplification center, an amplification basis and amplification connections.

If we are speaking about the fairy tale amplifications created by C. Dickens, the amplification center is metaphoric and thematic. And cultural and historical context, as well as entourage, are defining – they are Victorian England and revolutionary France.

The motives which determine the historical and personal curse of the events of the characters compose the amplification basis in 'The Tale of Two Cities'.

Amplification connections in the Dickens's fairy tale amplifications are connected with the characters of 'The Tale of Two Cities', which model fairy tale images: the King-Father, Cinderella, the Fairy, the charming prince, and Cinderella's antagonist – the wicked witch.

So, fairy tale amplifications in C. Dicken's literary work 'The Tale of Two Cities' represent «a complex system of integrated texts, which have a common off-text orientation, form an inclusive unity, marked with notional and language wholeness» [3].

Such amplification patterns as a fairy tale entourage and a complex of motives are presented in this literary work.

The fairy tale entourage as a part of an amplification pattern is represented in the Dickens's novel 'The Tale of Two Cities' with the help of a category of space. There are two locations in the novel – Victorian England and France. The method of doubling the space allows to create two worlds, divided by a boundary – the English Channel. This game with the space layouts allows C. Dickens to actualize the fairy tale motives of the motherland loss (Charles Darnay), exile (doctor Manette – imprisonment in the Bastille), acquisition (doctor Manette's coming back to his motherland).

The usage of information about the customs and the traditions of Victorian England helps to implement fairy tale amplification and create a unified image of the country. C.Dickens creates the image of England, using the historical traditions, («'Pray, Doctor Manette,' said Mr. Darnay…—'have you seen much of the Tower?'») [1], the religious traditions («The great bell of Saint Paul's was striking one in the cleared air…») [1], the political traditions («in the regretted days of the merry Stuart, who sold it» (Stuart was the English kind Charles II, who sold out the interests of his own Motherland to the French)) [1], and also creates a geographical map of the city and its suburbs («There were solitary patches of road on the way between Soho and Clerkenwell…»)[1]. In the novel one can find information about the education, which people got those days («A certain portion of his time was passed at Cambridge, where he read with undergraduates as a sort of tolerated smuggler who drove a contraband trade in European languages, instead of conveying Greek and Latin through the Custom-house»)[1] and how the Londoners spent their free time («Accordingly, Mr. Stryver inaugurated the Long Vacation with a formal proposal to take Miss Manette to Vauxhall Gardens; that failing, to Ranelagh» (Vauxhall Gardens and Ranelagh were the most favourite places of entertainment in the XVIII centure)) [1]. The descriptions of the trials also play a significant role in the novel («in the passages of the Court House ») [1].

Introduction of the cultural and historical context of the revolutionary France allows to realize fairy tale amplification. The author depicts France on the eve of the revolution, at the time of the escalation of social problems. The method of contrast is used for geographical division of the country into the squares for poor and squares for rich («From the Palace of the Tuileries, through Monseigneur and the whole Court, through the Chambers, the Tribunals of Justice, and all society (except the scarecrows)…» - « there was a flutter in the air that fanned Saint Antoine and his devouring hunger far away») [1]. C. Dickens provides an indication of the judicial system, which seems to be nothing but farce, (« the Fancy Ball descended to the Common Executioner: who, in pursuance of the charm, was required to officiate 'frizzled, powdered, in a gold-laced coat, pumps, and white silk stockings.' At the gallows and the wheel—the axe was a rarity—Monsieur Paris, as it was the episcopal mode among his brother Professors of the provinces, Monsieur Orleans, and the rest, to call him, presided in this dainty dress ») [1], of those times' fashion («The fashion of the last Louis …was conspicuous in their rich furniture…») [1], of the dynastic history («…of the last Louis but one, of the line that was never to break — the fourteenth Louis… but, it was diversified by many objects that were illustrations of old pages in the history of France ») [1].

Fairy Tale amplifications, presented as entourage, create the cultural and historical context and are connected with the idea of a 'specular' space, two-dimensional universe, the semblance of two cities – London and Paris.

Fairy tale amplifications in the novel "A Tale of Two Cities" are also realized through the system of motives. All the motives used by the author are the motives of the time and can be divided into several groups: the ghost of time, the motive of the alternative future, the motives of time reversibility, the parallel time motive.

The motive of the ghost of time sounds at the beginning of the work, fulfilling the role of the ax of Destiny, the omen that will come to pass. («It is likely enough that, rooted in the woods of France and Norway, there were growing trees, when that sufferer was put to death, already marked by the Woodman, Fate, to come down and be sawn into boards, to make a certain movable framework with a sack and a knife in it, terrible in history») [1]. This motive is repeated far more than once in the work itself, changing its scale: from the universal presage of coming disaster to the feelings of a common man.

The motive of the alternative future is connected with the image of Charles Darnay, who decides to change the course of time, condemning him to continue the senseless existence of a French aristocrat. He moves to England, changes his name, he is eager to give up the inheritance and the ancestral castle, he works hard and succeeds.

The motive of time reversibility is related to the image of Dr. Manette. The horrible fate of this person is connected with time aberrations, time stops and its comeback. Having spent 18 years in the Bastille on a false denunciation, he lost the sense of time. (« - 'Buried how long?' The answer was always the same: - 'Almost eighteen years.' - 'You had abandoned all hope of being dug out?' - 'Long ago.' - 'You know that you are recalled to life?' - 'They tell me so.' - 'I hope you care to live?' - 'I can't say'») [1]. Even after his imprisonment came to an end, this person didn't get away from the time's pursue: it will send him back to the past, again and again.

The motive of completeness of the time is connected with the theme of death and eternity.

Running water becomes a symbol of time. This leitmotif is often repeated in the novel. Anything that can flow like water becomes an equivalent to the completeness of time: the vine, which slopped out in the suburb of Saint Antoine, the fountain on the square of the Tuileries, where little Jacques was crushed, the fountain in the garden of the duke's house, where the mask-faced man will die («The fountain in the village flowed unseen and unheard, and the fountain at the chateau dropped unseen and unheard—both melting away, like the minutes that were falling from the spring of Time— through three dark hours ») [1].

The motive of the parallel time is connected with the ideas of afterlife, deadmen and revenge. This is an epitome of the Superior Court for those who couldn't find verity on this Earth. The motive of parallel time is connected with myths, legends, believes, Gothic stories. Everything that seems like a fairy tale, acquires features of a terrible reality, when a wicked person ends his existence. The noble's death is marked with three symbols: mythical (mythical basis concerning the plot of a ballad 'Lenore' by a German poet Bürger, in which a deceived groom comes at midnight to his bride, puts her on the horse's back behind him and rushes madly to the graveyard, where they both disappear in a grave), gothic (the face of the stone Gorgon – the monster, whose glance turned people into stone), The Old Testament (a revenge for the child's murder).

«It portended that there was one stone face too many, up at the chateau. The Gorgon had surveyed the building again in the night, and had added the one stone face wanting; the stone face for which it had waited through about two hundred years. It lay back on the pillow of Monsieur the Marquis. It was like a fine mask, suddenly startled, made angry, and petrified. Driven home into the heart of the stone figure attached to it, was a knife. Round its hilt was a frill of paper, on which was scrawled: 'Drive him fast to his tomb. This, from Jacques'» [1].

The motives of time as a realization of a fairy tale amplification in 'The Tale of Two Cities' by C. Dickens create a vertical context of the literary work, enriching it with notional connotations, widen the field of study and specify the understanding of the images.

On the basis of the research, which has been carried out, conclusions about the semantic role of amplification were made: fairy tale entourage create cultural and historical context of an epoch, fairy tale motives define the course of time in the text of the literary work.

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第三个千年媒体话语形成和运作的心理机制
PSYCHOLOGICAL MECHANISMS OF THE FORMATION AND FUNCTIONING OF THE MEDIA DISCOURSE OF THE THIRD MILLENNIUM

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抽象。这篇文章涵盖了当今媒体话语在与人类意识的心理机制的相互作用中形成和发挥作用的问题。该研究着重于三种基本的心理机制–目标设定，心理设定和反思。据说，考虑到上述心理机制，构建任何复杂性的媒体话语都可以被认为是影响现代人和社会意识的最有力工具之一。通过目标设定，心理设定和在结构关系和互动中的反思机制，新创建的媒体话语以特定的接收者为关注对象，能够渗透并反映他们在媒体话语空间中的活动程度。以及在现实生活中；他们的个人和社会目标，理想和抱负。因此，在考虑到个人意识的心理机制的基础上，通过对他与媒体话语空间互动的角度，对他进行了进一步的研究。

关键词：媒体话语，心理机制，目标设定，心理设定，反思。

Abstract. *The article covers the problem of the formation and functioning of the present-day media discourse in its interaction with the psychological mechanisms of human consciousness. The study focuses on three basic psychological mechanisms – goal-setting, psychological setting and reflection. It is stated that the construction of a media discourse of any complexity taking into account the above-mentioned psychological mechanisms can be considered as one of the most powerful tools for influencing the consciousness of modern man and society. Through the mechanisms of goal-setting, psychological setting and reflection in their structural relationship and interaction, the newly created media discourse, focused on a specific group of recipients, is able to penetrate and reflect the degree of their activity in the media discourse space as well as in real life; their personal and social goals, aspirations and ambitions. Thus, the further study of a man of the third millennium through the prism of his interaction with media discourse space is introduced, taking into account the psychological mechanisms of the individual's consciousness.*

Keywords: *media discourse, psychological mechanisms, goal-setting, psychological setting, reflection.*

Modern society, characterized by the digitalization of its structural and content components, exists and develops in a huge media space, the basis of which is the Internet, print, television, radio, music and cinema (Croteau, 2014). It is impossible to imagine the 21st-century person outside the media environment, isolated and deprived of the opportunity to generate his own as well as someone else's media discourse; to express various subjective-objective views, his "Self" image and attitudes towards other people or events in the present-day media discourse. Therefore, it is not surprising that understanding the relationship between the media and society, as well as the media discourse constructed between them, is an important issue in many scientific fields (including linguistics, journalism, sociology, political science, economics, and philosophy).

Media discourse is the main form of existence of the language of modern media, as well as a special kind of term "discourse", defined as "speech acts" (van Dyck, 2009); "a form of using the language in real time (on-line), reflecting a certain type of human activity" (Uvarova, 2015); "a type of verbal communication involving a rational critical examination of the values, norms, and rules of social life" (J. Habermas) (cit. ex Uvarova, 2015).

We share the viewpoint of a Russian researcher O.V. Shiryaeva about the modern media discourse functioning in creolized and multimedia communication (Shiryaeva, 2017). In turn, these pragmatic factors influence the formation of the semantics of discourse as a synthetic whole. If verbal means retain a dominant role in the rational development of the world picture, then visual and graphic discourse enhances the impact function, influencing, first of all, the mechanisms of unconscious reception and structuring of visual signs.

The modern media discourse space of the first quarter of the 21st century sets as its paramount task not only to distinguish various types of human activity but also to contribute to their further development, thereby acting as an indicator of the evolution of human consciousness. Modern media have a powerful influence on the shaping of people's lives, as well as on how they contribute to the spread of culture and lifestyle. A person of the third millennium becomes extremely sensitive, and sometimes dependent on the world of digital media in the technological, educational, political, economic and entertainment spheres of public life. People of a new millennium allow media discourse space to become part of their own life. Thus, from the functional point of view, a modern media discourse can be comparable to a certain information matrix, which purposefully and intentionally penetrates human nature, dissolving and transforming it from the inside. The key objective of the present-day media discourse is to serve as a conductor of infor-

mation policy as well as to constantly influence the consciousness and personal experience of an individual (Guslyakova, 2014). Accordingly, our study is aimed at analyzing such a scientific phenomenon as psychological mechanisms for presenting information in a modern media discourse space based on the cognitive, affective, and behavioural spheres of human consciousness.

The concept of "mechanism" came to psychology from psychophysiology, in which, along with the concepts of "reaction, a process", it was used as the main one. For methodological substantiation of the concept of "psychological mechanism", the researchers use S.L. Rubinstein's perception of the "mechanism" which is the process of awareness of a person's experience of his attitude to something very significant for him (Rubinstein, 2000). In addition to this interpretation of the concept of "mechanism", in our scientific study we will also consider it, on the one hand, as a process of influence, driven by the inclusion of verbal and non-verbal systems in order to establish communication for the transmission of information that is necessary for joint activities (Brudny, 1977; Guslyakova, 2013; Sokovnin, 1974; Bogomolova, 1978). On the other hand, the idea of the mechanism of interaction is revealed through the analysis of the psychological "contribution" of the participants of this interaction, "exchange of actions", that is, through their mutual influence (Andreeva, 2007; Lomov, 1984; Dikaya, 1985).

In general, the psychological mechanism in the framework of this study refers to the complexly organized internal formation of the integral structure of the individual's consciousness, which is a set of internal mental transformations (manifested in structural changes in consciousness, in the relationships and connections of its structural components), which, interacting with the media space, ensure the formation of consciousness and the occurrence on this basis of changes in the individual's behavior. The psychological mechanisms for presenting information in a media discourse space is, first of all, a hierarchical structure, which includes three basic mechanisms that influence an individual in the process of his interaction with a media discourse: the mechanisms of goal-setting, psychological setting and reflection (Guslyakova, 2013). The influence of these psychological mechanisms on information recipients in the course of their interaction with the media discourse space occurs under the influence of external and internal social, political and economic factors and conditions.

The goal-setting mechanism involves the identification of several key goals and objectives of the media content necessary for presenting a media discourse to the communicants with their "correct" (directed) perception and subsequent actions. Despite the existing randomness and spontaneity of the emergence and dissemination of information content in the modern media discourse, by itself, it is a "directed" entity. Any media discourse is always created for a specific purpose and is accordingly oriented with a clear goal to influence the consciousness of a certain group of people. The construction of a media discourse by its authors already implies the allocation of a goal-setting mechanism as a component of the recipient's consciousness.

As an illustrative example of the use of the goal-setting mechanism of the recipient's consciousness in its interaction with the media discourse space, one can cite the video clips of the famous Russian blogger and oppositionist Alexei Navalny, posted with periodic frequency on his Youtube channel. All video posts of Alexey Navalny have a pronounced critical attitude to the official authorities in modern Russia, to the so-called "Masters of the Kremlin" and directly to the head of the Russian state itself. The main message of the media discourse generated by Navalny and his team is the fight against corruption and the unfair distribution of income between representatives of different social layers in Russia. Accordingly, the goal that the addressees of this media discourse pursue is to bring to the awareness of as many people as possible the understanding that the state in which they live constantly misleads their citizens, hiding the true social, economic and political situation in the country. Thus, the mechanism for setting the recipient's consciousness in their interaction with the media discourse created by Alexei Navalny will reflect the extremely expressed goal of opposing the "negative, destructive activity of the legal authority in the Russian state" and "desperate attempts by the non-systemic opposition to save their country from crooks, thieves and corrupt officials ".

For the goal and tasks laid down by the addressees of a certain media discourse to reach the consciousness of its audience, another psychological mechanism of the individual's consciousness is important - the mechanism of psychological setting.

The mechanism of psychological setting is a given representation of information in a media discourse; highlighting a specific audience to which some knowledge or information will be addressed. It should be noted that the readers may also have a certain psychological attitude to particular media content or its senders.

The mechanism of psychological setting is very well implemented in the political media discourse, especially when it comes to a variety of election campaigns, for example, the presidential election. For instance, the 45th President of the United States, Donald Trump, created a powerful psychological attitude in his election media discourse, which was later transformed into the presidential slogan "Make America great again!" for his audience of voters. The slogan, which was extremely simple in its sound, had a rather strong psychological impact on the consciousness of the American electorate, which resulted in the victory of Donald Trump in the next presidential election, despite a lot of criticism from his political opponents. Thus, a media discourse created in the media space with the right psychological setting and formulated goal, oriented to the selected audience of recipients, can have a strong impact on the cognitive, affective and behavioural spheres of consciousness of the recipients of the information message.

When interacting with media discourse space and the perception of media content in the minds of the recipient, there is an understanding and analysis of the information received. In this case, we are talking about the process of reflection on a

perceived piece of information by the individual's consciousness. Therefore, correspondingly, the third important psychological mechanism of human consciousness - the mechanism of reflection - is involved.

Reflection in the modern world of digital technologies, innovations and media discourse space is the need to understand the inner essence of the 21st-century person; his values, ambitions, emotional experiences and achievements through the prism of interaction with the media environment, being influenced by this environment and innovative mass media.

The mechanism of reflection involves the comprehension of goals, motives, attitudes, relationships that are forming or can form between media content and its recipients.

Through this mechanism of consciousness, the addressee can answer the question of how important is the information received for him in the process of his interaction with the media discourse; what is his attitude to the perceived media content; how far its content is reliable and appropriate for personal and public use. The reflection mechanism is presented in the comments left by the recipients in their interaction with the media discourse space. In the electronic version of the media publication "Komsomolskaya Pravda" you can find a lot of readers' comments on certain information blocks. The publication "Business Ombudsman Boris Titov: We have enough oil for a long time. This is the problem "(Kozurov, 2019) has a large number of diverse readers' reviews.

For example,

"Enough, but not for everyone. China without oil and gas in a historically short time has turned from a backward country to the leading country in the world. All this time, the Soviet-Russian rulers pumped oil and gas out of the country under the spell that this good is full and will last forever. Under the Soviets, money at least went to the state, and now only symbolically "(ibid.).

"Both America and Norway are also full of oil. But there is just something that does not prevent them from engaging in other production. If we had no oil, these bureaucrats would explain the backwardness of the country by its absence. They correctly say that something always disturbs a bad dancer ... " (ibid.).

"There are more and more billionaires, and the detachment of the poor has increased ... Does someone work sucks? Someone could not cope at all?... If the country is for the elect and the people are sideways ..... It's time for the people to wake up and throw off this rabble .... "(ibid.).

As can be seen from the above comments, the readers actively enter into discussions of the problem of rational and non-corrupt use of natural resources of the Russian state in the media discourse of the Komsomolskaya Pravda media holding created by the addressee-journalist Dmitry Kozurov. Reflected by the reader-

ship, the problem of Russia's natural riches and their plundering cause recipients many negative emotions, which they transform in the form of their wishes, advice and commentary in the media discourse space. A similar stream of amateur commentary can be seen by reading and analyzing the electronic versions of the New York Times media publication under the heading “Trump Pressed Ukraine's Leader on Inquiry Into Biden's Son” (Barnes et al., 2019). This media discourse was created to discuss the problem of Joe Biden’s diplomatic relations in Ukraine, as well as his son’s business position in a gas company owned by the Ukrainian oligarch. Interest in this topic is reflected in the huge number of comments left in the media discourse space (around 2259). It is obvious that in the minds of American citizens the political processes taking place inside the country and beyond its borders remain in priority.

For example,

"Good for President Trump if true. Corruption in foreign countries by Americans regardless of whether they are a Biden should not be tolerated and should be brought to light and investigated. When Joe Biden mentions shenanigans while campaigning, hopefully, the American voters will recall the Biden ones. " (ibid.)

Thus, the psychological mechanism of reflection of the recipient’s consciousness is actively manifested in the process of interaction of the latter with the media discourse. It is important to emphasize that this activity of the functioning of the reflection mechanism does not have geographical, national, or other boundaries. The nature of its action is universal, as long as there is the consciousness of a rational person, capable of interacting with media discourse space.

The recipient’s consciousness mechanisms - goal-setting and psychological setting - similarly manifest themselves with the only difference being that they involve the selection of more specific goals, objectives and orientation to a specific media audience.

Thus, the psychological mechanisms of consciousness of a participant in a media discourse – goal-setting, psychological setting and reflection – are an interconnected structure of a cyclic type, activated by the interaction of communicants with a media discourse space.

A competent construction of one or another media discourse must necessarily take into account the structural relationship of the psychological mechanisms of its participants’ consciousness, to achieve the most effective result of the representation of information content in the proposed media discourse space.

The American researcher J. Thompson in the early 90s of the last century drew attention to the growing power of new media in all aspects of modern society (Thompson, 1991). Plunging into a new information environment for him, a person involuntarily becomes the object of close attention and analysis of the "producers" of this new media discourse space. A man of the third millennium, regardless of his age, national, racial and geographical characteristics, turns out to be an "embedded" representative of the new

media world, and his cognitive, affective and behavioural properties of consciousness are closely connected with the existence of a new digital environment. It is this new media environment, which produces many diverse media discourses every second that activates the action of such psychological mechanisms in the individual's mind as goal-setting, psychological setting and reflection.

The construction of a media discourse of any complexity taking into account the above-mentioned psychological mechanisms can be considered as one of the most powerful tools for influencing the consciousness of modern man and society. Through these psychological mechanisms of consciousness in their structural relationship and interaction, the newly created media discourse, focused on a specific group of recipients, is able to penetrate and reflect the private and public "Self" of this focus group, the degree of their activity in the media discourse space and real life; their personal and social goals, aspirations and ambitions. In essence, we are talking about the further study of a man of the third millennium through the prism of his interaction with media discourse space, taking into account the psychological mechanisms of the individual's consciousness. This becomes especially relevant among the younger generation, whose around the clock presence in the digital environment makes them especially sensitive to its effect.

Studying the construction of a media discourse taking into account the psychological mechanisms of human consciousness in the process of its interaction with the media space will help to track both positive and negative qualitative and quantitative changes in the minds of modern people. Despite the criticism that the media discourse space faces today for its influence, addiction among a large number of people as well as for its large number of negative media content, from our point of view, the media discourse of the third millennium also has positive aspects, which are primarily reflected in more budget education that many people may obtain in the information space at present.

Historically, the influence of media publications such as "Uncle Tom's Cabin" by Harriet Beecher Stow and "Origin of Species" by Charles Darwin has changed people's view of the world. Therefore, we believe that the design and functioning of the modern Russian and foreign media discourse in its interaction with the psychological mechanisms of consciousness (reflection, goal setting and psychological setting) in the modern information era will make a fundamental scientific contribution to the development of linguistic theories within the framework of theoretical and applied linguistics and in related sciences explaining the reasons why the modern linguistic personality is influenced by a variety of media sources. This, in turn, will allow us to interpret and predict the consequences of such an influence (including such negative experiences as the threat of terrorist acts, suicidal behaviour of a person, mass riots, influence on the counting of votes in political election campaigns, etc.).

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俄罗斯政治精英的成熟
MATURITY OF THE RUSSIAN POLITICAL ELITE

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注解。 本文试图确定国家政治精英对国家发展的影响。 这种影响在一定程度上取决于精英的成熟度，对国家利益的了解以及在国家政治，经济和社会发展的主要方向发展过程中维护国家利益的能力。 如果个人利益在政治精英中间占上风，那么这种国家注定会落后。 只有通过对新的政治精英进行教育才能带领俄罗斯走上经济增长和繁荣的道路，才有可能摆脱俄罗斯当前的状况。

关键词：政治精英，公共行政，官僚机构，腐败，资本出口

Annotation. *This article attempts to identify the influence of the country's political elite on the development of the state. This influence is to a decisive extent determined by the maturity of the elite, knowledge of national interests and the ability to uphold them during the development of the main directions of the country's political, economic and social development. If personal interests prevail among the political elite, then such a state is ultimately doomed to lag. A way out of the current situation in which the Russian state finds itself is possible only with the education of a new political elite capable of leading the country along the path of economic growth and prosperity.*

Keywords: *political elite, public administration, bureaucracy, corruption, export of capital*

Very curious is the assessment of the processes taking place in Russia in the post-Soviet period, given by various authoritative representatives of the expert community. For example, the Israeli public figure Jacob Kedmi, who once headed the Israeli secret intelligence agency ”Nativ”, impartially analyzes the activities of

not only the Russian, but also the Soviet leadership. Yakov Kedmi compares the industrial policies of the Chinese and Russian leaders and notes that the guilt of the Russian leadership in reducing the country's defense is undeniable. The Chinese government forces its capitalists to invest in those sectors of Chinese industry that the state needs. But in Russia, it was thought that a market economy would determine everything. And these super-profits from the sale of oil in the 2000s, when the price exceeded $ 110 per barrel, in addition to the looting, were invested in real estate abroad, in yachts, in diamonds. In China, this was not allowed. And now, according to Jacob Kedmi, all this money is lost for Russia[8, p. 146]. In this assessment, which is quite offensive to us, the analyst very unpleasantly points out how the capital of the domestic economy that was stolen in Russia and exported to the West was legalized in the West.

But nevertheless, Yakov Kedmi pays tribute to us, pointing out that at the last moment Russia was shocked and now, at a frantic pace, with errors, paying exorbitant prices, is trying to bring its military industry and economy to normal development, but not in greenhouse conditions, when the cost of oil is not so high. The United States has set its goal to achieve complete superiority over Russia and China in military equipment, for which new generations of nuclear and thermonuclear weapons are being developed. And now, the main goal of Russia is to prevent the Americans from achieving their goal. People can work in Russia. Here they are used to doing it in an emergency manner. As the saying goes: "Catch up and overtake." Today we have achieved our goal. And the Americans began to realize that the bet on Russian disorder and mismanagement, which would allow them to widen the gap in strategic weapons, failed. This gap, on the contrary, is narrowing, and this has to be recognized [8, p. 146-147].

Of course, one can suspect Yakov Kedmi of a not entirely objective assessment of the current situation in the modern Russian leadership, given the vast experience in Israeli intelligence and its certain diplomacy. Confirmation of what may serve his reflection on the essence of state interests, the observance of which is inherent in state officials. Since, before becoming an Israeli citizen, Jacob Kedmi was born and raised in the Soviet Union, we have no reason to doubt his incompetence in assessing the leadership of our country. He believes that before Stalin's death there was a state policy and state interests that were implemented by the most brutal measures, sometimes inhuman, but the goal of the policy was always state. Stalin, in his opinion, was always a statesman and defended the interests of the whole state, and not of some one group. However, after the death of Joseph Stalin, Soviet leaders gradually ceased to care about the state. Yuri Vladimirovich Andropov was the last of the Soviet leaders who tried to think in the public interest. In his own way, with his own mistakes, remnants, but still. And after it the catastrophe has already begun. When the head of the country does not care about the state, the state is doomed.

The main problem that the Russian state put twice, first in the face of the empire, and then the Soviet Union, to the brink of complete disaster is the degradation of power and the state elite, which was unable to cope with any problem posed to it by the state and society. Since 2000, the situation has changed, but not enough.

If you look at today's Russian state elite, you can't be sure that they, except for a few people, think about the state, are able to think on a national scale and understands what it means to manage the state.

What is most worrying about the current Russian elite? Corruption, which is intolerable, exists there. When others steal it is also important, but not so scary. When power steals - this is the worst thing, because it does not steal from itself - from the people, for itself. And this is robbing the state. Theft of elites is the biggest threat to the state. In Russia with its traditions - even more so. You can read that Ivan the Terrible, Peter I wrote about embezzlement. Today it is just as true, as if Peter I wrote yesterday about what is happening. Moreover, corruption of power cannot be sufficient or acceptable in level. There is no such thing. Power cannot be corrupt even by twenty percent. And in Russia it is much more corrupt. In power, the acceptable value for corruption is zero. Having looked at examples from other countries, one can understand that it is possible to eradicate corruption, but the methods must be tough and consistent.

Take, for example, Singapore. The two main population groups there are peoples whose countries have always been quite severely corrupt, the Chinese and the Indians. Although in China they are now fighting corruption - more or less successfully, but they are fighting. Corruption in Singapore is zero. Moreover, the issue here is not the size of the state, Singapore is small, and China and India are large. You just need to act consistently and tough.

As former Singaporean Prime Minister Lee Kuan Yew said: "To fight corruption, first put in jail your three best friends. You know why, and they know why." There are no friends in power. All friends are not in power. Personally, you can have friends. But if your friend breaks the rules even a bit, he can remain your friend, but he will not work in this position. And there is no problem. Whoever is not capable of control, let him not control. Friends are all at home, not in the public service. Not where they rule the country.

Where this is not eradicated, the state suffers. Yes, there are states that can live with this. In Japan, rabid corruption. But the Japanese state lives on. In France, Germany, England, corruption. The United States has wild corruption. But this does not threaten the state. For Russia, the corruption of the power means death. Proven twice in a hundred years.

That is, the main problem of the Russian state today is seen in the weakness of the elite. There is a lack of elite with state thinking, which does not manage to develop power of sufficient quality for their country at all levels, so that this power can effectively cope with the problems of the state [8, p. 210-214].

Such a low assessment of the Russian leadership by one of the leading international analysts, which, of course, is Yakov Kedmi, could not be unnoticed by Russian experts either. For example, Mikhail Delyagin, director of the Institute for Globalization Problems, notes that for the last quarter of a century we have had big problems: with obvious (despite the background and unfocused irritation) satisfaction of the "broad masses" the quality of management is frighteningly declining.

It would seem that after such a statement, an analysis of the quality of governance of the Russian Federation will follow. However, as modern Russian experts should, Mikhail Delyagin very expectingly nods to the fact that even the most effective control systems of our time - American and Chinese - make amazing and quite obvious mistakes. China has just (by admitting western rating agencies to its market) actually abandoned the strategy of creating its own macro-region and has moved to compete with the United States at the global level - in their own field, in which it is doomed to defeat.

The effectiveness of American governance, according to Mikhail Delyagin, is clearly manifested in the senseless aggression against Russia, and in the actual alliance with international terrorism against those who are trying to curb it. And in relation to the USA - the quintessence of the West [3, p. 6].

Rector of the Russian Presidential Academy of National Economy and Public Administration, Vladimir Mau, believes that non-economic factors play a more significant role than economic ones for Russia's progress and economic growth. In making investment decisions, modern technologies reduce the role of labor and increase the importance of reliability, predictability of public policy. Countries begin to compete not with labor costs, but with management costs. That is, conditionally, it is no longer important for pipe production, you have cheap Chinese labor or expensive American - the share of labor is very low, and the movement of capital is quite easy, the localization price is not high. But the proximity of the developer and the consumer and a predictable state are important. If earlier, say, it took five years to invest billions for oil production, and then 3–40 years to recoup the project, now shale oil production can be started quickly and just as quickly depending on the situation, production can be stopped and moved to another point.

That is why, according to Vladimir Mau, when choosing an investment point, the quality of public administration comes to the fore. And here we are confronted with a corrupt and excessive bureaucratic burden on the economy, with an inability to focus on strategic decisions, select priorities and implement them sequentially [5, p. 4].

The lack of professionalism of public servants has now become noticeable in almost all areas of the state. Doctor of Economics, Professor Nikita Krichevsky draws attention to the fact that one hundred Russia in the last Global Pension Index - 2017 from Natifixis Global Asset Management was among the five worst

countries in the world for pensioners. He is sure that the main reason for such an unenviable position of Russia in this rating was the incompetence of "pension" officials. In his opinion, one thing is certain: if the Russian bureaucrats were really interested in the development of both state and non-state pension provision, they would have worked in at least 20 years (the law "On Non-State Pension Funds" on May 7, 1998) to study and implement the most common foreign practices, and not proceed from budget opportunities [7, p. 6].

The decrease in the effectiveness of public administration in Russia, an increase in its criminality and corruption should inevitably lead to the need to reduce the state apparatus, to identify the most professional workers, and thereby increase the efficiency of public administration. However, in fact, over the past few years there has been growth, which is clear from the table we have presented.

Table 1. *The dynamics of changes in the number of employees of state bodies of the Russian Federation in the period from 2000 to 2016 (per 10,000 residents) [4, p.7]*

Years	Number of employees (person)
2000	79,4
2001	78,3
2002	86,4
2003	90,2
2004	91,9
2005	102,4
2006	110,9
2007	114,4
2008	117,7
2009	118,0
2010	115,4
2011	112,1
2012	109,7
2013	107,8
2014	153,6
2015	148,5
2016	142,9

From table 1 it can be clearly seen that the number of employees of state bodies in our country has grown from 79.4 people per 10 thousand people in the permanent population in 2000 to 142.9 people in 2016, or 80%. Meanwhile, according to the information of the popular Russian weekly “Arguments and Facts”, 150 bureaucrats in Russia accounted for 2 bureaucrats per 1,000 souls, in today's Russia - 15 [10, p. 6-7].

At the end of 2016, there were 2 million 146 thousand officials in government bodies in the Russian Federation. There are 1 official for 35 able-bodied people in our economy. Moreover, among the authorities in our country, they are distributed as follows:

- 86,8% - executive;
- 10,8% - judicial;
- 1,4% - legislative;
- 1% - another [1, p. 7].

According to the Accounts Chamber of the Russian Federation, at least 9 ordinary employees should be accounted for by each chief. But in some departments, the share of managers is already many times greater than expected, and every year it grows. Since 2002, the number of public servants in Russia has increased, and in 2016 decreased by 5.6%, but this happened due to the lower level. The number of managers is growing. The number of deputy heads of federal bodies increased by 18%, the number of department directors - 21%, heads of departments - by 13%. In the territorial authorities, the total number decreased by 11.9%, while the number of managers increased by 8.4%

According to the newspaper "Komsomolskaya Pravda", it is necessary to highlight the following problems of officials involved in public administration.

Firstly, the official does not provide additional value to the economy.

Secondly, he has no incentive to save budget money.

Thirdly, the payment of his labor is not tied to the results and to the real economic result [1, p. 7].

This is what leads to a decrease in the quality of public administration in our country. This is the usual position of modern Russian analysts: yes, in our country the situation with the quality of management is not very good, but in the rest of the world it is not at all better.

Moreover, there are ardent supporters of the fact that corruption in our country is an absolute good for it. It is it that is the lubricant that makes the mechanisms of the modern state government system reliably spin. At the same time, there are well-known figures of science and culture in the country who justify the existence of corruption in our country. For example, the writer Edward Radzinsky, who specializes in creating serious works on Russian history, claims that corruption in Russia was, is and will be. The conversation between the prosecutor general Yaguzhinsky and Peter the Great has been preserved. The emperor ordered Yaguzhinsky to write a decree: "If someone steals so much that you can buy a rope, he will be hanged on it." “Sovereign,” replied Yaguzhinsky, “do you really want to be left without subjects? We all steal, only with the difference that one is bigger and more noticeable than the other” [9, p. 16].

On the "usefulness" of corruption for Russia argues doctor of historical sciences, professor, head of department at the Moscow State Pedagogical University, Galina Talina who, considering the era of Peter the Great, rightly notes that under Peter the corruption begins to be seen as a matter contrary to the interests of the state. Under his rule, special institutions are created. Fiscal receives not a salary, but part of the fine that is exacted from the perpetrator. At this time, the most prominent corrupt official in Russia was one of Peter's closest associates, Alexander Menshikov. However, according to Galina Talina, there is an opinion that the robbery of Menshikov was beneficial to Peter himself, because if there was not enough money, they immediately knew who could be shaken [2, p. 14]. This historical fact resembles the situation that faced the country during the Winter Olympic Games in Sochi in 2014, when President Vladimir Putin "shook" the oligarchs, securing the construction of individual Olympic facilities on them.

In addition to our domestic experts, Western analysts are also involved in the development of the topic of the positiveness of corruption for the development of the economy. For example, the "Vedomosti" newspaper reprinted an article by "Amy Kazmin" from the American Financial Times, which analyzes the economic policies of modern India. In their article, they notes that Indian Prime Minister Naredra Modi promised to solve two acute problems - corruption and slow economic growth. But since the beginning of 2016, GDP growth rates that previously reached 7% began to decline and in the second quarter of 2017 fell to 5.7%, the lowest level in three years. According to some experts, the anti-corruption campaign impedes economic growth. It is noted that having gone on a crusade against corruption, the Indian government killed economic activity.

Naredra Modi came to power in 2014, accusing big businessmen close to the previous government of misappropriating state welfare and taking him abroad. He promised that the return of these funds to their homeland will allow them to pay 1.5 million rupees (more than $ 20,000). For the sake of fighting black cash, Modi retired large banknotes. He hoped this would turn hidden cash into "worthless pieces of paper." But contrary to forecasts, about 99% of the banknotes withdrawn from circulation were placed on deposits or exchanged. Now the tax authorities are investigating 1.8 million companies and individuals whose deposits, placed after demonetization, significantly exceed the declared income.

The price for the anti-corruption campaign is a decrease in entrepreneurial and consumer confidence, says Amy Kazmin. Withdrawal of cash from circulation hit the real estate market, and officials became afraid to make decisions. Since the late 1990s, bureaucrats have used their power to eliminate obstacles to business, but now they do not want to do this so as not to incur charges. The fact is that in India, many laws contradict each other, so those who try to follow the rules will be paralyzed. Similar fears interfere with tidying up state-bank balances, as officials hesitate to write off the debts of influential borrowers [6, p. 5].

Thus, the main reason for the export of capital from Russia and its legalization in Western countries was the corruption of the Russian elite. Understanding the illegality of the capital acquired in Russia, officials hoped to reliably hide the stolen goods abroad. As a result, the powerful financial cash flow from Russia could not fail to attract the attention of Western leaders. It is this circumstance, in our opinion, that has become the main reason for the introduction of personal sanctions against the most odious representatives of the Russian political elite.

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地理行业知识：以秋明州地区的天然气厂为例
GEOGRAPHICAL INDUSTRY KNOWLEDGE: ON THE EXAMPLE OF GAS-OIL PLANTS OF TYUMEN OBLAST

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抽象。 本文讨论了秋明州天然气和石油精炼厂的建立和发展的自然和社会因素。 这些因素导致设计时间和项目价格的增加，也导致产品价格的增加。 减少项目时间最重要的部分是与地理科学家及其知识一起举行的公开会议。 也有人认为，没有其他领域的专家，项目通常将无用，并且会导致环境和国家专业知识的失败。

关键词：天然气行业，自然，人口，生态，生态项目。

Abstract*. This article discusses the natural and social factors of the founding and development of gas and oil refineries in the Tyumen oblast. These factors lead to an increase in design time and price of projects, which also leads to an increase in the price of the product. The most important part of reducing project time is open sessions that are held with geography scientists and their knowledge. It is also argued that without specialists from other fields, projects will not be useful in general and will lead to the failure of environmental and state expertise.*

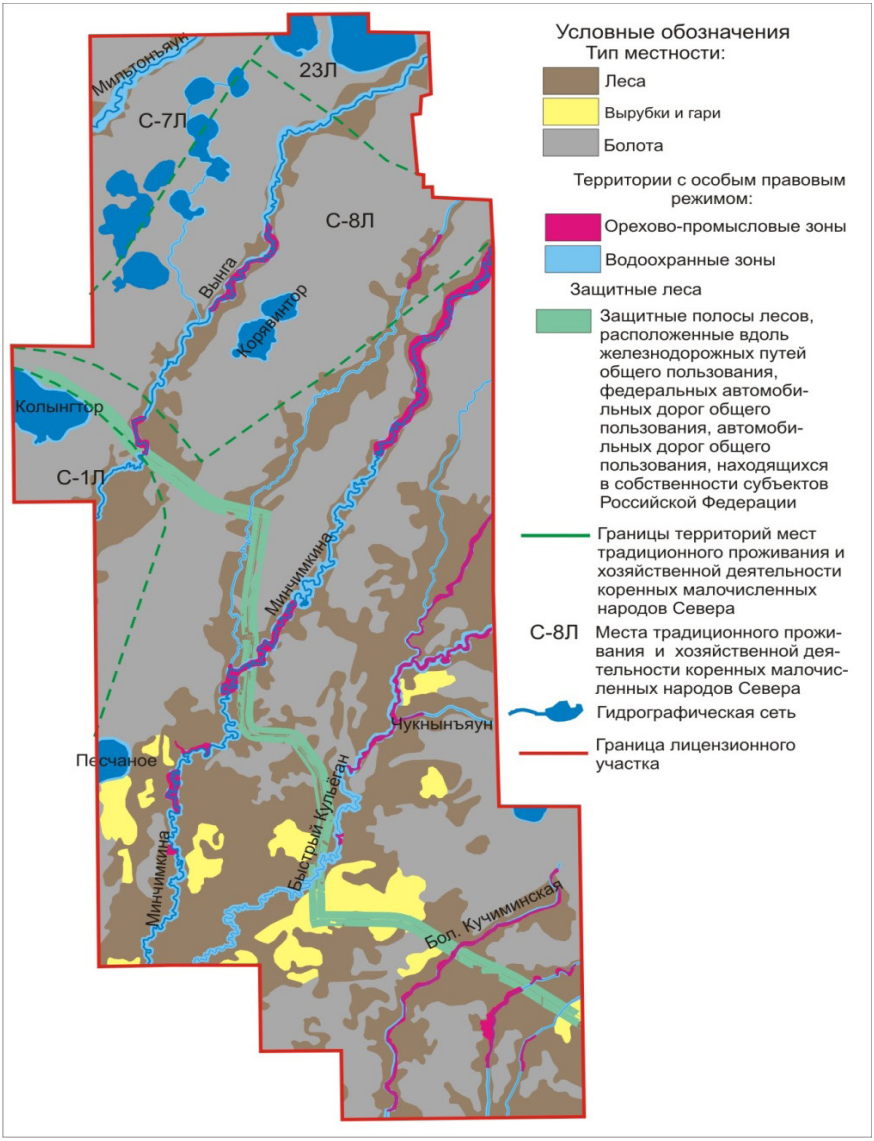
Keywords: *gas-oil sector, nature, population, ecology, ecology projects.*

At the end of the Soviet period and in the current post-Soviet period, one of the widely discussed topics in our country is the topic of the consequences of the impact of oil and gas sector enterprises on the natural and social environment. More than 30 years have passed as the procedure for environmental impact assessment (EIA) is firmly entrenched in Russian legislation, and through it in environmental design. However, the project solutions for the development of the territory proposed by the projectors to society do not always find support among the population, as evidenced by the tough discussions that arise at public hearings.

One of the main reasons for what is happening is that design decisions on the arrangement of the terrain are often made without taking into account the knowledge about it. This knowledge is perfectly mastered by representatives of geographical sciences and other earth sciences. A participant in a public hearing on the part of the population is the one who knows the area well, the land on which he lives, and therefore understands the nuances of the behavior of nature when exposed to objects of the technogenic sphere. In order for the discussion to proceed in a constructive form, the design organization must have specialists not only in the design of the placement of technogenic objects, but also in the environmental profile with geographical knowledge, capable of giving a reasoned answer to the questions that arise. As a rule, geography specialists possess such knowledge, since geography is the only science that studies the Earth as a whole. But in their studies, geographers also rely on knowledge of other sciences, therefore, the determination of the consequences of the impact of oil and gas industry objects on the natural and social environment is studied on the basis of an integrated approach by synthesizing a whole group of indicators of different sciences.

In the Tyumen oblast, the main oil and gas producing region of the Russian Federation, enterprises, oil and gas wasps, are faced with many factors that increase the costs of their production, transportation and processing. Costs can reach 10% or more of the cost of capital investments. Part of these costs is associated with the need to take into account the natural features of the area where mining is limited by environmental legislation. These include water protection zones, coastal protection zones, protective forests and specially protected areas of forests, plants and animals listed in the Red Books, specially protected natural territories, places of residence of the indigenous peoples of the North (IPN), permafrost and other dangerous geological phenomena, etc. These territories are put on geographical maps, and combined with designed objects. Priority is given to the compilation of geographical maps of various subjects, as in the case of the provision of geographical information, also to the geographical sciences. An example of a territory with some natural and social objects that have an increased degree of protection and which are taken into account when designing the placement of oil and gas production facilities in the Tyumen oblast is shown in Fig. 1.

Water protection zones and coastal protection strips are allocated along watercourses and around many water bodies in accordance with the Water Codes of the Russian Federation (2006, Article 65) [2]. Their sizes depend on the length of the river and the area of the reservoir, and range from 50 to 200 m. Such areas are available in all fields. For example, in the Middle Ob oblast the share of water protection zones in a number of deposits may exceed 50%. In order to reduce the impact on water protection zones and coastal protection zones, oil and gas enterprises, in addition to the existing state and industry regulatory documents, develop corporate documents.



ig. 1. *Map of the Bystrinsky license area*

Source: [1]

Protective forests and especially protective forest areas. Allocated in accordance with the Forest Code of the Russian Federation (2006, chapter 15) [3]. In the part of the Tyumen oblast where hydrocarbon production is conducted, the most common protective forests and especially protective forest areas include: 1) forests located in water protection zones, 2) performing the functions of protecting natural and other objects (forest protective strips located along the railways, federal highways, public roads, public roads of federal subjects, green zones, etc.), 3) valuable forests - forests located in forest-tundra zones, walnut-fishing zones, forbidden forest lanes, laid along water bodies and spawning-protection strips of forests. Particularly protective forests also include coastal, soil-protective forest areas located along water bodies, slopes of ravines. Forests with one degree or another degree of protection are found in almost all fields. The mining rules are set forth in the project document "Forest Development Project", which is subject to approval by state expert bodies.

The city line is defined in accordance with the Town Planning Code of the Russian Federation dated December 29, 2004 № 190-FL [4]. Isolated on a small number of deposits. In particular, at the Samotlorskoye (Nizhnevartovsk), Yuzhno-Yagunskoye (Kogalym) deposits. Varyegan (Raduzhnyy), Megion (Megion), Chumpass (Langepas), Lyantorsk (Lyantor), West and East Surgut (Surgut), Ust-Balyksk (Nefteyugansk), Urengoy (Novy Urengoy). All named deposits are under development. For example, annually over 200 thousand tons of oil and 10 million m^3 of associated petroleum gas are produced within the city district of Kogalym. In the city limits of Surgut, production is even higher - 2.6 million tons of oil and more than 40 million m^3 of associated petroleum gas.

The territories of traditional nature management of the indigenous peoples of the north (IPN). In the Tyumen oblast, the IPN territories include the entire territory of the autonomous okrugs (Khanty-Mansi Autonomous Okrug-Yugra and Yamalo-Nenets Autonomous Okrug) and the Uvat oblast of its southern part. The form of organization of life activities IPN are the territories of traditional nature management (TTNM) and national communities. Almost everywhere where the peoples of the north live, oil and gas deposits are discovered. So, in the Khanty-Mansi Autonomous Okrug-Yugra, TTNM territories are available in all municipalities (Table 1).

Table 1

The territories of traditional nature management of IPN in Khanty-Mansi Autonomous Okrug-Yugra by 01.01.2018

№	Administrative district	Amount of TTNM	Number of subjects of law	TTNM share of the area of the district,%	The number of hydrocarbon deposits *
1	Beloyarsky	34	269	17,4	22
2	Berezovsky	21	81	9,7	13
3	Kondinsky	35	143	3,3	41
4	Nefteyugansky	33	298	49,6	49
5	Nizhnevartovsky	133	1188	24,9	140
6	Oktyabrskiy	54	199	13,4	27
7	Sovetskiy	4	13	0,8	28
8	Surgutskiy	107	2022	54,1	174
9	Khanty-Mansiyskiy	54	333	22,4	49
	Total by okrug	520	4546	23,6	

Note: * number of deposits are located in several municipal districts and are taken into account in the statistics of each district.

Source: [5-6].

In accordance with federal and regional laws, for enterprises engaged in the exploration, search and mining of minerals in the IPN territories, a prerequisite is the conclusion of economic agreements (contracts) with the owner of TTNM (community) for compensation payments. In addition, oil and gas workers conclude agreements with local authorities on the allocation of funds for the socio-economic development of territories (municipal areas). All efforts by federal and regional authorities are aimed at maintaining IPN as ethnic groups.

Another point associated with IPN taken into account in environmental design is the assessment of demographic indicators and health indicators of the population of a particular TTNM (community), municipal district and federal subject. This data is needed including to determine the amount of financing of medicine in areas of indigenous peoples. Significant funds are allocated annually for these purposes. Only in the Khanty-Mansi Autonomous Okrug-Ugra for 2002-2010 2.2 billion rubles were allocated. (Fig. 2).

The effectiveness of funds allocated to the indigenous population in relation to the territory of the Khanty-Mansi Autonomous Okrug-Yugra can be traced from the data on the primary incidence of IPN and the entire population of the Autonomous Okrug, given in Table. 2. As follows from the table, the incidence of the indigenous population of the north in 2002-2018 was 1.3 times lower than the rest of the population as a whole and in almost all classes of diseases. The difference

reached 2-3 times. For example, in the indigenous population, the incidence of the genitourinary system is 2 times lower and the number of injuries and poisonings is as many times lower, the musculoskeletal system and connective tissue are 2.2 times lower, and neoplasms are 3 times less common. The indigenous population in relation to the rest of the population recorded a 3-fold excess of diseases in the blood and blood-forming organs. There are no excesses for other diseases.

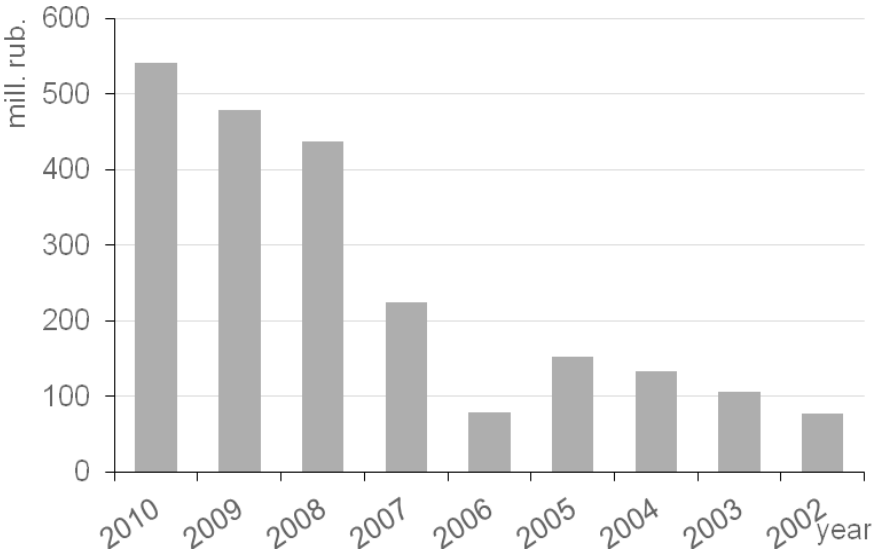


Fig. 2. *The cost of medical services of the indigenous peoples of the North of the Khanty-Mansi Autonomous Okrug-Ugra in 2002-2010*

Source: [7]

Main conclusions:

1. In the EIA procedure, knowledge of geography and other earth sciences was in demand. At the same time, priority is undoubtedly over geography, since this is the only science that studies the Earth in a complex and shows its diversity on geographical maps, which are an integral part of project documentation.

2. The cost of the final products of the oil and gas industry — oil and gas — is influenced by features of nature, the value and status of which are enshrined in federal and regional environmental legislation. Therefore, industrial work is allowed subject to an expanded list of environmental measures. This in turn implies additional costs both for the development of project documentation, and for the construction of environmental facilities.

Table 2

Primary morbidity in the Khanty-Mansi Autonomous Okrug-Ugra by disease classes per 1,000 of the corresponding population

Disease classes	2002		2010		2018		Av.	
	IPN	Total by okrug	IPN	Total by okrug	IPN	Total by okrug	IPN	Total by okrug
Total	788,3	904,9	562,5	900,8	801,4	935,7	717,4	913,8
Infectious diseases	64,5	55,5	36,6	48,7	38,2	38,0	46,4	47,4
Neoplasms	3,2	8,6	2,2	11,2	4,9	11,4	3,4	10,4
Diseases of blood, blood-forming organs	17,6	4,0	7,7	4,1	6,6	3,6	10,6	3,9
Endocrine system diseases	13,9	10,6	2,0	10,5	11,9	14,6	9,3	11,9
Mental disorders	8,6	7,5	2,7	6,0	1,4	2,9	4,2	5,5
Nervous system diseases	19,1	22,8	8,2	15,6	14,7	16,9	14,0	18,4
Diseases of the eye and adnexa	30,8	43,3	15,9	38,2	29,8	35,9	25,5	39,1
Diseases of the ear and mastoid process	13,6	24,5	11,7	27,3	16,2	23,4	13,8	25,0
Circulatory system diseases	11,9	16,1	9,2	20,5	16,2	20,9	12,4	19,2
Respiratory diseases	385,4	361,5	322,0	379,1	465,0	456,6	390,0	399,0
Digestive system diseases	42,0	50,1	23,3	37,5	43,1	47,6	36,1	45,0
Diseases of the skin and subcutaneous tissue	32,8	60,8	19,1	52,0	24,2	54,8	25,4	55,9
Diseases of the musculoskeletal system and connective tissue	29,5	45,1	19,0	38,3	26,5	37,5	25,0	40,3
Diseases of the genitourinary system	29,5	47,1	17,6	66,8	38,4	54,8	28,5	56,2
Congenital malformations	2,3	1,9	1,3	1,6	1,6	1,6	1,7	1,7
Injury and poisoning	51,1	107,2	38,5	106,3	51,4	92,2	47,0	91,9

Source: [7-9].

3. The cost of oil and gas also includes costs determined by the interests of the indigenous peoples of the North living in the vast territories of the Russian North, Siberia and the Far East. The allocated funds determined by compensation agreements, agreements on the socio-economic development of the territory are aimed, on the one hand, to preserve the existing system of environmental management, improve the quality and standard of living, on the other hand, to preserve them as ethnic groups.

4. The most important link in improving the quality and standard of living of the indigenous peoples of the North is the implementation of the national project "Health". In the main oil and gas producing region of the Tyumen oblast, in the Khanty-Mansi Autonomous Okrug-Yugra, the efficiency of investing in public health is obvious, which is confirmed by a lower incidence (30%) in almost all classes of diseases in relation to the rest of the population of the Autonomous Okrug.

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奥伦堡地区的工业旅游：发展和主要中心

INDUSTRIAL TOURISM OF ORENBURG REGION: BACKGROUND OF DEVELOPMENT AND MAIN CENTERS

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抽象。 考虑将工业旅游作为一个系统进行解释。 揭示了区域差异，并分析了最不发达地区工业旅游的吸引力对象分布。 揭示了发展前提和主要中心。 完成了对该地区工业旅游吸引力和发展的民意调查。

关键词：奥伦堡州工业旅游游览工业物品旅游中心

Abstract. *The interpretation of industrial tourism as a system is considered. The territorial differentiation is revealed and the attractive objects distribution is analyzed for industrial tourism in the obalst. The development preconditions and main centers are revealed. The public opinion survey on industrial tourism attractivity and development in the region is done.*

Key words: *Orenburg region, industrial tourism, excursions, industrial objects, touristic centers.*

There is currently no universally accepted definition of industrial tourism. The Federal Law “On the Basics of Tourism in the Russian Federation” (as amended on April 18, 2018) does not contain this term; the Federal Target Program “Development of Domestic and Inbound Tourism in the Russian Federation (2011 - 2018) also does not mention this type of tourism [1; 2]. S. A. Romantsova defines industrial tourism as “visiting existing or once existing industrial enterprises” [3]. S. S. Polyanina, L. V. Dokashenko understand industrial tourism as “organized visits to existing enterprises in order to satisfy cognitive, professional, business and other needs” [4].

In 2018, the head of the Federal Agency for Tourism, O. Safonov, at a regular meeting of the Federation Council of the Russian Federation said that “this year it is planned to begin the development of industrial tourism. This is an important task for us. ” According to him, the main direction will be the Urals, in particular, Chelyabinsk, in which many industrial enterprises have survived. “For some regions of Russia, it is necessary to introduce the mandatory development of tourism, in some regions this will be at the request of local authorities,” the head of the Federal Tourism Agency emphasized [5].

We regret to note that at the moment in Russia the issues of industrial tourism cultivation are rather poorly developed, there is no clear interaction between industrial enterprises, the state, educational organizations and chambers of commerce in terms of coordinating joint efforts to introduce it at the regional level. Industrial tourism can be considered as a system of interaction between its various components (Figure 1). In those countries where they try to develop industrial tourism, vital sectors of the economy are also developing.

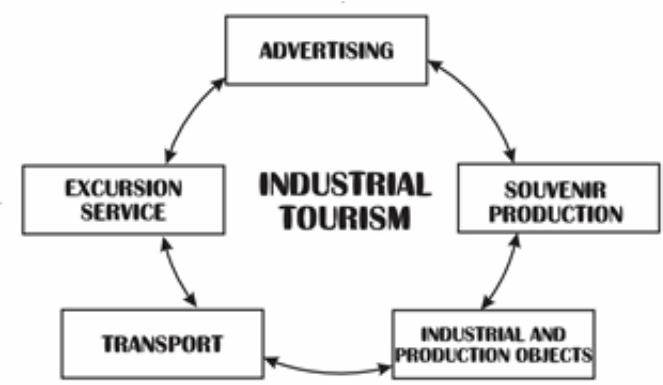

Figure 1 - *The structure of industrial tourism*

The main factors affecting the territorial differentiation of industrial tourism are: natural-resource, economic, social, environmental and people's interests. Currently, industrial tourism is well developed in European countries, especially in Western Europe: France, the UK, Germany, Italy, the Netherlands. In the USA, the homeland of industrial tourism, 92% of all businesses are open to tourists. It is worth noting that this type of tourism is in special demand among local tourists (unlike European countries).

Industrial tourism in the constituent entities of the Russian Federation has significant potential for its development, therefore, the interest of state authorities and travel agencies in its promotion is extremely necessary. Carrying out excursions to industrial facilities is very profitable. No need to build large hotels, improve landscape design. All that is needed is a comfortable bus, a guide and the industrial or production facility itself.

Analyzing the location of the industry in the Orenburg region, we identified three main centers of industrial tourism in the region (Fig. 2):

- The central region: the city of Orenburg and the Orenburg, where the gas industry of the region, transport engineering, electrical engineering, agricultural engineering, chemical, light and food industries are concentrated. A significant number of higher educational institutions, secondary educational institutions, branches of universities and schools - the main consumers of this type of tourism are also concentrated here;

- Eastern region: the eastern part of the region (Orsk, Novotroitsk, Mednogorsk, Gai, Kuvandyk). Mining, processing and metallurgical complexes of the region, the chemical, light and food industries, heavy and electrical engineering, machine tools, a small number of secondary school students are concentrated here;

- Western region: the western part of the region (Buguruslan, Buzuluk), where the oil industry, transport, heavy and agricultural machinery, chemical and wood processing, light and food industries, a small number of secondary schools are concentrated.

In the course of our study, we conducted a sociological survey. The purpose of which was to identify the awareness and interest of the population in industrial tourism. 120 people were interviewed: 76 women and 44 men. 82% of respondents are students of educational institutions, aged 17 to 22 years; 14% are working people between the ages of 23 and 35, and 2% are people of retirement age. All respondents would like to participate in industrial excursions and tours and personally participate in production cycles. 98% of respondents believe that existing travel companies could promote industrial tourism. When asked about acquaintance with industrial tourism and its essence, 113 people (94.2%) answered that they were familiar with industrial tourism (either heard or participated in industrial excursions), 7 people (5.8%) replied that they were not familiar with this kind of tourism. When asked about participation in industrial excursions, 79 people answered positively (yes, they participated). 70 people participated in industrial excursions on the Black Sea coast of Russia (wine excursions). **:** This indicates that industrial tourism is relatively well developed on the Black Sea coast of Russia. 9 people named different places, such as the Moscow Chocolate Factory, “Syrt” in the Orenburg region, as well as perfume and cosmetics factories, automobile factories in Europe and the USA, wine tours in Bulgaria, France, beer tours in Germany and the Czech Republic. In the Orenburg region, 56 people said they would like to visit the gas and helium plant, 63 people have chosen the factory of downy shawls (Fig. 3, 4).

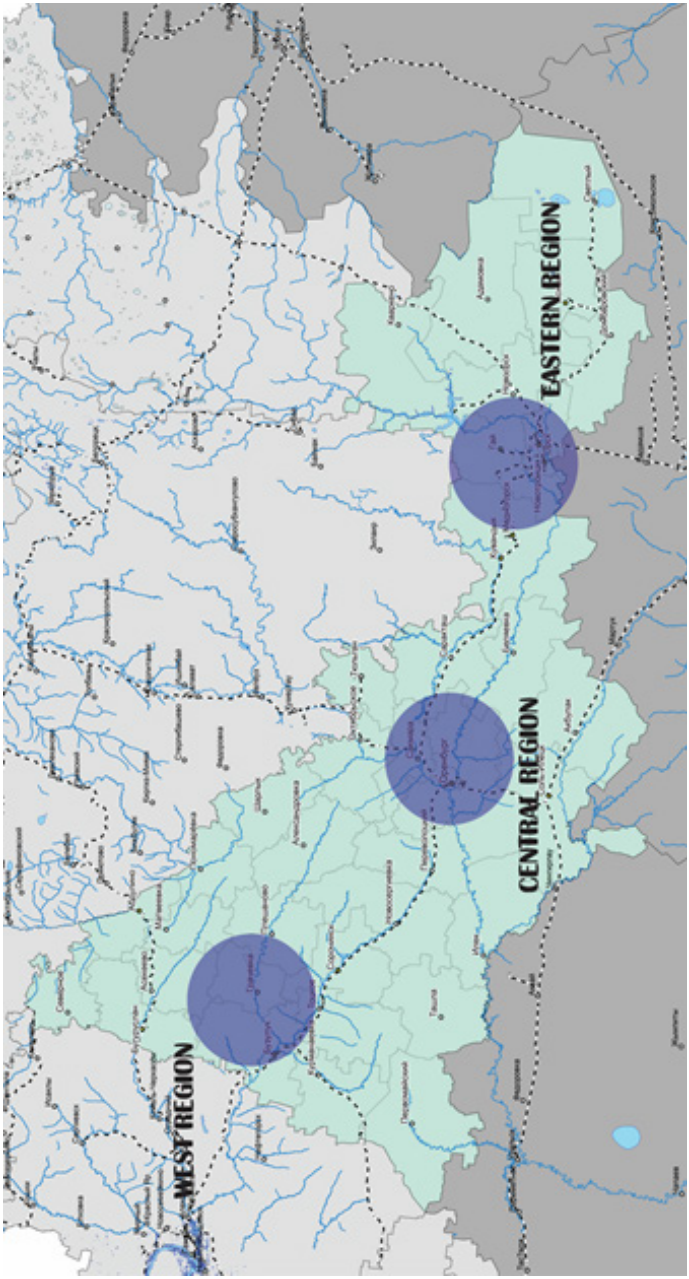

Figure 2 - *"Cores" of industrial tourism in the Orenburg oblast*

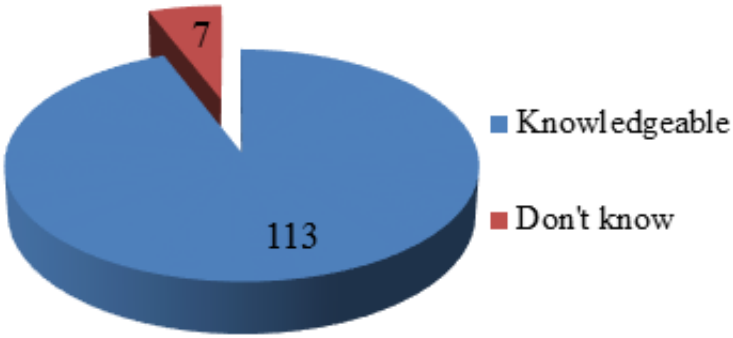

Figure 3 - *Acquaintance of respondents with industrial tourism*

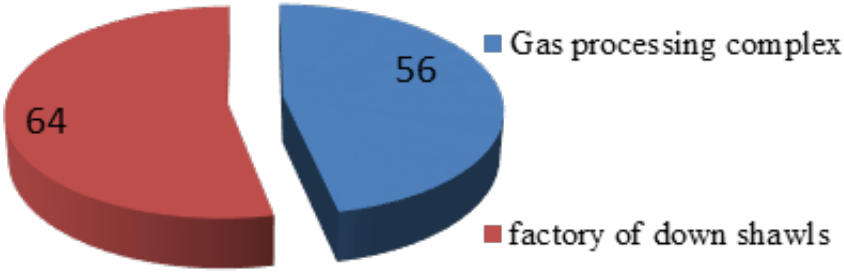

Figure 4 - *The desire of the respondents to visit the industrial facilities of the Orenburg region*

In the Orenburg region, there are prerequisites for the development of this type of tourism. There are all components for this: industrial enterprises, both operating and temporarily inactive; educational institutions of different levels, and tour operators who would develop this type of tourism. Most importantly, enterprises should cooperate and open their doors to tourists.

An important aspect of the successful development of industrial tourism is the territorial proximity and cooperation with educational institutions that graduate specialists in the profile of enterprises. It follows that one of the most promising target audiences of industrial tourism consumers are university students, industrial excursions for which serve both as a way of training and as a means of gaining practical knowledge and skills during visits to enterprises, and as a result, these graduates are in demand specialists and potential candidates to fill vacant positions at this enterprise - notes Orenburg economist Yu. N. Nikulina [6, 7].

In the Orenburg region, enterprises: "Orenshal", "Polymer", "Syrt", Sakmar-

skaya CHPP willingly conduct excursions for groups of students and schoolchildren. Some enterprises prefer secrecy; these are "Iletskol", "Gazprom Dobycha Orenburg", the "Hoffmann" brewing company and many others. In Europe, this problem is solved quite simply. A museum is opened at the factory, the entire production cycle is shown in miniature, tourists are led around the factory, or they are allowed to go only to a certain site. At the end of such excursions one can purchase souvenirs with a logo or emblem of the place where they were [8].

We are sure that the development of this type of tourism will bring additional funds to the Orenburg region and provide jobs for the local population at virtually no cost. The development of this direction in the region is an impetus for the development of small and medium-sized businesses by increasing the investment attractiveness and image of the territory, and also helps to solve the issues of staffing the regional economy (Fig. 5).

Figure 5 - *The relationship of industrial tourism with industries*

In the course of studying materials on this issue, it was found that conducting excursions to industrial and production facilities in Europe and North America is a profitable solution for everyone. For enterprises, this means obtaining additional investments, a successful advertising campaign for the company's “openness”, and creating competition between companies, which positively affects the production of consumer goods. For tourists, this is an opportunity to get impressions that contribute to the improvement of education and the choice of a profession by young people. Industrial tourism in Europe and the USA is an integral part of the tourism market, and such tours have been operating since the 19th century.

It is possible that after some time industrial tourism in the Orenburg region will develop dynamically, because this type of tourism - is an advertising move for enterprise managers, a demonstration of transparency and honesty of management, confidence in front of competitors.

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代谢综合征和肥胖患者颞下颌关节状况的比较特征
COMPARATIVE CHARACTERISTICS OF THE CONDITION OF TEMPOROMANDIBULAR JOINT IN PEOPLE SUFFERING FROM METABOLIC SYNDROME AND OBESE

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抽象。 研究的重点是对代谢综合征患者和肥胖患者中TMJ疾病的患病率进行比较评估。 共检查了436例患者：359例患有骨病的代谢综合征患者和77例肥胖患者。在长期内，评估了具有各种骨科结构的假肢对代谢综合征患者TMJ状态的影响。 根据研究结果，确定患有代谢综合征的个体中TMJ病理学的患病率较高。 结果表明，在这类患者中，手术良好的整形外科手术结构三年导致颞下颌关节的病理改变。

关键词：代谢综合征，骨病，颞下颌关节，肥胖，整形外科。

Abstract. *The study focuses on a comparative assessment of the prevalence of TMJ diseases in patients with metabolic syndrome and obese patients. A total of 436 patients were examined: 359 patients with metabolic syndrome associated with osteopathies, and 77 patients with obesity. The impact of prosthetics with various orthopedic constructions on the state of TMJ in individuals with a meta-*

bolic syndrome in the long-term period was assessed. According to the results of the study, a higher prevalence of TMJ pathology in individuals suffering from metabolic syndrome was determined. It was revealed that in this category of patients, the operation of well-made orthopedic structures for three years leads to a decrease in the pathology of the temporomandibular joint.

Keywords: *metabolic syndrome, osteopathy, temporomandibular joint, obesity, orthopedic constructions.*

According to the World Health Organization (WHO), metabolic syndrome is seen as a "non-infectious epidemic of the present." This is due to the wide spread of the disease and a high risk of development of cardiovascular diseases. Metabolic syndrome leads to early disability of patients, having a negative impact on the functioning of various organs and systems of a person [4,6,9,15,21]. Metabolic syndrome is a terrible condition, accompanied by the phenomena of diabetes mellitus, osteopenia and disorders of the cardiovascular system [3,10,14,16,18]. About 30% of the world's inhabitants are overweight, and every 10 years the number of cases increases by 10%.

The study of the dental status of patients suffering from metabolic syndrome has been reflected in many research papers [1,2,5,17]. The work of scientists on a large sample of patients with long-term results of treatment of this pathology is of interest [7,12,13]. At the same time, there are practically no works devoted to studying the condition of the temporomandibular joint in patients with metabolic syndrome [8,11,19,20].

The purpose of the study was to study the prevalence of TMJ pathology in patients suffering from metabolic syndrome and assess the impact of orthopedic rehabilitation of patients on the state of TMJ.

Research objectives:

1. study the state of TMJ in patients with metabolic syndrome;
2. assess the impact of orthopedic rehabilitation with various orthopedic structures on the state of TMJ and to track the long-term results of treatment;
3. identify the effect of compliance with the treatment process on the dynamics of the prevalence of TMJ pathology, as a result of dental orthopedic treatment in patients with metabolic syndrome associated with osteopathies.

Material and methods.

A total of 436 patients were examined: 359 patients with metabolic syndrome associated with osteopathies, and 77 patients with obesity. To verify the metabolic syndrome, patients were examined at the FSBI "Endocrinological Research Center" of the Ministry of Health of the Russian Federation.

Among the patients were 319 women (73.2%) and 117 men (26.8%); the average age of the examined was 47.6 ± 2.1 years.

After complex dental treatment of 359 patients with metabolic syndrome associated with osteopathies, they underwent orthopedic treatment with strict compliance with the indications when choosing the necessary prosthesis designs.

Were made::

– ceramic-metal bridge prostheses (124 people);

– arch prostheses with clasp fixation (72 people);

– arch prostheses with lock fixation (58 people);

– full removable dentures (27 people, including 24 on both jaws);

– fixed prostheses on intraosseous implants (55 people);

– removable cover prostheses on intraosseous implants (23 people).

Comparative clinical and radiological examination of patients with metabolic syndrome associated with osteopathies, as well as patients with obesity, allowed us to evaluate the following indicators:

– prevalence of dentition deformities (%);

– number of displaced teeth per examined;

– prevalence of the temporomandibular joint pathology (K.07.6) (%);

–prevalence of partial dentition defects according to Kennedy (I, II, III, IV class, combinations of defects) and complete adentia (including on both jaws) (%);

– persons with dentures, including single crowns, bridges, partial dentures, full dentures (% of the examined);

Statistical Analysis Methods.

Statistical processing of the results of the study was carried out using the standard set of tools of the office application Microsoft Office Excel 2013. The arithmetic mean value (M) and the standard error of the mean (m) were calculated. The statistical significance of the obtained results (p) was calculated using Student's criterion (t) and its interpretation on the basis of a standard table of critical values of the Student's criterion. The significance level (α)corresponded to the probability of the α- error equal to 5% (α=0,05), the results were considered statistically significant at $p < 0.05$.

Results.

In the course of the study, a significant number of examined revealed dentition deformities due to untimely prosthetics and periodontal diseases; in patients with metabolic syndrome -44.0%, in the comparison group to a lesser extent - 35.1%.

The frequency of pathological changes in the temporomandibular joint in patients with metabolic syndrome was 40.1% versus 29.9% in the comparison group ($p < 0.01$).

Partial defects of the dentition were found in 91.9% in the main group and in 96.1% in the comparison group. In the structure of partial defects, Kennedy classes I, II, III, IV and their combination in persons with metabolic syndrome are as follows: 13.4%, 17.2%, 22.3%, 8.9% and 30.1%; in the comparison group - 10.4%, 11.7%, 40.3%, 14.3% and 19.5%. Obviously, a more frequent combination of defects in patients with metabolic syndrome ($p < 0.01$) (Fig. 1).

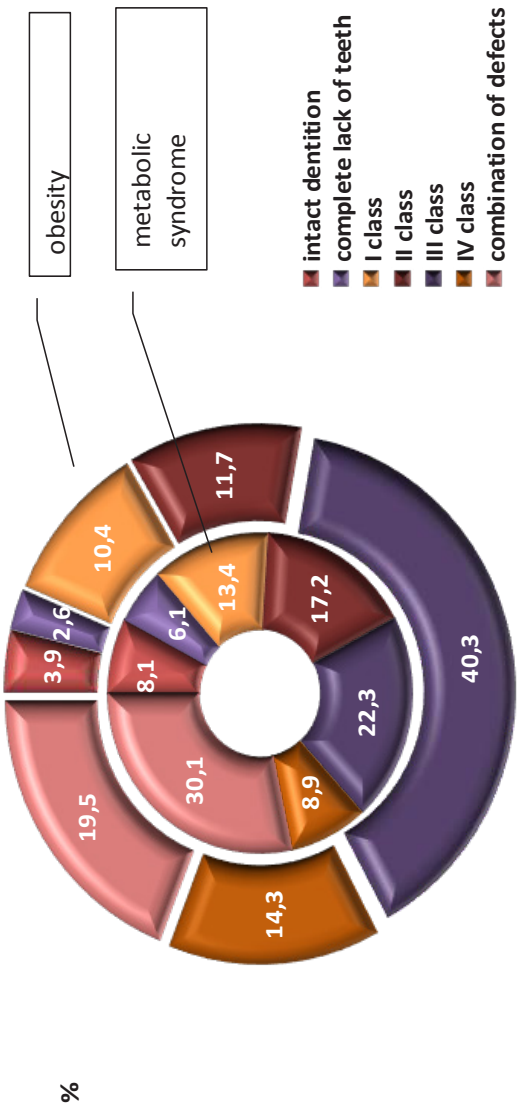

Figure 1. *Comparison of dentition defects in patients with metabolic syndrome associated with osteopathies and in patients with obesity*

The presence of dentures was slightly different in both compared groups (59.6% in the main and 54.6% of the comparison, p <0.05), but nevertheless, for all types of prosthetics, a larger number of them was revealed in individuals with metabolic syndrome: single crowns 30 , 9%, bridges 25.0%, partial dentures 16.2%, full dentures 7.5%; the frequency of use of these prostheses in the comparison group, respectively - 24.7%, 20.8%, 10.4%, 3.9%.

Thus, a comparative study revealed a deeper dental pathology in patients with metabolic syndrome compared with obese people (Table 1).

Table 1. *Comparison of indicators of dental status in patients with metabolic syndrome associated with osteopathy and in patients with obesity*

Indicator	MS + OP (n=359 including 337 with teeth)	Obesity (n=77 including 75 with teeth)
Dentition deformation	**158/44,0%**	**27/35,1%**
Number of teeth shifted	**3,0±0,2**	**1,8±0,1**
TMJ pathology	**144/40,1%**	**23/29,9%**
Kennedy defect	**330/91,9%**	**74/96,1%**
I	48/13,4%	8/10,4%
II	62/17,2%	9/11,7%
III	80/22,3%	31/40,3%
IV	32/8,9%	11/14,3%
combination of defects	108/30,1%	15/19,5%
Full edentia	**27/7,5%**	**3/3,9%**
including on both jaws	22/6,1%	2/2,6%
Presence of dentures	**214/59,6%**	**42/54,6%**
single crowns	111/30,9%	19/24,7%
bridges	90/25,0%	16/20,8%
partial removable dentures	58/16,2%	8/10,4%
full removable dentures	27/7,5%	3/3,9%

Monitoring of the TMJ status indicators in patients suffering from metabolic syndrome after using various types of orthopedic structures showed certain improvements, to varying degrees, depending on the orthopedic structures.

The phenomena of the temporomandibular joint pathology decreased three years after orthopedic prosthetics by the frequency of their detection: on average in the group from 40.1% to 35.6% ($p < 0.05$), for bridges from 40.4% to 33.9% ($p < 0.02$), for arch prostheses (clasp fixation) - from 51.4% to 50.0% ($p > 0.05$); for arch prostheses (locking fixation) - from 48.3% to 44.8% ($p < 0.05$); for complete removable dentures - from 66.7% to 59.3% ($p < 0.05$); for fixed dentures on dental implants - from 14.6% to 10.9% ($p < 0.01$); for cover prostheses on dental implants - from 13.0% to 8.7% ($p < 0.01$). (Fig. 2).

Thus, as one would expect, the operation for three years of all orthopedic structures reduced the prevalence of the temporomandibular joint pathology.

At the same time, with prosthetics with bridges, the prevalence of TMJ pathology decreased by 6.5%, arch prostheses with clasp fixation - by 1.4%, arch prostheses with lock fixation - by 3.5%, full dentures - by 7.4%, fixed dentures on implants - by 3.7%, removable dentures on implants - by 4.3%.

A number of patients with metabolic syndrome had low compliance with maintaining their health and fulfilling medical and preventive prescriptions of doctors, which affected the state of TMJ.

Thus, the pathology of the temporomandibular joint - in 33.9% with metal ceramics and 50.0% - with arch prostheses - increased slightly in frequency in the absence of patient compliance (35.3% and 57.1%, respectively) (4.0 difference %, $p > 0.05$) (12.4% difference, $p < 0.05$).

Conclusions:

1. According to the results of a comparative examination, the difference in the state of TMJ was determined, reflecting the more negative effect of the metabolic syndrome associated with osteopathy on the tissues and organs of the maxillofacial region compared with the dental status in obesity.

So, in people with metabolic syndrome, the prevalence of temporomandibular joint pathology is 25.4% more common than in the comparison group, possibly due to the more frequent presence of combined and complete defects in the dentition (35.2% and 48.0% respectively).

2. The reduction of the incidence of temporomandibular joint disease in patients suffering from metabolic syndrome three years after a comprehensive rehabilitation, as a result of pre-prosthetic preparation of the mouth and the functioning of adequate dentures is encouraging.

3. In patients suffering from metabolic syndrome with low compliance, less pronounced effectiveness of dental treatment is observed, accompanied by a decrease in the service life of orthopedic structures, as well as a lower percentage of improvement in TMJ.

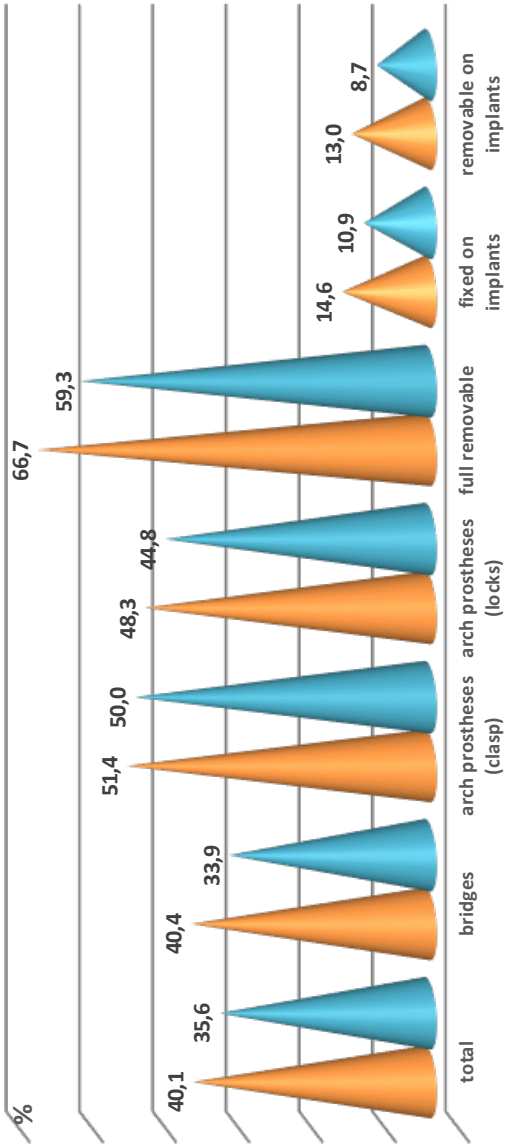

Figure 2. *Dynamics for over 3 years of detection of pathology of the mandibular joint in patients ith metabolic syndrome associated with osteopathy, depending on the orthopedic design*

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关于年龄较大的患者的牙齿素养和医疗活动问题
ON THE QUESTION OF DENTAL LITERACY AND MEDICAL ACTIVITY OF PATIENTS OF AN OLDER AGE GROUP

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抽象。这篇文章介绍了342名老年患者的龋齿强度指数的结构以及口腔的卫生状况。 在所检查的患者组以及医疗活动的某些方面均观察到了口腔护理方案。在被检查的个体中，获得了高水平的龋齿强度（0.34±0.02），大量拔牙（56.12%）和令人满意的牙科保健水平（51.05%）的数据。 结论是需要对整个人口进行教育工作，以改善口腔卫生和增加牙科保健水平。

关键字：牙齿素养，医疗活动，牙齿状况，老年患者。

Abstract. *The article presents materials on the structure of the caries intensity index in 342 patients of the older age group, and the hygienic condition of the oral cavity. The oral care regimen was observed on the examined group of patients, as well as certain aspects of medical activity. Data were obtained on a high level of caries intensity (0.34 ± 0.02), a large percentage of extracted teeth (56.12%) and a satisfactory level of dental care (51.05%) in the examined individuals. The conclusion is drawn on the need for educational work among the population as a whole to improve oral hygiene and increase the level of dental care.*

Keywords: *dental literacy, medical activity, dental status, patients of the older age group.*

Improving treatment and preventive measures in the field of dentistry consists of the development and implementation of modern methods of treatment and prevention of dental diseases, as well as the active participation of the patient in this process (D.I. Kicha et al., 2003 and others). An important component of prevention is social and hygienic measures, which include the formation of hygienically grounded behavior in various spheres of life: hygiene, eating habits, attitude to bad habits, timeliness of seeking medical help, etc. (Yu.P. Lisitsyn, 2001; .A. Dymova, 2004).

Medical activity is one of the most important factors of health in general and a healthy lifestyle, it is the basis of primary disease prevention, prevention of the development of a chronic disease and its recurrence (D.I. Kicha et al., 2003; I.A. Dymova, 2004).

Medical activity characterizes a person's behavior in connection with a personal assessment of his own health and the health of others, the implementation of medical recommendations, visiting a medical institution with a preventive purpose and in case of illness, the nature of treatment, self-medication (Yu.P. Lisitsyn, 2002).

The condition of the oral cavity is one of the main indicators of the general health of the body and is characterized by indicators that reflect the quantitative signs of diseases of the teeth, gums, level of hygiene, etc.

Epidemiological studies conducted in various cities of Russia show an increase in the prevalence and intensity of dental caries and inflammatory periodontal diseases in various age periods (Yu.G. Tarasova et al., 2011; L.Yu. Agafonova et al., 2014; P.G. Gavrilov et al., 2018).

At present, the dental incidence rate in our country among the child population has been studied quite well (S.Yu. Kosyuga, D.I. Botova, 2017), however, the prevalence and severity of major dental diseases among people of the older age group has not been studied enough, and only a few studies have been done on this question.

Purpose: to determine dental hygiene literacy and medical activity among people of an older age group in the city of Izhevsk.

Materials and methods: on the basis of voluntary informed consent, 342 patients aged 70.67 ± 1.44 years who applied for dental care to private dental clinics of the city of Izhevsk were examined. Of these, 224 – were women and 118 were men. In all patients, the index of caries intensity was determined by the DMF index (V.V. Gunchev et al., 2008), the hygienic state of the oral cavity by the simplified plaque index on approximate surfaces (API) according to Large (V.V. Gunchev et al., 2008).

During the examination, a questionnaire was used, which included questions about the awareness of patients about oral hygiene, risk factors for dental diseases, their implementation and compliance with medical recommendations, as well as the comorbidity of somatic and dental diseases.Results and discussion: The DMF index in the examined individuals was 23.52 ± 1.26. The "D" indicator was 1.64 ± 0.20, the "F" indicator was 9.08 ± 0.73, the "M" indicator was 13, 20 ± 1.17. The average level of caries intensity is 0.34 ± 0.02, which corresponds to a high PEC. Hygienic condition of the oral cavity according to the simplified index of plaque on the approximate surfaces (API) at Large 52.55 ± 0.30%, which indicates a satisfactory hygienic condition of the oral cavity.

The level of dental care in these patients was 51.05%, which characterizes this indicator as satisfactory.

The studies were conducted by us by the method of sociological survey on a specially developed questionnaire, the questions of which concerned such aspects as: regularity and regimes of brushing teeth, the use of additional objects and means of oral hygiene, motivation to maintain and preserve dental health. The survey was carried out by self-filling questionnaires by patients at the time of their initial request for dental care.

Particular emphasis was placed on secrecy of the information received. At the same time, the purpose of the study and the need for sincere answers were explained in detail.

It was found that 74.56 ± 2.1 out of 100 respondents preferred to talk with a doctor over all other sources of information (TV and radio broadcasts, popular medical literature, etc.) to get information about their health. Moreover, 84.5 ± 1.7 patients would like to receive more detailed information on the use of medicines and hygiene products, 36.1 ± 2.3 on nutrition issues.

When asked about the awareness of respondents about the effect of oral health on the condition of other organs and systems, 47.36% answered that they did not know this information.

Basically, questionnaires noted the relationship between the health of the oral cavity and the gastrointestinal tract.

General practitioners do not remind patients of the need to visit a dentist, for example, only 19% of respondents indicated that local GPs recommended that they visit a dentist in order to rehabilitate foci of chronic infection.

The survey found that less than half (45.02 ± 2.4) of the 100 respondents, mostly men, were satisfied with the hygienic condition of the oral cavity. The phenomena of halitosis were noted by 21.05 ± 1.9 respondents, among which men also prevailed.

The analysis of hygienic behavior showed its low level. So, out of 100 respondents, half (53.21 ± 2.4) carried out oral hygiene only once a day, a fourth of the respondents - 24.85 ± 1.56 - did oral hygiene twice a day. Only every tenth patient was engaged in tongue hygiene.

The time spent on hygiene measures showed: 74.85–2.3 per 100 respondents spent less than 1 minute on this procedure.

As a result of the survey, it was found that all respondents used toothpaste for brushing their teeth. However, only 6.72±1.3 out of 100 respondents chose toothpaste on the recommendation of a dentist; in most cases, it was purchased taking into account television advertising or based on price category.

Rinse aid was used by 43.56 ± 2.4 respondents. The reason for the irregularity of their use, respondents noted the high price and lack of information on the appropriateness and necessity of their use.

The presence of removable or partially removable prostheses in the oral cavity was observed in 33.62% of patients. In half of them prostheses needed to be replaced, the rest of the patients needed treatment by an orthopedic dentist.

All patients with prostheses clean their dentures with toothpaste; 4 of the surveyed patients, or 1.16%, use special means for cleaning dentures.

The treatment regimen of patients for dental care was as follows: of the 100 respondents, more than half (55.26 ± 2.3) were not seen at the dentist for more than three years, 24.56 ± 2.1 for more than two years. 64.61 ± 2.1 patients have not completed the previously initiated treatment.

Thus, the analysis of hygienic dental literacy and medical activity revealed low level in patients of the older age group. The high level of caries intensity, a large percentage of extracted teeth and a satisfactory level of dental care in this group of patients dictate the need to carry out work to educate patients of a motivated attitude to maintaining dental health as an integral part of improving the body, as well as measures for the comprehensive prevention of dental diseases, including training oral hygiene with the selection of hygiene items and means, treatment at the dentist orthopedist and therapist. Carrying out this work among schoolchildren and students, as well as among the economically able-bodied population, will increase the level of dental care for the population in the future.

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俄罗斯西北白海沿潮带动下的两种盐生植物的日常活动

DAILY ACTIVITY OF TWO HALOPHYTES UNDER TIDAL DYNAMICS ON THE WHITE SEA COAST OF NORTH-WEST RUSSIA

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抽象。本文提供了有关白海沿岸地区两种盐生植物物种（车前草，中生植物，Triglochin maritima L，水生植物）的反应数据。 揭示了两种针对潮汐动力学的物种行为的策略。 水生植物Triglochin maritima的结构性（被动），与叶面积和气孔体积的增加有关，Maritima的植物（间质）的功能性（主动），与淹没条件下的代谢变化有关。 关于在车前草中羧化机理和“气膜”机理参与的假设。

关键词：沿海地区适应机制潮汐（也许？）洪水车前草L Triglochin maritima L

Abstract. *The paper presents data on the reaction of two halophyte species (Plantago maritima L, mesophyte, Triglochin maritima L, hygrophyte) in the White Sea coastal area to tidal influences. Two strategies for the behavior of species on tidal dynamics are revealed. Structural (passive) in the hydrophyte Triglochin maritima, associated with an increase in leaf area and volume of the aerenchyma, and functional (active) in Plantago maritima (mesophyte), associated with metabolic changes in the flooding conditions. Hypotheses are expressed about the participation of the carboxylating mechanism and the "gas film" mechanism in Plantago maritima.*

Keywords: *coastal territories, adaptation mechanisms, tidal cycle (maybe?,) flooding, Plantago maritima L, Triglochin maritima L,*

Introduction

The White Sea is the inland sea of Russia and belongs to the group of seas of the Arctic Ocean. The coastal strip of the White Sea, like all other seas, is a piece of the earth's surface adjacent to the coastline and subjected to tidal rhythm (Sergienko, 2008; Markovskaya et al., 2010). The rhythm of biological processes – is

the most intriguing field of knowledge and research. A special place in it is occupied by phenomena obeying the lunar rhythm, which on the sea coasts cause tides of the sea water twice a day, forming and maintaining the structure and biota in the littoral zone of the coastal part of the sea (Markovskaya et al. 2017).

Tidal dynamics is a leading factor in the coastal strip and to a large extent determines the strength and nature of the impact of a number of other factors: salinization of water and soil, temperature, light, oxygen and carbon dioxide availability for plants, and a number of other factors.

The autotrophic components of this territory include well-studied algae, as well as higher vascular plants and lichens, which today remain insufficiently studied.

Purpose of the study: identify the regulation of photosynthesis in two halophytes in tidal dynamics on the upper and lower littoral of the White Sea coast.

Fig. 1. *Map of sampling sites (sampling sites are marked with flags)*

Materials and methods

Area of study. The study was conducted during the summer field seasons 2012-2019. on the coastal sections of the White Sea coast: Pomeranian coast of the White Sea in the vicinity of the village of Rastnavolok (64°32′16″N, 34°46′48″E); Karelian coast in the vicinity of the village of Keret (66°17'33"N33°35'28"E); Pomeranian coast

in the vicinity of the village of Kolezhma (64°22'81"N35°93'14"E); Karelian coast in the vicinity of the village of Rabocheostrovsk (64°59'41"N34°47'52"E); Dolgaya Bay in the vicinity of the village of Solovetsky (65°05'52 "N 35°41'33"E) (Fig. 1)

Objects of study: Higher terrestrial plants growing on the upper (near the shore) and lower (near the water edge) littoral of the White Sea coasts: *Plantago maritima* L (mesophyte) and *Triglochin maritima* L (hygrophyte),

Research Methods: Anatomical and morphological parameters of the epidermis of the leaf was investigated by the method of prints according to Polacci (Zakharevich, 1954). Biological repetition of 30 times. Measurement of leaf area was carried out in 30-fold repetition using the Image program.

Stomatal conduction was determined by Leaf Porometer (Decagon Devices, Inc., USA). 20-fold biological repetition.

The parameters of chlorophyll *a* fluorescence intensity were recorded using a JUNIOR-PAM fluorimeter (Heinz, Walz GmbH, Germany) after a 30-minute dark adaptation.

The rate of CO_2 assimilation and plant transpiration was measured using a portable gas analyzer LCPro + from ADC BioScientific Ltd. (Kosobryukhov, Markovskaya 2016) The analysis of carbon dioxide carbon dioxide gas exchange curves was carried out according to the model of Farquhar et.al. (1980).

Statistical methods. For statistical data processing, the software packages "*Microsoft Excel 7*" and "*Statistica for Windows*" were used. The reliability of the results was evaluated using Student's t-test at $p = 0.95$. The tables and graphs show the average values with standard errors.

Results and discussion

One of the features of the life of a number of terrestrial vascular plants on the White Sea coast is the growth in unstable environmental conditions on the littoral, where the rhythmic fluctuations in the water level in the day due to tidal dynamics require the reconfiguration of the photosynthetic apparatus from the air to the aquatic environment. The native species of this territory successfully undergo their ontogenetic development, which indicates their high stability under these conditions (Sergienko, 2008; Markovskaya et al., 2010). However, the problem of mechanisms that allow these species to withstand the conditions of periodic flooding twice a day and quickly switch from one medium to another is not covered in the literature.

Tab. 1 and 2 presents the results of anatomical studies. In plants on the lower littoral (closer to the water edge, high flooding) compared with plants near the coast (low flooding). *Triglochin maritima* - leaf area increases, there are no changes in the size of epidermal cells and cuticles. The number of stomata does not change on the upper and lower sides of the leaf. In *Plantago maritima* plants, leaf area decreases, epidermal cell thickness and cuticle layer size decrease. The number of stomata increases on the upper and lower sides of the leaf.

Table 1. *Leaf area and epidermal size in plants under different growing conditions on the littoral of the White Sea*

Plant specie	Upper littoral			Lower littoral		
	Leaf area mm²	Epidermis thickness µm	Cuticle thickness µm	Leaf area mm²	Epidermis thicknes µm	Cuticle thickness µm
Triglochin maritima	212±57**	19±3	2±0,3	1199±347**	21±3	2±0,1
Plantago maritima	1848±235**	27±3**	6±1**	841±37**	19±2**	2±0,1

** - Differences are significant if p≤0,01

Table 2. *The number of stomata per 1 mm² of leaf area in plants under different growing conditions on the littoral of the White Sea*

Plant specie	Upper littoral		Lower littoral	
	Top side of leaf	Bottom side of leaf	Top side of leaf	Bottom side of leaf
Triglochin maritima	78±9	82±6	73±7	75±8
Plantago maritima	86±13**	127±8	121±6**	149±9

** - Differences are significant if p≤0,01

The study of physiological parameters was performed in the diurnal cycle of tidal dynamics. For this purpose, plant samples were taken at full tide and full low tide, when the plants were under water for a long time (about 3 hours) and in the air (about 3 hours), as well as in transitional stages of tidal dynamics, when the plants were half-flooded.

Analysis of the stomatal gap and stomatal conductivity values in *Triglochin maritima* plants during the tidal cycle showed that the maximum values of these parameters were achieved at low tide, the minimum values were observed during complete submersion. *Plantago maritima* plants have the maximum stomatal conductivity and stomatal gap noted both during complete submersion in the tide, and outside of flooding at low tide.

Both species were not stressed in any of the stages of the tidal cycle, which indicates the adaptation of these plants to littoral conditions. In *Triglochin maritima* plants, the maximum values of the main vital signs are observed in transition periods (*ETR, qP*), and the minimum - at full tide. Under conditions of drying, the *ETR* values decrease, and *qP* reach high values. Low *NPQ* values at all stages of the tidal cycle.

In *Plantago maritima* plants, the maximum values of all indicators (*ETR, qP, NPQ*) are high at full low tide and full high tide. And in transition periods they are much lower.

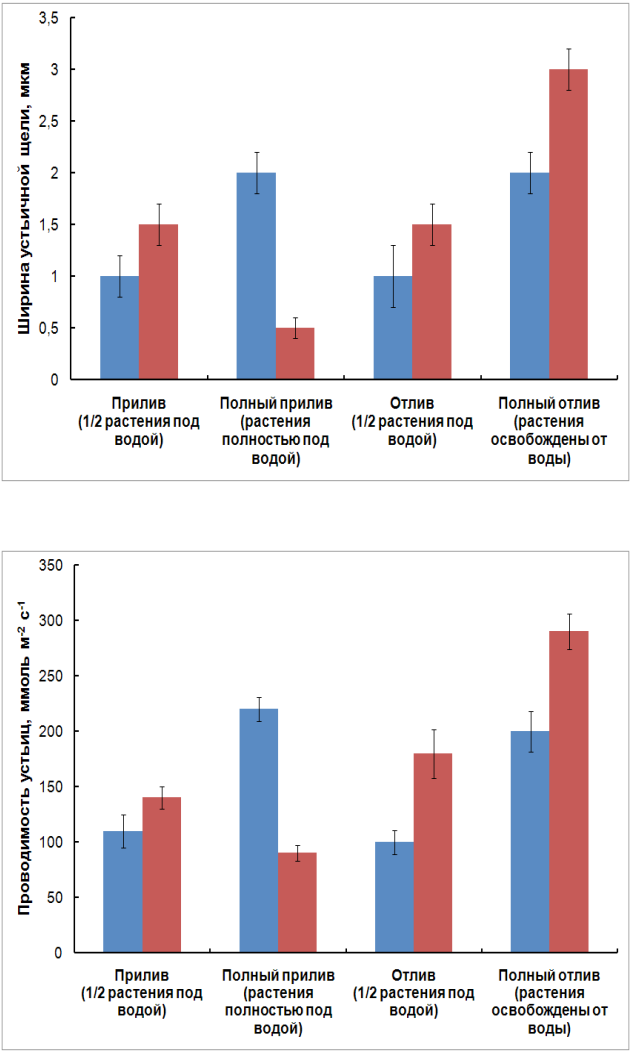

Fig. 2. *Assessment of the condition of stomata: stomatal fissure width and stomata conductivity at different stages of the tidal cycle. Plantago maritima data is marked in blue, Triglochin maritima data is marked in red*

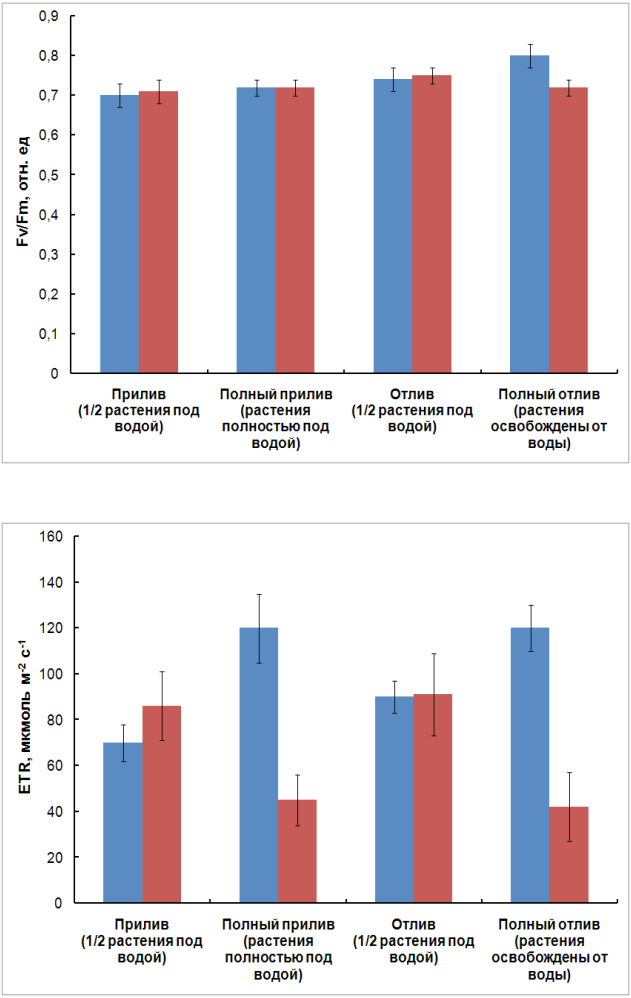

Fig. 3. *Fluorescence parameters of chlorophyll a: Fv/Fm, ETR at different stages of the tidal cycle. For objects, color codes as for Fig. 2.*

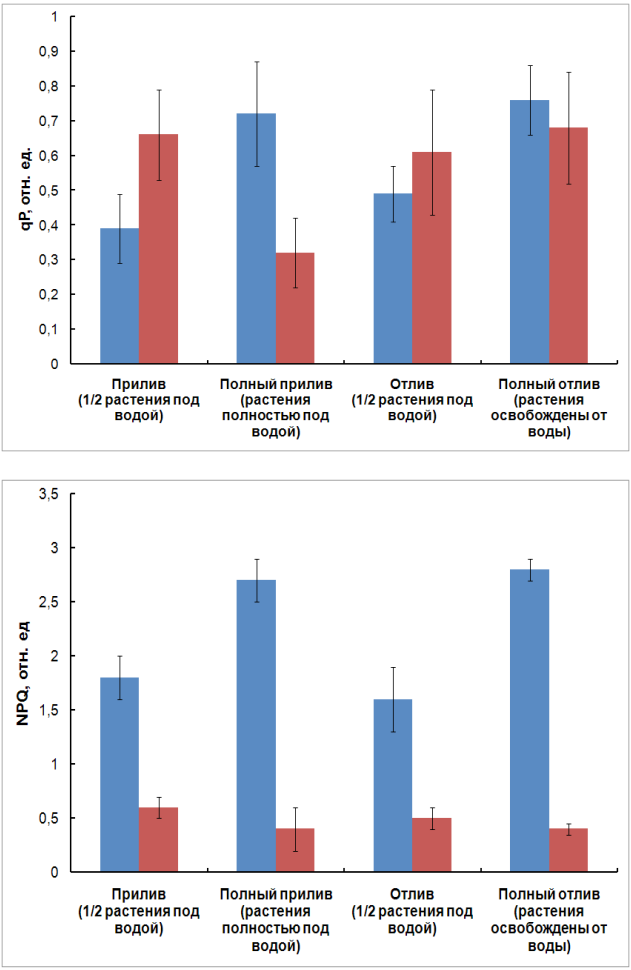

Fig. 4. *Chlorophyll a fluorescence parameters: qP, NPQ, at different stages of the tidal cycle. For objects, color codes as for Fig. 2.*

Analysis of photosynthesis parameters in *Triglochin maritima* plants showed a low intensity of photosynthesis and transpiration, but a high concentration of the internal amount of carbon dioxide, which indicates the work in this type of aerenchyma. It reacts to an increase in CO_2 with a 4-fold increase in the intensity of photosynthesis. This indicates that the habitat of the species is limited by the carbon dioxide content in these habitat conditions. *Plantago maritima* plants

showed a high level of photosynthesis intensity and only a twofold increase at saturating concentrations of CO_2, which may be due to two routes of CO_2 input (hypothesis on the inducible activity of carbonic anhydrase) under natural conditions (during flooding) (Larkum et al., 2017) and the presence of a gas film (Ohta et al., 2018; Kurokawa et al., 2018). High carboxylation rate and electron transport rate, as well as high *ETR* values indicate active assimilation. At the same time, part of the incoming energy is not used by the plant, as evidenced by the high non-photochemical quenching of fluorescence (*NPQ*).

Table 3. *Parameters of photosynthesis under an increased concentration of carbon dioxide at low tide*

Parameters	Plantago maritima	Triglochin maritima
Maximum absorption rate CO_2, μmol $CO_2/(m^2s)$	85,0±4,8	48,7±3,4
Maximum carboxylation rate, μmol $CO_2/(m^2s)$	123,0±20,9	56,2±9,8
Carboxylation efficiency, μmol $CO_2/(m^2sPa)$	1,78 ± 0,24	1,38 ±0,33
The electron transport rate upon saturation with light, μmol $/(m^2s)$	428,0 ±93,7	140,3 ±14,4
The rate of utilization of triose phosphates, μmol $CO_2/(m^2s)$	29,3 ± 46,8	13,2 ± 1,8
The speed of dark breathing in the light, μmol $CO_2/(m^2s)$	9,8± 1,7	17,2 ± 3,4
Carbon dioxide compensation point, μmol CO_2/ mol	115	196

Conclusion

Two strategies for adapting to the conditions of the tidal cycle are revealed: structural (passive) and functional (active). *Triglochin maritima* (hygrophyte) – "passive". Structural adaptation in this species is accompanied by an increase in leaf area and aerenchyma volumes. *Plantago maritima* (mesophyte) – “active” and provides an increase in the number of stomata and a decrease in the thickness of the epidermis and cuticle. An increase in stomatal conductivity and fluorescence indices during underwater photosynthesis is also noted, the stomatal gap is wide open and, as we assume, there are two carboxylating mechanisms in full tide and the presence of a gas film. Similar adaptation strategies have been noted in the literature in terrestrial species with different durations of flooding outside of tidal dynamics (Bailey-Serres et al., 2008)

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在极地高山植物园举行的生物植物保护领域科学研究的最重要成果
THE MOST IMPORTANT RESULTS OF SCIENTIFIC RESEARCH IN THE FIELD OF BIOLOGICAL PLANT PROTECTION, HELD AT THE POLAR-ALPINE BOTANICAL GARDEN

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抽象。本文介绍了在极地高山植物园进行的生物植物保护领域的新生物技术数据，以保护热带和亚热带植物的收集并在温室的人工生物污染中维持生态平衡。介绍了：蚜虫蚜和罗氏蚜虫Vier混合育种技术；姆布兹乌斯•姆肯齐埃•舒斯特和普里查德的繁殖方法；利用Amblyseius mckenziei来保护短尾短柄大棚温室植物的方法；一种捕食性螨类植物Phytoseiulus persimili | Athias-Henriot的联合使用方法。以及针对多种害虫的Amblyseiusmackepziéi：蜘蛛螨（Tetranychus urtica Koch。），蓟马（Heliothrips haemorrhoidalis Bouche，Parthenothrips dracaenae Heeger）和温室地（Brevipalpus obovatus）；花蜜传送带的农作物轮作，作为害虫和食虫的附加饲料（营养）培养基。

关键词：生物技术，植物保护，害虫复合体，虫螨，繁殖方法，联合使用方法。

Abstract. *The paper presents data on new biotechnologies in the field of biological plant protection carried out in the Polar-Alpine Botanical Garden to preserve the collection of tropical and subtropical plants and maintain ecological balance in the artificial biocenosis of the greenhouse. Presented are: Aphidoletes aphidimyza Rond and Aphidius colemani Vier co-breeding technology; breeding method for Amblyseius mckenziei Schuster & Pritchard; the method of using Amblyseius mckenziei for the biological protection of greenhouse plants from Brevipalpus obovatus Donnadieu; a method for the joint use of predatory mites Phytoseiulus persimili|Athias-Henriot. and Amblyseius mackepziéi against a complex of pests: spider mites, (Tetranychus urtica Koch.), thrips (Heliothrips*

haemorrhoidalis Bouche, Parthenothrips dracaenae Heeger) and greenhouse plots (Brevipalpus obovatus); crop rotation of the flower-nectar conveyor, as an additional feed (nutrient) medium for pests and entomophages.

Keywords: *biotechnology, plant protection, pest complex, ntomoacariphages, breeding method, method of joint use.*

On the Kola Peninsula, almost in the very center of Khibiny, is the Polar-Alpine Botanical Garden-Institute of N.A. Avrorin KSC RAS - the northernmost in Russia and the first of three botanical gardens in the world beyond the Arctic Circle.

Tropical and subtropical plants are found in two stock greenhouses. Today this collection is represented by more than 1000 species from 106 families. It includes diverse representatives of various regions of the globe. Systematic and ecological-geographical compositions of plants (ferns, conifers, palm trees, succulents) have been created in the stock greenhouse. Of particular value to the collection is the variety of useful properties of its exhibits - these are decorative, medicinal, food and technical plants that invariably attract the attention of visitors [3].

Protecting plants from diseases and pests is very important in adverse northern conditions. A high-tech biological method for protecting greenhouse plants from pests has been developed and is widely used in the Garden. A long-term experiment on the adaptation of introduced insects and ticks allowed the formation of entomophage cultures (called PABGI cultures): *Phytoseiulus persimilis* Athias-Henriot., *Amblyseius mckenziei* Schust., *Aphidoletes aphydimyza* Rond., *Aphidius matricariae* Hal., *A. colemani* Vier., *Encarsia formosa* Gahan., providing long-term and stable control over the number of plant pests in the collection greenhouse.

To maintain phytosanitary stabilization of the artificial agroecosystem, uterine reserve plants were identified in the greenhouse and natural biocontrol zones were identified in the foci of the primary pest concentration, which allows colonized parasites and predators to multiply and, after the hosts, move to other plants. The introduced multi-purpose tactics of directional changes in the ratios of beneficial and harmful species in favor of the former by forming and maintaining balanced foci of phytophages ensures decorativeness tropical and subtropical plants in greenhouses all year round.

The following biotechnologies have been developed in the Polar-Alpine Botanical Garden for the biological protection of plants in greenhouses and orangery.

● **Co-breeding technology of *Aphidoletes aphidimyza* and *Aphidius colemani*.** A method for joint breeding of entomophages (predator and parasite), which includes the sowing of bean seeds, the cultivation of bean plants, the colonization and propagation of *Aphis fabae* on bean plants, carried out as a

"green conveyor", the resettlement, feeding and reproduction of *A. aphidimyza* and *A. colemani* colemani, performed together and simultaneously on the same area in a greenhouse at a temperature of 10 ° C-20 ° C and relative humidity from 50 to 70%. The technology allows to increase the yield of biomaterial while reducing the consumption of seed and reducing production costs, to expand the technological capabilities of the biological method of protecting plants of closed soil against aphids. Patent for the invention has been recived [2].

● **Method for breeding of *Amblyseius mckenziei.*** *Acarus farris* Oudemans and *A. mckenziei* ticks in a volumetric ratio of 30-75: 1, respectively, are placed in the prepared feed substrate, which is an unsifted flour bran. The stages of feeding and reproduction of ticks are carried out simultaneously for 11-14 days at a temperature of 16-25 ° C and a relative humidity of 65-80% in the presence of an air humidifier, which is used moistened natural sand. The proposed method differs from the generally accepted technique in that the wholemeal bran is used as a feed substrate with a bran layer thickness of 5-7 cm, the bran containers are simultaneously populated by *A. farris* and *A. mckenziei* mites. The yield of biological material increases 4 times with a 2-fold reduction in the period of breeding ticks in comparison with known methods. The method does not require the use of expensive equipment, it is environmentally friendly and can be used for biological protection of plants of closed soil against a pest - thrips in any agricultural enterprise. Patent for the invention has been recived [1].

● **Methods of using PABGI *Amblyseius mckenziei* for the biological protection of greenhouse plants from *Brevipalpus obovatus* Donnadieu.** The method of using *Amblyseius mckenziei* of the PABGI culture for biological protection of greenhouse plants from *B. obovatus* consists in populating *A. mckenziei* in the pest sites of different densities in two ways: 1 - multiple (periodic, weekly) colonization on paper rolls to obtain a guaranteed protective effect in a short time and 2 - combined colonization (using a surrogate host - *Acarus farris*) in different containers, based on the long-term self-regulation of the predator-prey system and the creation of a restraining barrier to reproduction of the pest – by thrips.

● **The technology of using *Amblyseius mckenziei* PABGI culture in the fight against *Brevipalpus obovatus*.** Containers with a feed substrate consisting of flour bran with ticks *Akarus farris* and *Amblyseius* mckenziei in a volume ratio of 1: 100: 60 [1] are suspended in the middle tier of plants in close proximity to the leaves most populated with *B. obovatus* twice a month. In containers, due to a food source in the form of *A. farris*, the abundance of *A. mckenziei* and its gradual distribution increase, which ensures the constant presence of acarifagus on plants for a long period of time. The biological effectiveness of *A. mckenziei* largely depends on the pest population density and is 25-60% at 21-28 days after predator colonization.

● **Method for the joint use of predatory mites *Phytoseiulus persimilis* and *Amblyseius mackenziei* against a complex of pests: spider mites, (*Tetranychus urtica* Koch.), thrips (*Heliothrips haemorrhoidalis* Bouche, *Parthenothrips dracaenae* Heeger) and greenhouse corpuscles. (*Brevipalpus obovatus*).** In order to introduce *A. mckenziei* into the foci of *B. obovatus,* we have used an improved technique - hanging containers with a predator and a prey (*A. mckenziei* + *Acarus farris*) in a ratio of 1: 5 in different tiers of plants and simultaneous release of *Ph. persimilis* by laying out the bean leaves in the ratio of predator: prey 1:10 twice a month. This ensures the constant presence of acariphages on plants over a long period of time and biological control of pests *H. haemorrhoidalis*, *P. dracaenae* and *T. urtica* and *B. obovatus* is carried out at an economically insensible level without affecting the decorativeness of plants. The biological effectiveness of *A. mckenziei* and *Ph. persimilis* largely depends on the density of pest populations and is 50-80% depending on the time of year.

● **The development of crop rotation of the flower-nectar conveyor as an additional feed (nutrient) medium for pests and entomophages.** Numerous phytophage colonies (aphids and whiteflies) are formed on flowering plants, which make it possible to contain uterine cultures of entomophages in the insectarium: *Aphidius colemani, Aphidoletes aphidimyza, Encarsia formosa* without diapause during the year and contribute to an increase in the duration of their life cycle from 7 to 12 days, increase the search ability and fertility. Individual links of the flower-nectar conveyor are enhanced by the use of additional artificial nutrition. To do this, artificial flowers were made from a foam sponge, soaked in a solution consisting of honey and flower pollen, and placed throughout the greenhouse into pests foci. Wetting foam flowers once a week with nutritious dressings in the form of: 1) 10% honey solution (10 g/1l) + flower pollen (5-7 "balls"); 2) solution of flower pollen (25-30 "balls" per 1 liter of water); 3) 20% honey solution prolongs the female life cycle up to 9-15 days., Allow populations to survive critical environmental conditions, significantly increase the time during which the *A. aphidimyza* female lay eggs, and parasitize pests (aphids, whiteflies) females of *A. colemani* and *E. formosa.*

Biotechnologies developed by the Polar-Alpine Botanical Garden for the use of entomoacariphages allow regulating and maintaining the level of biocenotic equilibrium in the artificial biocenosis of the greenhouse, minimizing chemical treatments, and improving sanitary and hygienic working conditions. The introduction of new methods for breeding entomophages allows to increase the volume of biomaterial while reducing production costs, does not require the use of expensive equipment, is environmentally friendly and can be implemented at any enterprise engaged in growing plants in greenhouses.

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甲壳纲作为研究水生环境油污染的试验对象
CRUSTACEA AS A TEST OBJECT FOR THE RESEARCH OF THE OIL CONTAMINATION OF AQUATIC ENVIRONMENTS

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注解。评价碳氢化合物对水环境的污染程度的问题非常重要，而且由于不同质量分数的等量油污污染物对水生生物的毒性程度不同，这一事实也变得很复杂。本文以阿斯特拉罕地区（2013-2015年）的具体研究为例，介绍了使用生物测试方法评估意外漏油事件对天然水体造成的危害的优势。考虑以下问题：确定天然水中油类污染物的毒性；不同馏分的石油产品安全浓度LC10的计算和比较分析；通过考虑生物指标LC10评估紧急漏油的影响对水介质造成的损害。生物测试的结果表明，石油产品中最重的石油馏分对大蚤（Daphnia magna Straus）的影响最大。溶解和分散在水中的重油馏分的极限无害浓度（LC10）比柴油馏分的LC10小2倍，对石油产品的轻汽油和中等石油馏分的LC10小20倍。溢出到Volozhka银水通道表面的油类产品的无害浓度等于0.014 mg / dm3。这是渔业水库水中油品的MAC（0.05 mg / dm3）的3.6倍，这是确定污染毒性和经济损害程度的基准。使用计算得出的LC10指数和生物系数CBIO（如果LC10小于MAC）可以让我们考虑碳氢化合物对水生生物的直接影响程度，并使对水介质造成的破坏的计算更加准确和客观。在对水生环境的油污染进行复杂的研究时，应采用生物测试方法以及传统的分析方法。

关键词：石油污染，水环境，生物测试，毒性作用，无害浓度，破坏。

Annotation. *The problem of evaluating the degree of the pollution of aquatic environments by hydrocarbons is very important, and it is complicated by the fact that the equal mass concentrations of oil contaminants with different fractional composition have different degrees of toxic effects on aquatic organisms. The paper presents the advantages of using the method of biotesting for evaluation of the harm caused to natural water objects by the impact of accidental oil spills using the example of specific studies in the Astrakhan region (2013-2015). The following questions are considered: determination of toxicity of oil pollutants in the natural water; calculation and comparative analysis of safe concentrations* LC_{10} *for the petroleum products with different fractions;*

the assessment of damage caused to the water medium by the impact of emergency oil spills by taking into account the biological indicator LC_{10}. The results of biotesting shows that the heaviest oil fractions of petroleum products have the maximal effect on Daphnia magna Straus. The limiting harmless concentrations (LC_{10}) of the heavy oil fractions dissolved and dispersed in water is 2 times less than LC_{10} for the fractions of diesel fuel and 20 times less than LC_{10} for the light gasoline and medium petroleum fractions of the petroleum products. The harmless concentration of oil products spilled on the surface of Silver Volozhka water channel is equal to 0.014 mg/dm^3. This is 3,6 times less than the MAC of oil products in the water of fishery reservoirs (0.05 mg/dm^3), which is taken as a benchmark in determining the degree of toxicity of pollution and economic damage. The use of the calculated index of LC_{10} and biological coefficient C_{BIO} (if LC_{10} is less than MAC) allows us to take into account the degree of influence of hydrocarbons directly on aquatic organisms and makes the calculations of damage caused to water medium more accurate and objective. Biotesting methods, along with the traditional analytical methods, should be utilized in complex studies of oil pollutions of the aquatic environments.

Keywords: *oil pollution, aquatic environment, biotesting, toxic effects, harmless concentration, damage.*

Introduction

Currently, anthropogenic pollution is one of the main factors that have a significant negative impact on the aquatic environments. Oil and petroleum products are examples of the most dangerous pollutants to the aquatic environment. The greatest danger to aquatic organisms of the entire spectrum of petroleum products present water-soluble and dispersed oil components [1,2]. Typically, the following fractions of the oil are distinguished: petrol (lighter) fractions, kerosene (average) fraction, diesel fraction, oil (heavy) fraction, fuel oil [3]. The problem of evaluating the degree of pollution of water by hydrocarbons is extremely important, and it is complicated by the fact that at equal mass concentrations of petroleum pollutants with different fractional composition have varying degrees of toxic effects on living organisms [4,5].

Thus, it is suggested that it is objectively useful and timely to study the influence of different fractions of petroleum products on the physiological activity of a various type Crustacea by biotesting methods. In addition, it is important to study the possibility of using the biotesting in the system for assessing the degree of accuracy of natural waters and for calculating the damage caused by the impact of emergency oil spills. The aim of this work is to investigate the effect of toxicity of various fractions of petroleum products on the physiological activity of crustaceans (Crustacea type) by applying a method of biotesting.

To achieve this goal the following tasks were accomplished:

1) We determined lethal and safe concentrations of petroleum pollutants in natural water. The MAC of oil products in water of the fishery reservoirs and results of the bioassay safe concentrations of petroleum products in the natural water are compared.

2) We conducted experiments on the bioassay of different fractions of petroleum with a series of dilutions in cultivation water. We also compare the values of MAC for oil products in water of fishery reservoirs and results of the bioassay safe concentrations of various fractions of petroleum products in water [6,7].

3) We used a comprehensive system for assessing the harm caused to a fishery reservoir by oil pollution, taking into account LC_{10} and the biological coefficient of the C_{BIO} using the example of the accident of oil tanker at the Silver Volozhka river.

Materials and Methods.

In the lower reaches of the Volga river, among the main groups of crustaceans, the second place on average in terms of abundance and biomass is occupied by neg. Cladocera, there are representatives of shell crayfish, amphipods, mines. Representatives of the Cladocera order (type Crustacea) are an extremely important key link in the food networks of natural reservoirs and the most sensitive indicators of pollution of natural water [2]. Therefore, the biotesting was performed on the test objects of the Crustacea type: Daphnia magna, Straus - representative of the Cladocera detachment (Cladocera); Moina weismanni Ishikawa - representative of the Daphniiformes squad; Cypridopsis aculeata - representative of the order Podocopida (Ostracodes).

The research material was samples of natural water and oil-containing pollutants taken and analyzed for toxicity in the branch of the Center for Laboratory Analysis and Technical Measurements in the Southern Federal District - Center for Laboratory Analysis and Technical Measurements in the Astrakhan Region

Each sample and its dilution were replicated three times. Account mortality and monitoring of the changes in physiological state of the test objects in acute experiments and in the control experiments were carried out prior to the expiration of 96 hours. To determine the harmless concentrations (BC) we used the method of direct calculations and method of probit-analysis using the software Excel.

The quality the control assessment of the toxicity of pollutants in the experiment was conducted by determining the sensitivity of the used test organisms to a reference toxicant – the potassium dichromate ($K_2Cr_2O_7$)[6].

Results and discussions.

The results of the sensitivity study of test objects with respect to oil contaminants of various origin and toxicity tests (harmless multiplicity dilution (LCR_{10}) and lethal multiplicity dilution (LCR_{50}) are presented in Table 1.

The tests showed that the test objects studied showed similar sensitivity to the effects of each of the oily contaminants (moving to the surface of the water, whirling on its side, difficulty breathing, lack of active power)

It should be noted that after 1 hour from the beginning of the experiment the sample №6 (bitumen) was noted bubbling from the test objects: Daphnia 100% Cypridopsis 20%, Moin 10%. At the end of the experiment (96 hours), test organisms switched to active swimming in the water column, the death was not more than 10%.The impact of the factor decreased.

With the purpose of studying the influence of pollution of the aquatic environment with oil products on the living organisms by method of CCA and biotesting at the test facility Daphnia magna, Straus, a comparative analysis of samples of natural water and film oil selected at oil spills in 2013-2015 on water bodies Volga river, Bahtemir, Kizang, Bobyor, Direct Bolda, Curve Bolda, Serebryanaya Volozhka was done.

Table 2 shows the results of comparison of MAC and actually harmless concentrations (LC_{10}) of natural water samples, which obtained by method of probit-analysis using Excel program.

Table 1

No.	Oil contaminant	The test objects of the Crustacea type					
		Daphnia magna,Straus		Moina weismanni I.		Cypridopsis aculeata	
		LCR_{10}	LCR_{50}	LCR_{10}	LCR_{50}	LCR_{10}	LCR_{50}
1	Oil sludge 1	35,4	10,0	32,6	9,2	38,5	10,9
2	Oil sludge 2	38,5	10,9	38,5	10,9	42,0	11,9
3	Oil sludge 3	46,7	13,2	46,7	13,2	46,7	13,2
4	oily wastewater 1	6,9	4,5	6,9	4,5	5,2	1,8
5	oily wastewater 2	8,0	4,9	8,0	4,9	6,3	3,0
6	Bitumen	1,0	-	1,0	-	1,0	-

Table 2

Comparison of the values of MAC for oil products in water of fishery reservoirs and harmless concentrations (LC10) of petroleum products in the samples of natural water

Name of indicator	№ of test													
	16*	17	18А	18Б	18В	18Г	18Д	18Е	19А	19Б	20В	20Г	20Е	20Ф
MAC, mg/dm^3	0,05													
LC_{10}, mg/dm^3	0.061	0.07	0.034	0.036	0.136	0.118	0.111	0.107	0.059	0.031	0.038	0.038	0.067	0.04
MAC: LC_{10}	0.82	0.71	1.43	1.39	0.37	0.42	0.45	0.05	0.85	1.61	1.32	1.32	0.75	1.25

From the Table 2 it can be seen that in 43% of the samples of natural water contaminated with petroleum products in the fact the safe concentrations of LC_{10} are much less than the MAC.

To compare the degree of influence of different fractions of petroleum products on hydrobionts, a series of experiments on the test object was carried out. The following pollutants were utilized in the experiments: gasoline (gasoline or light fraction); kerosene (medium or kerosene fraction); diesel fuel (diesel fraction); machine oil (or heavy oil fraction); Oily waste taken from the surface of the water in the place of emergency oil spill on a water surface at Silver ProtokaVolozhka.

Analysis of the results of experiments suggests that the greatest toxic effects on the test object 1 hour after the start of the experiment was caused by motor oil and diesel fuel. The manifestation of the physiological disorders (moving to the surface of the water, whirling on its side, no characteristic spasmodic movements, difficulty breathing, lack of active power) was observed in 100% of the test organisms at concentrations: 0.05 mg/dm^3 (polluter-machine oil) and 0,25 mg/dm^3 (polluter-diesel fuel).

With the exposure time 96 hours, similar physiological changes in the test organisms were observed for different concentrations of the pollutants in the water. With the increase in the number of fatalities, the surviving test organisms were observed to adapt to the effects of the pollutants (see Table 3).

Table 3

The effect of the oil concentration in water samples (mg/dm^3) on the physiological characteristics of the test objects 96 hours after the start of the experiment.

Physiological changes	Gasoline mg/dm^3	Kerosene mg/dm^3	Waste oil product mg/dm^3	diesel fuel mg/dm^3	machine oil mg/dm^3
Recovery of motor function of the organism, normalization of processes of respiration, nutrition	-	-	От 0.025 до 20	-	От 0.025 до 0.05
Death 10% (LK0) Death of 50% (LK50) Fatal 100% (LK100)	0,25 2 20	0,25 2 20	0,012 0,05 20	0.025 0,25 4	0.012 0.025 0.05
Active sudden movement in the water column, movement of the valves is uniform, breathing and nutrition without deviation from the norm, the lethal outcome (10%) was observed in	0.05	0.05	0.012	0.012	0.012

Analysis of the Table 3 show us that the greatest toxic effects in the test organisms 96 hours after the start of the experiment were caused by the engine oil, the waste oil and the diesel fuel. From Table 3 one can see that the harmless limit concentrations (BC_{10}) dissolved and dispersed in water heavy oil fractions of oil 2 times less than BC_{10} fraction of the diesel fuel and 20 times less than BC_{10} light gasoline and medium petroleum fractions petroleum products. The impact of the factor decreased.

Table 4 shows the results of comparison of the values of MAC and actually harmless concentrations (LC_{10}) of different fractions of petroleum products, which obtained by method of probit-analysis using the Excel program.

Table 4

Comparison of the values of MAC for oil products in water of fishery reservoirs and safe concentrations of various fractions of petroleum products in water (exposure time 96 h)

Name of indicator	Gasoline	Kerosene	Waste oil product	Diesel fuel	Machine oil
MAC (mg/dm^3)	0.05				
Death 10% (LC_{10}) exposure time 96 h (mg/dm^3)	0,337	0,320	0,014	0,028	0,012
MAC: LC_{10}	0,15	0,16	3,57	1,79	4,17

According to the degree and nature of the toxic effects on the test object, the waste taken from the site of the emergency spill on a water body occupies an intermediate position between the heavy and light fractions of oil. Its harmless concentration (LC10) is 3.6 times lower than= the MAC value.

The results obtained in the course of our experiments fully confirmed that the toxicity of hydrocarbon pollutants of natural water which different fractional composition, accordingly, can be significantly different for the same quantitative content of the pollutants.

In scientific literature there are various points of view on which method of determining the toxicity of the aquatic environment is the most precise and efficient: chemical, biological or other methods. In the practice of environmental organizations in Russia the calculation of the amount of the harm (damage-D(У) from accidental pollution of water body by oil products is determined by the formula №2 Methodology [8]:

$$D(У) = К_{ВГ} * К_{ДЛ} * К_{В} * К_{ИН} * Н_{i}, \quad (1)$$

in that:

$К_{ВГ}$ - coefficient taking into account natural and climatic conditions depending on the season;

$К_{В}$ - coefficient taking into account environmental factors (state of water bodies);

$К_{ИН}$ — the rate of indexation that takes into account the inflationary component;

$К_{ДЛ}$ - coefficient taking into account the duration of the negative impact of harmful (polluting) substances on the water body in case of failure to take measures;

$Н_{i}$ – is the fee for calculating the amount of damage in accordance with Table 8 of Methodology [8]. $Н_{i}$ set taking into account the MAC and total mass of oil products. The biological indicator LC_{10} of aquatic organisms actually safe for hydrobionts in cases of accidental spills is often several times lower than the MAC value.

The idea of using biotesting to assess the damage caused by the impact of accidental spills of petroleum products on natural water bodies of fishery importance is follows. In order to improve the quality of the assessment of damage, it is proposed to introduce an additional biological coefficient C_{BIO} ($K_Б$) in the generally accepted formula №2 Methodology [8] for calculating of the damage. C_{BIO} takes into account the multiplicity of exceeding the MAC for petroleum products in relation to the biological LC_{10}, which is determined by biotesting on water test objects (Daphnia, etc.)

$$C_{BIO} = MAC / LC_{10} \quad (2)$$

in cases where the actual LC_{10} is a more limiting indicator then the MAC,

$LC_{10} < MAC$ ($C_{BIO} < 1$)

Let us consider the use of a comprehensive system for assessing the harm caused to a fishery reservoir by oil pollution, taking into account LC_{10} and the biological coefficient of the C_{BIO} by the example of accident of an oil tanker of the Silver Volozhka. For this emergency situation, the estimated indicator of biotesting is a LC_{10} =0,014 mg/dm^3, and the MAC (maximum permissible concentration) for oil products MAC=0,05 mg/dm^3. From the above it follows:

$$C_{BIO} = 0{,}05 \text{ mg/dm}^3 / \ 0{,}014 \text{ mg/dm}^3 = 3{,}6$$

This indicates that in this case, the level of the LC_{10} for oil products is 3,6 times lower then the MAC. So the 1 ton of the oil products trapped in the Silver Volozhka channel and 3,6 tons of the oil products with a LC_{10} = MAC = 0,05 mg/dm^3 has toxicity equal to that of toxicity. Damage for this case, taking into account the C_{BIO} will be:

$$D(У) = K_{ВГ} * K_{ДЛ} * K_В * K_{ИН} * Hi * C_{BIO}, \quad (3)$$

where: Hi – the tax for calculating the amount of the damage in accordance with Table 8 of Methodology [8] is equal to 962000 RUB;

$K_{ВГ}$ _ in accordance with Table 1 of Methodology [8] is equal to 5;

$K_В$ _ in accordance with Table 2 of Methodology [8] is equal to 1,41;

$K_{ИН}$ _ in accordance with paragraph 11,1 of Methodology [8] is equal to 1.

The amount of damage caused to the water body of the Silver Volozhka channel by accidental contamination with oil products, tacing into account C_{BIO} was:

D(У) = 962000 RUB * 1,15 * 5 * 1,41*1 * 3,6 = 7799415 RUB * 3,6 =28077894 RUB

The damage caused to the water body of the Silver Volozhka channel, excluding C_{BIO} amounted to:

$$D(У) = 962000 \text{ RUB} * 1{,}15 * 5 * 1{,}41 * 1 = 7799415 \text{ RUB}$$

The actual damage taking into account C_{BIO} is 3,6 times greater than the damage calculated only on chemical analysis.

Conclusion.

In conclusion, we can say that the use of bioassay in the Crustacea such as test objects in the system to estimate damage caused to natural water bodies influence of accidental oil spills objectively useful and timely. The application of a calculated indicator of biological safety concentration LC_{10} and the biological coefficient C_{BIO}

($K_Б$) at the test facility improves the quality of assessment of the degree of accuracy of oil-contaminated water environments and the accuracy of calculating damage to natural water objects (if LC_{10} < MAC; C_{BIO} < 1). Based on these results, it can be concluded that the proposed solution is promising and the possibility of its application in the practice of state control of environmental organizations.

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柴油机燃烧室火焰的光谱特征

SPECTRAL CHARACTERISTICS OF FLAME IN THE COMBUSTION CHAMBER OF THE DIESEL ENGINE

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注解。基于用于计算通过辐射的热传递的区域方法的数学模型的使用，被应用于船用柴油机的燃烧室，需要对许多能量特性进行初步确定。其中最重要的是火焰的光谱光学厚度。本文的目的是开发一种计算方法，用于评估6×24/36船用柴油机燃烧室中火焰的光谱光学厚度。结果表明，火焰光谱光学厚度的大小取决于三个主要参数：辐射的衰减系数，烟尘颗粒的浓度及其光学特性（平均直径和衍射参数）。针对船用柴油机6×24/36进行负载特性测试时，炭黑颗粒的尺寸分布和火焰光谱光学厚度的值随曲轴旋转角度的变化而变化。给出了主要方法，这些方法使得可以使用有关其光谱光学厚度的计算数据来确定燃烧室中火焰黑度的积分程度。

关键词：船用柴油光谱火焰厚度辐射传热

Annotation. *The use of mathematical models, which are based on the zonal method of calculating heat transfer by radiation, as applied to the combustion chamber of a marine diesel engine, requires the preliminary determination of a number of energy characteristics. The most important of these is the spectral optical thickness of the flame. The purpose of this article is to develop a calculation method for evaluating the spectral optical thickness of a flame in a combustion chamber of a ship diesel 6 ЧН 24/36. It is shown that the magnitude of the spectral optical thickness of the flame depends on three main parameters: the attenuation coefficient of the radiation, the concentration of soot particles, and their optical characteristics (average diameter and diffraction parameter). The size distribution of carbon black particles and the values of the spectral optical thickness of the flame are presented as a function of the angle of rotation of the crankshaft for marine diesel engine 6 ЧН 24/36 when tested against a load characteristic. The main approaches are given that make it possible to determine the integral degree of flame blackness in the combustion chamber using the calculated data on its spectral optical thickness.*

Keywords: *marine diesel, spectral optical flame thickness, radiation heat transfer*

Introduction

The structure of mathematical models (MM), allowing to determine the local radiation fluxes on the surfaces of the parts of the combustion chamber (CC) of marine diesel engines as initial ones, includes a number of energy characteristics. The most important of them is the spectral optical thickness of the flame [1,2]. The purpose of this article is to develop a calculation method for evaluation of the spectral optical thickness of a flame in the SS of a marine diesel engine 6 ЧН 24/36. As is known [1, 2], the magnitude of the spectral optical thickness of a flame is mainly determined by three parameters: the attenuation coefficient of the radiation, the concentration of soot particles, and their optical characteristics (average diameter and diffraction parameter). In earlier studies [3], optical data on soot particles (average diameter and diffraction parameter) were taken from the data published in the scientific and technical literature and had a very approximate character. This introduced a significant (up to 15–20%) inaccuracy in the calculated value of the local resulting radiation fluxes in CC of diesels. In the framework of this article, for the first time in the domestic practice of studying radiation heat transfer in CC of diesel engines, a method for estimating the spectral optical thickness of a flame is considered taking into account the real (obtained experimentally) optical characteristics of soot particles as applied to a ship diesel engine of type 6 ЧН 24/36 [4,5].

Experimental-calculation method for determining the spectral optical flame thickness in a marine diesel engine CC

The main emitter in the luminous flame of marine diesel are soot particles. The local concentration and optical characteristics of the latter together with the absorption coefficient determine the degree of blackness of the flame [6]. An analysis of the theoretical solutions for the region of small values of the diffraction parameter given in [1, 2] shows that soot particles have a low absorption capacity in the entire spectral region of the thermal radiation of the flame. The magnitude and spectral behavior of the attenuation coefficients are largely determined by the diffraction parameter ρ and the dispersion of the optical parameters $n(\lambda)$and $\chi(\lambda)$ (refractive index n and absorption index χ), n and χ are related by (1)

$$m = n - i\chi, \tag{1}$$

where $i = -1$.

Thus, to calculate the emission of soot particles (soot flame), along with the particle size d (average diameter), it is necessary to know their quantitative refractive indices $m(\lambda)$ in all areas of the thermal radiation spectrum of the flame. The question of the optical parameters of amorphous carbon (soot) was considered in detail in [1, 2].

The determination of the spectral attenuation index K_λ is related to the question of whether the soot particles formed in the CC of a marine diesel engine of type 6 ЧН 24/36, can be considered small or not, since the expression for K_λ in the region of small and large particles does not coincide. It was shown in [1] that soot particles can be classified as small if the condition $\rho \le 0{,}1$ is satisfied for $|m|\rho < 1$ for the near infrared region of the spectrum from $\lambda = 0.5$ μm to $\lambda = 6.0$ μm. Calculations by the parameters $|m|\rho$ for particles of diesel soot were performed in [6]. Their results showed that the dependence $|m|\rho$ is close to a hyperbole and the condition $|m|\rho<1$ is satisfied for | throughout the near infrared region of the spectrum, and therefore, the soot particles in the flame of a diesel engine with full justification can be attributed to small particles. Because of this, to determine the spectral attenuation coefficient, you can use the formula presented in [1]

$$K_\lambda = \Phi(m)\rho, \tag{2}$$

where $\Phi(m)$– complex refractive index function;

$\rho = \pi d/\lambda$ – diffraction parameter;

d – the average particle diameter of soot;

λ – radiation wavelength.

As established in [1], the dependence $\Phi(m) = f(\lambda)$ is linearly decreasing and in the wavelength range from 0.5 μm to 6.0 μm is described with sufficient accuracy by the equation

$$\Phi(m) = 1{,}36(1 - 0{,}1\lambda), \tag{3}$$

Substituting in (2) the value $\Phi(m)$ from (3), we obtain the expression for the spectral attenuation coefficient

$$K_\lambda = 1{,}36(1 - 0{,}1\lambda)\rho. \tag{4}$$

The validity of dependence (4) for a turbulent soot flame, which is the flame in the CC of a marine diesel engine, is shown in [7]. Dependence (4) is approximate; a comparison of the results of calculating K_λ from (4) and exact theoretical formulas was performed in [1] Moreover, it was shown that up to $\rho \le 0.1$ the values of K_λ, calculated on a computer using exact formulas and according to dependence (4) practically coincide. At $\rho > 0.1$ noticeable discrepancies appear. However, even for $\rho = 0.15$ the difference (on average over the entire region of the flame radiation spectrum) is not more than 10%. In the calculations, the average diameter of soot particles was taken on the basis of experimental data [4,5] and was d_{cp} = 0.035 - 0.045 μm. The aforementioned makes it possible to successfully apply formula (4) for calculating the emission of soot particles in luminous flames with a diffraction parameter $\rho \le 0{,}1$ [1]. The size distribution of soot particles obtained by the authors of this article when testing a marine diesel engine of 6 ЧН 24/36 by the load characteristic for the mode of 100% of the rated power Ne_{nom} is shown in Fig. 1. On the histogram shown in this figure, the curves of normal distribution are specially plotted to show a very significant difference from the experimental data.

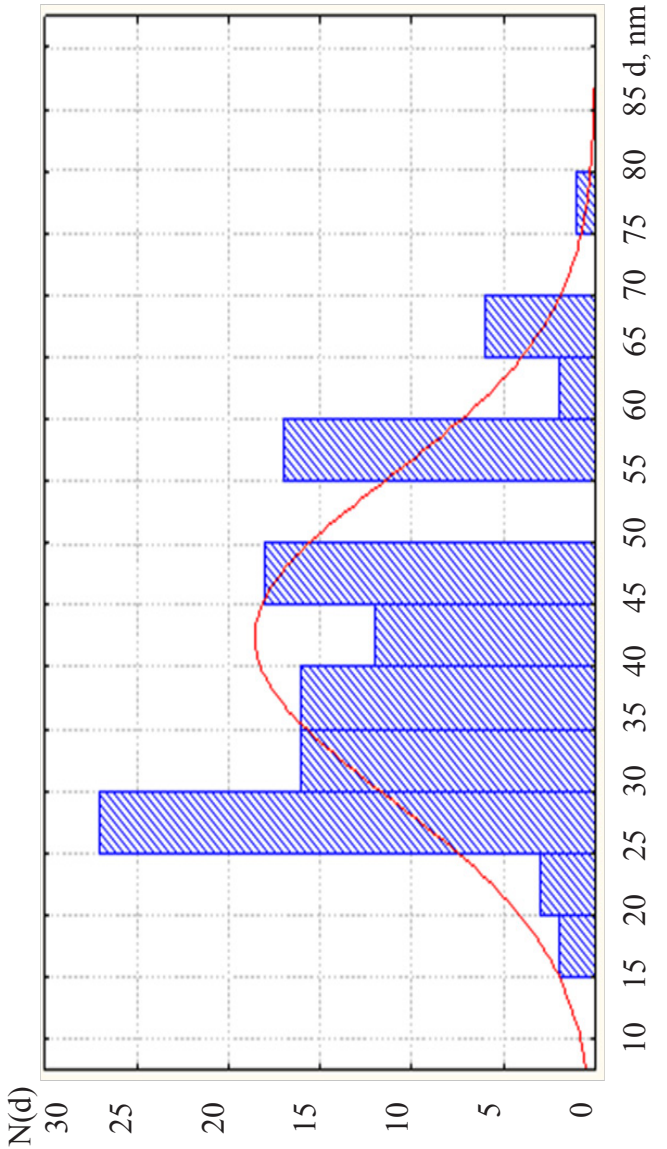

Fig. 1. *Dispensation of soot particles on sizes of marine diesel 6 ЧН 24/36 by power 100% from Nenom*

Similar conclusions regarding the type of size distribution of soot particles came to other researchers who studied their optical characteristics experimentally [8, 9].

The spectral optical thickness of the flame τ_λ s associated, as is known [1,2], with the spectral attenuation index K_λ by the equation

$$\tau_\lambda = 1,5K_\lambda \mu L/(\gamma d). \quad (5)$$

where μ – is the concentration of soot particles;

L – is the effective path length of the beam;

γ – specific gravity of soot particles.

The value of γ for particles of diesel soot lies in a narrow range of 1800 – 2100 kg/m^3 and can be taken equal to 1950 kg/m^3. Substituting into expression (4) in (5) and performing the transformation, we have

$$\tau_\lambda = \frac{6,4}{\gamma}\left(\lambda^{-1} - 0,1\right)\cdot \mu L. \quad (6)$$

Denoting a constant value of 6.4/γ by C, we finally obtain

$$\tau_\lambda = C\left(\lambda^{-1} - 0,1\right)\cdot \mu L. \quad (7)$$

The results of calculations of the spectral optical thickness of the flame as applied to the CC of a marine diesel engine 6 ЧН 24/36 for the regime of 100% Ne_{nom} are shown in Fig. 2. Very strong dependence of this value both on the wavelength and on the angle of rotation of the crankshaft (CS) should also be noted. The latter is explained by the nature of the change in the concentration of soot particles in the CC of marine diesel engine 6 ЧН 24/36 as a function of the angle CS.

Spectral and integral degrees of flame blackness in a marine diesel engine CC

The spectral optical thickness of a flame is related to its spectral degree of blackness by Bouguer's law.

$$\varepsilon_\lambda = 1 - exp(-\tau_\lambda). \quad (8)$$

Substituting expression (7) in (8), we obtain

$$\varepsilon_\lambda = 1 - exp\left[-C\left(\lambda^{-1} - 0,1\right)\cdot \mu L\right] \quad (9)$$

The transition from the spectral degree of blackness of the flame to its integral value can be carried out by dependence

$$\varepsilon = \frac{\int_{0,5}^{6} \left\{1 - exp\left[-C\left(\lambda^{-1} - 0,1\lambda\right)\cdot \mu L\right]\right\} E_0 d\lambda}{\int_{0,5}^{6} E_0 d\lambda}, \quad (10)$$

where E_0 – the radiation intensity of a completely black body at a temperature of a diesel flame, determined according to Planck's law.

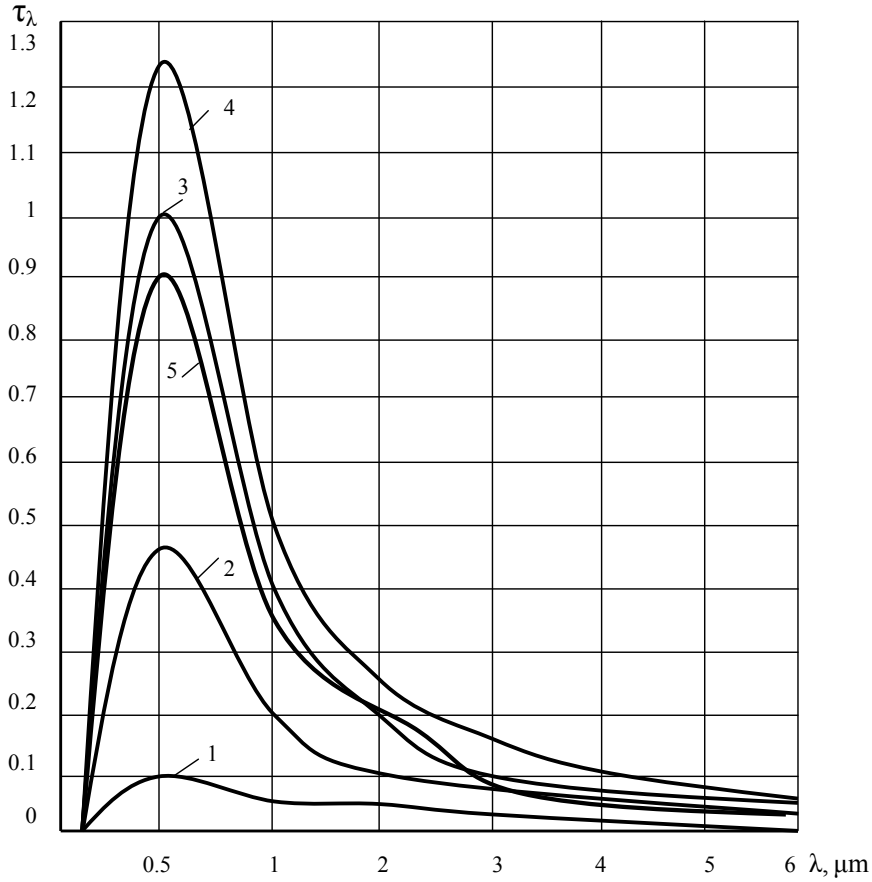

Fig. 2. *Variation of spectral optical thickness of flame in marine diesel 6 ChN 24/36 by power 100% from Nenom: 1 – TDC; 2 – 200 CS after TDC; 3 – 400; 4 – 600; 5 - 800*

The values of the integral degree of flame blackness for five modes of the load characteristic of marine diesel engine 6 ЧН 24/36, calculated according to dependence (10), are presented in Fig. 3. It can be seen from it that with increasing diesel load, the integral degree of flame blackness increases.

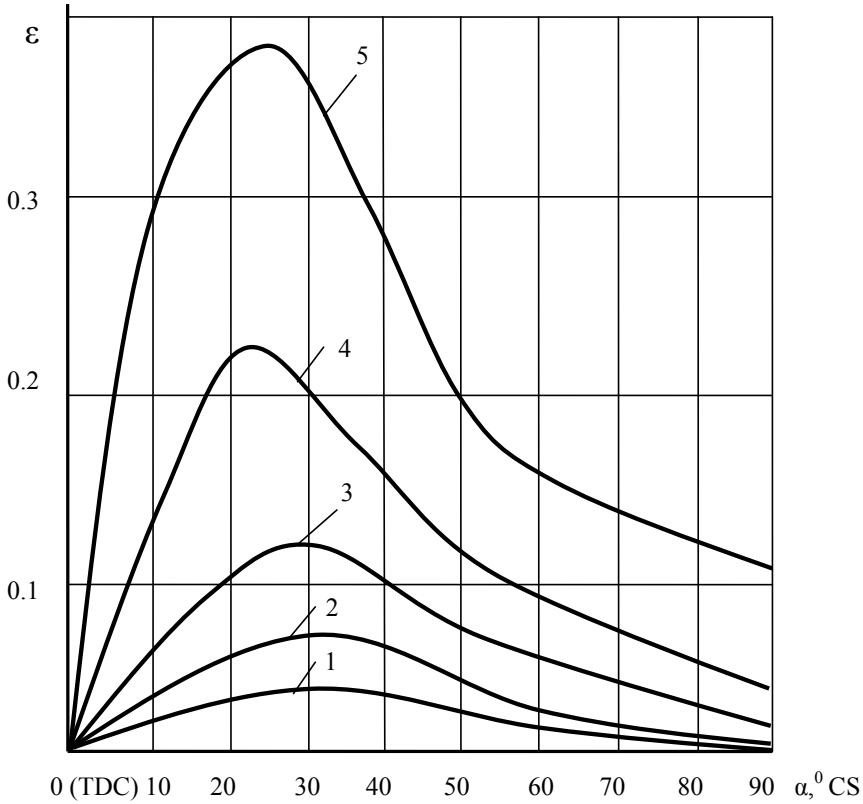

Fig. 3. *Variation of integral degree of flame blackness by experience of marine diesel 6 ЧН 24/36 by power data: 1 – idling; 2 – 25% of Nenom; 3 – 50%; 4 – 75%; 5 – 100%*

Conclusion

Estimates of the spectral optical thickness of the flame and its integral degree of blackness proposed in the article were used in zonal MM to calculate the local resulting radiation fluxes on the surfaces forming CC [10]. The calculated data on the resulting radiation fluxes obtained in [10] made it possible to establish the most thermally loaded sections of the piston surfaces and the cylinder cover of marine diesel engine 6 ЧН 24/36. This is the central part of the spherical recess on the piston and part of the surface of the cylinder cover slightly offset from the center. A comparison of the calculated and known experimental data on the local resulting radiation fluxes showed an average difference of 10-15%, which is quite acceptable for the practice of designing and refining modern marine diesel engines.

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北极条件下节能建筑的材料和结构
MATERIALS AND STRUCTURES FOR ENERGY EFFICIENT CONSTRUCTION IN ARCTIC CONDITIONS

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抽象。NEFU的建筑材料，产品和结构生产部在北部雅库茨克州和楚科奇州的节能建筑的矿物材料有效建筑材料的开发和应用领域的科学和实践研究结果 介绍了俄罗斯的北极地区。

关键词：支撑北极地区，矿物原料，波特兰水泥，复合石膏粘合剂，干燥建筑混合物，多孔和轻质混凝土，泡沫混凝土，颗粒泡沫玻璃。

Abstract. *The results of scientific and practical research of the Department of Production of Building Materials, Products and Structures of NEFU in the field of development and application of effective building materials from mineral raw materials for the construction of energy-efficient buildings in the North Yakutsk and Chukotka Arctic zones of Russia are presented.*

Keywords: *supporting Arctic zones, mineral raw materials, Portland cement, composite gypsum binder, dry building mixes, cellular and lightweight concrete, foam concrete, granular foam glass.*

From the construction point of view, it is customary to classify the Far North as the territory of the northern construction and climatic zone in accordance with the construction standards SNiP 2.01.01-82 “Construction climatology and geophysics”.

The Arctic and subarctic regions of Russia belonging to the Far North occupy almost 1/3 of the country's territory. Along the coast of the Arctic Ocean, they can conditionally be divided into 3 parts: European, West Siberian, and Northeast. Of these, the European part is most industrially developed, then, by to the level of development and cultivation, the northern regions belonging to Western Siberia go. The least developed territory are the North Yakut and Chukotka supporting Arctic zones [1], which include the Republic of Sakha (Yakutia) (with a center in the village of Tiksi) and the Chukotka Autonomous Region (Anadyr).

The main features that must be taken into account in engineering practice include the harsh climate, the permafrost state of soils and economic conditions due to remoteness from industrial centers and low development of territories.

The delivery scheme for building materials from the mainland, primarily cement, was and remains seasonal and expensive. Therefore, it is necessary to develop the industry of local building materials, taking into account their transport accessibility and energy security. In addition to many minerals, for example, gold, tungsten, tin, coal, etc., the northeastern regions have huge reserves of mineral and industrial raw materials for the production of building materials [2].

Ammosov North-Eastern Federal University (NEFU) has a developed infrastructure of the scientific and educational complex, has modern equipment for the development of basic and applied research. The university includes 6 research institutes, 13 institutes, 5 faculties, 3 branches - Polytechnic Institute in Mirny, Technical Institute in Neryungri and Chukotka branch, which was opened at the end of 2010 in Anadyr, as well as 2 colleges and 1 lyceum. The Federal University is called upon to ensure the formation of personnel, scientific and innovative potential for the integrated development of the regions of the North-East of Russia and seeks a scientific and innovative center that provides a high level of the educational process, research and technological developments in the Far East.

NEFU employees conduct systematic scientific research in the field of building materials science and construction in the extreme climatic conditions of the Arctic and the North. In our opinion, the main attention in low-rise construction should be given to the development of small-scale production of building materials from light and cellular concrete, especially in hard-to-reach areas, including the Arctic regions of Russia.

Many years of creative cooperation with leading experts, scientific institutes and universities have allowed us to develop competitive technologies for the construction of energy-efficient full-cycle buildings (from products to finished buildings), which are based on:

- portland cement made by joint grinding of clinker, gypsum stone and active mineral additives, taking into account the conditions of production; compositions and production technology were tested on the basis of river quartz-feldspar sand of the Lena basin and zeolite-containing rocks of the Honguruu deposit [3];
- composite gypsum binder made by joint grinding of active mineral additives (zeolite, burned rocks) and gypsum [4];
- compositions for producing heat-insulating foam concrete of non-autoclave hardening of a grade by to average density D300 (RF patents № 2361985 and № 2491257);
- compositions for producing structural and heat-insulating foam concrete of autoclave hardening of the average density D500 grade with concrete class B2 [5];
- compositions of adhesives and plasters for wall structures made of cellular concrete (FIPS priority information on the invention on to application №2014103175/03 (004869) dated 01.31.2014 “Dry building mix”);
- compositions for producing granulated foamglass - penoceolite from zeolite-containing Honguruu minerals [6];
- 3-layer foam concrete blocks with thermal liner (RF patent № 108774);

- construction of external walls (RF patent № 2361985 and № 119769);

-construction of heat-insulated strip and pile reinforced concrete foundations (RF patents № 137036 and № 148793).

Studies on Portland cement established the possibility of obtaining Portland cement of the type CEM II/A-P 32.5N and CEM II/A-P 42.5N from imported Portland cement clinker and local mineral additives while saving 5-15% of Portland cement clinker. It has been established that the use of Portland cement with mineral additives makes it possible to obtain structural and heat-insulating non-autoclave foam concrete brands of medium density D600-D800 with improved properties: compressive strength increases by 15.83-16.48% and 13.74-15.15% with samples on Portland cement of the grades CEM I 32.5B and CEM I 42.5B, respectively, acceleration of the hardening of the concrete mixture by 21-29% and a decrease in shrinkage deformation by 6-10% [7].

A technology has been developed for the production of monolithic heat-insulating foam concrete D300-D400 using modified Portland cement PC-B by introducing a complex additive on the basis of gypsum and fine-ground burned rock into Portland cement, which allows in real construction conditions to accelerate the work on the installation of monolithic thermal insulation from foam concrete by 2-3 times.

The fundamental possibility of obtaining heat-insulating foam concrete D300-D400, intended primarily for repair and restoration work to eliminate thermal insulation defects in small volumes, based on composite gypsum binders (CGB) with the addition of Portland cement and fine ground burned rock, has been established [8].

In addition, Portland cement and CGB can produce effective wall products from lightweight concrete with aggregates from granulated foam glass - penoceolite with a bulk density of 150-250 kg/m^3 and wood chips.

Based on penoceolite, lightweight concrete grades of the average density D500-D700 class of compressive strength B0.5-B3.5 and thermal conductivity (in dry state) 0.121-0.137 W/(m·K) were obtained.

The best results were obtained in the production of wall blocks from autoclaved foam concrete, with an average density of 500 kg/m^3, the concrete class is B2.

Technical and economic indicators of the production and use of non-autoclave and autoclave foam concrete from local raw materials in low-rise construction for extremely cold climates using the example of the construction and operation of experimental facilities:

- wooden-frame individual houses with filling walls made of heat-insulating foam concrete D300 in the rural settlements of Appany and Okoyemovka (total area – 100-150 m^2, cost 1 m^2 - 25-30 thousand rubles (in 2012 prices), the level of energy efficiency of the building does not exceed 30.0 Wh·h/(m^2 ^{o}C·day) according to SP 50.13330.2012 “Thermal protection of buildings”);

-2-storey monolithic frame building with walls filling made of heat-insulating foam concrete D300 in Yakutsk (actual reduced heat transfer resistance of the walls was 5.67 W/(m2•°C);

- 2-storey buildings from autoclave hardening wall blocks and 3-layer foam concrete blocks with a thermal liner in the city of Yakutsk (total area - 120-200 m2, cost of 1 m2 - 35-45 thousand rubles (in 2014 prices), level the energy efficiency of the building does not exceed 30.0 Wh•h/(m^2·°C·day) according to SP 50.13330.2012 “Thermal protection of buildings”);

- 3-storey monolithic-frame building of the construction market in Yakutsk with 0.6 m thick walls made of foam concrete blocks D600 (actual heat transfer resistance of the walls was 3.3 W/(m^2·°C).

- the proposed constructions of the base and foundation make it possible to maintain the “warm floor effect”, to rationally use the permafrost state of soils, which ensures their high bearing capacity throughout the entire life of the building.

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阻尼土壤层以减震地震

DAMPING LAYER OF SOIL FOR DAMPING SEISMIC VIBRATIONS

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注释：本文介绍了地震的性质，如何免受各种影响，世界上不同的科学家提出了建筑物的隔震方法以及基于确保建筑物和结构的抗震性和地震防护的研究 在对他们的工作进行分析时，提出了它们的优缺点。为了保护建筑物免受地震的破坏，提出了一种以筛网形式的（地震）隔离层（壳）作为土壤的阻尼层。

关键词：阻尼层，岩土工程，地震影响，地震振动。

Annotation. *This paper presents the nature of an earthquake, how to protect from various effects, different scientists of the world proposed methods of seismic isolation of a building, as well as studies to ensure the earthquake resistance and seismic protection of buildings and structures, based on their analysis of the work, the advantages and disadvantages offered by them .A seismic insulating base in the form of a screen – (a shell)- as a damping layer of the soil as the base was proposed to protect the building from earthquakes.*

Key words: *damping layer, geotechnics, seismic impact, seismic vibrations.*

The constructive solution of the damping layer of soil. The screen - shell for protecting buildings and structures from seismic effects is a structure immersed in the ground a shell located around the building, made of a silicate column in the form of a cylinder.

The screen-shell makes it possible to increase the efficiency of damping seismic vibrations by ensuring the unified operation of the soil-foundation system. It can be used to protect buildings and structures constructed in seismically hazardous areas, as well as to protect them from vibration, the source of which can be any technological equipment.

The screen in the form of a cylinder includes a damping backfill in the form of sand having its physical and mechanical characteristics. In order to determine

the weight, volume of this damping soil, as well as the radius and depth of the cylinder, it is necessary to set the geometric dimensions of the existing building and determine its weight, since the mass of soil enclosed inside the shell is equal to the mass of the building. This pattern was proposed Rusinov A.V. in his invention, a screen for protecting buildings from seismic effects.

In this case, the GrandAsia building, business center with twelve floors and two underground car parks, was chosen to determine the design of the screen - shell. The area of the projected facility is located in the Almaly district of Almaty.

The project involves the construction of an office building 12 floors . It provides placement of underground parking in two levels.

According to the geological profile, the site has a calm relief, includes three geomorphological layers of the same genesis, the thickness of the layers varies naturally along the strike. Groundwater excavations with a depth of 21 meters are not opened. According to the thickness of the layers, the layer is: 40 cm. Plant layer; 100 cm. Loam and there is a boulder with admixtures of sand and clay not exceeding 3%, this percentage does not affect the properties of the soil. The boulder serves as a natural base, has great water permeability, has a rigid skeleton and high load-bearing ability, conditional design resistance, Ro = 0.3 MPa.

The soil is not connected, capillary rise of water is absent. The specific gravity of the soil is $\gamma = 22.8$ KH / M3, the angle of internal friction is $\varphi = 23$ degrees, the adhesion (cohesion) of the soil is C = 34 kPa. Estimated seismicity - 9 points; soil category by seismic properties - II; soil freezing depth - 130cm; groundwater lies at a depth of more than 21 m. The area is unsinkable by groundwater.

The business center contains an underground parking and office center. The building is a 12 floors with dimensions in the axes of 16.5 × 28.5 m.

Pebbled soil with sand filling was taken as the base of the foundations. The foundations for the building are monolithic reinforced concrete slab. Under the foundation, concrete preparation is carried out from concrete of class B7.5 on sulfate-resistant cement.

The building is a monolithic frame structural system. Walls ¬– monolithic, fragmented of heat block. The thickness of all the walls in the underground part is 300mm and 500mm. The thickness of all the walls in the aerial parts is 200mm and 500mm.

Columns - monolithic reinforced concrete with a section of 500 × 500 mm; crossbars and floor slabs - monolithic reinforced concrete- crossbars with a section of 400 × 250 mm; - overlap in the basement and on the first floor 200 mm thick, on the other floors - 160 mm. The partitions between the living rooms and the office partitions are plasterboard. Partitions of bathrooms and in technical floors - from splitter blocks. Stairs - monolithic reinforced concrete of individual performance. The material of all monolithic structures is concrete of class B20.

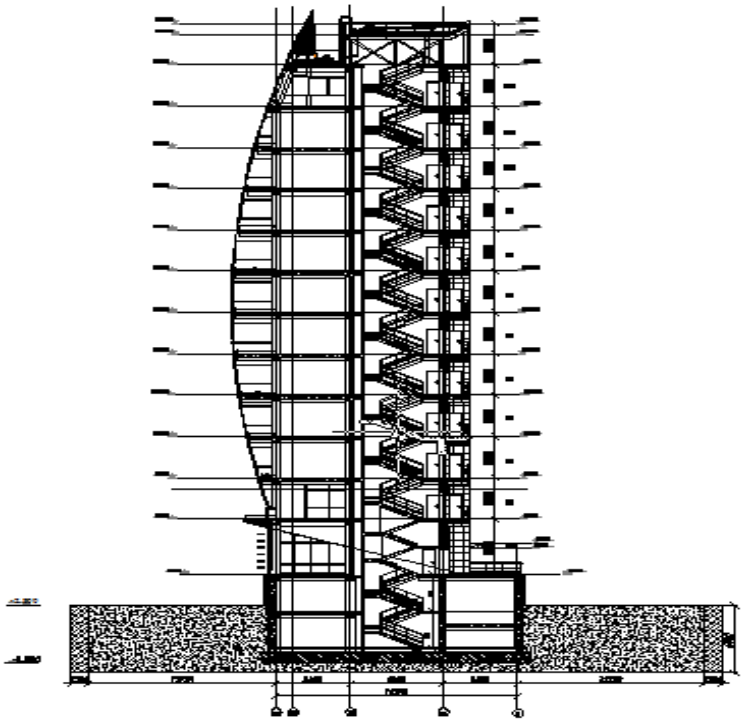


Figure 1 - *Plan and section of an office building*

Insulation - semi-rigid miniplate (NOBASIL). The roof is a metal profile, flat with an internal drainage system. Balconies and loggias are monolithic reinforced concrete. Balcony fencing - metal grilles made of chrome steel. Next, to find the weight of the damping layer of soil, we find the total weight of the building, since the mass of soil enclosed inside the shell is equal to the mass of the building. To determine the weight of the building, we collect the loads on the slab: per 1 m2 of flooring, per 1 m2 of flooring, per 1 m2 of floor of the 1st floor and 1 m2 of auto parking.

Table 1 - *Determination of loads from the weight of the building*

Title of load	Regulatory load кН/м²
1. Constant load	
metal profile grade PS-13 0.7 mm, γ = 7800 kg / m³	0,055
top layer - Uniflex EKP 5 mm, γ = 1800 kg / m³	0,09
bottom layer - Uniflex "Vent" 3.5 mm, γ = 1100 kg / m³	0,039
insulation - min. plate NOBASIL JPS 150 mm, γ = 200 kg / m³	0,3
vapor barrier - Uniflex EPP 5 mm, γ = 1300 kg / m³	0,65
waterproofing 2 mm, γ = 1500 kg / m³	0,03
leveling layer of cement. sand. 40 mm solution, γ = 1800 kg / m³	0,72
monolithic reinforced concrete plate 160 mm, γ = 2500 kg / m³	4
Total	5,299
2. Long-term temporary (useful)	0,5
3. Short-term (snow)	0,7
Total	1,2
TOTAL	6,499
1. Constant load:	
– porcelain tile(granit) 13 mm, γ = 2400 kg / m³	0,312
– adhesive mastic for floor coverings 5mm, γ = 1200 kg / m³	0,06
– cement-sand mortar screed 20mm, γ = 1800 kg / m³	0,36
– comunications	0,1
– partitions	0,7
– monolithic reinforced concrete slab 160 mm, γ = 2500 kg / m³	4
Total	5,532
2. Long-term temporary (useful)	1,5
3. short- term	0,3
Total	1,8
TOTAL	7,332
1. constant load:	
natural granite 13 mm, γ = 2600 kg / m³	0,338
adhesive mastic for floor coverings 5mm, γ = 1200 kg / m³	0,06
cement-sand mortar screed 30mm, γ = 1800 kg / m3	0,54
monolithic reinforced concrete plate 200 mm, γ = 2500 kg / m³	5
Total	5,938
2. Long-term temporary (useful)	1,5
3. Short -term	0,3
total	1,8
TOTAL	7,738
1. constant load	
concrete screed with surface ironing 30 mm, γ = 2000 kg / m³	0,6
cement-sand mortar screed 30mm, γ = 1800 kg / m³	0,54
waterproofing from two layers of hydroisol 3 mm, γ = 1500 kg / m³	0,045
monolithic reinforced concrete plate 200 mm, γ = 2500 kg / m³	5
Итого:	6,185
2. Long-term temporary (useful)	1,5
3. Short-term	0,3
total	1,8
TOTAL	7,985

Determination of the weight of 2 floors of car parking:
crossbar weight - 13.267 kH; column weight - 21.529 kH.
There are 18 columns and crossbars in each floor.

$$q \cdot (a \cdot b) +18 (13.267 + 21.529) = 7.985 \cdot (28.5 \cdot 16.5) =$$
$$= 3754.95 + 626.328 = 4381.27 \cdot 2 \text{ floors} = 8762.55 \text{ kH} \approx 876 \text{ t.}$$

Determination of the weight of the 1st floor:

$$q \cdot (a \cdot b) +18 (13.267 + 21.529) = 7.738 \cdot (28.5 \cdot 16.5) =$$
$$= 3638.79 + 626.328 = 4265.12 \text{ kH} \approx 427 \text{ t.}$$

Weight determination of 11 - typical floors:

$$q \cdot (a \cdot b) +18 (13.267 + 21.529) = 7.332 \cdot (28.5 \cdot 16.5) = 3447.8 + 626.328 =$$
$$= 4074.2 \cdot 11 \text{ floors} = 44816.2 \text{ kH} \approx 4{,}482 \text{ t.}$$

Determination of the weight of the coating or technical floor:

$$q \cdot (a \cdot b) +18 (13.267 + 21.529) = 6.499 \cdot (28.5 \cdot 16.5) =$$
$$= 3056.15 + 626.328 = 3682.48 \text{ kH} \approx 368 \text{ t.}$$

Determination of the weight of the foundation plate:

$$(a \cdot b \cdot h) \cdot \rho = (28.5 \cdot 16.5 \cdot 1) \cdot 2200 = 1125.436 \text{ kg.} \approx 1\,126 \text{ t.}$$

Determination of the weight of the walls (heat blocks):

$$(l \cdot b \cdot h) \cdot \rho = (47.4 \cdot 0.5 \cdot 3.3) \cdot 1000 = 78{,}210 \text{ kg} = 78.21 \text{ tons} \cdot 14 \text{ floors} =$$
$$= 1094.94 \text{ tons} \approx 1{,}095 \text{ tons}$$

Total weight of the building:

$$876 + 427 + 4\,482 + 368 + 1\,126 + 1\,095 = 8\,274 \text{ t.}$$

Now, having calculated the weight of the building, we determine the settlement - constructive scheme of the screen - shell.

The mass of the building is equal to the mass of the damping layer of soil, on the basis of this m_ (gr.) = 8 374 t.

$$m = \rho \cdot V = 1{,}600 \cdot V = 8374 \text{ t.}$$

The volume of the damping layer of soil:

$$V = 8374/1600 = 5233.75 \text{ m}^3$$

The volume of the building submerged in soil:
Baseplate volume:

$$V = a \cdot b \cdot h = 29.4 \cdot 17.4 \cdot 1 = 511.56 \text{ m}^3$$

The volume of the lower floors of the parking lot immersed in the ground:

$$V = a \cdot b \cdot h = 28.5 \cdot 16.5 \cdot 4.2 = 1975.05 \text{ m}^3$$

The total volume of the building submerged in soil:

$$V_{\text{(total зд)}} = 511.56 + 1975.05 = 2486.61 \text{ m}^3$$

The volume of the screen of the shell with damping soil:

$$\llbracket V = V \rrbracket_{\text{(dem. Gr.)}} + V_{\text{(total зд)}} = 5233.75 + 2486.61 = 8020.36 \text{ m}^3$$

From here, having set the depth h = 6m, we find the radius of the cylinder R

$$V = \pi R^2 \cdot h = 8020.36 \text{ m}^3,$$
$$R = \sqrt{(V / (\pi \cdot h))} = \sqrt{(8020.36 / (3.14 \cdot 6))} = 20.63 \text{ m} \approx 21 \text{ m}$$

The cylinder made as follows. After marking with a drilling machine, a slit is cut in soil with a density of 1600 kg / m3, depth 6 m, width 1.2 m, filled with concrete of class B 20.

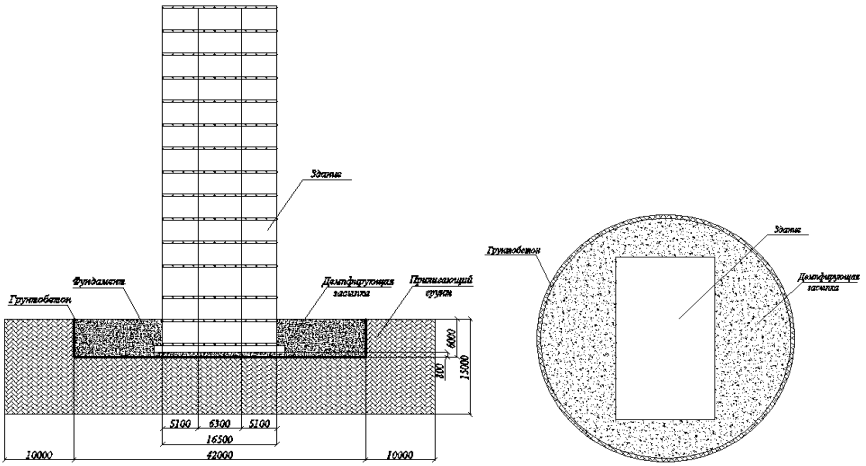


Figure 2 - *Settlement - structural diagram of the screen – shell*

Methodology and calculation algorithm in the Plaxis. In order to model soil behavior for a given geometric model, the corresponding soil model and its material parameters should be adopted. In Plaxis, soil characteristics are collected in data sets for materials that are stored in an appropriate database. data set from a database can be assigned to one or more clusters. For structures such as walls, slabs, anchors, geotextile materials, etc., the system is similar, but different types of structures have different parameters, and therefore different types of data sets.

Plaxis distinguishes material data sets for Soil & Interfaces (Soil and Partition Surfaces), Beams (Beams), Anchors (Anchors) and Geotextiles (Geotextiles). Material datasets are created mainly after entering boundary conditions. Before creating the grid, data sets for all materials must be installed, and all clusters and structures must have a corresponding data set.

Calculation algorithm

The calculation is carried out in the following sequence:

- the frequencies and forms of swing are determined;
- the parameters η_ik and β_i are determined by the corresponding formulas;
- for each i-th frequency, the seismic forces S_ik applied to the k-th are determined; these forces are considered as external forces corresponding to the n load cases, where n is the number of the considered vibration modes;

- a static calculation is made for n load cases from the found forces S_ik;
- the calculated efforts (M, Q, N) are determined by the formula: $\sum_{i=1}^{n} N_i^2$

Table 2 - *Characteristics of the sand layer*

parametres	denotation	value	Ед. изм.
model of soil	Model	Мор - Кулон	-
Type of soil behavior	Type	Дренированный	-
Dry weight	$\sum Mweight$	17.0	кН/м^3
humid weight	g_{wet}	20.0	кН/м^3
Horizontal soil permeability	k_x	1.0	м/сут
Vertical soil permeability	g_y	1.0	м/сут
The Young's module (constant)	E_{ref}	13000	кН/м^2
Poisson's ratio	n	0.3	-
Ground connectivity (constant value)	c_{ref}	1.0	кН/м^2
Friction angle	J	31.0	°

Calculation results

After successful completion of the calculation, you can look at the monitor screen or print the following results: - for each waveform, the values of the seismic forces and the corresponding waveforms are displayed; - the calculated efforts M, Q, N are displayed; The following should be considered. The result for all efforts determined by the formula (4.20) is a positive number. At the same time, according to the rule adopted in the program, positive moments rotate the rod clockwise. The material of the screen - the shell of the seismic insulating base is soil concrete, and the bulk material is represented by medium-sized sand, their properties and parameters are indicated on the A1 sheet drawing, sheet 3, which is a calculation model for loading into the Plaxis.

Calculation of the damping layer for seismic effects

In this paper, we carry out a comparative calculation of a building model with traditional seismic reinforcement and a building with a seismic insulating base for seismic effects.

As can be seen from the comparison, a building with a seismic insulating base receives more soil deformation than a building with a traditional seismic

reinforcement, but since there is a damping layer of granular material inside the screen of the seismic insulating base, these deformations are irreversible (plastic) due to this, vibration energy is absorbed and a building with a seismic isolation

base receives less building displacement than a building with traditional seismic reinforcement. The diagrams of axial forces and bending moments are shown in

which the diagrams of a building with a seismic insulating base are 20-30% smaller than a building with traditional seismic reinforcement, which reduces the seismicity of the area by 2 to 3 points.

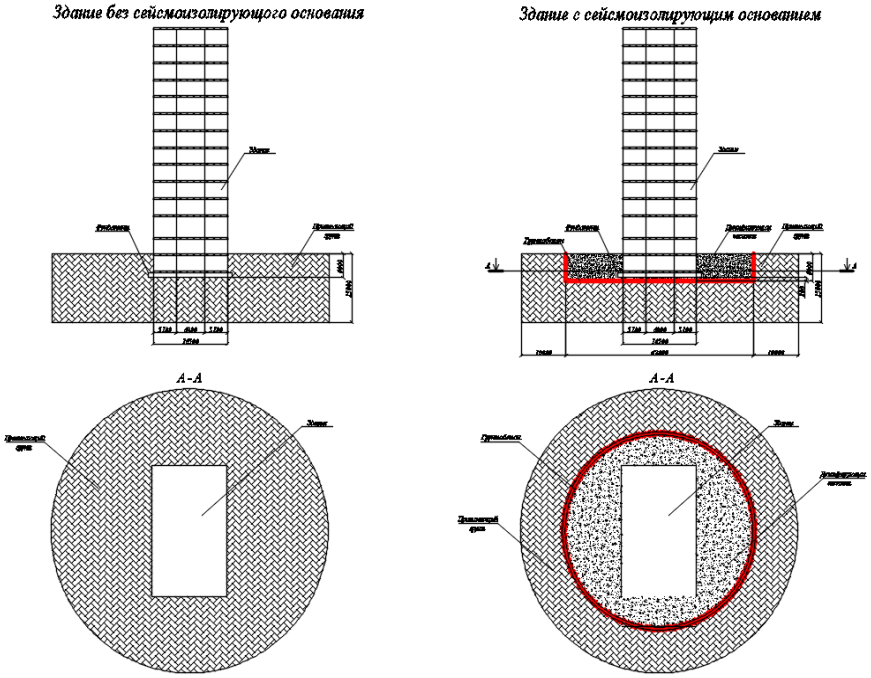
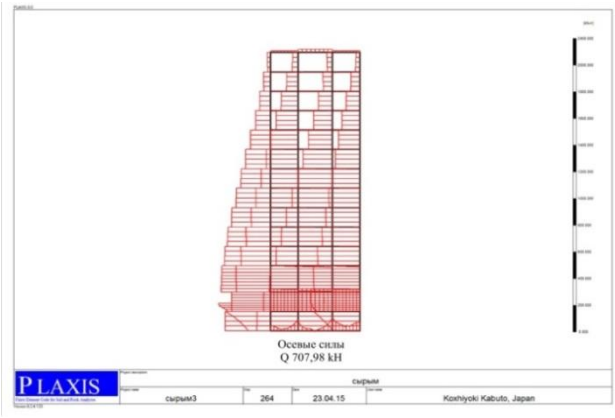


Figure 8 - *Design scheme of building models with traditional seismic reinforcement and with a seismic insulating base*



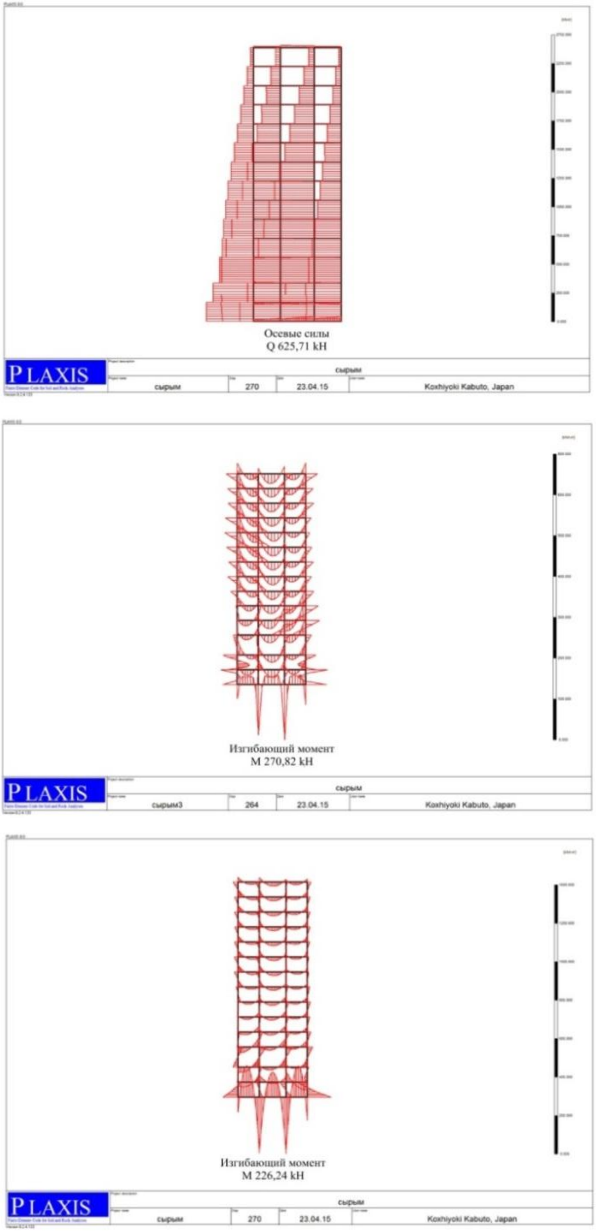
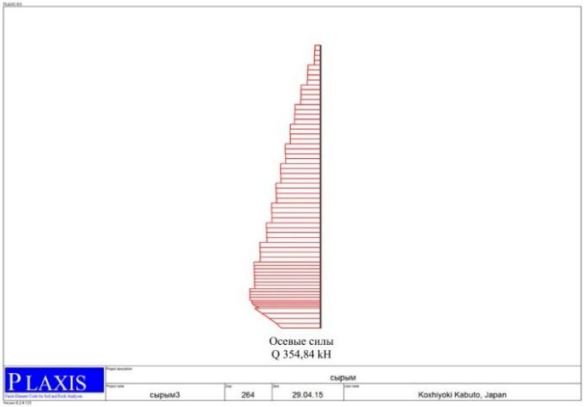
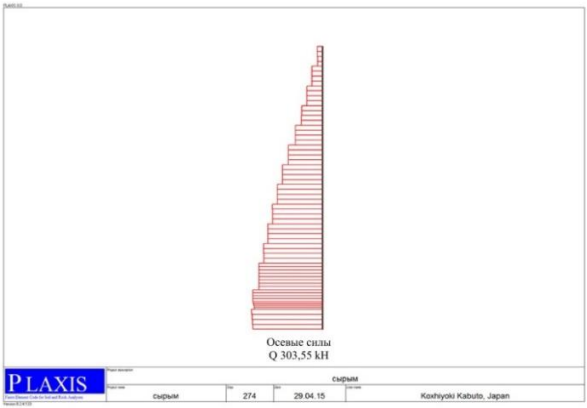
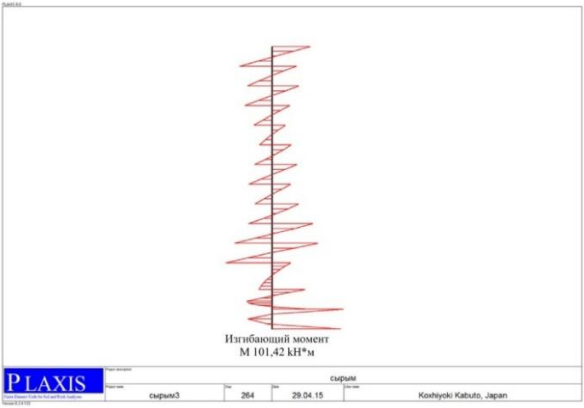


Figure 9 - *Diagrams of axial forces and bending moments*


Осевые силы
Q 354,84 kH
PLAXIS
сырым
сырым3
264
29.04.15
Koxhiyoki Kabuto, Japan


Осевые силы
Q 303,55 kH
PLAXIS
сырым
сырым
274
29.04.15
Koxhiyoki Kabuto, Japan


Изгибающий момент
M 101,42 kH*м
PLAXIS
сырым
сырым3
264
29.04.15
Koxhiyoki Kabuto, Japan

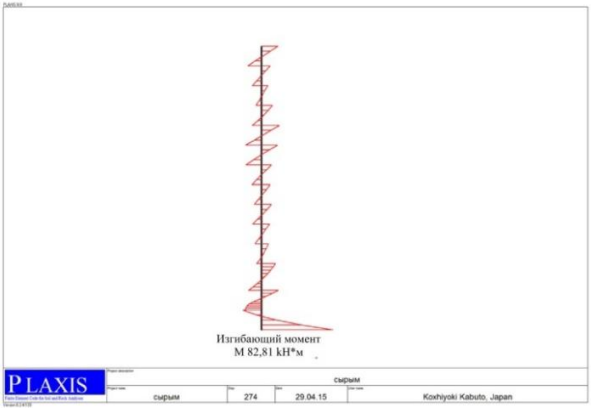


Figure 10 - *Diagrams of axial forces and bending moments of columns*

CONCLUSION

In this study of constructive scheme, the seismic isolating base and the calculations performed, established the following:

1. The results of calculating the model of a building with a seismic insulating base indicates a decrease in the seismic load on the building from earthquakes by 2-3 points;

2. The use of structural solutions of the seismic isolating base in seismic areas can reduce the cost of seismic settlement of buildings and structures, which reduces the estimated cost of the building by 20-30%;

3. This constructive solution of a seismic insulating base in the form of a sheath-shell can be used as constructive measures to protect the unique structures of an existing building that add historical value;

4. Also, this design of the seismic insulating base is an anti-filtration curtain, which allows protecting the soil environment of the base from aggressive waters and preserving the natural physical parameters of the damping layer.

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关于拓扑建模并行系统和任务
ABOUT TOPOLOGICAL MODELING OF PARALLEL SYSTEMS AND TASKS

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抽象。该工作总结了作者对并行计算系统和任务的拓扑建模的研究，并包括对并行计算原始拓扑模型的正式和口头描述，从而允许系统的信息相关处理器的不相邻连接，从而可以修改图形 增加系统的程度，从而增加要解决的任务图在系统中同构嵌入的可能性。 用于比较并行系统的缩放和容错方面的拓扑的工具包基于作者的图形投影描述方法和使用该方法的算法。

关键词：并行计算拓扑模型 图形的投影描述； 可伸缩性和容错性的拓扑功能。

Abstract. *The work summarizes the author's research regarding topological modeling of parallel computing systems and tasks and includes formal and verbal descriptions of the original topological model of parallel computing, allowing non-adjacent connections of information-related processors of the system, which allows to modify the graph of the system to increase its degree and, accordingly, increase the possibility of isomorphic embeddings in it of graphs of tasks to be solved. The toolkit for comparing topologies with respect to scaling and fault tolerance of parallel systems is based on the author's method of projective description of graphs and on algorithms using this method.*

Keywords: *Parallel computing, topological model; projective description of graphs; topological functions of scalability and fault tolerance.*

Introduction. The path to exaflop computing is to combine hundreds of thousands of individual computing elements into systems of millions of computing cores. In this case, the adequacy of the interconnect to the maximum joint use of these cores in solving large problems is decisive. The author's research is aimed at solving the problem of creating formal methods for the architectural design of parallel computing systems (CS) and organizing fault-tolerant parallel computing. The essence of the topological component of this problem is that, despite the generally recognized dependence of the parallelism potential CS on the topologies of interconnect used in its construction, such dependencies do not have a formal reflection.

The problems of analysis and synthesis of CS topologies are traditionally solved by graph theory methods that establish bijective correspondences between system modules and graph vertices, as well as between sets of communication lines and graph edg-

es. However, neither in the theory of networks and systems, nor in the theory of graphs, the problem of studying topologies by methods that exclude the need for enumeration has practically not been studied. This is explained by the low level of graph descriptions used that specify only adjacency relations, which determines the non-polynomial nature of the search for higher order relations necessary for CS research and focuses on the development of heuristic, stochastic or genetic methods and algorithms. The non-determinism inherent in such methods inevitably leads to unpredictable consequences caused by the delay (irrelevance) of the reaction to current changes in the system and the inadequacy (inaccuracy) of such a reaction. Increasing the complexity of the systems leads to a narrowing of the area of joint satisfaction of the conditions of relevance and reliability with an increase in the probability of emergencies.

So, the problem to be solved in the work is connected 1) with the lack of a topological model of parallel computing, establishing unambiguous formal dependences of potential parallelism of tasks on the CS topology; 2) with the absence of topological criteria of parallelism reflecting these dependencies and deterministic methods for their calculation; 3) with a non-polynomial (combinatorially "explosive") dependence of the computational complexity of the deterministic methods for adapting CS to the problems it solves. The paper presents the results that make up the essence of the approach proposed by the Author to analytical modeling of parallel systems and problems with various topologies.

1. Topological model of parallel computing systems. The study of the conditionality of the potential of systems with respect to parallelism by the topologies of their interconnect implies abstracting from the limitations associated with the presence in the parallel algorithm of non-parallelizable fragments taken into account by the classical version of Amdahl's law. However, the exclusion of the "scalar" factor disregards another factor that impedes the linear scaling of the performance of a computing system — the dependence on interprocess exchanges, associated not only with the topology of the system network, but also with its technological characteristics. Therefore, it is necessary to distinguish between topological and technological factors according to their influence on the real system performance and on the limiting (with directive performance criteria) order of subsystems so that the relative ordering of the topologies being compared remains unchanged for any technological characteristics of the interconnect or for any classes of tasks to be solved and data.

The essence and novelty of the presented approach is the creation of a topological model of parallel computing, which allows to identify formal correspondence of topology abstracted from the network technologies used by the interconnect to the key property of the parallel system - potential parallelism. The lower boundary of parallelism is considered by us as a generalized unit of measurement and is determined by the limiting rank of a parallel information-fully connected problem with limited reachability of information-related branches of the problem [1]. The justifi-

cations for the admissibility of such abstraction and the possibility of analyzing the purely topological aspects of increasing potential parallelism are presented in [2].

To assess the impact of CS topology on its parallelism, we abstract from applications, considering them to be unlimitedly parallelizable and not containing scalar fragments. We introduce the following notation: W and w are the time-measurable amounts of computations when solving an arbitrary problem on one and p processors of a computer system; the volumes of the data to be exchanged corresponding to the number p of involved processors are denoted by Q ($p = 1$) and $q = Q/p$, while measuring them with information units (bytes). So, assume that:

1. The parallel algorithm does not contain scalar fragments, and can be divided into an arbitrary number p of informationally connected branches: $1 \le p \le \infty$.

2. The total amount of calculations W and the volume Q of data to be exchanged do not depend on the number of processors p and are evenly distributed among them: $w = W / p$ and $q = Q / p$.

3. Scaling data in a task with coefficient m increases the amount of calculations W and the volume Q of data to be exchanged by m times.

It is well known that the constraining factors of the parallelism build-up system proportional to the size are, firstly, the practical impossibility of implementing a fully connected topology even in relatively small systems, and secondly, the presence of delays in the implementation of interprocessor exchanges. Therefore, we supplement the above list of assumptions accepted in our model with the following:

4. All processors are identical, their total number n is enough to implement p parallel branches ($n > p$), the initial distribution of data on the processors is not required.

5. The total volumes W and Q are independent of the topology of the communication network and the network technology used (NT - Network Technology), and there are no restrictions on the minimum volumes w and q.

6. The time expenditures $T_{ND}(p)$ for exchanges between information-related processors are proportional to the distances $L(p)$ between the vertices of the CS subgraph and the delay function $t_{NT}(q)$, depending on the NT used in the system: $T_{ND}(p) = L(p) \times t_{NT}(q)$, here the ND index is an abbreviation for Network Delay

7. Computing and communication elements of CS allow time-combined operation, moreover, $T_{ND}(p) > w$, and the time of actual delays taking into account the combination is determined by the difference $T_{ND}(p) - w > 0$.

8. The combination of topology and NT used in the computing system guarantees the absence of network collisions and associated delays.

The sixth of the above properties of the model presented here is trivial in the practice of building and using communication networks: as a rule, the transmission time of messages between the most distant elements is estimated by the diameter of the corresponding graphs characterizing the communication delay in the worst case. Note that the indispensable property of the function $tNT(q)$ is its inverse of p and its direct dependence on Q: $p_1 < p_2 \Rightarrow t_{NT}(Q / p1) > t_{NT}(Q / p_2)$ *and* $q_1 > q_2 \Rightarrow t_{NT}(q_1) > t_{NT}(q_2)$.

The use of technologies with a different dependence of the $t_{NT}(q)$ function in CS would contradict the main goal of parallelization - to achieve the required efficiency in the implementation of user applications and their required reliability, associated with an increase in the complexity of algorithms and/or the volume of processed data. However, unfortunately, an increase in the number of processors p by a factor of kp which leads to a proportional decrease in the specific volume q of exchanged data, leads to a decrease in the time $t_{NT}(q)$ of information interaction between physically adjacent processors not in the same but in the proportions that are used in the *NT* system , i.e. with some technological (inherent to the used network technology) coefficient

$$k_{NT} = k_p^{-1} \cdot t_{NT}(q) / t_{NT}\left(k_p^{-1} \cdot q\right).$$

Modifying the well-known Amdahl's law taking into account points 6 and 7 of our model, we obtain the acceleration S_p, achieved by parallelizing the problem on p branches

$$S_p = \frac{W}{w + \left(L_S(p) \cdot t_{NT}(q) - w\right)} = \frac{W}{L_S(p) \cdot t_{NT}(q)}.$$

Then the limiting distance $LS(p) \geq 1$ for the acceleration S_p, prescribed for a given number of processors p is determined from

$$L_S(p) = \frac{W}{S_p \cdot t_{NT}(q)}.$$

It is necessary to understand the differences in the sources of the conditionality of the distance L and the number of processors p in the *(W,Q)*-task: if the limiting distance $L(p)$[1] for a given p is determined by the function $t_{NT}(Q/p)$, i.e., the network technology used in CS, then the limit number $p(L)$ of the processors, which can be used for the distance L allowed by the problem, is determined only topologically, i.e., it depends on the graph used in the system. Thus, the ratio between the computational volumes W and the information interactions Q in the parallel *(W, Q)*-task and the speed used in the *NT* system determines the interdependence of the number p of the involved processors and the maximum permissible distance $L(p)$ between the information adjacent vertices of the corresponding subgraph in the graph CS, while the topology determines the possibility of implementing such a subgraph. Considering that the distances between the vertices of the unweighted graph *G(V, E)* are determined by the number of transit sections and are integer, we call the integer part $L(p)$ the reachability $\partial(p)$:

$$\partial(p) = \lfloor L(p) \rfloor, \; 1 \leq \partial(p).$$

Reachability $\partial(p)$ characterizes the requirement for the topology used in CS, which consists in the following: successful (in relation to the prescribed solution to the problem with criteria W and Q of criterion S,) parallelization on p processors is possible only when at least one embedding of information is guaranteed by the system topology the graph of the problem to the graph CS, in which the distances between informationally adjacent vertices do not exceed $\partial(p)$. We note here the in-

[1]Hereinafter, the indices of the used evaluation criteria (acceleration, efficiency, etc.) are insignificant and we omit them.

tuitive direct dependence of the success of the investment on the distance: a larger $L(p)$, due to the use of a higher-speed of NT, corresponds to a greater likelihood of subgraphs in the CS graph satisfying the directive values p and S_p.

The problem of embedding the information graph of a problem in a graph of a computer system is one of the most important in the theory of computer systems. Its solution is connected with the problem of recognition of isomorphism in graph theory and causes the unfading interest of the corresponding specialists. In the framework of the topological model described here, in [1], a solution to the problem of embedding problems in a statement based on the replacement of the adjacency relations of vertices of the graph CS by relations of their limited reachability was first presented. Topological exponents of scalability of parallel systems and problems were first introduced in [2, 3]. In work[4], the problem of increasing the parallelization potential of the tasks of increasing not the number of processors but the edges while maintaining the basic addressing and routing methods was investigated. In works[5–7], the problems of analyzing the topological fault tolerance of a scalable computing system and ensuring its resistance to failures of a given multiplicity were considered, the relationship between the functions of topological scalability and topological fault tolerance of systems was determined, and the dependence of topological fault tolerance on the girth of the graph of the computing system was shown.

2. Projective Description of CS Graphs. The theoretical basis for the analysis, comparison and synthesis of topologies of parallel systems effective with respect to potential parallelism is the graph description method proposed in [8], which for the first time provided a formal basis for the transition from stochastic and heuristic methods of analysis and synthesis of topologies to analytical ones. The use of this method, for example, in the development of biochemical problem-oriented databases [9] and in other applications [10, 11] has also proved its promise. The essence of the method is to describe the graph by projections, and the following is sufficient information to understand the material presented.

The projection $P(v_j)$ of the graph $G(V, E)$ is a multilevel construction, at the zero level of which there is a vertex $v_j \in V$, selected as a foreshortening; the subset of vertices of the first level generated by it $V_{1j} \subset V$ contains all the vertices of its environment $N(v_j)$, and the i-th level ($i \geq 1$) is a collection of subsets of vertices, each of which is generated by a vertex of the (i 1)- th level and is an environment this vertex without those vertices that precede it in this projection. Thus, the "vertex precedence/subset generation" relation actually models the adjacency relation of the previous vertex to the vertices of the subset generated by it. The formal record of these relations in the bracket description of two arbitrarily taken adjacent levels of the projection of the graph has the form

$$v_{i1}{}^{V_{i+1,1}}, \ldots, v_{ij}{}^{V_{i+1,j}}.$$

Here, the vertices v_{i1} and v_{ij} of one of the subsets of the *i-th* level precede and are adjacent to the vertices of the subsets $V_{i+1,1}$ and $V_{i+1,j}$ of the higher (i + 1)-th level generated by them.

The vertex v_{ij} *k*- level projection $P_k(v_0)$, constructed from the angle vertex v_0, corresponds to the ordered set of vertices $W(v_{ij}) = (v_0, v_{10}, \ldots, v_{ij})$, which is a simple chain from (v_0 to v_{ij}, the length of this chain is $\partial(v_0, v_{ij}) = i$. In the general case, some (except for perspective) projection vertices $P_k(v_0)$ can be m_{ij}- multiple: $0 \le m_{ij} \le \Sigma_i C_i - \Sigma_i |V_i|$, where C_i – is the number of elements of the *i*-th level of the projection $P_k(v_0)$, and $V_i \subset V$ – is the set of graph vertices represented by the *i*-th level of projection. The difference between m_{ij} and unity means the presence of the corresponding number of simple chains from the angle vertex v_0 to the vertex v_{ij}.

The number *i* of the level in the projection $P(v_0)$ determines the distance between the vertices V_i of this level from the angle vertex v_0 and the fact that the level ke, which for the first time determines the set of vertices of all the lower projection levels of the graph *G(V, E)* to *V*, corresponds to the eccentricity $e(v_0)$ of the vertex v0 in the projection $P(v_0)$:

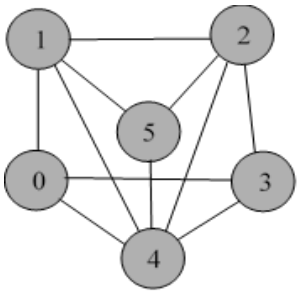
$$e(v_0) = k_e \mid \bigcup_{i=0}^{k_e-1} V_i \subset V, \quad \bigcup_{i=0}^{k_e} V_i = V.$$

This condition is called the condition of vertex completeness of the projection; however, its implementation is not always sufficient to determine all edges of the graph. The projection $P_k(v_0)$ of the graph *G(V, E)* will be complete only if it defines all its vertices and edges. Therefore, the necessary conditions for the completeness of the projection can be written as follows:

$$\bigcup_{i=0}^{k} V_i = V \text{ and } \bigcup_{i=0}^{k} E_i = E,$$

here $E_i = \{e_{uv} \mid u \in V_{i-1}, v \in V_i\}$ – the set of edges incident to pairs of vertices of neighboring projection levels. It is easy to see that the condition of vertex completeness of any projection of a graph is absorbed by the condition of its edge completeness.

We demonstrate the above with a simple example of the graph shown in Fig. 1 together with its



$$P(0) = 0^{(1^{(2,4,5)},3^{(2,4)},4^{(1,2,3,5)})},$$
$$P(1) = 1^{(0^{(3,4)},2^{(3,4,5)},4^{(0,2,3,5)},5^{(2,4)})},$$
$$P(2) = 2^{(1^{(0,4,5)},3^{(0,4)},4^{(0,1,3,5)},5^{(1,4)})},$$
$$P(3) = 3^{(0^{(2,4,5)},2^{(1,4)},4^{(0,1,2,5)})},$$
$$P(4) = 4^{(0^{(1,3)},1^{(0,2,5)},2^{(1,3,5)},3^{(0,2)},5^{(1,2)})},$$
$$P(5) = 5^{(1^{(0,2,4)},2^{(1,3,4)},4^{(0,1,2,3)})}.$$

Figure 1 - *Graph and its projections*

2-level projections:

The technology for constructing bracket (projective) descriptions of a graph and their properties are presented in sufficient detail in works [12–15] and are generalized in [16, 17]. Since any projection explicitly contains metric characteristics commonly used in topology analysis, such as shortest and alternative routes, vertex eccentricities and graph diameter, the use of projective description of graphs eliminates the need for time-consuming calculation of these characteristics, which would be inevitable with the traditional description of graphs by adjacency/incidence matrices. The transformation of the projections of the original CS graph into the projections of the graph of given attainability, which is required by the topological model of parallel computing described above, is also quite simple and reduces to the compression of the original projections [18, 19]. Embedding the information graph of the problem in a graph with a degree of vertices increased in this way is greatly facilitated. Examples of solving this problem can be found in [20-26].

Conclusion. All parallel systems in the process of their operation are subjected to studies of speed and efficiency on various classes and sets of tasks and data. However, differences in the technical, technological, topological, applied, and other architectural components of the systems give the results obtained exclusivity and with only some limitations can be extended to other systems and tasks. This prevents a complete picture of the formal conditionality of parallelism from the topology of systems. In this paper, an attempt is made to fill the gap in this regard. For this purpose, a parallel computing model is proposed that is divided into two components: the first is referred to parallel applications and ascribes to them the properties of unlimited parallelism, the second is assigned to a computing system in which the parallelism restrictions are determined by the maximum permissible distance between the information adjacent vertices of the CS graph associated with the speed of its communication environment and volumes of computing and exchange operations of a parallel task. The graph description method proposed by the Author not only allows us to compare the topological characteristics of parallel systems and tasks, but also allows us to analytically obtain interconnect topologies with specified properties.

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植物生物量臭氧化。 漫反射紫外光谱法研究松木中木质素的破坏
PLANT BIOMASS OZONATION. STUDY ON LIGNIN DESTRUCTION IN PINE WOOD BY MEANS OF DIFFUSE REFLECTANCE UV SPECTROSCOPY

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抽象。 使用漫反射紫外光谱，我们研究了在不同水分含量下臭氧化的松木样品。

根据紫外光谱，在松木的臭氧化过程中，首先破坏了聚芳族和二苯乙烯结构，然后破坏了愈创木脂基衍生物，然后破坏了含羰基和羧基的芳族木质素结构。 松木的臭氧处理会导致木质素含量降低。 在臭氧消耗量为2-3 mmol / g的情况下，水分含量超过65%的木材中，木质素的破坏效率很高。 当水含量低于40%时，松木的臭氧处理可降低臭氧消耗量，从而获得具有不同含量的芳族，羟基-芳族和聚芳族结构的各种LCM改性剂。

关键词：木材，木质素，臭氧，紫外线-漫反射光谱

Abstract. *Using diffuse reflection UV spectroscopy, we studied samples of pine wood ozonized in the presence of different water contents.*

According to the UV spectra, during ozonation of pine wood, polyaromatic and stilbene structures are first destroyed, then guaiacyl derivatives, and then carbonyl- and carboxyl-containing aromatic lignin structures. Ozone treatment of pine wood leads to a decrease in the lignin content. Lignin destruction proceeds efficiently in wood with a water content of more than 65% in the ozone consumption range of 2-3 mmol/g. When the water content is below 40%, ozone treatment of pine wood allows for low ozone consumption to obtain a variety of LCM modifications with different contents of aromatic, oxygenated-aromatic and polyaromatic structures.

Keywords: *wood, lignin, ozone, UV - diffuse reflection spectroscopy*

Ozone is an effective oxidizing agent for aromatic compounds, and in this regard is used for the destruction of residual lignin in the processes of obtaining paper pulp [1-3]. The treatment of plant biomass with ozone is considered as a promising method of delignification, which allows to increase the yield of monosaccharides during subsequent enzymatic hydrolysis [4-7]. This approach is also interesting from the point of view of cellulose production, since cellulose destruction during ozonation of LCM is relatively small [8, 9].

The study of wood as a starting material for ozone treatment is of interest due to the high content of cellulose and its high degree of polymerization. In addition, a significant amount of industrial wood waste can serve as a raw material for further chemical processing, which is of practical interest [1,2,8,9].

It was established [4–10] that one of the necessary conditions for the delignification of biomass under the influence of ozone is the presence of water in the structure of the sample, the optimum amount of which is different for different types of plant substrates.

In works [9, 10], ozone absorption by pine wood with different water contents was studied. Based on the results of studying the process of ozone absorption, it was concluded that the water content of 60-63% is optimal for the processing of pine wood. It was noted in work [8] that, under conditions of optimum water content, a degree of delignification of 40% is achieved. It was established that during ozonation of pine wood, lignin ozonolysis products are formed - glyoxalic, formic and oxalic acids. It was shown that acid oxidation by ozone takes place in the aqueous phase of the sample [8, 10].

By the IR method, the destruction of aromatic structures of lignin and the formation of carbonyl and carboxyl containing aliphatic compounds are shown [10]. LG destruction is enhanced with an increase in the specific ozone consumption achieved with an increase in the water content in the ozonized wood sample. In [11], the formation of oxy-aromatic compounds in ozonized pine wood was noted.

In this paper, we continue the study of the process of delignification of pine wood under the influence of ozone. The aim of the work is to study the destruction of lignin in wood, ozonized in the presence of different water contents. In the work, ozonized samples were studied by diffuse reflection UV spectroscopy.

Experimental part

Pine wood sawdust (*Pinus silvestris*) with a particle size of 0.315-0.63 mm and a water content (moisture content - MC) of 7 to 85 ± 1% relative to the mass of oven dry wood was used as the test material. $MC=(m_{H2O}/m_{o.d.w.})\times100\%$. Samples were prepared according to [10]. The mass of the samples was 0.42 – 0.45 g with a volume of 0.75±0.02 ml. The constancy of the volume of the samples allowed the experiment to be carried out at a constant contact time of the reagent in the reaction zone [15].

Ozonation was carried out in a flow unit in a fixed-bed reactor equipped by temperature controller (25 C) according to the procedure [10]. The amount of absorbed ozone at time *t* was calculated from the kinetic curves of the dependence of ozone concentration according to [10]. Immediately after treatment with ozone, the samples were washed with water and dried in air.

Diffuse reflectance spectra (DR) of wood samples (300 mg) were recorded on a Specord M-40 instrument with an integrating sphere in the range of 220–820 nm. When recording the DR spectra, a $BaSO_4$ sample was used as a reference (its reflection is taken as 100%).

Results and discussion

Table 1 presents the characteristics of the samples studied: the water content in the sample (MC,%) and the amount of absorbed ozone (Qr). Sample № 1 - original pine wood.

Table 1. *Characteristics of ozonized wood samples: moisture content in the sample (MC,%) and specific ozone absorption (Qr, mmol/g)*

№	MC,%	Qr, mmol/g	№	MC,%	Qr, mmol/g
1	7	0	7	35	1,1
2	7	0,2	8	40	1,3
3	15	0,3	9	45	1,6
4	20	0,5	10	60	1,9
5	25	0,6	11	65	2,5
6	30	0,7	12	80	2,7

From table 1 it is seen that an increase in the moisture content in the original sample allows to achieve higher values of the amount of absorbed ozone. The results of ozone absorption by wood with different water contents are presented and analyzed in detail by us in [10].

Figure 1 shows the UV diffuse reflectance (DR) spectra for the initial sample and the ozonized samples from table 1.

It can be seen that, depending on the specific ozone consumption, a change in the DR spectrum occurs. For a number of ozonized samples, the reflection in the entire spectral region increases, and the sample “bleaches”. At 550 - 650 nm, condensed polyaromatic and quinoid structures are absorbed [13], which can be formed during lignin transformations during storage of lignocellulosic material. It can be seen that these structures, as well as compounds absorbing at 390 - 400 nm, are primarily destroyed by ozone in the region characteristic of stilbenes and stilbenquinones. This result is consistent with the idea of the reactivity of aromatic compounds to ozone [2]. Polyaromatic compounds and stilbene structures are more actively oxidized by ozone [3]. At the same time, destruction of various guaiacil structures is also underway.

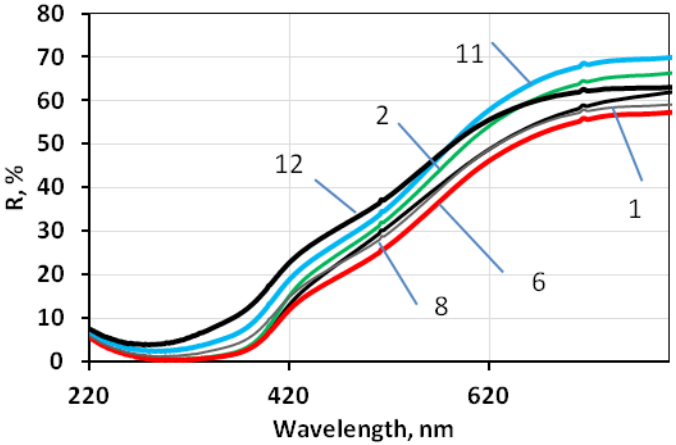


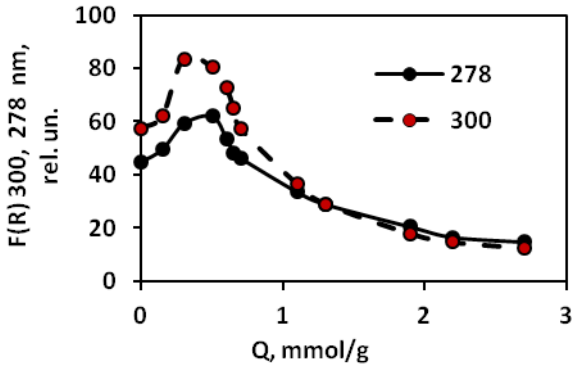
Fig. 1. *UV diffuse reflectance spectra of pine wood samples. The figure shows the numbers of samples from table 1*

The spectra show that, at low ozone consumption, structures that absorb in the region of 220–400 nm and in the region of ~ 500 nm are not being destroyed. The destruction of these structures is more characteristic for higher values of Qr. At Qr >1.3 mmol/g under the influence of ozone, the destruction of chromophores absorbing in the entire spectral region occurs.

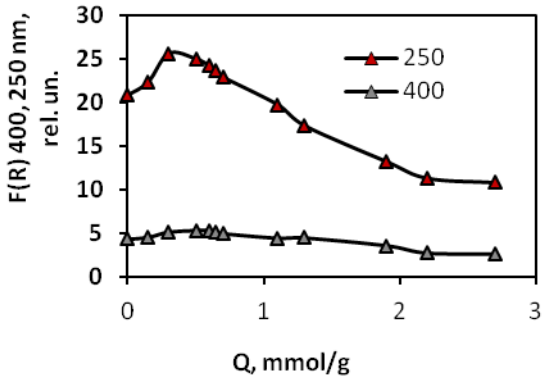
For quantitative and semi-quantitative analysis by DR spectra, it is most correct to use the Kubelka-Munk parameter (***F(R)***), which is the ratio of the absorption coefficient to the scattering coefficient of the medium and is determined by the formula: $F(R)=k/s=(1-R)^2/2R$.

F (R) allows us to estimate the absorption of an infinitely thick layer of a sample at a given wavelength. To assess the depth of destruction of the aromatic and quinoid structures of wood samples during ozonation, ***F(R)*** values were calculated for λ= 278, 300, 250 and 400 nm, shown in Fig. 2 for different values of specific ozone absorption.

In principle, the chromophore groups of lignin are characterized by absorption in a wide spectral region with maxima from 205 to 650 nm [12-14]. Let us consider the changes in the spectrum in some areas characteristic of the main structural models of lignin. From the curves of Figure 2 it can be seen that in the ozone consumption range of 1.5 - 2.5 mmol/g, the value of F (R) decreases at λ = 250, 278, 300, and 400 nm. This indicates that the lignin structures absorbing in these spectral regions are destroyed by ozone. This applies to structures with absorption at 278 nm (guaiacol, guaiacylpropane, guaiacyl ethanol, guaiacylpropanol), as well as polyaromatic structures with absorption at 390-400 nm and structures with absorption at 300 nm [12-14].



A)



B)

Fig. 2. *The dependence of F (R) at a wavelength of 278 nm, 300 nm (A) and 250 nm and 400 nm (B) of the DR spectra of pine wood on the specific absorption of ozone*

From Fig. 2.A it can be seen that at low values of ozone consumption (< 1 mmol / g), absorption increases at 300 nm, where carbonyl-containing aromatic structures (acetogacon, guaiacylpropanone, vanillin) absorb. Note that the listed carbonyl-containing compounds are also characterized by high extinction values in the region of ~ 270 nm.

The curves in Fig. 2B show that the value of ***F(R)*** at a wavelength of 250 nm also passes through a maximum at Qr <1 mmol/g. This fact is also explained by the modification of wood aromatics during the formation of carboxyl-containing aromatic compounds (for example, vanillic acid). With an increase in Qr, are also being destroyed.

Fig. 1 and 2 indicate the influence of water content on the process of destruction of lignin in wood during ozonation. It was shown [4–10] that for the effective absorption of ozone by wood (and its delignification), an excess of water is required relative to the fiber saturation point (FSP), corresponding to a water content of 30%. Figures 1 and 2 show that the effective destruction of all types of aromatic structures by ozone is observed at the initial value of the water content in wood of 60-80%. Apparently, these conditions correspond to the balance between the reactions of ozone with lignin on the accessible part of the LCM surface and the reactions of ozone with the products of lignin transformations, which are both on the surface and in the aqueous phase of the sample. At higher MC values, inhibition of ozone absorption due to reactions of ozone with products was noted [8, 10].

It was shown [15] that the drying of the sample, which accompanies the ozonation experiments that are carried out in a flow-system, also affects the process of treating wood with ozone. During ozonation of samples with a water content of ≤ 45% due to wood drying, the water content becomes lower than FSP. This leads to a reduction in the surface size of not swollen wood; the contribution of processes occurring at the boundary becomes significant: the gas phase - the surface of the lignocellulosic material. Under these conditions, the role of free-radical processes that occur on the outer surface of the pores of LCM increases. During these reactions, the LCM aromatic structures condense and polymerize, which we noted earlier in [16]. In addition, lateral substituents of aromatic rings are oxidized, resulting in the formation of aromatic ketones, aldehydes and acids, which are then slowly oxidized by ozone [3]. Note that the formation of such compounds was noted in the study of the UV spectra of dioxanlignin isolated from pine ozonized wood [11].

During prolonged ozonation at a water content below 45%, the destruction of lignin by the ozonolysis mechanism is suspended. A more complete destruction of the lignin available to the reagent is possible when ozonizing wood with a higher water content and, as can be seen from Figure 2, changes little with an MC above 60-65%. This result is consistent with the idea that the optimum water content for pine wood is in the range of 60-63%.

These works show that when ozonizing pine wood, polyaromatic and stilbene structures are first destroyed, then guaiacyl type structures, and then carbonyl- and carboxyl-containing aromatic lignin structures.

An analysis of the diffuse reflection spectra in the UV region showed that ozone treatment of pine wood leads to a decrease in the lignin content. Lignin destruction proceeds efficiently in wood with a water content of more than 65% in the ozone consumption range of 2–3 mmol/g. When the water content is below 40%, ozone treatment of pine wood at low ozone consumption allows to obtain a variety of LCM modifications with different contents of aromatic, hydroxy-aromatic and polyaromatic structures.

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臭氧吸附净化被苯酚污染的水

OZONE-SORPTION PURIFICATION OF WATER CONTAMINATED WITH PHENOL

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注解。考虑将吸附和臭氧化结合作为从苯酚中纯化水的方法。已经研究了工业吸附剂GAC（颗粒活性炭）和活性炭纤维（ACF）的吸附性能。结果表明，两种吸附剂的吸附特性，例如比表面积，吸附容量和吸附系数都是可比的。同时，由于具有最佳的动力学特性，ACF上的吸附效率明显高于GAC。

吸附后研究了在GAC和ACF吸附剂存在下苯酚水溶液的臭氧化作用。给出了有关通过吸附和臭氧化从苯酚中联合净化水效率的数据。通过苯酚在碳吸附剂上的初步吸附，可以实现从苯酚及其部分氧化产物中进行深度提纯，在这种情况下，使用ACF进行水净化更为有效。

关键词：臭氧吸附法臭氧活性炭苯酚水净化

Annotation. *Combination of sorption and ozonation as a method of water purification from phenol is considered. Adsorption properties of the industrial adsorbent GAC (granular activated carbon) and activated carbon fiber (ACF) have been investigated. It is shown that the adsorption characteristics of both adsorbents, such as the specific surface area, adsorption capacity, and adsorption coefficients are comparable to each other. At the same time, due to the best kinetic characteristics, the adsorption efficiency on the ACF is significantly higher than on the GAC.*

Ozonation of phenol aqueous solutions in the presence of GAC and ACF adsorbents was studied after adsorption. Data on the efficiency of combined water purification from phenol by sorption and ozonation are presented. Deep purification of water from phenol and products of its partial oxidation is achieved by the preliminary sorption of phenol on the carbon adsorbent, in this case water purification using ACF is more effective.

Keywords: *ozone - sorption method, ozone, active carbon, phenol, water purification*

Introduction

Phenols are often found in wastewaters of petrochemical, pharmacological, pulp and paper industries, plastics and food industries. Due to the high toxicity, phenols are classified as especially dangerous water pollutants, as some of them are potentially dangerous for human health. The presence of such pollutants as phenol in the human body can cause degeneration of protein tissues, paralysis of the central nervous system, damage to the kidneys, liver and pancreas. [1] According to the requirements of the US Environmental Protection Agency (EPA), the phenol content in the wastewater should not exceed 1 mg /l [2]. According to Russian and European standards, the maximum permissible concentration (MPC) of phenol in drinking water is 0,001 мг/л [3]. The need to remove phenols from industrial waters and their decontamination is obvious. At present, many methods of removing phenols and their derivatives from wastewater are known. These include oxidation, deposition, ion exchange, extraction, and adsorption. One of the most effective is the non-destructive method of water purification - sorption on carbons. High efficiency of purification by carbons is achieved due to their high porosity, large surface and sorption activity [4-9].

Currently, alternatives to granular and powdered activated carbons are known: these highly efficient sorbents are carbon fiber materials that have not yet found wide application in water purification. They are characterized by very high sorption activity and a significant potential of consumer characteristics. [5-9], and therefore present a scientific and practical interest for studying the effectiveness of their application in water purification from man-made pollutants [7].

Among oxidation methods of water purification from phenols, the ozonation shows great promise [10-12]. Using this method to remove phenol and its derivatives allows almost complete destruction of aromatic compounds depending on the ozone dose and the contact time with ozone. [13] Products of incomplete oxidation of aromatic compounds formed during ozonation react slowly to ozone, which increases economic costs. In addition, water treatment by ozone can produce more toxic compounds than phenol, for example, formaldehyde. [14-16]. More effective method is a combination ozonation and sorption [16, 17], since it allows to remove the residual impurities by sorption, with a reduction in energy costs.

The aim of this research is to study the process of purifying water contaminated with phenol using activated carbon (GAC) and activated carbon fiber (ACF), and to investigate their main characteristics and properties. The possibilities of their use for the removal of phenol from water have been studied as sequential sorption and ozonation.

Experimental

Phenol (chemical purity) was used. Activated carbon fiber (ACF) (produced by NPO Neorganika, Electrostal, Russia) and granular activated carbon (GAC) (manufactured by OAO Sorbent, Perm, Russia) were used as adsorbents. Activated carbon fiber (ACF) is received by heat treatment of a non-woven fabric based on viscose fibers and mtilon fiber. [18]. Granulated activated carbon (GAC) is obtained from hard coal, coal char and bonding medium by granulation of the resin paste, carbonization and steam-gas activation.

The specific surface area of the adsorbents and the pore size distribution were determined by low-temperature nitrogen adsorption (77K) using the AUTOSORB-1 Analyzer (Quantachrome Instruments, USA). The calculation of S_{BET} surface and pore size values was performed using the software package supplied with the analyzer. The error in measurement is 10%.

Adsorbent samples weighing from 0.05 to 1.8 g were placed into the flasks containing 250 ml of phenol solution with concentration from 0.5 mg/l (500 MPC) to 5.0 mg/l (5000 MPC). The flasks were continuously shaken for 12 hours in a flask shaker (Vib Labourtechnik Ilmenau / Tür, Type Thys 2 (Germany). The carbon adsorbent was then filtered off through a glass filter, and the filtrate was analyzed by UV- spectrophotometer.

To study kinetics of phenol adsorption process, the concentration of phenol was measured periodically during 24 hour. The amount of adsorbed phenol was calculated according to the formula

$$G= (Co-C)\times V/m, \quad (1)$$

where V and m are the volume (l) and sample weight (g),
Co and C are the initial and equilibrium concentrations of phenol (mg /l).

In studying the equilibrium adsorption of phenol on carbon sorbents, 25 ml of phenol solution was added to the adsorbent sample of 0.3 g. The concentration of phenol ranged from 0.4 to 8.0 g/l. Sorption was carried out for three or more days at a temperature of 25°C (temperature controller LOIP, Russia) with continuous stirring. The solution was then filtered off from the adsorbent and analyzed by UV-spectrophotometer.

Ozone was obtained from oxygen using a laboratory ozonizer (Medozon, Russia). The concentration of ozone in the ozone-oxygen mixture was from 1%. Ozonation of phenol solutions of 50 ml volume with a concentration of 0.1 to 300 mg /l was carried out in a flow system unit with a bubble reactor at the gas flow rate of 5 l/ h. Ozone concentration was measured by photometer (Medozon 254/3). To estimate ozone losses because of dissolution in water, it was also carried out a blank (controlling) run. The sample of distilled water (pH 5.7) was chosen as a sample of the blank run. The blank run sample was characterized by the same volume as the samples of the experimental run. A coincidence of ozone concentration at the outlet of the reactor of experimental and blank run was assumed as a criterion of the completion of the reaction.

A current value of the ozone consumption (*a)* was computed by numeric integration of kinetic data of Fig 1A, using Equation (1).

$$a = \frac{U}{c_{ph}} \int_0^t (C_t^* - C_t) dt \quad (3),$$

where

U is the gas flow rate (l/s),

C_t and C_t^* are the current ozone concentration (mol/l) at the outlet of the reactor containing the investigated solution, and for the blank run, respectively

C_{ph} is a concentration of phenol solution.

Phenol solutions with concentration of 300 mg/l was treated with ozone (1v %, flow rate of 5 l/h) in the presence of an adsorbent one day after the addition of the sample to the phenol solution. The efficiency of water purification from phenol (E,%) was calculated as

$$E = (Co - C) \times 100/Co. \quad (2)$$

HPLC, Gas-chromatography and mass- chromatography

Phenol concentration was recorded with a Cary 300 (Varian) spectrophotometer at a wavelength of 269 nm. At high concentrations the solutions were 10-100-fold diluted.

Phenol water solutions were analyzed using HPLC Agilent 1100 (USA with a UV detector (195 nm) (column Zorbax SB-C18) and by mass spectrometer (Termo DSQ-II).

Results and discussion

1. Characteristics of adsorbents

The data on the specific surface area and the pore size distribution for the adsorbents are shown in Table 1.

Table 1. *Characteristics of adsorbents*

Sorbent	S, m^2/g	Total pore volume, cm^3/g	Micropores volume cm^3/g, (d<2 nm)	Mezopores volume cm^3/g	Average pore diameter d, nm
ACF	720±70	0.28 (d<64nm)	0.25	0.03	1.87
GAC	770±80	0.42 (d<40 nm)	0.12	0.30	2.16

The obtained results show that the specific surface area of the ACF carbon fiber is almost 90% of the surface of the GAC, but in comparison with the GAC, the ACF carbon fiber contains 90% micropores by volume, whereas GAC contains only about 30% of micropores.

Sorption of phenol

The kinetic curves of phenol sorption on ACF and GAC are presented in Fig. 1. The Figure 1 shows that sorption on the ACF occurs at a much higher initial rate, exceeding that on the GAC by more than 3-fold. One may see that the efficiency of phenol removal is 61-88% for the first 5-15 min on the ACF adsorbent, and only 2-13% were removed using GAC during the same time. Sorption equilibrium on the ACF sorbent occurs within 1 hour, and it takes more than 6 hours on GAC (Fig. 1.). Figure 2 shows the isotherms of phenol sorption from aqueous solutions on ACF and GAC.

The steep initial section of the phenol sorption isotherm on the ACF is explained by the high content of micropores, including supermicropores. The phenol adsorption isotherm on GAC differs due to the fact that micropores and mesopores participate in the adsorption process.

Two isotherm models (Langmuir and Freindlich model) often used to describe the sorption of organic compounds on carbons [5,8,9] were applied to the experimental data to obtain further information on the adsorption process. The equations that describe the models are as follows:

$$G = \frac{1}{K_L G_m} + \frac{C}{G_m} \quad (4)$$

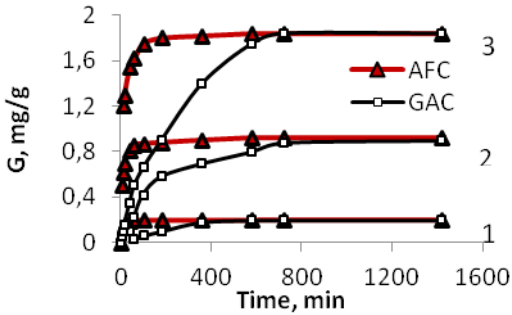

Fig. 1. *Kinetic curves of phenol sorption on ACF and GAC. Phenol concentration, mg/l: 0.6 (1), 2.4 (2),4.6 (3)*

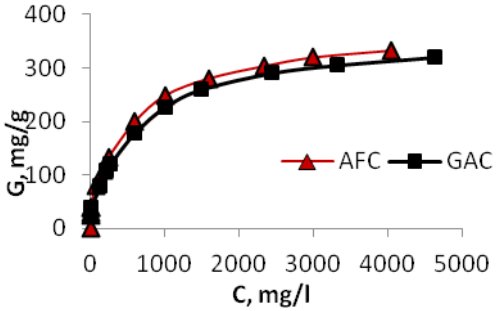

Fig. 2. *Adsorption isotherms of phenol on ACF and GAC*

Where C and G are the equilibrium concentrations of phenol in the solution and on the surface of the sorbent, K_L is a direct measure of the intensity of the adsorption process, G_m is adsorption value related to the surface area occupied by a monolayer of adsorbate, reflecting the adsorption capacity.

$$lgG = \lg K_F + n\ lgc \quad (5),$$

where K_F is a system constant related to the bonding energy; and the slope n is a measure of adsorption intensity or surface heterogeneity. The results of the data fit with the Langmuir and the Freindlich models and the related correlation coefficients (R^2) are shown in Table 2. The experimental data fit better with the Langmuir model (R^2 ~0.999) than with the Freindlich model. It is seen from Table 2 that the adsorption interaction constant K_L for the ACF is slightly higher. Adsorption of phenol is likely to occur by π–π interactions between phenol ring and π –electrons of the polyaromatic carbon sheets. Comparison with the data on the phenol sorption on other carbon sorbents shows that the K_L values correspond to the interval of values obtained for activated carbons, and the value of G_m exceeds them [9].

Table 2. *The fitting parameters of phenol sorption on ACF and GAC*

Sorbent	Langmuir equation parameters					Freindlich equation parameters		
	G_m, mg/g	G_m, mmol/g	K_L, l/mg	R^2	σ, nm^2	n	K_F, mg/g /(l/mg)^n	R^2
ACF	360	3.9	0.024	0.999	0.31	0.39	22	0.987
GAC	350	3.7	0.019	0.999	0.34	0.38	20	0.987

Table 3. *Efficiency of phenol removal after ozonation and combined with sorption on ACF and ozonation.* C_{phenol} *=200 m/l.*

Process	Time, hour	E, %
Phenol + O_3	0,5	33
Phenol + O_3	1,0	47
Phenol + O_3	2,0	86
Phenol +ACF+ O_3	0,5	95
Phenol +ACF+ O_3	1,0	100

The values of the area occupied by one molecule in monolayer (σ) given in the Table 3 for both adsorbents are similar. Comparison with the size of phenol molecular area (0.4 nm^2 [8]) indicates the formation of a tightly organized monolayer. Some of adsorbed molecules can be angular oriented to the surface. It is seen that the adsorption parameters for ACF-A and GAC are similar (Table 3).

Ozonation of phenol solutions in combination with sorption

Fig. 3 presents the kinetic curves of ozone concentration in ozonation of phenol solution, as well as phenol ozonation in the presence of sorbents. Firstly, ozone concentration at the outlet of the reactor with phenol solution decreases just as it occurs in the blank run because of the filling of the reactor by ozone. Then the concentration increases and achieves the initial value characteristic also for the blank run. It means that the reaction between phenol and ozone is completed.

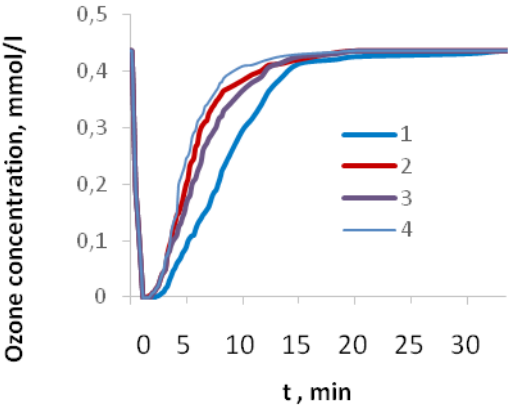

Fig. 3. *Kinetic curves of ozone concentration at the outlet of the reactor in ozonation of phenol solution (1), phenol solution in the presence of ACF (2) and GAC (3), obtained after adsorption. Ozone concentration in the blank run with distilled water (4). Cphenol 200 mg/l.*

With ACF the ozone concentration reaches a stationary level faster than if in ozonation without an adsorbent, since some of the phenol is adsorbed. Ozone is consumed by reactions with the residual phenol and ozonation products present in the solution [10,11]. The molar ozone consumption *a* is about 0.5 – 0.7 mol O_3/ mol phenol. With GAC the process of reaching a stationary level is much slower because of the possible reaction of ozone with the GAC adsorbent [19]. The *a* value increases very much. Efficiencies of phenol removal after ozonation and combined sorption on ACF and ozonation are presented in Table 3.

The data in Table 3 show the high efficiency of phenol removal when combining sorption on ACF and ozonation. The content of residual phenol in the solution after ozone-sorption treatment on the ACF is 20-50 times lower than ozonation without ACF.

The high efficiency of ozone/sorption treatment of water is a result of the synergistic effect of various processes, where the contribution of sorption as the main process of phenol removal is enhanced by the removal of secondary contaminants - the products of water ozonation.

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UDC 541.123.6

Na，Ca // SO_4，F-H_2O系统在50° C时的相平衡

PHASE EQUILIBRIA IN THE Na, Ca// SO_4, F– H_2O SYSTEM AT 50°C

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抽象。 利用平移法研究了Na，Ca // SO_4，F - H_2O体系在50° C时的相平衡，并首次建立了其闭相图。

关键字：翻译方法-相平衡-分量-图表-几何图像。

Abstract. *The phase equilibrium of the Na, Ca //SO_4, F – H_2O system at 50°C was studied by the translation method, and its closed phase diagram was constructed for the first time.*

Keywords: *translation method – phase equilibria – components –diagram – geometric images.*

Knowledge of the laws of phase equilibria of the Na, Ca // SO_4, F – H_2O system is necessary to establish optimal conditions for the separation of sulfate and fluoride salts of sodium and calcium from natural and technological solutions containing these salts.

As an analysis of the literature [1] shows, this system has not been previously investigated.

We studied it using the translation method, which follows from the principle of compatibility of structural elements n and (n + 1) component systems in one diagram [2]. According to the translation method, structural elements of the diagram of n-component systems, when the next component is added to them (at constant temperature and pressure), increase their dimension by one and are translated to the level (n + 1) of the component composition in a transformed form. For example, in this case, invariant points of n - component systems at the (n + 1) component level turn into monovariant curves, and monovariant curves into divariant fields, etc. Transformed geometric images,

according to their topological properties, at the level of (n + 1) component composition, intersecting each other (observing the Gibbs phase rule) form geometric images of the system at this component level. Thus, the translation method will make it possible to predict the possible phase equilibria of multicomponent systems (when moving from the n-component level to the (n + 1) component level) and theoretically construct their closed phase diagrams. A more detailed application of the translation method for predicting the structure of the phase equilibrium diagram in multicomponent water – salt systems was considered in [3-4].

The studied four-component system includes the following three-component systems: $Na_2SO_4 – CaSO_4 – H_2O$, $NaF – CaF_2 – H_2O$, $NaF – Na_2SO_4 – H_2O$ and $CaF_2 – CaSO_4 – H_2O$. According to [5], systems $Na_2SO_4 – CaSO_4 – H_2O$, and $Na_2SO_4 – NaF – H_2O$ under 50°C are investigated by the solubility method and for them at this temperature, respectively, two invariant points were established. Three component systems $NaF – CaF_2 – H_2O$ and $CaF_2 – CaSO_4 – H_2O$, according to [5], are not investigated. If the structure of their diagram is accepted as simple eutonic, then each of them will be characterized by one invariant point. Based on the foregoing, for the isotherm of 50°C, systems Na, Ca//SO_4, F – H_2O, at the level of three-component composition, the following invariant points with equilibrium solid phases will be characteristic (Table 1).

Table 1

Phase equilibria in the invariant points of the Na, Ca// SO_4,F–H_2O system at 50°C at the level of three-component composition

Invariant point	Precipitation phase composition	Invariant point	Precipitation phase composition
$Na_2SO_4 – CaSO_4 – H_2O$ system		$Na_2SO_4 – NaF – H_2O$ system	
E_1^3	Te + Gb	E_4^3	Wo + Sr
E_2^3	Gb + Gp	E_5^3	Sr + Te
$NaF – CaF_2 – H_2O$ system		$CaF_2 – CaSO_4 – H_2O$ system	
E_3^3	Wo + Fo	E_6^3	Fo + Gp

In the table. 1 and further, E denotes an invariant point with an upper index indicating the multiplicity of the point (system component) and a lower index indicating the ordinal number of the point. Accept the following conventions: Te-tenarditis Na_2SO_4, Gb – glauberite $Na_2SO_4 \cdot CaSO_4$, Gp – gypsum $CaSO_4 \cdot 2H_2O$, Wo – willomite NaF, Fo – fluorite CaF_2, Shr – sheireritis $Na_2SO_4 \cdot NaF$.

Figure 1 shows the phase equilibrium diagram of the Na, Ca//SO_4, F – H_2O system at 50 ° C at the level of a three-component composition in the form of a "Scheme" of a tetrahedral prism, which is constructed on the basis of the data in Table 1.

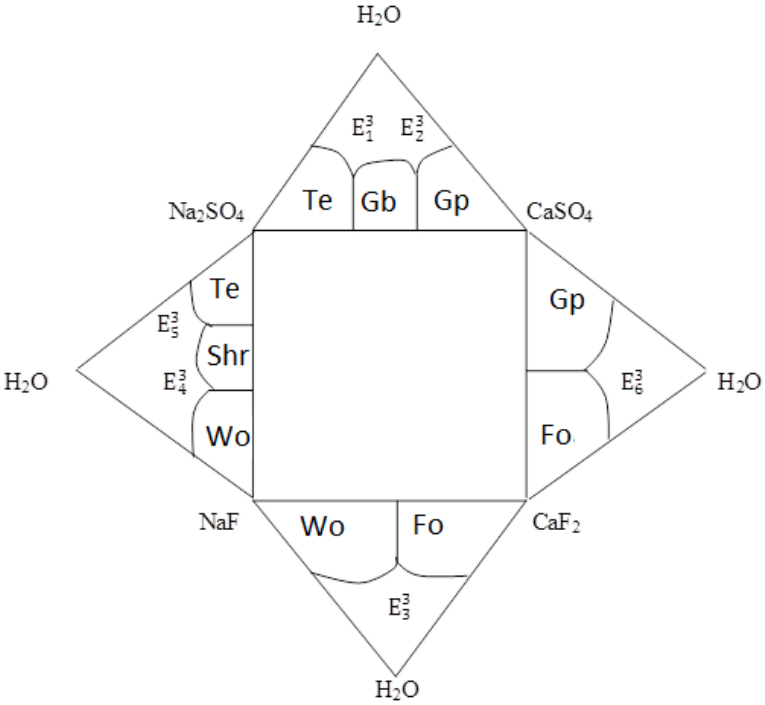


Fig. 1. *Diagram of phase equilibria of the Na, Ca// SO_4, F - H_2O system at 50°C at the level of a three-component composition in the form of a "Scheme" of a prism*

The "through" translation of [3,4] triple invariant points to the level of four-component composition leads to the formation of the following quadruple invariant points with equilibrium by solid phases:

$$E_1^3 + E_5^3 \dashrightarrow E_1^4 = \text{Gb} + \text{Te} + \text{Sr};$$

$$E_2^3 + E_6^3 \dashrightarrow E_2^4 = \text{Gb} + \text{Gp} + \text{Fo};$$

$$E_3^3 + E_4^3 \dashrightarrow E_3^4 = \text{Wo} + \text{Fo} + \text{Sr}.$$

A diagram of the phase equilibria of the Na, Ca// SO_4, F–H_2O system at 50°C onstructed on this basis at a four-component composition level shows that the divariant fields Gb, Sr, Fo are not closed. For their closure, we found the fourth invariant point with equilibrium solid phases using the "intermediate" translation method [3,4] E_4^4 = Sr + Gb + Fo.

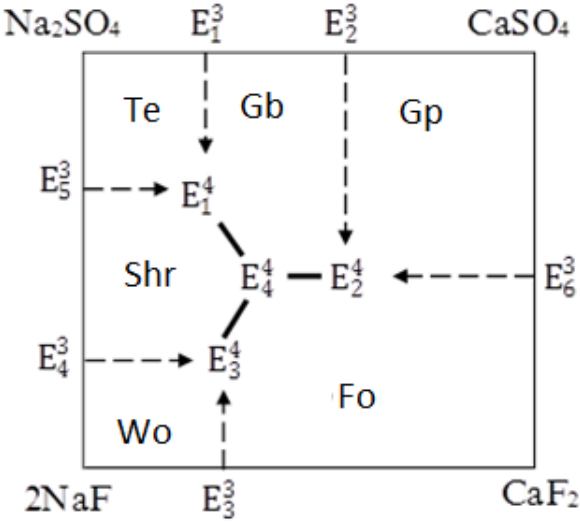


Fig. 2. *Schematic diagram of phase equilibria of the Na, Ca// SO_4, F - H_2O system at 50°C, constructed by the translation method*

Figure 2 shows the final version of the schematic [6] diagram (salt part) of the phase equilibria of the 50°C isotherm of the Na, Ca// SO_4, F–H_2O system at the level of four-component composition. The presented diagram combines elements of the structure of the system at the levels of three- and four-component compositions. In particular, the sides of the diagram are the coordinate cores of the diagram of the three-component systems that make up this four-component system. On them are schematically plotted (projected) the positions of the corresponding invariant points. When translating to the level of four-component composition, they turn into monovariant curves (in the figure, these monovariant curves are shown as dashed lines, and the arrow indicates the directions of translation). The phase composition of the precipitation of these curves is identical to the phase composition of the translated triple invariant points. The monovariant curves formed during the translation of triple invariant points at the level of four-component composition mutually intersecting (following the Gibbs phase rule) form quadruple invariant points, the phase composition of the precipitation of which is given above.

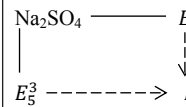
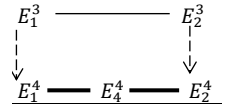
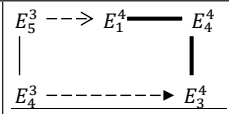
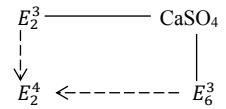
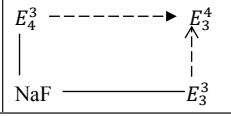
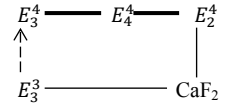
Between the invariant level points of the four-component composition, monovariant curves pass, which are characterized by the following phase composition of precipitation:

$$E_1^4 \text{ —— } E_4^4 = \text{Gb} + \text{Sr};$$
$$E_2^4 \text{ —— } E_4^4 = \text{Gb} + \text{Fo};$$
$$E_3^4 \text{ —— } E_4^4 = \text{Sr} + \text{Fo}.$$

The system under study at the level of the four-component composition is characterized by the presence of six (6) divariant fields, the contours of which are presented in Table. 2.

Table 2

Equilibrium solid phases and contours of divariant fields in the diagram of the Na, Ca// SO_4, F–H_2O system at 50°C

The equilibrium solid phase of the fields	The contours of the fields in the diagram (Fig. 2)	The equilibrium solid phase of the fields	The contours of the fields in the diagram (Fig. 2)
Te		Gb	
Sr		Gp	
Wo		Fo	

The structure of the system under study at 50 ° C shows that the crystallization fields of fluorite, sheirerite and glauberite border 4 of the 5 fields of crystallization of other phases. This indicates that, due to their low solubility, these salts occupy a significant part of the studied system under the given conditions.

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