SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

Materials of the International Conference

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参与者的英文报告

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这些会议文集结合了会议的材料 – 研究论文和科学工作者的论文报告。 它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。
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These Conference Proceedings combine materials of the conference – research papers and thesis reports of scientific workers. They examines tecnical and sociological issues of research issues. Some articles deal with theoretical and methodological approaches and principles of research questions of personality professionalization.

Authors are responsible for the accuracy of cited publications, facts, figures, quotations, statistics, proper names and other information.

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CONTENT

GEOGRAPHICAL SCIENCES

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

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。

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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”

在服务业的非正式网络形式中安排自营职业者的经济活动
ARRANGEMENT OF THE ECONOMIC ACTIVITY OF SELF-EMPLOYED IN INFORMAL NETWORK FORMS OF THE SERVICE INDUSTRY

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注解。 本文证实了在服务部门组织自营职业经济活动的非正式网络形式的新概念和方法论愿景，界定了它们在现代经济中的作用，提出了一些概念，阐明了网络的原因，确定了它们的主要内容。类型。 得出的结论是官方收入与自营职业者参与非正式网络的关系。

有人提出需要采取综合办法解决自营职业问题，将目前的问题转变为未来经济增长的源泉。

关键词：自营职业，就业，非正规经济网络，非正规经济，监管，研究。

Annotation*. The article substantiates a new conceptual and methodological vision of informal network forms of organizing the economic activity of self-employed in the services sector, defines their role in the modern economy, suggests a number of concepts, clarifies the causes of networking, identifies their main types. The conclusion is made about the connection of official incomes with the participation of the self-employed in informal networks.*

There are proposals on the need for an integrated approach to solving the problem of self-employment, turning its present problems into a source of future economic growth.

Keywords: *self-employment, employment, informal economic networks, informal economy, regulation, research.*

In recent years, Russia has undertaken a series of efforts to identify and legalize the self-employed part of the population, including in the context of the need to reduce the share of the non-formal economy.

According to some estimates, the number of self-employed in the Russian Federation ranges from 12 to 20 million people, acting as the basis of informal (shadow) labor relations.

Self-employment is a widespread phenomenon and is developed in many countries of the world. For example, in the USA, self-employed people and their employees make up 30% of the workforce. The industries with the largest number of self-employed people include agriculture, construction, business and services [1].

Self-employment manifests itself in different contexts, embracing new types of activities and manifesting itself in unexpected angles and incarnations, which is reflected in the research conducted by scientists (Scott H., Yamamoto I, Deborah L. Olson, González Menéndez, MC, Cueto, B. and others) [2; 3], as well as being the subject of analysis of various government bodies and social services in many countries of the world [4; 5].

Under the self-employed refers to individuals who directly interact with customers on the individual performance of work on the agreed terms and for remuneration.

Self-employment in legislative documents and scientific literature is primarily regarded as the activity of individual workers who realize their individual economic interests and benefits. Meanwhile, taking into account the integration processes occurring in the economy, each self-employed person is a participant in the process of performing interrelated work leading to the formation of an economic network or its separate segment. In this regard, solving the problems of self-employment in Russia requires the use of an integrated approach to the causes and processes of the network bases of their organization.

Self-employed, meeting the requirements of Russian legislation, belong to the legal (rightful, legitimate) form of self-employed activities and, accordingly, self-employed, which do not meet the requirements of Russian legislation, belong to the illegal (unlawful, illegitimate) form of performance of activities aimed at obtaining income.

Self-employment is characterized by the following distinctive features: the initiative nature of labor, direct personal contact with the customer, self-organization, self-management, independent activity within the framework of the labor process and stages of the life cycle of work (services), personal responsibility for the results of its activities.

Prerequisites for the network organization of self-employed are a number of the following causes and phenomena. First, the needs of people satisfied by motivated adaptation behavior on the part of participants in self-employment processes, ensuring their own interests and cooperating with partners.

Secondly, environmental factors that have an active influence on economic actors in the form of customers and performers who are seeking to implement their interests.

Thirdly, the presence of organizational and legal, institutional conditions in the state and society, as well as the expansion of technical and technological capabilities, including the development of Internet communication technologies.

In the network organizations of the self-employed, their properties are realized in the form of institutional, integrative, communicative and hierarchical and effectiveness.

The institutional property manifests itself through institutions (norms, behavioral patterns) and institutions (laws, organizations), which to some extent are realized in the informal network structures of the self-employed:

- in the form of certain groups of people who initiatively perform various tasks and works;
- as organizational forms that implement specific functions on behalf of a group of participants or the entire network, including regulating the behavior of people in the right perspective;
- as a set of organizations with resources that allows you to perform activities, as well as functions that meet the needs of customers;
- as roles of people, especially important for network members.

The integrative property means that the informal network structures of the self-employed are capable of interacting, uniting the participants, creating coalitions by them. Networks provide intersubjective connections between the participants, orient them towards the formation of a coherent organization and a single team with a unity of purpose, interests and requirements. Integrity is a network-forming factor leading to the value unity of the participants (based on shared values and goals); organizational unity (within a single organization); professional and business unity (operational interaction in a single labor process).

The communicative property means that each of the participants of the network organization and each network as a whole are not isolated from other networks and the external environment; they are interconnected by a multitude of communications.

The property of sociability reflects the ability of the self-employed to communicate, interact with each other, to have flexible behavior and to establish profitable relationships with partners.

The hierarchy property reflects the pattern of building networks located at each level (tier) of the hierarchy. The analysis shows that the informal network structures of the self-employed are structured, possess qualities and certain integrity at the levels of the hierarchy.

Efficiency shows the degree of achievement of the planned result of activity. The performance of a self-employed worker consists of the following elements:

- readiness - the inclination (desire) of the person to perform this work, based on the needs, waiting for remuneration, the desire to perform work, etc.;

• human capabilities in the form of a combination of his physical, professionality, professional abilities to perform this work;

• conditions of work, including the organization of labor, the availability of means of labor and their characteristics, psycho-physiological working conditions, etc.

The reasons for the formation of informal networks by self-employed workers are diverse and include:

• the complexity of the life situation that requires the survival of certain groups of people on the basis of mutual support, increased reciprocal exchanges and interaction between themselves and other categories of the population [6];

• low wages and incomes, lack of work;

• public reaction to the actions of the authorities in the regulation of the economy and society [7];

• transformation of the structure of society, increasing the role of collective interaction [8; 9], etc.

Economic entities in the informal sector can not be considered separately but in the form of maximizers, minimizers or optimizers of the result of their activities. Given the conditions of their work, established rules (norms) of behavior and the external situation, they can selectively fulfill such roles.

In addition, this choice of people is difficult to predict because of the difficulty of identifying all the factors (both economic and non-economic) that influence their behavior. However, the self-employed are united by a common thing - ignoring the economic interests of society and the state, as well as a negative attitude towards state regulation of the economy. The interests of the self-employed individual are considered primary, which creates the character of his attitude to society.

One of these basic factors is the historical and evolutionary trend of the path of Russia, which reveals the lack of proper experience of interaction between the state and the individual. Virtually all attempts in the history of the country to establish a rational interaction between them through reforms ended in discrediting the plan (an example of the reforms of Peter I, the building of communism, the transition to a market).

The study showed that in the course of their professional activities, the self-employed interact with a large number of partners, who, in turn, form a number of the following network entities: a network of customers; information network; logistics network; network of tools and objects of labor; a network of monetary and financial services; network of intermediaries; network of relatives and friends; other types of networks.

The scheme of the informal economic network of self-employed may have the following form (Figure 1).

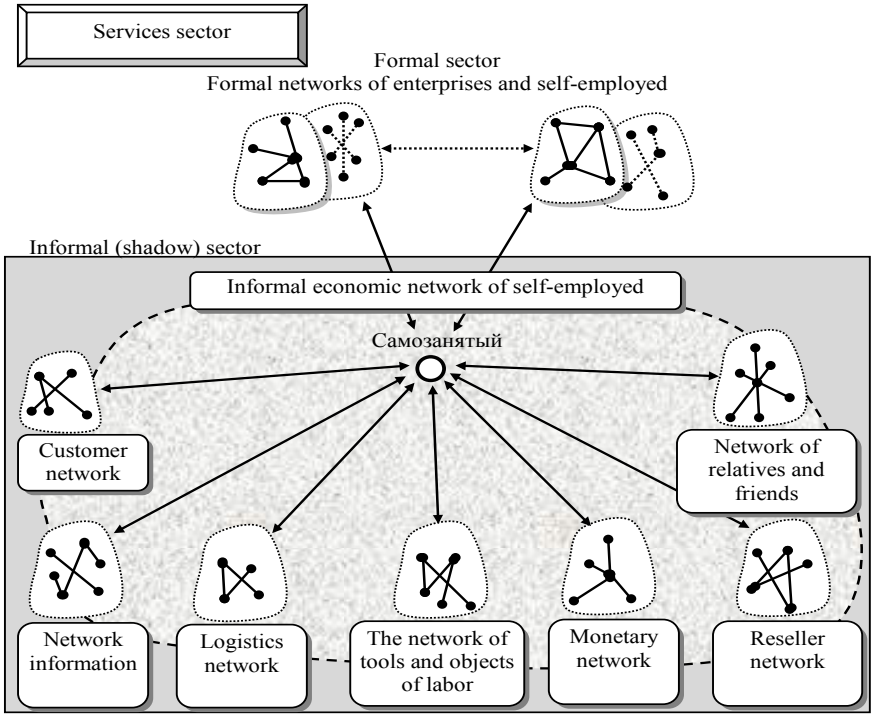

Figure 1 - *Scheme of the informal economic network of the self-employed*

The customer network consists of a combination of previous and potential customers who were self-employed or provided services and work. This is the main source of income for the self-employed, the area of application of his labor.

Economic activity in the "priority sector" is officially recognized and supported by the government, which ensures significant benefits. So, they have privileged access to cheaper loans, benefit from restricting competition through influencing tariffs, quotas, licenses, etc., thereby reducing the cost of work, ensuring high wages and higher average incomes.

At the same time, the peripheral sectors of economic activity have practically no support, function in more unfavorable conditions, which causes a reduction in wages and average incomes, leads to a reduction in the number of employees.

The consequences of such a differentiation between sectors lead to the risk and uncertainty of receiving cash by workers employed in sectors with low incomes and in fact force them to engage in informal activities.

The informal sector of self-employed should be considered simultaneously as a problem and a reserve, a source of future economic growth.

The reasons for the transition of people into the informal sector of the economy and the creation of networks require more detailed study. Such preferences of people can not always be explained by the principle of rationality, their orientation towards utility and benefit, the choice of the optimal form of activity.

Network forms of organizing self-employed activities require a comprehensive approach to the problems of creating new jobs, increasing wages and incomes, reducing the poverty of the population, and training it. Particular attention should be paid to issues of state support for self-employed, including their training and retraining of new activities and the basics of the economy, rent of premises, equipment and tools, creating conditions for gradual withdrawal from the "shadow" and transition to entrepreneurship, etc. Simplified registration, reporting and taxation regimes should be supported, and access to state and municipal orders should be provided.

A special role for self-employed can play the possibility of obtaining preferential loans at all stages of self-employed activities: to start (open) your own business; for its development and renewal; for expansion and transition to entrepreneurship.

The reasons for the formation of informal networks of self-employed are diverse and are largely due to negative trends in the economy and the preferences of people who realize their interests and benefits.

It is advisable to develop and implement a long-term program to support self-employed activities, taking into account in it the directions for solving the whole complex of problems that currently exist.

As a result of the study, it was revealed that groups of the population with lower official incomes are distinguished by their large participation in self-employed activities, which is confirmed by the high level of correlation. It has also been determined that inequality in the distribution of wealth and income between different categories of the population is increasing, due to intersectoral differences in the concentration of power and resources.

The article reveals and summarizes the approaches to the content of informal network forms of organizing the economic activity of the self-employed, discloses key concepts and gives an idea of the phenomenon of self-employed in the informal network form of the services sector, which can be used in further developments on this scientific issue.

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数字化条件下俄罗斯小农业企业发展的机遇与问题
OPPORTUNITIES AND PROBLEMS OF DEVELOPMENT OF SMALL AGRIBUSINESS IN RUSSIA IN THE CONDITIONS OF DIGITALIZATION

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注解。 文章强调了将数字化引入俄罗斯联邦经济农业部门的小企业国家支持机制的问题。 揭示了数字化在小型农业综合企业发展水平上的重要性，考虑了转型的前景以及从政府机构到农业企业小企业的系统互动垂直互动的问题。 结论是降低商业风险的可能方法。

关键词：小农业企业，数字化，信息支持，商业环境，农业。

Annotation. *The article highlights the problems of introducing digitalization into the mechanism of state support of small business in the agricultural sector of the economy of the Russian Federation. The importance of digitalization at the level of development of small agribusiness is revealed, the prospects for transformation and the existing problems of interaction on the vertical of system interaction from government bodies to small businesses in agribusiness are considered. Conclusions were made on possible methods to reduce business risks.*

Keywords: *small agribusiness, digitalization, information support, business environment, agriculture.*

Currently, the innovation direction of the Russian economy is being actively discussed - the digital economy, approved by the Order of the Government of the Russian Federation on July 28, 2017, the Digital Economy of the Russian Federation Program, aimed at improving the quality of life of the population and increasing the competitiveness of the country as a whole [5].

Digitization of the agrarian sector of the economy as the least technologically advanced, least “mastered” by information technologies, will in the future allow it to be transformed into a high-tech business within the framework of the “smart agriculture” project, by reducing costs and increasing productivity.

In practice, the most problematic to readiness to master digitalization is small agribusiness. “The tasks of information support by state mechanisms and Internet information resources and the degree of their importance in the economic development of a country are defined by law and functionally supported by certain legal acts” [2; 1, p. 495]. Despite the priority areas for supporting small businesses in the agro-industrial sector of the economy, sufficient attention “as the basis for improving the business environment and creating favorable conditions for business development, there are a number of difficult-to-solve problems. For example, the information-analytical system Business Navigator SMEs, created in 2016 by the Federal Corporation for the Development of Small and Medium-Sized Business on the Internet, is a free Internet resource for registered users [4; 1, p. 496]. In essence, this information resource was created as an information and advisory database that combines several resources from various primary sources of state support to small business entities and government structures aimed at supporting and developing entrepreneurship on one platform. In fact, “when requesting to verify a counterparty and detail some data, it’s not the source of information that is used, but redirection to an intermediary with a proposal to use premium access on a paid basis” is proposed [1, p.496]

The same problem is the lack of efficiency in the exchange of information data between government and fiscal authorities involved in the system of state support for small and medium-sized businesses. There is no access to barrier-free information exchange in the single-window mode when reporting by subjects to the tax authorities and Rosstat. In fact, there is a fact of discrepancies in reporting information due to the lack of unified administration and processing of reports, the lack of a unified system for collecting reports.

In order to establish “feedback” to assess the effectiveness and efficiency of the provided types of state support for small business, among business environment, regular sociological surveys are conducted. One of such surveys, according to the assessment of the effectiveness of the information security system of entrepreneurs, where representatives of small and medium agribusiness of the Saratov region were selected as respondents, showed bureaucratic barriers among more than 92% of respondents. The survey results showed the flaws and imperfections of the proposed mechanisms, the availability of transaction costs of information retrieval. And when representatives of the state support system try to establish feedback to clarify existing problems in interaction, one can often hear about the problematic nature of accessing and receiving activities within the framework of state support programs, the authorities' unwillingness to create favorable conditions for business development.

Currently, for entrepreneurs, obtaining information services in terms of digitalization is a costly method of obtaining information, as services are provided

quickly only on a paid basis, otherwise, the information may be of doubtful quality ... Small agribusiness, already fragile of its organizational structure and financial component, risks "to increase the already high costs of business and, as a result, create prerequisites for" going into the shadows"" [1, p.497], creating next tax schemes, reducing s legal employment and increase in unemployment. All these numerous factors activate the conditions for the creation and application of regular schemes of illegal business, and as a result, the reduction of tax payments and other income to the state budget.

"In addition to significant barriers to small business development, such gaps in information support destroy the institution of trust in government support mechanisms, form a negative opinion in the business environment about government support for small businesses that create bureaucratic barriers to its development, and with a "commercial touch". In this regard, the creation of conditions for the access of small agribusiness entities to information will reduce business risks, will allow to solve the problem of efficiency. Competitive monitoring and forecasting of the agrarian market conjuncture will provide access to real prices for agricultural products and reduce losses on intermediary services, simplify the construction of transport chains. That is why the Ministry of Agriculture of the Russian Federation has defined as the strategic guidelines for the development of the digital economy in the agro-industrial sector: creating the conditions (environment) to increase the transparency of agricultural markets for households and consumers; providing open data to developers; the provision of public services and portals for agricultural producers; the transition from the management of the agro-industrial complex of the Russian Federation "in the fire brigade mode" to management based on planning and risk prediction [3]. Solving this task requires making constructive decisions by the state authorities and revising the interaction of subordinate structures" [1, p.497], updating the current agrarian policy in the conditions of digitalization of Russian agriculture and the country's agro-industrial complex as a whole. It is obvious that the restructuring of agrarian education in institutions of higher and secondary vocational education of agrarian profile is necessary in order to train specialists with competences in the field of digitization of agriculture, and special training for managers of specialists of agricultural organizations.

Realizing the potential of small forms of entrepreneurship in the agro-industrial sector of the Russian economy with the introduction of digitalization mechanisms, although costly methods, implies an increase in the well-being of the population, will provide new opportunities for the growth of national welfare to create a new economic system with full participation of the state and reducing trans-banned costs of vertical links.

As practice and analysis of statistical data shows, the effectiveness of the complex of information and financial measures of state support speaks of the positive

economic effect of the measures provided. Thus, in the period from 2016 to 2018, the number of registered small and medium-sized businesses employed in the agricultural sector, has increased by 41.9% against the background of the total growth of SMEs in all sectors of the economy by 2.99% in 2018 in relation to 2016. Moreover, an increase in the number is observed both among medium-sized enterprises and among micro and small forms of entrepreneurship in the agro-industrial complex in the whole country. Nevertheless, the share of employed subjects in agriculture in 2018 amounted to only 2.64% of the total number of registered IP of legal entities belonging to a small and medium-sized business. More details about this are given in table. one.

Table 1. *Analysis of the number of small and medium-sized businesses engaged in the agricultural sector, units.*

SME category / period	2016	2017	2018
micro enterprises	104 646	123 158	150 379
small enterprises	6 789	7 587	7 789
medium enterprises	1 137	1 507	1 629
Of them:			
Legal entities	33 317	38 364	43 590
PI, other forms	79 255	93 888	116 207
Total SMEs in the agricultural sector	112 572	132 252	159 797
Total SMEs	5 865 780	6 039 216	6 041 195
Total average number of workers employed by SMEs	15 885 749	16 106 581	15 873 589

* Compiled by the author based on the data provided [6].

The active introduction of digital technologies in agriculture was stressed by Deputy Prime Minister Alexei Gordeyev: “Today there is no point in convincing anyone that digital technologies are necessarily advanced business organizations. The obvious thing is that if there is no digital technology, there are no any advanced positions, ”said the Prime Minister.

As Vladimir Vladimirovich Putin noted: “This is a question of the national security and technological independence of Russia, in the full sense of the word — our future.”

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俄罗斯政府采购制度的当前问题
CURRENT ISSUES OF RUSSIAN GOVERNMENTAL PROCUREMENT SYSTEM

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注解。 本文讨论了2019年采购货物，工程和服务的招标程序的现行问题及其特点，同时考虑到现行立法。 联邦法“关于商品，工程，国家和市政需求服务领域的合同制度”的主要条款日期为04/05/2013 N 44-Ф3（以下简称 - 44-Ф3），以及 分析了2011年7月18日第223-Ф3号（以下简称“223-Ф3”）的“关于某些类型法人实体的货物，工程，服务的采购”的联邦法，影响了经济活动的经济方面。 市场参与者，无论组织和法律结构以及部门隶属关系。

关键词：44-Ф3，223-Ф3，政府采购，俄罗斯联邦合同制度，购买TRU的招标程序。

Annotation. *The article discusses the current issues of the tender procedures for the procurement of goods, works and services in 2019, their features, taking into account the current legislation. The main provisions of the Federal Law "On the contract system in the field of procurement of goods, works, services for state and municipal needs" dated 04/05/2013 N 44-Ф3 (hereinafter - 44-Ф3), as well as the Federal Law "On the procurement of goods, works, services by certain types of legal entities" dated July 18, 2011 No. 223-Ф3 (hereinafter - 223-Ф3), are analyzed, affecting the economic aspects of the economical activities of market participants, regardless of the organizational and legal structure and departmental affiliation.*

Keywords: *44-Ф3, 223-Ф3, government procurement, contract system of the Russian Federation, tender procedures for the purchase of TRU.*

The contract system in the field of procurement of goods, works, services to meet state and municipal needs (hereinafter referred to as the contract system in the field of procurement) is the set of participants in the contract system in the field of procurement (the federal executive body regulating the contract system in the

field of procurement The Russian Federation on the regulation of the contractual system in the field of procurement, other federal executive bodies, state bodies of the constituent entities of the Russian Federation, local authorities, authorized to perform regulatory and control in procurement, The State Atomic Energy Corporation "Rosatom", the State Corporation for Space Activity "Roskosmos", customers, procurement participants, including those recognized as suppliers (contractors, performers), authorized bodies, authorized institutions, specialized organizations, operators of electronic platforms) and carried out by them, including using a unified procurement information system (except for cases where the use of such a unified information system is not provided for by this Federal Law), in accordance with the legislation of the Russian Federation and other regulatory legal acts on the procurement contract system actions aimed at meeting state and municipal needs [1].

Government procurement occupies a significant share in the cost part of the country's budget. Solving the problem of efficient budget spending is impossible without the establishment of a rational and transparent public procurement system. On the basis of world practice in the Russian Federation, a system of organizing public procurement was developed and implemented, based on publicity, openness, economy and accountability. The goal of the system is to eliminate corruption in public procurement, increase the manageability of procurement procedures and, most importantly, optimize state budget expenditures. In practice, the designated principles are implemented by publicly posting procurement information on an open Internet portal, and the selection of a supplier (performer) is carried out on the basis of a competitive selection or auction.

The system of government procurement in Russia is constantly being improved and changed. In 2019, the public procurement system has undergone fundamental changes. Next, we consider the most pressing issues of the contractual system of the Russian Federation in 2019. For the most complete clarity, the information is systematized and is presented in Table 1. [2]

Таблица 1. *Актуальные вопросы контрактной системы РФ в 2019 году*

Subject (section)	**Matter (changes that came into force in the current legislation in 2019)**
The latest changes in the legal regulation of the contractual system, which have entered into force, incl. new regulations [3]	Renewing blocking control for federal customers.
	Verification by the Federal Treasury of information sent by customers to the Registry of Contracts.
	Permission to indicate a trademark or “equivalent”.
	Establishing of special requirements for the description of drugs for medical use.
	Changing the order of review by supervisory authorities of appeals of individuals, including complaints.
	Changes in requirements for the description of the object of purchase. Description of the object of purchase in the light of the abolition of the requirement of objectivity of the description: the algorithm description.
	New requirements for bank guarantees used as collateral for bids and contract enforcement.
	Changes in the order of maintaining RNP and sending information to the RNP.
	Changes in the order of procurement planning, adjustment of procurement plans and schedules.
	Changes made to the Resolution of the Government of the Russian Federation of November 16, 2015. №1236 «On the establishment of a ban on the admission of software originating from foreign countries, for the purposes of procurement for state and municipal needs.»
	Changes in the rules of maintaining a catalog of goods, works and services.
Recent draft amendments to legislation on the contract system	New changes in Laws 44-ФЗ, 223-ФЗ and Administrative Code of the RF.
	Changes in the rules of import substitution. The application of the order of the Ministry of Finance of Russia №126n.
	Typical contracts.
	Improvement of anti-dumping measures.
	Conduction of closed auctions in electronic form.
Projects of development and changes in the contractual system of the regulator (Ministry of Finance of Russia) [5]	Cancelation two-level planning (plan and schedule).
	Development of catalog of products, works and services.
	Tightening of requirements for conФЗicts of interest.
	New measures to support the SMP and SONKO.
Methodical recommendations of the joint venture of the Russian Federation on the audit [5]	Inspection, analysis and assessment of the legality, expediency, validity, timeliness, efficiency and effectiveness of procurement expenditures, as well as evidence of illegal actions.
	Justification documents provided by trusted customers.

Purchases from a single supplier (contractor, executor) [1]	New bases for procurement from a single supplier (contractor, executor).
	Cases and grounds for procurement from a single supplier (contractor, executor).
	Errors in justification of the choice of non-competitive method of purchase.
	Unambiguous characteristics of the goods at the conclusion of a contract with a single supplier (the purchase of «parking cards»).
	«Simplified contract» in procurement from a single supplier (contractor, performer).
	Procurement notices from a single supplier (contractor, performer) as a violation of the principle of openness of information.
	Negligence, ignorance of the requirements of the Law on the Constitutional Court as a circumstance exempting from a fine in case of delay in publishing information.
	The possibility of classifying violations as insignificant without administrative liability in the form of a fine.
	Procedure for the procurement organizer in case of unauthorized discovery of illegally published information.
	Terms of placement of the notice.
Crushing of purchases up to 100 (400) thousand rubles. Same names of purchased goods, works, services in the annual volume of purchases [3]	The ban on the separation of the purchase of related goods, works, services for items of several contracts in the legislation of the Russian Federation.
	The position of the FAS of Russia and the Ministry of Economic Development of Russia on the issues of "fragmentation". Letter of the MED of the Russian Federation dated July 14, 2016 №D28i-1805. Letter of the MED of the Russian Federation dated July 14, 2016 No. D28 and 1805. Letter of the FAS of the Russian Federation of April 25, 2017. №RP / 27902/17.
	The practice of the Prosecutor's Office of the Russian Federation on the issue of «crushing of procurement». Identification of one common purpose of procurement, the identity of the conditions and forms of the contract in pre-trial and judicial practice.
	Legal ways of purchasing the same goods, works, services from the same supplier (contractor, performer).
	Practical recommendations on the substantiation of the purchase by the customer with the charge of «crushing».
The initial (maximum) contract price (IMCP) and contract price (CC). Justification of the formation, inclusion in the documentation, detection of overstatement and underreporting of the NMCC and the Central Committee [3]	Purchase price as a criterion for the efficient use of budgetary funds.
	Contract budget and IMCP. The method of market analysis and the principle of effective use of budget funds.
	Features of the methods of substantiation of the IMCP.
	Algorithm for determining IMCP.
	Review of methods for determining the IMCP, as provided for by the law on the Contract System.
	Pricing according to the rules of Article 22 44-ФЗ (methods: comparable market prices, regulatory, tariff, design estimates, cost, other methods).

The initial (maximum) contract price (IMCP) and contract price (CC). Justification of the formation, inclusion in the documentation, detection of overstatement and underreporting of the NMCC and the Central Committee [3]	Restrictions on the choice of method for determining IMCP, provided for by 44-ФЗ.
	Methodology for determining the price group.
	Collecting supplier pricing data.
	Identity, uniformity and comparability in determining the IMCP.
	Identical and homogeneous goods, works, services: definition errors.
	Non-standard methods of substantiation of IMCP: parametric method, etc.
	Price offers from affiliated and interdependent bidders.
	Features of the compilation of IMCP calculation tables, the choice of a unit price in the price group.
	Calculation IMCP for the supply of goods in the configuration.
	Negative effects of lowering of IMCP. Ways to overcome them.
	Requirements of regulatory bodies in terms of the justification of the IMCP.
	The consequences of matching the description when requesting IMCP of one brand as a restriction of competition.
	Overpricing as evidence of procurement constraints.
	The consequences of matching the description when requesting IMCP of one brand as a restriction of competition.
Order evaluation procedures and the predestination of the result of the procurement. Protection against claims of procurement participants and regulatory authorities	Features of determination of the winner for the contest and request for proposals.
	Present value: features of use.
	Vulnerability of the rules established by the PP of the RF dated November 28, 2013 №1085: methods to ensure victory for an arbitrary participant. The procedure for assigning points taking into account weighting factors as an abuse by the procurement organizer.
	The inadmissibility of establishing as a criterion of experience in the procurement of works and services.
	The subjective nature of the evaluation of applications on the criteria established in the documentation.
	The subjective nature of the evaluation of applications on the criteria established in the documentation.
	Review of customer errors during the evaluation. Manipulation of peer review.
	Evaluation of the participant's experience and «similar work».
	The position of the FAS of Russia on the assessment. The main detected errors in the assessment.

Changes in the requirements for the procurement participant in 2019. Procurement Participant Declaration [3]	Member compliance with current legislation. Legitimacy of non-establishment of license requirements in the procurement of licensed activities: positive protection practice in the FAS Russia. Combining in one lot of work and services presented in different markets with a limited number of potential participants in the procurement, with permits as a sign of restriction of competition. Subcontractor license. Features of the use of licenses issued by the licensing authority of the subject of the Russian Federation.
	Anti-corruption requirements (ФЗ of December 28, 2016 No. 489): changes were made to Part 1 of Art. 31 (requirements for procurement participants).
	The practice of attracting legal entities on the basis of Art. 19.28 Administrative Code of the Russian Federation (Illegal remuneration on behalf of a legal entity). Register of Prosecutors of the Russian Federation.
	Ways to check procurement participant.
Dumping prices in the conduct of procurement: a significant underestimation of the proposed contract execution prices and the algorithm of actions of the procurement organizer [4]	Classification of cases of unreasonable and reasonable underestimation of the price offer.
	Additional grounds for rejection of applications with dumping prices as a contradiction to the requirements of 44-ФЗ.
	Confirmation of the justification of the dumping price and legitimate requests for economic feasibility and calculation.
	Vendor errors in justifying prices during dumping.
	Features of the use of three anti-dumping mechanisms.

Thus, in 2019, the range of topical issues is extremely diverse. There is a need to change and understand the provisions of the public procurement system, as well as to create conditions and prerequisites for its further improvement. With such a diversity, all the same, the main issues remain the practice of applying 44-ФЗ and 223-ФЗ, accompanying competitive procedures for public procurement of goods, works and services, as well as improving the control over the execution of government orders

Conclusions of the study:

1. The economic situation in the world stimulates the state to improve and drastically change the system of state competitive purchases.

2. The transition to a new method for conducting competitive procedures will allow enterprises to more efficiently use budget funds.

3. The list of topical issues in 2019 makes it possible to identify areas for improving the public procurement system in order to increase its efficiency.

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哈萨克斯坦商业银行的特殊投资活动
SPECIAL INVESTMENT ACTIVITIES OF THE COMMERCIAL BANKS OF KAZAKHSTAN

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注解。 本文以哈萨克斯坦为例，考察了发展中经济体商业银行投资活动的特点。 分析了银行贷款的现状，限制商业银行投资活动的问题和因素。
关键词：商业银行，商业银行投资活动，银行贷款，投资融资。
Annotation. *The article examines the features of the investment activities of commercial banks in developing economies on the example of Kazakhstan. The analysis of the current state of bank lending, problems and factors constraining the investment activity of commercial banks are given.*
Keywords: *commercial bank, investment activity of commercial banks, bank loan, investment financing.*

In conditions of high competition and scientific and technical progress, manufacturers have to constantly improve the quality and update the range of products and services in order to meet market requirements. This rapid renewal process encourages entrepreneurs to look for new sources of funding to implement their ideas and meet consumer demand. The dominant source of financing the real sector of the economy in developed countries is bank lending. Bank credit shows an ever-increasing demand for credit products, since it contributes to the growth of return on equity and profits for entrepreneurs. The system of bank lending, becoming an independent sphere of banking activity, seeks to harmonize financial and credit relations with its companies by borrowers in order to achieve maximum efficiency for the creditor banks themselves. Participation of the bank in the investment process ensures the return value movement at the operational stage of the investment project, the formation of income and the return of loan debt, which allows considering investment loans as part of the project cycle. In this regard, it is interesting to identify the features and problems of development of bank lending for investments as a specific product of banking in countries in transition to a market economy.

For modern Kazakhstan, it is very important to make the transition to a new stage of production intensification by expanding investment activity and introducing innovations in all sectors of the economy. Kazakhstan, which is striving, like other developing countries, to create favorable conditions for the development of its internal economic space, is very important to build a financial and credit system that would be able to solve the problem of financing innovation and investment activities.

At present, the participation of Kazakhstani commercial banks in financing the real sector is one of the most acute problems. As a result of the peculiarities of the socio-political and economic development, a set of factors has been formed in Kazakhstan that significantly limit the possibilities for the development of investment activity. In particular, there are structural problems in the development of the economy and significant imbalances in the development of individual regions; underdevelopment and small number of potential domestic institutional investors, which are private investment funds and the Unified Accumulative Pension Fund; weak resource base for financing; low investment attractiveness of the country for foreign investors. In these conditions, a special role is given to commercial banks, which can become active participants in investment activities and provide loans for investment projects.

According to analysts, for the successful development of the economy, bank loans must be at least 100% of the gross domestic product of the country. In Kazakhstan, as of 2017, the share of bank loans in relation to GDP was less than 17%, which is much lower than in developed countries (195% in Canada, 182% in Germany) and less than in Russia (48%) and Turkey (64%) [1].

In Kazakhstan, the participation of commercial banks in investing in financing the real sector of the economy occurs through a mechanism of state regulation. Such levers of government regulation are various instruments of monetary policy, such as reducing the refinancing rate of the national regulator, increasing government support for systemically important banks, increasing refinancing of banks, and others. These levers of influence are combined with measures of direct regulatory regulation of banking activities relating to the requirements for the formation of the bank's own capital and mandatory reserves, reduction of the risk level of active banking operations of the bank, etc.

The need for investment in the Kazakh economy is very high, which is associated with the need to update and modernize assets in all sectors of production, the development of small and medium-sized businesses. However, the banking sector is not able to provide adequate funding and on reasonable terms. According to a survey conducted by the National Bank of Kazakhstan among the heads of commercial banks, the demand for lending in the corporate sector after falling to zero in 2017, in 2018 showed a slight increase in all quarters of the year. At the same

time, the demand for credit from large enterprises has decreased, which, according to analysts, indicates not market mastery and the absence of new projects for financing, but rather a deferred demand for a loan.

The demand for loans from small and medium-sized enterprises has a steady upward trend, however, mainly due to the growing need for working capital. According to the official statistics of Kazakhstan, the share of small and medium-sized businesses in the country's GDP is about 30%. At the same time, according to the data of the First Credit Bureau in 2017, over 75% of business loans in the loan portfolio of second-tier banks accounted for small and medium-sized businesses [2].

Although commercial banks in the future plan to increase the investment portfolio in this business sector, however, the main source of such expansion are various programs of state support for SMEs. Large business, however, draws its investment resources from other sources, since the development of long-term investment loans is hampered by the limited long-term resource base of most Kazakhstani commercial banks.

One of the important reasons for the restriction of commercial bank lending is the presence in the economy of a large segment of state-owned companies that receive funding from the state treasury, either from quasi-state organizations or through external loans guaranteed by the state. At the end of 2016, corporate liabilities amounted to 92% of GDP, while the loan portfolio of legal entities of the banking system accounted for only 19% of GDP. At the same time, the assets of the state organizations Samruk-Kazyna, Baiterek and Kazagro accounted for 59% of GDP, and together with the assets of the unified pension fund, 74%, which characterizes the current state of the investment activity of commercial banks in Kazakhstan [3].

In Kazakhstan, credit risk is in many ways the result of macroeconomic factors affecting the state of the economy, the financial market, or business. According to financial analysts, the main reasons for high market interest rates in the country's commercial banking sector are relatively high inflation and relatively high credit risk of borrowers. The central regulator, taking into account the state of the economy, sets the amount of loan interest, which directly affects interest rates on STB loans. The refinancing rate of the National Bank of the Republic of Kazakhstan since April 2019 was set at 9% and was reduced compared with the previous year by 0.25%, taking into account the current level of inflation in the country for tenge loans; changes in the average interest rate on interbank loans; average interest rate on deposits; structure of bank credit resources; loan demand and other factors.

Financial instability and a relatively high level of inflation reduces the interest of depositors and lenders in placing their money on deposits and in banks' bonds, which makes it necessary for banks to maintain high interest rates on attracting

deposits and, accordingly, even higher rates on loans. Commercial banks of Kazakhstan offer loans to commercial customers at a fairly high rate, an average of tenge loans - 12.4%, and in a freely convertible currency - 5.3%. Although there is a tendency to reduce the interest rate, which over the past 3 years has almost halved, but this applies mainly to short-term loans. For long-term investment loans provided in tenge, on the contrary, interest rates almost doubled over the same period - from 10% to 19.1%. [four]. High interest payments paid by bank borrowers lead to a minimization of borrowed funds, a decrease in profits, an increase in equity capital, and this leads to a decrease in profitability of capital and a decrease in investment opportunities.

In the banking sector, there is a process of concentration and consolidation of capital. Thus, the share of the 10 largest banks in the country together account for over 88% of the total loan portfolio of second-tier banks, while the share of the other 18 banks accounts for less than 12%. The concentration of lending in the hands of a narrow circle of banks reduces competition in the banking sector and the possibility of the rest for balanced growth in lending to the economy. In the structure of long-term loans, providing investments, there is a tendency to reduce the issuance of loans for the purchase of fixed assets (their share is 8.7%), for the purposes of construction and reconstruction (their share is 5%). Credits that ensure the growth of the national economy are shrinking and flow into the sphere of satisfaction of consumer goals. The share of the corporate portfolio decreased in 2018 to 59.8% compared with 66.4% in 2017.

The quality of loans issued by the bank is characterized by the share of non-performing loans in the bank's portfolio. As official statistics show, in recent years, STB has somewhat improved the quality of the loan portfolio, as evidenced by the decrease in the volume and share of overdue bank loans to 16.4% in 2018. However, according to the national regulator, the actual level of non-performing loans of STBs is much higher than those officially indicated in bank statements, which is a result of banks' deliberately distorting the real picture of their bad loans, using a tool for restructuring loans. The real level of bad loans in the first half of 2018 was 23.6% [5].

Thus, it can be stated that the participation of banks in financing investments in the real sector of the economy has not yet received serious development in Kazakhstan, despite the understanding of its necessity by all stakeholders, and is very cautious in nature. Investment activity of commercial banks remains low due to the insufficient resource base of banks, the short-term nature of liabilities, high investment and credit risks, and imperfect intrabank risk management systems.

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数字经济中公司制度资本的转变
TRANSFORMATION OF INSTITUTIONAL CAPITAL OF A COMPANY IN A DIGITAL ECONOMY

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注解。 本文讨论了现代企业固有的一种新型资本 – 制度资本，揭示其内容及其在数字经济中发生的转型过程。 特别关注企业制度资本转变的形式，包括平台商业模式。

关键词：制度资本，数字经济，加性技术，平台商业模式。

Annotation. *The article discusses a new kind of capital inherent in a modern firm - institutional capital, reveals its content and its transformation processes occurring in the digital economy. Special attention is paid to the forms in which the transformations of the institutional capital of a firm are manifested, including platform business models.*

Keywords: *institutional capital, digital economy, additive technologies, platform business models.*

Among the features of the digital economy, there are constant diffusion of innovations, high speed and pace of development, transformation of business processes of enterprises and industries, the emergence of new business models, the development of new "smart" products, the formation of new markets. The author of the article describes the process of transforming the institutional capital of a firm in a digital economy, which gives a vector of strategic initiatives for a modern firm.

In the modern world, it is customary to single out two models of the digital economy:

1. The production model of mass short-lived (1-3 years) high-tech products based on the "double reduction" strategy - reducing the lifetime of the product being produced and the time it takes to develop a new product and forcing the consumer to purchase a new product to replace the old one. This is a model of the US digital economy. There are no high-tech companies in Russia that produce on the basis of this model.

2. Production model of long-lived (10-15 years and more) repairable industrial products of high reliability and availability (model of the digital economy of Russia).

Currently, in Russia, the transfer of innovations to the digital economy is actually at a very initial stage. Analyzing various digitalization options in other countries, several models can be distinguished (table 1). At the present stage, the development of digitalization processes in the economy and society as a whole in Russia is more consistent with the Venezuelan model. In the Russian Federation, the share of the digital economy in GDP is 2.8%, or $ 75 billion, with a significant part ($ 63 billion) in the consumption sector (Internet commerce, services, online search, and offline purchases), which corresponds to 84% of the total share of the digital economy and about 39 places in the world [1].

The author of the article believes that today the contours of the Russian model of the digital economy have been quite clearly formed, let's call it transplanted (imported). Russia does not produce gadgets in the broad sense of the word - personal computers, tablets, cell phones, all this is imported from other countries, share of innovatively active enterprises is small, varying within no more than 5%, just like the modest digital technologies of Industry 4.0 .

One of the effective ways to climb the digital plateau is to transfer innovation to the digital economy, i.e. technology transfer 4.0 to various sectors, industries and spheres of the economy for profit. The transfer is possible in the variant “developer - producer”, as well as in the variant “enterprise - market - consumer” [1].

One of the new organizational forms relating to the institutional capital of a modern firm, identical to the high level of the digital economy, is the “smart or digital enterprises” format. Such enterprises are based on the platform business model, the consideration of which is the object of research in this publication.

During the industrial revolutions, and the whole world is now covered to some extent by the fourth industrial revolution, there is a massive modernization of production, and, above all, industrial production in the direction of systemic qualitative changes. For a company as an economic entity, this becomes a long-term perspective for ensuring breakthrough competitiveness, and in the short-term period serves to ensure the preservation of existing winning positions and survival. However, it is necessary to take into account the continuity of development - modern firms are able to move to the technologies of economics 4.0, provided that they master the technologies of the previous level - economics 3.0.

Table 1 - *Options for digitization of the economy in different countries [1, 2, 3]**

Model	Model content	Results
Asian model	The introduction of advanced technologies: Internet of Things, Big Data, online medicine. Example: APR countries - China, Thailand, etc.	Added value for the economy: 5-7 trillion. rub. in year. Backlog: less than 5 years
Middle Eastern model	Growth in the share of online consumption. Example: Middle Eastern countries - UAE, Saudi Arabia	Value added for the economy: 0.8-1.2 trillion. rub. in year. Backlog: 8-10 years
Venezuelan model	The stagnation of the digital economy, the growth of the digital divide with the leaders. Example: Venezuela	Value added for the economy: 0.1-0.2 trillion. rub. in year. Backlog from leaders: 15-20 years
Russian model	Most ($ 63 billion) is in the consumption sector (online commerce, services, online search, and offline purchases) - this is 84% of the total share of the digital economy in the country. First of all, the digital economy will be applied in the banking sector through the massive introduction of blockchain	In Russia, the share of the digital economy in GDP is 2.8%, or $ 75 billion. In the United Nations E-government Development Rank, Russia ranks 35th; in the ICT Development Index (IDI) - 45th place; in the Networked Readiness Index (NRI) - 41st place. Lagging behind the leaders: the former chairman of the board of the Center for Strategic Research (CSR) A. Kudrin believes that Russia is 3-4 times behind the digitization of the economy from the leading countries and is unlikely to bridge this gap by 2024. Other assessments: Russia's lag behind the leaders of the rating is 5-8 years

In the digital economy, new product creation technologies are used — additive manufacturing technologies that allow production of any product in layers based on a computer-based 3D model. This process of creating an object is also called "growing" because of the gradual production. If in traditional production, a blank is first made, from which all unnecessary is then cut off, or it is deformed, then using an additive technology, a new product is created from an amorphous consumable (powder). Depending on the technology, the object can be built from the

bottom up or, conversely, to obtain different properties. The first additive production systems worked mainly with polymers. Currently, 3D printers as an additive manufacturing base work with polymers, composite powders, engineering plastics, and with various types of metals, sand and ceramics. Additive technologies are actively used in mechanical engineering, industry, science, education, design, medicine, foundry, and in many other areas. The pioneers of the use of additive technologies in the industry are well-known firms BMW and General Electric.

Advantages of additive technologies:

1. Improved properties of finished products. Due to the layering of the products have a unique set of properties. For example, the parts created on a metal 3D-printer in terms of their mechanical behavior, density, residual stress and other properties are superior to analogs obtained by casting or machining.

2. Huge savings in raw materials. Additive technologies use practically the amount of material that is needed to manufacture the product. Whereas with traditional manufacturing methods, the loss of raw materials can be up to 80-85%.

3. The possibility of manufacturing products with complex geometry. Equipment for additive technology allows to produce items that can not be obtained in another way. For example, the part inside the part. Or very complex cooling systems based on mesh structures (which cannot be obtained by casting or stamping).

4. Production mobility and faster data exchange. There is no need to apply drawings, measurements and create samples. At the core of additive technologies is a computer model of the future product, which can be transferred in a few minutes to anywhere in the world - and immediately begin production.

Russian companies began to apply additive technologies relatively recently, but now they are actively increasing the use of 3D printing in production and science. Equipment for additive production, well-integrated in the production chain, allows not only to reduce costs and save time, but also to begin to perform more complex tasks.

The company Globatek.3D, starting in 2010, supplies 3D printing and 3D scanning systems to Russia. This equipment successfully works at industrial enterprises, institutions of the military-industrial complex and aerospace industry, at the largest Russian universities - MSTU. Bauman, MEPI, MISIS, SSAU and others. The Samara State Aerospace University uses additive technology SLM 280HL, installed by Globatek.3D specialists.

The modern market of additive production is about $ 1.3 million, including the production of special equipment and the provision of services, at a ratio of approximately 1: 1. The share of Russia among the countries actively developing and applying technologies of additive production is about 1.2%, for comparison, the US share is 39.1%, Japan 12.2%, Germany 8.0%, China 7.7% and tends to increase.

The author of the article believes that in the conditions of digitalization, the applied business models, as one of the forms of the institutional capital of a firm, are transformed and act as a platform-based business model. Platform business models bring exogenous transformations (changes from the outside) into a modern firm and are based on the added value that the new system creates. Platform business models have the following advantages [4]:

1. The network effect of a bilateral market - occurs when two groups of users (usually product creators and consumers) create added value for each other, gaining mutually beneficial advantages.

2. Simplification of distribution - such business models can be scaled and allow you to make profits “in the long tail” of the distribution schedule, avoiding the increase in costs associated with the classic linear scaling of retail.

3. Asymmetrical growth and competition - although platform-based business models are based on some kind of mainstream market, as a rule, they also include work in markets outside the usual industry. Asymmetry arises when competing companies strive for the same market goal, using different approaches from different areas, which allows each player to find their market niche.

4. Spot customization of production is the most comprehensive in content and timely consideration of the needs and preferences of specific consumers (the author's addition).

Thus, one of the new organizational forms related to the institutional capital of a modern company, identical to the high level of the digital economy, is the “smart or digital enterprises” format, and the institutional capital of a company in the conditions of digital transformation is a new type of platform business model.

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外在人的反思水平的混响：犯罪学方面
REFLEXIVE LEVEL OF REVERBERATION OF THE PERSON OUTSIDE: CRIMINALISTICS ASPECT

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注解。 本文讨论了人格在其活动中反映的性质和机制。 作为法医技术领域研究的一部分，基于手写，面部表情，步态和有法医学意义的人的信息手势的反映特征。 该发现基于使用实验方法的结果。

关键词：反思机制，犯罪痕迹，犯罪人格，笔迹，步态，模仿，手势。

Annotation*. The article discusses the nature and mechanisms of reflection of the personality in its activities. Conducted as part of research in the field of forensic technology is based on the features of the reflection in the handwriting, facial expressions, gait and gestures of information about a person with forensic significance. The findings are based on the results of using the experiment method.*

Keywords*: reflection mechanism, crime traces, criminal personality, handwriting, gait, mimicry, gestures.*

The nature and content of research on the mechanism of reflection of the personality outside is somewhat more complicated than it seemed at the stage of initial forensic investigations. There is no single universal formula “traces of crime - the identity of the criminal”, since the identification significance of the various components of the personality is not the same, primarily because of the different nature of these components.

In the mechanism of reflection of the personality outside, it is advisable to distinguish three levels of reflection of personal characteristics: reflexive (displayed in stereotypical activity), behavioral (reflected in everyday activities) and adaptive (reflected in biographical facts) display of the personality outside [1. 197-198].

The basic level of reflection of the personality outside is the reflection. Due to the primitivity of the nature of the reflex, this level was first studied by forensic scientists and found its reflection in studies of the reflection of the personality of the criminal in handwriting, gait, and gesticulation. The priority reflexive level is mainly represented by a system of mental processes.

Speaking about the mechanism of reflection of the personality outside without regard to the level of this reflection, it is necessary to understand the nature of the mechanism of homeostasis. Homeostasis is a property of any system, expressed in the desire for a state of rest, the adaptive form of which acts as an energy saving mode. It follows from the above that human activity is determined by the need to reduce tension and maintain a state of internal psychophysiological balance. The reinforcements that a person receives from outside reduce the strength of the initial motivating factor; reinforcement, corresponding to the incentive factor, eliminates the need for the body to supplement. The modern level of human development is explained by the inherent desire for balance, resulting from the realized ability to maintain a state of internal equilibrium by reducing the tension of the motive.

Thus, the proposition that, in its ordinary or stressful individuality, a person is prone to choosing an option not from the whole range of possibilities, but only from the most usual, we take as a basis.

As already mentioned, the reflexive level of the expression of personality traits to the outside has been thoroughly studied by the forensic science and it is generally accepted that it includes several levels. The leading level, represented in the consciousness, is responsible for goal setting, and the lower levels, although they are responsible for functionality, are unconscious [2].

Thus, self-control in the considered motor acts is practically absent from the moment of automation of movement. In fact, a person is interested in the ultimate goal of each movement, and how this will be realized is irrelevant for the man. Thus, the technique of performing each automated movement becomes secondary and is not controlled by man.

Firstly, the researches of forensic scientists are focused on the study of handwriting, facial expressions, gestures. These are quite complicated skills in terms of the mechanism of formation and implementation, they are formed quite long, therefore, the laws established on their basis are most reliable. Their high informational value for forensic science predetermined the possibility of conducting expert studies with categorical (positive or negative) conclusion based on the identified correlations.

Passing, in view of his wide popularity, the description of the mechanism of stereotyping of activity that generates the formation of a skill, let us proceed directly to the mechanism of reflection of the personality at the reflexive level outside.

There is an opinion that it is not the number of repetitive movements that is crucial for developing a new skill, but the moment of reinforcement is the achievement of some useful result for a particular person. At the same time, successful movements that have proven themselves to be regulated are gradually selected and consolidated, while unsuccessful movements, on the contrary, are suppressed and eliminated. Thus, the optimal “formula” of movement is sought for the particular person and a unique base of the motor level of reflection of personal characteristics is formed.

The process of transition from external real action to internal – ideal, explains why the manifestation of personal characteristics can be considered constant when performing movements. So, first, a person performs a certain action with an object (real or ideal) that is external. Then the action is internalized, "grows together" with the subject and becomes truly internal, mental. That is why the external activity that takes place should be perceived as determined by the human psyche: it is carried out on the basis of an internal program, the implementation of which occurs on the basis of such a process as exteriorization. Thus, we can talk about the implementation of the movements of each peculiar and appropriate to his subjective states and properties. However, simply introducing the terms of interiorization and exteriorization into the explanation of the mechanism of reflection of a person outside is clearly not enough.

The internalized algorithms are in their pure form a display of external realities in the personality cast. However, at the moment it is still unknown to what extent and how the conditioning of external factors occurs. For example, in relation to handwriting, interiorization passes two very dissimilar filters: the filter of the physical component of the personality and the filter of its mental component.

The filter of the physical component of the personality, for example, in relation to studies of handwriting, is expressed by the peculiarities of the development of the muscles of the shoulder girdle, the forearm and wrist, and the hand ligaments. Handwriting studies of the personality, taking into account its psychological nature, probably will not have high performance, not taking into account the process of handwriting formation. It is precisely because of the purity of the interpreted image that it is advisable to study the subsystem of human physical properties in the context of handwriting formation.

The process of exteriorization is determined by three factors.:

- physical component of personality
- mental component of personality
- situational component that determines the completeness of implementation in handwriting developed dynamic stereotypes.

It is not efficient to study all three of these factors without isolating them, since the variability of all three components makes it extremely difficult to establish correlations between them. That is why, in the study of handwriting, it is advisable to study the role of the physical component of the personality within the framework of the study of the process of exteriorization.

Speaking about the situational manifestations of motor skills, it should be noted that mental properties are the most static properties of character, therefore their manifestations outside are also quite stable. The variability of manifestation is predetermined by the peculiarities of the combination of short-term and long-term realization of a motor act with variation of conditions from the usual to the changed. The determination of the nature and degree of variation of the implementation of a motor act will make it possible to effectively make corrections to the correlations established by scientists between the personality characteristics of a person and their reflection in particular in handwriting.

Having considered the elements of the physical component of the personality and the situational component, we turn to the mechanism of reflection on the reflexive level of the psychological component of the personality. The reflection in question can appear in three undetectable directly from each other, conditionally autonomous forms, namely in the form of: typological features of higher nervous activity; projection mechanism; typological personality traits.

Types of Higher Nervous Activity (HNA). As is known, the type of HNA is a combination of primarily the innate and secondarily acquired properties of the nervous system, which determine the nature of the interaction of the organism with the environment and are reflected outside. In stressful and stereotyped conditions, predominantly innate mechanisms of higher nervous activity come to the fore.

There are three properties that determine the type of HNA: the strength of the nervous system, mobility and balance of the nervous system.

The strength of the nervous system is its resistance (excitation and inhibition) to long-term exposure to an irritant. Since the power of HNA is a macro factor, it is not surprising that it is realized in all the elements of behavior. The very nature of HNA sustainability predetermines the factor of small variation of the characteristics reflected outward. Thus, force as a property of the HNA type predetermines the degree of variability of reflections of the main factors.

As you know, the only type with a weak nervous system secreted is melancholic. It is in the actions of this type that the de-automation of skills in the context of the influence of environmental circumstances occurs to the maximum. This applies to both handwriting (variation in the general signs of handwriting under stressful conditions) and gait (variation in the elements of the track path).

Mobility is the speed at which new conditional connections are formed, and, consequently, high adaptability of the psyche, its emphasis on the factors of the external world. It is not surprising that HNA types with high mobility (sanguine, choleric) are characterized by a high level of extroversion.

Motility, as a property of HNA in stereotyped activity, is reflected in the dynamism of behavioral components, examples of which can be:

• in handwriting - its acceleration as a basic feature (the ratio of the height of characters and their width), reflecting the dynamism of the HNA type. When compressed handwriting, corresponding to a low level of dynamism, the width of the letters or the distance between them is less than the height of the letters; with a sweeping handwriting corresponding to a high level of dynamism - the width of the letters or the distance between them is greater than the height of the letters). Separately, we note that the medium overclocking in the pilot studies did not allow us to determine the degree of extroversion or introversion with great reliability of the conclusions;

• in facial expression - comparable intensity of simultaneous use of various groups of facial muscles (primarily the upper and lower parts of it). Recall that in the mimicry of introverted types, the intensity of simultaneous activation of

various groups of facial muscles is poorly expressed. In extraverts, in turn, there is a pronounced asymmetry of mimic manifestations in the left (social) and right (personal) side of the face;

• in gestures - for people with high mobility of mental processes, there is a large amplitude of gesture, their dynamism. A separate property of extraverted gestures is the variety of gestures. Speaking of diversity, we are talking not so much about the number of gestures, but about the fact that they are inherent in various micro- and macrogroups.

• in gait - for people with high mobility of mental processes, a stable high value of the step length (taking into account the height of a person) as compared with the average.

Balance - the ability to quickly transition from reactions of excitation to reactions of inhibition and vice versa. It is not surprising that types of HNA with high balance (sanguine, phlegmatic) are characterized by a high level of adaptability to environmental changes.

Balance, as a property of HNA, in a stereotyped activity is reflected in the form of the level of adaptation to the changing conditions of behavioral components, examples of which may be:

• in handwriting - its sophistication (the ability to perform text at a fast pace, steady coordinated movements in accordance with the generally accepted cursive system), the degree of which increases towards the end of the letter, especially written in conditions of unusual. With highly developed handwriting, corresponding to a high level of adaptability, there is a high level of manifestation and pace and coordination of movements; with poorly developed handwriting, corresponding to a low level of adaptability - their low level of manifestation.

• in facial expression — comparable fullness of mimic manifestation. Thus, in persons with low balance of mental processes (choleric and melancholic) the mimic reaction has a weakly expressed final stage. So, in choleric people, as a rule, the mimic reaction ends abruptly at the end, and in melancholic people, it clearly loses its intensity.

• in gestures - in persons with a high degree of balance in mental processes, there is a rapid “borrowing” of gestures from the person with whom it contacts. The examined persons very effectively unknowingly copy the micromovements of the interlocutor's shoulder girdle.

• in gait - in individuals with a high balance of mental processes in the tracks (hypothetically) stable high values of the step width (taking into account the speed of a person’s movement) can be reflected in comparison with the average.

Projection. As is well known, projection is a mechanism of unconscious mental defense, by means of which subjective experiences are transferred to the object. For example, a specific color is a reflection of a specific subjective experience. Projection is a mechanism for reflecting outwardly, above all, psychological properties, less commonly states.

Not all forms of unacceptable feelings, desires, motives, ideas, etc. are stably projected in human activity with a high degree of probability. This is not surprising, because if we consider the projection of personal tension reflected in handwriting, then it is easy to see that these forms are extremely few. What is a person consistently projected in the framework of stereotyped activity? This is without a doubt the level of personal aggressiveness and the level of personal anxiety. That is, those parameters that are primarily the result of mental stress.

Personal aggressiveness in stereotyped activity is projected through an inadequately high level of mechanical effort. Examples may be:

• in handwriting - the intensity of pressure (the ratio of the width of the stroke, made with pressure, to the width of the stroke, performed without pressure. With low pressure, corresponding to a low level of aggressiveness, the width of the main and connecting bars is equal; with an average corresponding to the average level of aggressiveness - the main bars are twice as wide than connecting strokes; with a strong corresponding to a high level of aggressiveness - more than twice.);

• if facial expressions - overvoltage orbicularis oculi muscle, wrinkled brow muscles, large and small zygomatic muscle;

• in gestures - overstrain of the muscles of the hand and feet;

• in gait - pronounced with wiggling of the shoulders, in the most aggressive forms with the shoulders and pelvis, with a wide arrangement of hands relative to the body (University of Portsmouth), which determines the low variability of the slight foot angle along with the fact that the heel part of the foot is excessively printed. Considering the factor of inertia in the "wobbling" gait, an extremely insignificant step width should be reflected. Thus, the aggressiveness as a personal characteristic is reflected in the strong footprint of the heel part of the shoe, which is observed together with a small step width in the track of the tracks.

Personal anxiety in stereotyped activity is projected through an inadequately low level of application of mechanical efforts and in parallel with the instability of the manifestation of these efforts. Examples include:

• in the topographical features of the letter - a tortuous shape, less often narrowing downward in terms of large fields;

• in facial expressions - loss of tone (insufficient tension) of the occipital-frontal muscle, circular muscle of the mouth, small and large zygomatic muscles;

• in gestures - lethargy of the muscles of the hand and feet, grip of an object beyond its edge, repeated light touches of objects in front of a person or the same light self-contact, repetition of non-functional movements;

• in gait - overstrain of the muscles of the shoulder girdle, lowers the overall muscle tone, including the legs, which determines the pronounced variation of the step width within one tracks. Also, the indicator may be a small degree of variation of the components of the tracks in the process of walking and slow running.

Typological personality traits. The cognition of the peculiarities of the reflection of psychological properties outside, especially at the reflexive level, has a number of difficulties:

• The content of the concepts of specific psychological properties is uncertain. For example, such a property as principled, in various combinations can border on such properties as aggressiveness, rigidity, intellectual non-plasticity, self-sufficiency. It is not surprising that the reflection of such personal characteristics as principled in handwriting, gait, facial expression varies greatly.

• Separate psychological properties rarely appear to be strategic for the individual, and they should be reflected maximum at the level of private signs. This is true due to the objectively limited number of common signs of handwriting. However, the combination of common features of handwriting and features, manifested in its particular characteristics, at this level of development of psychological knowledge does not allow to establish the general patterns of the mechanism of reflection of personal characteristics in these stereotyped forms of activity. What has been said predetermines the low effectiveness of scientific research, which is actually blindly passing outside the framework of the scientific hypothesis.

The described difficulties are devoid of the study on the reflexive level of psycho-typological personality traits. If we take a typology of accentuated personalities, then the system-forming personal properties with a high degree of probability can be fixed in all forms of the reflexive level of expression of the personality outside. For example, in such a general sign of handwriting as a difficulty among representatives of the hysteroid type, a persistent tendency of manifestation of complicated handwriting is recorded.

Formalization of personal information, reflected outside on the reflexive level - the initial stage of knowledge of the mechanism of reflection of the person outside. In forensic investigation, the stated formalization stems from the measurability property of the reflected personal information. Thus, measurability in handwriting is carried out through the use of a system of general and particular signs of handwriting. This system has proven its effectiveness and can be transferred to forensic research of gestures, facial expressions and gait.

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专用合同培训框架的双重性以及在克拉斯诺戈尔斯克学院提供培训的研究成果

DUALITY OF THE DEDICATED CONTRACTUAL FRAMEWORK OF TRAINING AND THE RESULTS OF RESEARCH IN PROVIDING IT IN KRASNOGORSK COLLEGE

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抽象。 本文将职业教育的双重形式视为成功适应市场经济条件的教育现象。 通过对实验研究的分析，揭示了科学方法，教育方法，规划 – 组织，心理和教育性质的一些问题。

关键词：职业教育体系，二元性 – 质量管理储备，社会伙伴关系，克拉斯诺戈尔斯克学院实验结果。

Abstract. *The dual form of vocational education is considered in the article as an educational phenomenon successfully adapted to the conditions of a market economy. As a result of the analysis of experimental studies, a number of problems of a scientific-methodical, educational-methodical, planning-organizational, psychological and educational nature were revealed.*

Keywords: *vocational education system, duality - a reserve of quality management, social partnership, the results of the experiment at the Krasnogorsk College.*

Dual education, originated in Germany and widely recognized in the world practice of vocational education, is the product of close cooperation between educational institutions and employers. The future artisan / medicus acted as a student in the workshop, or at the officina, and his task was to observe the master's work and repeat his actions. After successful training, the student became an apprentice, but for independent work he had to pass an exam for the master, and this, in turn, required training from other masters.

From the second half of the 19th century, with the development of the industrial, the factory training system was already taking shape. Training and production

workshops began to open at the enterprises, in which the training of craft technology was carried out on a systematic basis.

The reorientation to market relations, the formation of an innovative labor market determined the need to revise the traditional approaches to the vocational education system. The modern economy has required training on the basis of social partnership of enterprises and vocational schools.

When hiring representatives of government agencies and businesses, it is not so much are interested the format of the "knowledge" of graduates but is interested in how much their willingness to engage in professional activities.

The dual training system is based on the interaction of two organizationally and legally independent "carriers of education", carried out in accordance with the legislation on vocational education and provides for the involvement in the preparation process of enterprises that go to quite substantial costs associated with the training of workers, as they are well aware that the cost of quality vocational training is a good capital investment. At the same time, they become interested not only in the results of training, but also in the content of the training and its organization. A potential employer who has his own idea of a specialist has the opportunity to "intervene" in the training process, complementing the content of training with a range of specific problems for this production. This determines the significance of the dual system as a model for the organization of vocational training, which makes it possible to bridge the gap and inconsistency in the relations between the industrial and educational spheres regarding the training of production personnel.

The dual system ensures timely response to changes in the needs of the industrial sector and taking into account the trends in the industry development. For domestic vocational education, the problem of establishing a close relationship with the production sphere is one of the most acute and urgent, which is emphasized both in the works of scholars and teachers, and in the regulatory documents determining the educational policy of the state in this area. Therefore, the extension of the dual organization principles to other levels of vocational education seems appropriate, timely and promising.

In dual training, it is planned to provide at the junior courses a general theoretical base, and in the second or third year - work according to an individual plan, containing practice-oriented educational tasks that need to be carried out under production conditions. To the leadership of this work should be involved practitioners (master mentors, instructors - teachers).

Within the framework of the dual education concept, the student is already involved in the production process as an employee of an enterprise who, according to his functional duties, manages the allocated resources, bears official responsibility, masters professional skills, and in certain cases receives salary.

At the early stages of training, students acquire certain professional competen-

cies, as well as such personal qualities as the ability to work in a team, the skills of optimal choice of a production and technological solution, responsibility for the assigned area of activity. In the process of work, they reflect on the future specialty in a new way and make an informed decision about the correctness of the choice of profession.

Above all, the future specialist in conscientious work can secure additional income, work experience and competitive employment prospects.

A partnership with an educational institution makes it possible at the early stages of vocational training to assess potential human resources and, in case of apparent inconsistency, deny the job well in advance or enlist him for a position with a lower salary, which ensures that the future graduate understands his “cost” in the labor market.

The educational institution is also interested in business partnership with production, as it gains access to current information about the current state of technology of production processes, facilities and equipment, and this allows you to make adjustments to training programs and update promising disciplines.

State vocational educational institution of the Moscow region "Krasnogorsk College" has existed for 60 years. The college plays an important role in the training of specialists for the North-West district of Moscow and the Moscow region. The founder of the college is the Ministry of Education of the Moscow Region. The college develops a system of social partnership based on equal cooperation with employers, trade unions, the Chamber of Commerce and regional employment centers. The leading partners of the college are the largest industrial enterprises of the city - PJSC «Krasnogorsk plant them. S.A. Zvereva ”, TIGI-KNAUF, BETSEMA, who are actively involved in the training of specialists and the development of educational and material base [3].

The main social partner of the Krasnogorsky College is the Federal Research and Production Center of the PJSC Krasnogorsk Plant. S.A. Zvereva "- is the leading and only in the country enterprises engaged in ground-based optical-electronic complexes and space monitoring systems [4].

The company is part of the defense complex of Russia. In August 2014, PJSC KMZ and Krasnogorsk College began working together to create a basic center for training workers, where students will master relevant educational programs of skilled workers and mid-level specialists in the field of mechanical engineering, metalworking, optical instrumentation based on elements of dual-purpose training of specialists from secondary vocational education with the subsequent fixing them at the enterprise [4].

At present, experimental verification of the scientific and methodological support of dual-purpose vocational training of students is carried out at PJSC KMZ and Krasnogorsk College. Developed and justified the contractual obligations of

the parties on the organization of parallel or sequential processes of theoretical and practical training, students' work activities, their distribution among workshops, services, workplaces of the company in accordance with the requirements of qualification characteristics in a social partnership of college and enterprise with production and learning process.

When distributing students based on the needs of the enterprise, the need to preserve the continuity of students' entrenchment in the workshops, whose work corresponds to the studied specialty, the need to acquire knowledge and competencies by type of activity, established by the FSES VPE, components of an increased level of education, are taken into account.

By the time of completion of practical training at the enterprise, students will be provided with the opportunity to improve the working level, the acquisition of related or new professions within the list of the classifier of workers and engineering and technical qualifications.

Close business cooperation of the practice leaders from the college and BTZ, the shop managers in matters of labor organization, payment, discipline and compliance with internal regulations, both in the workshop and in the college, and the adoption of operational measures to eliminate the difficulties established. The following features of educational work in the conditions of duality of targeted professional training of specialists are revealed:

- workload of students at workplaces, parallel employment with study classes do not release either students or teachers from the organization of educational work: they monitor and ensure academic performance, discipline in college and at work, students perform work and study duties;

- the formation of ethical, moral, legal norms in public behavior; formed the ability to organize relationships in the team, etc .;

- planning, organization, analysis of educational activities carried out taking into account the stay of students on the one hand, in terms of the workforce, on the other - in the team of students;

- introduce work on the conservation of the contingent of students.

\A number of features have been identified among students enrolled in the dual system of targeted education, which after the 2nd course go into an unusual transitional state, which is characterized by the following factors:

• large time employment both at the enterprise and at the college;

• lack of time for habitual forms of recreation, homework;

• high responsibility in the performance of job duties in the production of real products;

• differentiation in labor remuneration at different work sites in production workshops, between permanent workers and trainees;

• part-time non-core employment;

• the restructuring of the whole organism to a new mode of life; Often, dis-

satisfaction with working conditions and work, causing a violation of labor and academic discipline;

The introduction of the results of the experimental work, of course, gives positive results. This is evidenced by the great interest in the experiment on the part of many enterprises of the engineering industry, the demand for and good fixability of graduates in production.

Thus, during the ongoing experiment, along with the scientific and methodological, a number of problems of a planning, organizational, educational, methodical, psychological and educational nature are revealed.

It should be noted the lack of scientific and methodological support of the dual system of targeted professional training of workers and middle-level specialists. In pedagogical and methodical literature there is no common understanding of the structure and composition of scientific and methodological support. By scientific and methodological support of vocational training, we understand the process of finding and developing organizational, pedagogical and methodical mechanisms for bringing scientific results to their practical application in the activities of subjects of education. This circumstance leads to the subjective decision of many issues of pedagogical practice.

A common task for the entire system of vocational education of specialists of a basic and advanced level is to reduce the period of adaptation of the graduate in the workplace and the formation of the future specialist's full readiness for professional activity. At the same time, he should be capable of meaningful changes in his professional activities, depending on both dynamically changing situations and in terms of the demands of the labor market.

This task can be solved by means of dual target training of future specialists, which is built on the unity of three methodological bases: axiological (parity of educational and production values and goals), ontological (competent-modular approach), technological (organization of educational and professional activities).

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基于综合职业的高龄学龄前儿童运动活动增加模型
MODEL OF INCREASE OF MOTOR ACTIVITY OF OFTEN ILL CHILDREN OF THE SENIOR PRESCHOOL AGE ON THE BASIS OF THE INTEGRATED OCCUPATIONS

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注解。 本文考察了在综合学习基础上引入高龄学龄前儿童运动活动模型的实验工作。 在研究期间，评估运动模式并且通过测量法测量儿童运动活动的量。根据对照组和实验组的综合运动形式，提出了运动的比较指标。

关键词：高程模型，体力活动，常病儿童，学龄前儿童，综合课程。

Annotation. *The article considers the experimental work of introducing a model of increasing the motor activity of frequently ill children of senior preschool age on the basis of integrated ones. During the study, the motor mode was assessed and the amount of children's motor activity was determined by the method of shagometry. Comparative indicators of locomotion according to the forms of integrated exercises in the control and experimental groups are presented.*

Key words: *elevation model, physical activity, often ill children, older preschool age, integrated classes.*

The relevance of research

At present, the educational process in preschool education is characterized by an increase in the volume and intensity of educational and cognitive activity of children, which leads to a significant decrease in the already insufficient level of motor activity of preschool children [2].

Modernization of preschool education based on the integration of sections of educational programs allows diversifying the process of physical education and, in particular, physical education classes in order to interest children, thereby increasing their physical activity [1].

There is a problem between the need to include frequently ill children in various forms of increasing physical activity within preschool educational institutions and the lack of integrated models for constructing physical education classes.

Purpose of research: to develop and experimentally substantiate a model for increasing the motor activity of frequently ill children of senior preschool age on the basis of integrated activities.

Methods and evaluation of the control of motor activity

The pedagogical experiment took place in the natural conditions of the functioning of the kindergarten No. 39 «Belosnezhka» in the city of Surgut. In the formative experiment 24 frequently ill children of preschool age were involved. Evaluating the motor mode and determining the amount of motor activity allowed the method of shagometry. For this we used the pedometer OMRON HJ-113 with which we were able to determine the number of locomotion (steps) performed by the child in various forms of motor activity (Table 1).

Table 1 - *Priority forms of direct educational activities for physical development in kindergarten "Belosnezhka"*

	Form of organization	5-6	Amount of locomotion
1	Morning exercises (daily)	10-12 min	580-1100
2	Physical exercises in the gym (2 times a week)	25 min	1991-2110
3	Physical order (during class daily)	4 min	210-305
4	Game exercises on a walk (daily)	5 min	1200-1400
5	Individual work (daily)	6 min	300-340
6	Health games (2 times a week)	15 min	512-710
7	Independent physical activity (hour of motor creativity) (once a week)	25 min	1160-1950
8	Total number of locomotion		5953-7915

After analyzing classes in physical culture, we determined the motor density of classes, which amounted to no more than 60-70%. This, in our opinion, does not have a healing effect, since physical activities that do not cause stress to physiological functions and do not provide a training effect do not have a sufficient health effect. And the total density of employment was 75%, which was a consequence of low physical activity;

In parallel with the timing, was used pulsometry, for a more objective assessment of the motor activity of children in class. The results confirmed the previous findings and revealed the average level of heart rate of children 5-6 years old in class, which amounted to 100-130 beats / min.

Thus, the results of diagnostics of the level of motor activity of children led us to the conclusion that these methods of organizing children of the older group do not sufficiently allow improving motor activity.

To conduct the formative stage of the experiment, we developed a model for increasing the motor activity of frequently ill children of senior preschool age based on integrated classes. (Figure 1).

Fig.1. *Model of increase in motor activity of frequently ill children of senior preschool age on the basis of integrated activities*

In each of the proposed areas, the following forms of conducting integrated classes are included: music-rhythmic, thematic classes, “I care about my health”, training-type activities, which have their own tasks and features.

To test the effectiveness of the developed model, we conducted a formative experiment in the course of which, by the method of shagometry, we identified comparative indicators of motor activity for each form of integrated lesson (Fig. 2).

Considering the comparative indicators of motor activity in the experimental group, we see that at the beginning of the experiment, the average indicator is (1750), at the end of the experiment, this indicator increased significantly to 3980.

In the class "I care about my health", the average indicator is (1256), then at the end of the experiment the indicator increases to (3472), but not as much as in a training class.

In thematic studies, the average is (1374), then also after the introduction of the model, increases to (3471).

At the musical - rhythmic classes, the indicator was (1356), also at the end of the experiment, this figure increased to (3570).

The average index of motor activity on the employed by physical culture in the control group at the end of the year did not reveal significant increases (Fig. 3).

Considering the comparative indices of motor activity in the control group, we see that at the beginning of the experiment, the average indicator is (1674), at the end of the experiment this increased but not significantly to (2341).

The average indicator is equal to (1306) in a variable class, this indicator also increased to (2100) but not as significantly as in the experimental group.

In classes of mixed type, the average is (1276), there were also no significant changes compared with the experimental group, but slightly higher than in other classes of the control group (2540)

In the classroom of the traditional type, the indicator was (1346), there were also no significant changes, the indicator increased to (2139).

A comparative analysis of attendance in physical education classes for frequently ill children showed that the average duration of illness per child in the experimental group decreased from 38% to 12%. In the control group, the percentage of attendance of educational activities of often ill children of senior preschool age at the beginning of the year was 38%. at the end of the experiment 28% (Fig. 4).

Conclusions

Thus, the developed and tested model of increasing the motor activity of frequently ill children of senior preschool age on the basis of integrated exercises contributed not only to an increase in locomotion, but also to a decrease in morbidity in children. As well as an increase in attendance at physical education classes.

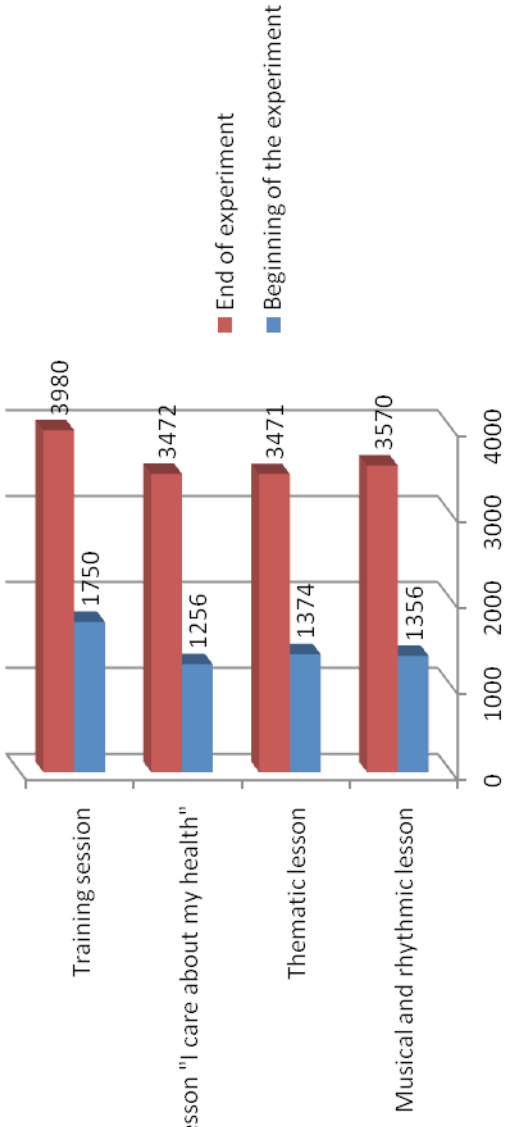

Fig.2. *Comparative indicators of locomotion according to the forms of integrated occupations (experimental group)*

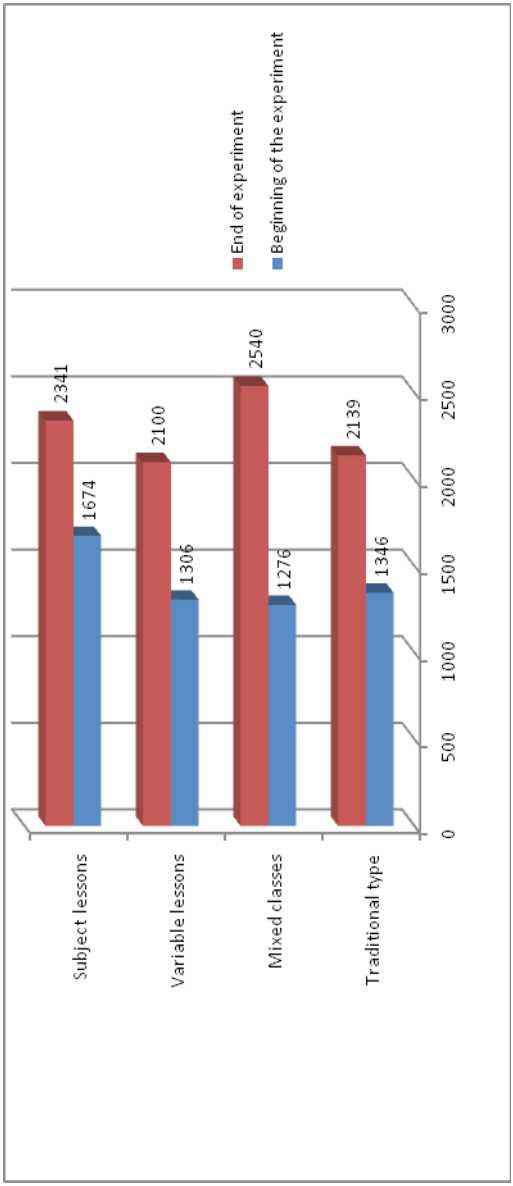

Fig.3. *Comparative indicators of locomotion according to the forms of integrated classes control group)*

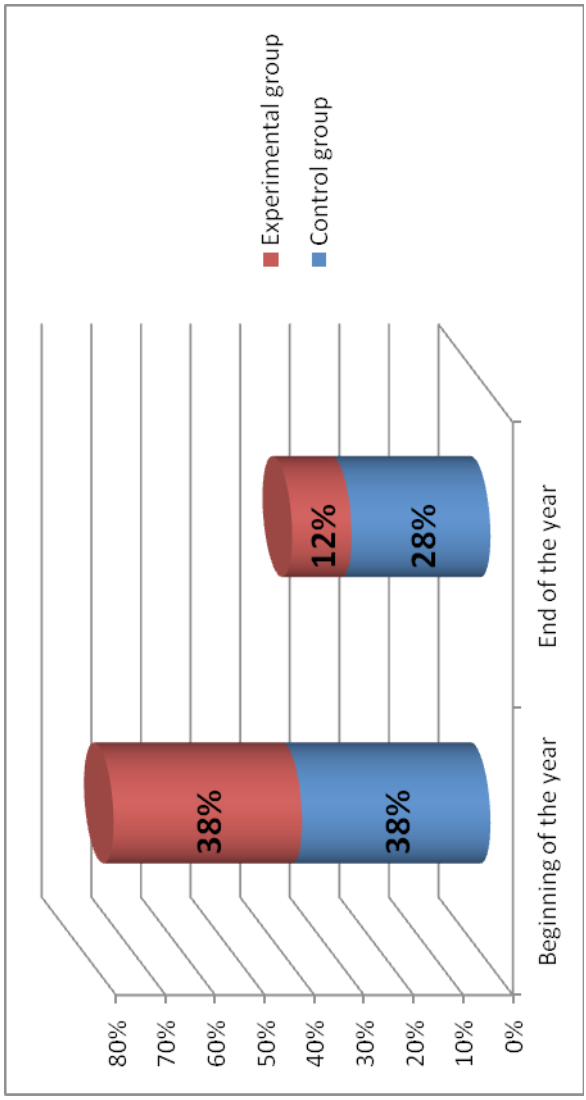

Fig.4. *Comparative analysis of attendance in physical education classes for frequently ill children*

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运用问题的方法来增强学生在生物学研究中的认知活动
USING THE PROBLEM APPROACH TO ENHANCE THE COGNITIVE ACTIVITY OF STUDENTS IN STUDY OF BIOLOGY

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注解。 文章揭示了问题方法的本质。 考虑了生物学课程中问题情境的类型和创建方法。 显示了教师组织问题方法的活动。 制定了若干方法条件，有助于其成功实施。

关键词。 问题方法，问题情况，教育问题，有条件的条件和技术。

Annotation*. The article reveals the essence of the problem approach. The types of problem situations and methods of their creation in biology class are considered. The activity of the teacher in organizing the problem approach is shown. A number of methodological conditions are formulated, contributing to its successful implementation.*

Keywords*. Problem approach, problem situation, educational problem, methodical conditions and techniques.*

In the rapidly changing information world, the social order of the school has changed - from a person who knows to a person who knows how. Now it is not enough to be able to reproduce the acquired knowledge - you need to be able to apply them for practical purposes, to be able to work with heterogeneous information, to use it. Modern society needs thinking competent specialists. The ability to successfully adapt to an ever-changing world is the foundation of social success.

Coming to the lesson, I really want the students to strive to learn new things, reason and argue, search and prove, want to learn something, that is, they have formed cognitive needs. I, as a teacher of biology, are frightened by the decline in interest and the level of knowledge on the subject.

The abundance of information, modern gadgets do not develop the inquisitiveness of the child's mind, do not deepen his knowledge, but make him a passive listener and consumer of ready-made knowledge (teachers will tell, I will hear on TV, I will find on the Internet)

The modern education system provides the teacher with the opportunity to choose among his many innovative methods “his own”, to take a fresh look at familiar things, at his own experience, at the opportunity to carry the information culture of effective knowledge to a student.

Having studied the work of M.I. Makhmutov and E.L. Melnikova, “Formation of cognitive independence, stable learning motifs and mental abilities, ways of working with a system of problem situations”. Acquainted with the work of Sh. A. Amonashvili "The development of mechanisms for self-realization, self-development, adaptation, self-defense, self-education necessary for the development of a distinctive personal image and dialogical and safe interaction with people, nature, culture, civilization," I understood that it was not interesting for a student to simply listen teachers, he is interested in the spirit of "competition", so she began to use the method of problem-based learning in her lessons.

Psychologists believe that the problem situation is the initial moment of the thinking process, when a person needs to learn and understand something new, unknown. In the process of creating and solving problem situations, creative mastering of knowledge and skills occurs, and mental abilities develop. Thinking usually begins with contradiction. The experience of applying problem-based learning in the classroom shows that it contributes to the formation of cognitive activity of students, provides a deep learning of educational material and is an effective means of developing students.

I am glad that there are creative students who are interested in knowledge, ready to argue and defend their point of view, to actively solve the proposed problem situations.

By putting a student in a problem situation that is interesting for the whole class, I get the opportunity to “break down” the mechanism of his thinking. With this approach, all students in the class work intensively with interest and desire: listen attentively - thinking, watching - thinking, reading - thinking, performing practical tasks - thinking. In the process of solving the problem, students acquire subjectively new knowledge. Thus, in the history of biology, two objectively contradictory facts were discovered: the cells divide, and the number of chromosomes in them does not change. At the time, scientists faced the question, the problem, what mechanism ensures such a constancy of the number of chromosomes and their uniform distribution. Such a question posed to students before studying cell division, brought to their consciousness and accepted by them, also causes intellectual difficulty and becomes a problematic issue for them. Putting the question, I patiently listen to the hypotheses of the students, then by the method of problem presentation I myself inform new, missing knowledge, while encouraging the students to engage in active cognitive activity, to participate in thinking about the learning problem. Non-traditional lessons always generate an interest among

students, make it possible to feel their involvement in solving a problem, cause him pride in himself and make him feel that he can do more. The student begins to believe in his strength.

Problem situation can be used at different stages of the lesson.:

when finding the lesson topic - You can use a fragment of the film “And the Dawns Here Are Quiet” - while studying the theme “Mosses” in the 6th grade, in the cartoon “The Ant - the Boaster”-when studying the topic "Movement methods of insects" in the 7th grade.

while explaining the material - Why are viruses attributed to living organisms, but attributed to a separate kingdom? - Grade 10 topic "Viruses"

Appropriate ways to create a problem situation can be when studying any topic of biology. Everything will depend on the characteristics of the age of the students and the means at the disposal of the teacher.

At the beginning of such lessons, several students usually work, most often strong ones, but more and more are gradually drawn in. The lesson with the problematic approach is to create psychological comfort for the student, implies a personal approach. The student can prove himself, show his abilities, express any extraordinary thought and be heard, leave the lesson with the assessment. In my work I use various techniques for creating problem situations.

1. Expression of new knowledge in a new form. For example, when studying the method of plant propagation in class 6, the problem can be identified: Why do fences most often grow plants whose seeds are propagated by the wind? (The gust of wind is held back by a fence, and the seed falls near the fence).

2. Finding a solution. In the 7th grade, when studying the topic “Detachments of mammals,” I put the problem question: King penguins leave up to five months young without food in harsh climatic conditions. How do penguins survive? (Chicks gather in a large flock, in which chicks constantly move from outside to the center of the pack, warming and cooling. It all depends on the number of chicks). Or a biology lesson in grade 6, the topic of "Photosynthesis": More than three hundred years ago, scientist Van Helmont put the experience - put 80 kg of earth in a pot and planted a willow branch in it, after weighing it. The plant growing in a pot was not given any nutrition for 5 years, but only watered with rainwater that does not contain mineral salts. After weighing the willow tree in 5 years, Van Helmont discovered that its weight increased by 65 kg, the weight of the earth in the pot decreased by only 50 g. How the plant produced 64 kg of 950 g of nutrients remains a mystery to a scientist. Pupils must answer this question. All subsequent work on the topic is based on the emotional charge, aimed at unraveling this experience, and, consequently, at unraveling the “process of photosynthesis”.

3. **Practical task, which students have never encountered**. When studying the topic "Lichens" -5 class, students from my story will learn that for a long time

scientists accepted all the usual and related ideas. Only Russian scientists A.S. Famintsinu and O.V. Baronetsky managed to isolate green cells from the excess, and they multiply by division and spores. Consequently, green cells are deprived of this independent plant - algae.

I formulate a problematic task: what are lichens? Which group of plants should they be assigned to?

4. **When explaining new material** i reveal the essence of the topic being studied. Then the students are invited to perform several experiments, and to answer a number of problematic issues that require students to consciously apply the information obtained to explain a specific situation. *Raise one hand up and the other down. After a minute, place both hands on the table.* Why did the raised hand turn pale and the lowered one turned red?

5. **Clashing different opinions of my students**, and then together we find the solution. *In the science fiction novel Amphibian Man, the young man Ihtiandru has his gills transplanted with which he breathes in water. What physiological problem that arose after this transplant and which did not allow the amphibian to survive in the water did not the author of the novel take into account?*

6. **I present class students with conflicting facts, scientific theories, or other points of view.**

Biology class in the 8th grade, topic “Immunity”: Fact one. In the last century, an epidemic of measles erupted on one of the islands of the Atlantic Ocean, which was introduced by a person infected in Europe. Of the 7,000 people in the population, only 98 of the oldest people were healthy and had measles 65 years ago.

Fact two. In 1967, a young Cape Town surgeon Christian Barnard first performed a heart transplant from one person to another. The operation was performed sterile, with high skill. However, a reliable engraftment did not happen, it was not possible to save the patient’s life.

Paradoxically, these two facts are interconnected. How?

When planning problem lessons, I definitely take into account age-related abilities of students. In grades 6-8 I focus on children's curiosity, the desire to study and observe living objects. It is known that in the bedroom should not be too many plants, as this deteriorates the oxygen regime in the room. It is also known that plants produce oxygen during photosynthesis, enriching the surrounding air. Do these facts seem to you to be contradictory? Why?

In grades 9-10 - students tend to summarize and systematize the data. For example: what functions the plasma membrane could not perform if its composition did not include proteins? Or why is the development with full transformation characteristic of many insects, although it is longer? Or why parthenogenetic development cannot be considered a consequence of asexual reproduction of organisms?

My task is to interest in subject, the process of gaining knowledge and keep attention, to make it clear that learning is not "serving in school", but an interesting job. Using a problem-based approach to learning has its own difficulties; on the one hand, it takes more time to prepare a teacher for a lesson; on the other hand, the student, in order to successfully discuss the task, must constantly improve his erudition. The problem-based approach to learning contributes to the development of students' skills of independent work. Develops logic, creativity in the search for knowledge, through the resolution of the problem. The student no longer succumbs to problems, but seeks to build an algorithm for solving.

After analyzing the introduction of problem-based learning in my work, i obtained such results. The average quality indicator in biology is higher than the average in the ESC, the biology performance is 100%.

Analysis of the quality of education for 3 years in biology

Academic year	Quality (general indicator)	Quality on biology
2016/2017	72,6	70,6
2017/2018	70,2	66,7
2018/2019(1 half year)	65,1	68
Total for 3 years	69,3	68,4

Using a problem-based approach allows students to increase interest in the subject, form new skills and abilities, and activate thought processes. Interest in reading biological literature is growing, knowledge in the field of biology is expanding. Students actively participate in the All-Russian Olympiad in Biology. Over the past 3 years: 2 winners and 1 winner in biology among 10-11x classes (2018 / 2019). The diploma of the prize winner of the open Olympiad in biology of the North-Caucasian Federal University "45 Parallel" was received in 2018 by 1 person and by 2019 3 students. Students also actively participate in Internet Olympiads and contests of various levels.

In 2018, the maximum result of the Unified State Exam in biology was 81 points.

In the 2017/2018 school year, out of three 9th grades, 23 people chose the final biology exam, which is 30%. This indicates a high educational interest in this subject. Thus, problem-based learning forms a harmoniously developed creative personality, able to systematize and accumulate knowledge, capable of high self-analysis and self-development.

In conclusion, I would like to emphasize the importance of the technology of problem-based learning as: developing, educating, health-saving.

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中学生获取外语实用能力的综合内容导向方法
THE INTEGRATED CONTENTS – ORIENTED APPROACH TO OBTAINING FOREIGN LANGUAGE FUNCTIONAL LITERACY BY SECONDARY SCHOOL PUPILS

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注解。 本文概述了解决中学生外语教育学科内容问题的一些方法，涉及现代范式理论（传统的基础知识 – 中心主义范式，人文主义人格导向范式：能力导向，主体 – 个人，网络，语义和 – 以文本为中心的方法选择外语教学内容）。

关键词：外语教育；单一内容；功能性外语素养；文本中心方法。

Annotation. *The article outlines some ways to solve the problem of subject content in the foreign language education of secondary school students, involving the theory of modern paradigms (the traditional basic knowledge-centrist paradigm, the humanistic personality-oriented paradigm: competence-oriented, subject-personal, network, semantic, and - text-centric approach in the selection of foreign language didactic content).*

Keywords: *foreign language education; single content; functional foreign language literacy; textcentric approach.*

For a number of years already, the pedagogical community has been concerned about the destruction of the fundamental nature of Russian education, which was accompanied, first and foremost, by the destruction of the subject content of academic disciplines. The head of the Ministry of Education and Science in 2016, O.Y. Vasilyeva began her activity with the application of certain efforts aimed at 1) developing content that is uniform for an elementary school by reducing the number of rows of academic disciplines on the same academic subject; 2)creation of a single basic content on the literature studied in primary school; 3)revising of the interpretation of some historical concepts based on the selectivity of the allegedly inherent historical memory of our people.

The lack of uniform content is especially sensitive in the organization of foreign language education, since it is now focused mainly on the use of British and American textbooks, in which instruction is concentrated not around the text as the main didactic unit, but around the description of pictures, which violates the objective laws of the development of humanitarian thinking, forming his cliffiness, discontinuity, leading to the refusal of learning linear reading as one of the types of speech activity.

In addition, the logic of learning a foreign language (hereinafter referred to as FL) regarding the levels of language, types of speech activity, and text content as the basis for the development of all humanitarian and philosophical thinking is not observed. The content of the text included in the textbook should be related to the principles of spirituality, morality, development of the intellect, the student's intellectualism, which develops the human culture, ultimately. The most significant, in this logic, two elements should be emphasized: a) the selection of foreign language content in syntagmatic terms, all at once for the whole foreign language education of basic school and b) the division of the selected holistic content in thematic relation according to the regressive order, i.e. when moving from the final theme to the first, which creates the possibility of using educational technologies, the essential characteristic of which is the focus on the final result. Accounting for students' awareness of the final result helps the teacher to justify the allocation of local, consistent module-rated blocks.

Our proposals require a change in the organization of the entire system of foreign language education in school, which is not possible to implement now for a number of the following reasons: 1) there is no thematic continuity of foreign language content when a student moves from one class to another; 2) there is no unity of factual information distributed between classes; 3) infinite pictures and images are described without reliance on the development of students' intellectual operations, which ultimately leads to the appearance of clip thinking, the latter being “reinforced” by performing tests that involve mainly multiple choice, teaching them to work in “yes”- “no” mode, distracting from reasoning, argumentation, analysis and other intellectual operations; 4) the writing of creative works (essays, reports, etc.) should be “standardized” in nature regarding their form, content and principles of control; 5) Russian authors' textbooks carefully copy the system of organizing foreign language education offered in British and American textbooks, without referring to the achievements of Russian and Soviet education.

It is obvious that all of the above requires new approaches, solutions and changes, which indicates the **relevance** of the problem stated in the title of the article. The **purpose** of this work is to offer one of the possible options for changing the current situation in the field of foreign language education. In this regard, we set the following **tasks** in this study.: 1) to formulate our understanding of

the phenomenon of "new approach in education"; 2) to identify the integrative components of the proposed approach, taking into account its correlation with modern educational paradigms; 3) provide a description of each of the integrative components of the approach; 4) to analyze and determine the role of each of the components in the development of the functional foreign language literacy of students. Let us turn to **elaboration of the essence of the stated problem.**

The author's approach we propose to achieve functional foreign language literacy of secondary school students (senior classes) is understood by us as a general theoretical setting, including the choice of object and subject of research, a plan for its implementation involving technologies and methods of implementation, the theory put forward by us taking into account the characteristics of "modern educational paradigms [7].

It is known that the organization of any educational process requires the choice of a specific education model (paradigm), which determines not only the goals, objectives and relations of the participants in the educational process, but also technology, methods for evaluating results, as well as the quality of didactic materials. The classification of modern educational paradigms is as follows.

1. Traditional Basic Knowledge Centrist Paradigm: the subject of the educational process is the teacher, the object is the student; method of training is the provision of ready information through the description, constant, reproduction; this paradigm focuses on results in the form of gaining knowledge and skills (KS); resources for the implementation of the paradigm are the same for all organizational, methodological and didactic материалы.

2. The humanistic paradigm: participants in the educational process are the subject (teacher) - the subject (student); Successful implementation of the educational process is possible with the interaction of the subjects of the educational process through pedagogical support, support, counseling. Learning technologies - creative, developing, allowing the student to independently obtain information; learning outcomes - KS and competences; as resources serve alternative organizational-methodical and didactic materials. The humanistic paradigm includes four varieties, which we consider below.

2.1 Person-oriented paradigm in the form of competence-oriented paradigm. It is characterized by the presence of developed reference competencies by a teacher for the selection of the student himself, depending on the level of his development; the use of selected content as a result of the refraction of an authentic scientific text into an educational text; in variable didactic aids, competences are the result of learning.

2.2 Personal-oriented paradigm in the form of a subject-personal paradigm characterized by the presence of an individual, developed for each student, educational trajectory, content selection "as a result of refraction of an authentic sci-

entific text into an educational text and the possibility for an individual to choose students with career-oriented“ anchors ”- spiritual, moral, educational, professional, contained in text content, under career-oriented “anchor” is understood as the orientation and interests of a certain person, prompting him to a certain professional activity ”[9]. Teaching aids for individual choice of students are used. The competence becomes the result of learning.

2.3 Person-oriented paradigm in the form of a network paradigm. We understand the network paradigm as a “philosophical concept, the basis of which is the approach to the world as an open and decentralized system of interactions, which has a network of feedback and the relationship between them” [4]. This type of paradigm is characterized by an independent search for educational information and the self-guidance of the student in the selection of authentic scientific educational content.

2.4 Meaning-Activity Paradigm, developed according to E.V. Bondarevskaya, in the innovation educational space, not only the educational paradigm changes, but also the paradigm of pedagogical science itself: the concept sphere, functions, research methods, ways of interaction with practice. This paradigm can be formulated as follows: separation of the process of pedagogical education from the epistemological sphere into the ontological sphere of pedagogical reality, activity and relations; this will replace the narrative forms of learning with the activity ones; education will be imbued with cultural meanings and values, pedagogical innovations and creative results of professionally significant activities. “The output thanks to the personality-oriented approach should be consolidated and developed in the semantic educational model, which, in our opinion, should, on the one hand, fill the deficiencies of the personality-oriented education, and on the other, integrate modern educational realities (new educational standards based on activity and competence approaches, pragmatic orientation of education, test control) "[2]. The main thing in this paradigm is that a newly prepared teacher (a teacher of a new type) will organize the process of foreign language education based on the development of individual meanings and their search, national values, priorities, and also spirituality, morality, intellectuality, i.e. culture

To develop the problem put forward in the title of the article, we offer an “**integrative approach to the achievement of functional literacy of secondary school students**” The essence of the approach is as follows: obtaining functional literacy by two levels of training - basic and advanced. Training at the basic level is organized taking into account the achievements of linguodidactics, and at the advanced level professional linguodidacty acquires special significance. Linguodidactics determines the strategy of thematic selection of language content and possible options for its introduction into the educational process using certain general pedagogical foreign language educational technologies implemented using such a science as a technique that takes into account the conditions of learning,

its goals and objectives, the level of preparedness of students of a particular educational institution, class , individual characteristics of students. Professional linguodidactics determines the principles of thematic selection of foreign language content created in the process of "refraction" of the actual content in real science of scientific style text content into the content of educational texts of a pragmatic language developed by S.G. Ter-Minasova; With this approach, we are dealing with different sublanguages. The process of "refraction" of authentic textual foreign language content of a scientific style into the content of foreign language educational texts of a pragmalinguistic style is carried out using **the text-centric approach developed in foreign language education.**

In the educational process, the most important role belongs to the content (semantic) side of the information revealed in the texts of a particular sublanguage. It helps to determine the value and meaning of professional activity. Considerable interest for the theory and practice of learning is the connection of the content information with the basic knowledge through its sides the "thesaurus".

The text as a source of information attracts the attention of many scholars studying it in literature, semiotics, and linguistics. In the dictionary interpretation of the text (from the Latin. Textus - fabric, plexus, connection) - is a semantic connection of a sequence of iconic units, the main properties of which are connectedness and integrity.

According to M.M. Bakhtin, the text - "is the primary givenness of all disciplines of *philosophical and humanitarian thinking*" [1].

In semiotics, text means "a meaningful sequence of any signs, any form of communication, including ritual, dance, etc. Semiotics, the general science of sign systems can make a considerable contribution to the methodological foundation of the theoretical pedagogy of linguodidactics "[4].

In *linguistics*, the text is "a sequence of verbal signs. Linguistics describes specific means that provide semantic attitudes transmitted in the text. The correctness of the text perception is ensured not only by language units and their compounds, but also by the necessary general knowledge fund, communicative background, therefore the text perception is associated with the perception, that is, the necessary conditions for the optimal existence of the text, which flow from its context "[8].

Text-oriented *linguistics* (text linguistics) explains language as a global phenomenon, from the point of view of modern linguistics, as an integral means of communication. It studies more deeply the connections of a language with various aspects of human activity. According to P.I. Galperin, the laws of the text can be comprehended only at the level of large textual constructions. ***Text linguistics*** - "is the science of essence and organization, as well as the prerequisites and conditions of human communication. This is a turn from language linguistics to speech linguistics "[3].

The text linguistics studies its "***ontological aspect*** (nature of the text, its status, difference from oral speech), ***gnoseological aspect*** (character of reflection of objective reality in the text); proper ***linguistic aspect*** (the nature of the language of the text); ***psychological aspect*** (character perception of the text); ***a pragmatic aspect*** (the nature of the attitude of the author of the text to objective reality and to meaningful material; the nature of the reader's information strategy formation in the right direction, "[5, p.36].

To study the text, a text-centric approach was developed, that is, a method of encoding and decoding the personal value information of three types of text that we classify:

- "*By way of generation* on authentic (scientific style) and training (pragmalinguistic style);

- *on sublanguage* - on texts from the field of electronics, rocket technology, mechanics, radio engineering, metrology, linguistics, etc.;

- by *the nature of the genre* - for a monograph, journal article, report, lecture, instruction, etc. "[6, p. 124.].

As part of the educational process, authentic texts of scientific style are functioning, representing scientific prose, and educational texts of pragmalinguistic style, representing carefully verified models of means of organizing authentic texts and representing intellectual prose samples created by the teacher for textbook texts, lectures, instructions, etc. The rules of organization and generation of authentic texts of the professional sublanguage should become known to the student in the course of his acquaintance with the main categories of text in the form of means of coherence and segmentation. coherence, boundary signals of the upper and lower boundaries of textual constructions. Only in this way will he reach the top of professional competence. The text in this case is the basis of education and self-education, the goal and means of the educational process.

The process of "refraction" of authentic texts takes place in two stages:

Stage I: an authentic text, selected at the discretion of the teacher - educational text of intellectual prose, processed and obtained by the teacher on the basis of the authentic text, - secondary text created by students on the basis of the educational text;

Stage II: authentic text selected by students on the basis of their professional value-semantic approach, secondary text created on the basis of authentic text by students — authentic text selected independently to expand already known authentic information for self-education and self-development as an element of background (professional) competence [5 , p. 153].

Based on the foregoing. It is possible to present a list of components of a content-oriented approach to the development of functional literacy of high-school students of the following type for the *basic level of education*: language level component; speech component, which envisages the development of intellectual

operations (analysis, classification, synthesis, separation of the general - private, compression, establishment of identity, equivalence, etc.); for an *advanced level of study*: a convergent paradigm component, i.e. the use harmoniously of all the achievements and results of all paradigms; priority value component, the selection of text content corresponding to the principles of spirituality and morality; textcentric component. The listed components function at the basic and advanced levels of education.

Conclusions: 1) the concept of "new approach in education" was formulated; 2) selected integrative components of the proposed approach, taking into account its correlation with modern educated paradigms; 3) use of the description of each of the integrative components of the approach; 4) analyzed and determined the role of each of the components in the development of functional and language literacy of students.

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协调医学院学生的独立工作应用积极的教学方法«卫生»

COORDINATION OF INDEPENDENT WORK OF STUDENTS OF THE MEDICAL FACULTY IN THE APPLICATION OF ACTIVE METHODS OF TEACHING THE DISCIPLINE «HYGIENE»

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注解。 一般卫生部制定了协调学生在“卫生”学科研究中的独立工作的指导方针。 该学科基于活动，系统和不变方法。 关于医生专业素质形成的教育工作通过鉴别诊断的元素来执行情境任务。 在培训模块化技术专业时，可以应用有条理的建议。

关键词。 激活教育过程，系统方法，不变方法，情境任务，教育工作。

Annotation. *Department of General Hygiene developed guidelines for the coordination of independent work of students in the study of the discipline "Hygiene". The discipline is based on an activity, system and invariant approach. Educational work on the formation of the professional qualities of the doctor perform situational tasks with elements of differential diagnosis. Methodical recommendations can be applied when training a specialty on modular technology.*

Keywords. *Activation of the educational process, a systematic approach, an invariant approach, situational tasks, educational work.*

Introduction

The organization of the educational process in the study of the discipline "Hygiene" for students of the specialty "General Medicine" can be fully implemented using modular technology, the introduction of which requires unification and harmonization of teaching methods and tools, as well as tools for monitoring students' knowledge. The aim of the work was to develop guidelines for the coordination of the implementation of students' independent work in the study of the discipline "Hygiene".

Materials and methods. In developing the recommendations, an assessment of the degree of readiness of students for the perception and study of medical and preventive disciplines was taken into account. In particular, the lack of scientific reflection skills, the ability to critically analyze and integrate previously acquired knowledge in the previous specialty training cycles in the study of hygienic problems that require an integrated approach to the analysis of human health disorders or the population under adverse effects of environmental factors (physical, chemical, biological, social, psychological).

Among the reasons affecting the effectiveness of the educational process, it should be noted that some students lack the motivation to study preventive disciplines and understand what role they play in the hierarchy of disciplines of training a doctor of a medical profile.

The concept of guidelines is the revitalization of the educational process, which, according to A.A. Verbitsky [1], consists in the transition:

- from informative to active methods and forms of education with the inclusion in the activities of students of the elements of problematic, scientific search, various forms of independent work;
- from school of reproduction, to school of understanding, school of thinking;
- to the activating, developing, intensifying ways of the organization of high school educational process;
- to such an organization of interaction between the teacher and the student, in which the emphasis is shifted from the teaching activity of the teacher to the cognitive activity of the student.

In drawing up the recommendations, it was taken into account that the main direction of the modernization of higher medical education today is to improve the quality of training graduates. The key role in this process is played by the teachers, their professionalism and the responsibility for the results of their work are traditional for this professional group.

The international standard ISO [2] defines quality as a set of properties and

characteristics of a product or service that determine their ability to meet established or implied requirements. This applies equally to graduates (a product of the educational process) and to teachers (quality of educational services). The quality of the educational process is determined by three components: resources, technology and the result of this process. The resources at the university are students and teachers, the material and technical support of the educational process, technology is the educational process, and the result of the process is a graduate who must meet modern social needs for the medical profession.

Guidelines have a focus on the unification of learning technology. When developing recommendations, they took into account the assessment of the students' readiness for perception and the study of medical and preventive disciplines; recommendations of psychological and pedagogical science; the theory of the phased formation of mental actions [3]; competence-activity approach to learning [4], as well as many years of pedagogical experience of compilers.

Results. The discipline is based on the activity, system and invariant approaches. An illustration of the activity approach is the emphasis on students' independent work in studying the discipline, the basis of which is the use in the educational process of professionally oriented situational tasks in all sections and topics of the discipline.

The system approach is implemented in the methodological instructions using situational tasks focused on the ultimate goals of teaching the specialty “General Medicine”, that is, on the qualification characteristics of the graduate and the requirements and orders of graduating (clinical) departments of the specialty.

As the ultimate goals of training a graduate in the specialty "General Medicine" provides for the formation of the following professional competencies:

- ability and readiness to implement a set of measures aimed at preserving and strengthening health and including the formation of a healthy lifestyle, preventing the occurrence and (or) spread of diseases, their early diagnosis, identifying the causes and conditions of their occurrence and development, as well as aimed at elimination of the harmful effects on human health of environmental factors;
- ability and readiness to conduct preventive medical examinations;
- readiness to collect and analyze patient complaints, his medical history;
- readiness to teach patients and their relatives basic hygiene measures of a health-improving nature, skills of self-monitoring of basic physiological indicators that contribute to the preservation and strengthening of health, and the prevention of diseases;
- readiness for educational activities to eliminate risk factors and develop healthy lifestyle habits.

The methodological recommendations for the implementation of the educational process provides an invariant approach. The invariant of the content is the

methodology of preventive medicine, and the invariant of activity is the evidence of a causal relationship between changes in health status and the action of environmental factors. The activity invariant−the paradigm of hygienic diagnostics,− serves as an indicative basis for the activity of studying all sections and topics of the discipline.

With the modern understanding of the educational process as a unity of educational and educational work, applied by the teacher activity, systemic and invariant approaches should have an educational role. The substantive part of educational work when working with students is the active assimilation of skills of professional behavior in solving professional tasks that the ISO standard in the field of training and education is treated as a product of the educational process.

The developed guidelines are focused on solving problems of educational work. They are necessary as a methodological document when using a point-rating system for assessing students' knowledge. Unified requirements and didactic techniques should create the same conditions for mastering competencies, as well as guarantee the use of the same for all criteria for assessing the success of training.

The transparency of the point-rating system of monitoring current performance, strict adherence to the provisions of the rating by teachers and the ability to control the fulfillment of the rating conditions by students should eliminate conflict situations that would be interpreted as bias towards an individual student or group of students.

The arsenal of methods of educational work with the technology of instruction indicated in the guidelines should be the methods of persuasion, motivation and schooling. The effectiveness of these methods is achieved by monitoring and coordinating the systematic extracurricular work of students in preparing for classes, strict discipline and mandatory registration of a full report (protocol) of classes, the quality of which depends on the assessment of the topic being studied.

Educational work on the formation of professional qualities of a doctor have situational tasks with elements of differential diagnosis. Such tasks, as a rule, of increased complexity should be in the bank of situational problems. This type of problem is solved with the involvement of the whole group in the discussion, with the guiding and coordinating search for the correct (or plausible) solution to the role of the teacher.

Performing such a task has the potential of inculcating the skills of self-education, it allows you to critically evaluate your knowledge, skills and abilities when answering questions. The assignment in groups can be accompanied by discussions, debates on problematic issues, what should be considered both as vocational education and as education by the method of criticism and self-control. There is reason to believe that this kind of activity contributes to the formation of a critically reflexive thinking.

When monitoring and coordinating the implementation of various types of independent work, the training and educational value of the final lessons in sections with the discussion of typical errors when writing tests and solving individual situational problems have a meaning. Incentive and benevolent remarks expressed by the teacher manifest themselves in subsequent classes in the desire of students to consolidate the positive effect of their participation in the work and in the desire to perform the task in accordance with the requirements of the rating and their own level of success claims.

The thematic plan of the classroom can not cover the entire volume of the substantive part of the curriculum. Methodical recommendations provide for monitoring and coordinating the study of material that is not included in the thematic plan of lectures and practical classes, when students perform extracurricular independent work in the form of writing essays. For this purpose, an extended list of recommended additional literature is included in the methodological recommendations. Using it correctly, the teacher can provide the students with a variety of topics of abstract messages and at the same time avoid duplication of abstracts by students of different groups.

Conclusions

Methodical recommendations summarize the experience of the cathedral team over a fairly long period of time. The compilers of the methodological recommendations consider it possible to use them in the organizational and methodological development of the innovation process of the transition of specialty education to modular technology..

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在应用复合物的基础上，提高9-12岁青年柔道运动员的技术准备状态
IMPROVEMENT OF TECHNICAL READINESS OF YOUNG JUDOISTS OF 9-12 YEARS ON THE BASIS OF APPLICATION OF COMPLEXES THE CATA

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注解。 文章论述了柔道青少年体育后备人才的技术训练问题 - 奥林匹克运动。 该主题的相关性是由于柔道国际舞台上14岁以下运动员的竞赛规则发生变化，年轻的柔道运动员在竞赛中的兴趣减少以及技术准备不足造成的伤害。 使用cata复合物有可能有目的地形成9-12岁的年轻柔道摔跤手的重要技术准备。

关键词：柔道，cata复合体，竞技活动，年轻运动员，动机。

Annotation. *The article deals with the problem of technical training of the youth sports reserve in judo - the Olympic sport. The relevance of this topic is due to changes in competition rules for athletes under 14 years of age in the international arena in judo, a decrease in the interest of young judoists in competitions and injuries caused by their insufficient technical preparedness. The use of cata complexes made it possible to purposefully form a significant technical readiness of young judo wrestlers of 9-12 years old.*

Keywords: *judo, cata complexes, competitive activity, young athletes, motivation.*

Currently, the state of development of judo in Russia cannot be considered fully satisfactory. One of the reasons for this situation is that the sport of higher achievements continues to largely prevail over mass sports, because of which there is a sharp lack of a prepared reserve of athletes.

Judo is a Japanese martial art that combines self-defense without weapons, philosophy, a type of combat sports. Judo, according to the Japanese classification, belongs to the modern martial arts and is the only one adopted in the family of Olympic sports.

First, this is the only martial art of the East, adopted in the family of Olympic sports. Secondly, judo technique, in contrast to the same karate, is not shock, but wrestling - throws, painful techniques, strangulation and restraint (some of the techniques are studied only in the form of cata). In judo, in contrast to the shock styles of martial arts, the basis is the fighting techniques in the stance and on the ground, rather than strikes.

Thirdly, unlike other common types of wrestling - freestyle, Greco-Roman - in judo the emphasis is on maximizing the use of enemy power, which brings this style closer to aikido [3].

In judo, as in wushu and karate, besides fights there are complexes of formal exercises - cata. Cata are practiced in pairs and allow you to master the physical and spiritual principles of judo, as well as to safely study techniques that are prohibited in competitions for reasons of trauma [5].

Cata (Jap. 型 or 形) is a formalized sequence of movements related to the principles of conducting a duel with an imaginary opponent. All cata are designed for physical development, careful mastering of attack and defense methods, as well as for understanding the very essence of judo by the Japanese Kodokan Judo Institute [4].

The most important part of the sports training of children and adolescents are competitions. The main goal of judo competitions is to monitor the effectiveness of a specific training stage, to gain competitive experience, and to increase the emotional level of the training process.

According to the results of the study of Verzhbitsky (2011), the active participation of novice judoists in competitions enhances their interest in classes: 93% of respondents expressed a desire to participate in competitions. But at the same time, frequent falling into the number of losers orients children towards a decline in interest in classes: more than 70% of respondents expressed sufficient willingness to leave classes in a sports school [1].

To solve this problem and form a competitive experience for judoists at the initial stage of preparation, it is necessary to develop training competitions that allow simulating competitive conditions.

Certification in the form of cata is the best way to solve this problem. At certification competitions, a demonstration of technology is held in pairs: Tory, demonstrating technical actions, and Uke, helping in their demonstration. The winner is determined by the lowest number of penalty points.

Such approaches to optimizing competitive activities allow judo to begin at any age. Judoists can choose to participate in competitions in confrontation with a rival or to demonstrate equipment in standard conditions.

It is important for professionals working with younger groups to take into account at competitions not only the result, but the correctness of movement, a variety of technical actions, tactical elements of actions, and discipline of the participants [kororotov]. Studying cata, occupying better master the technique of judo, bring up control over themselves, because during cata it is necessary to maintain the rhythm and pace of technical actions.

The purpose of research: the improvement of technical readiness of young judoists of 9-12 years based on the application of cata complexes.

For the experiment, 2 groups were created: control and experimental (12 judoists in each group).

The control group was engaged in judo on the program of sports training for youth sports schools and included some training on the development of cata.

In the experimental group, classes were conducted according to a comprehensive training program specially developed by us, which included classes only on cata, as well as the use of various tasks on cards, outdoor games, including techniques.

For a more complete assessment of the level of technical readiness involved in both groups, we used the method of expert evaluation in our work. During the competitive activity of young judoists, a team of experts (3 people) assessed the quality of mastering the elements and parts of the reception, the reception as a whole (in simplified and complicated conditions). Evaluation criteria are presented in table 1.

Table 1 - *Criteria for evaluating the technique of performing throwing cata by young judoists*

№ п/п	Criterion name	Manifestation when performing reception	Score (points)		
			criterion does not appear	criterion is partially manifested	criterion expressed significantly
1	Expediency of provisions	Expediency of provisions (initial - intermediate - final)	0	1	2
2	Fusion of action	The connection of elements of technology: stand, capture, movement, debalancing, reception	0	1	2
3	Direction of effort	Tory's effort, Uke's effort	0	1	2
4	Range of motion	Accounting for interposition in the rack	0	1	2
	Total:		0	4	8

Testing the effectiveness of the use of the proposed exercises we conducted during the experiment.

Prior to the experiment, according to an expert assessment on an 8-point scale, a higher degree of motor skills formation was observed among the young judoists of the control group compared to the athletes of the experimental group. This difference was 3.8% and was of an unreliable nature (p> 0.05).

As a result of the implementation of the experimental program, there was a tendency of a higher degree of development of technical skills of cat in the experimental group of subjects, while the results of the formation of motor skills were significantly higher (p <0.05) than in the control group by 42.0% (Table. 2).

Table 2 - *Comparative analysis of intergroup differences in expert evaluation of the two groups involved in the course of the experiment*

Indicators	Measurement term	EG M±m	$P_{ЭГ}$	CG M±m	$P_{КГ}$	$P_{ЭГ-КГ}$
The expediency of the provisions, points	befor	2,3±0,4		2,5±0,3		>0,05
	after	5,0±0,4	<0,05	3,0±0,4	>0,05	<0,05
Fusion of action points	befor	2,6±0,3		2,8±0,2		>0,05
	after	5,0±0,4	<0,05	2,9±0,3	<0,05	<0,05
Direction of effort points	befor	2,5±0,5		2,6±0,2		>0,05
	after	4,9±0,3	<0,05	2,8±0,4	<0,05	<0,05
The range of motion, points	befor	2,6±0,4		2,7±0,3		>0,05
	after	5,1±0,4	<0,05	2,9±0,2	<0,05	<0,05
Overall Grade	befor	2,5±0,4		2,6±0,3		>0,05
	after	5,0±0,4	<0,05	2,9±0,3	<0,05	<0,05

We see that the average value of the expert assessment put down by a specially created team of specialists from the experimental group (5.0 points), which exceeds these figures for those involved in the control group (2.9 points) and corresponds to the indicators "above average". The advantage of dealing with the experimental group can be seen in Figure 1.

In the subsequent classification competitions in cata, all 12 athletes of the experimental group met the standards of 4 and 5 Kyu, while only 6 of the athletes in the control group met these standards.

The study led to the following conclusions:

1. Young judoists can successfully master quite a lot of technical actions up to the skill stage, but the skill to form is very difficult. If we raise the requirements for action, then we have to retrain, because many actions are absorbed in a quality that does not withstand the increased requirements. In this case, the use of cata allows you to first learn the technique and have to develop further from the technique.

2. The main negative consequences for young judo wrestlers were: reduced interest in competitions and injuries caused by insufficient technical readiness.

Participation of young judo wrestlers in cata competitions allows avoiding injuries and increasing motivation for training and competitive activities by getting student Ky.

3. The use of throwing cata techniques allowed to improve the judo technique of athletes 9-12 years of the experimental group, as evidenced by the evaluation of the expert committee and performance indicators in the competitions of participants in this group.

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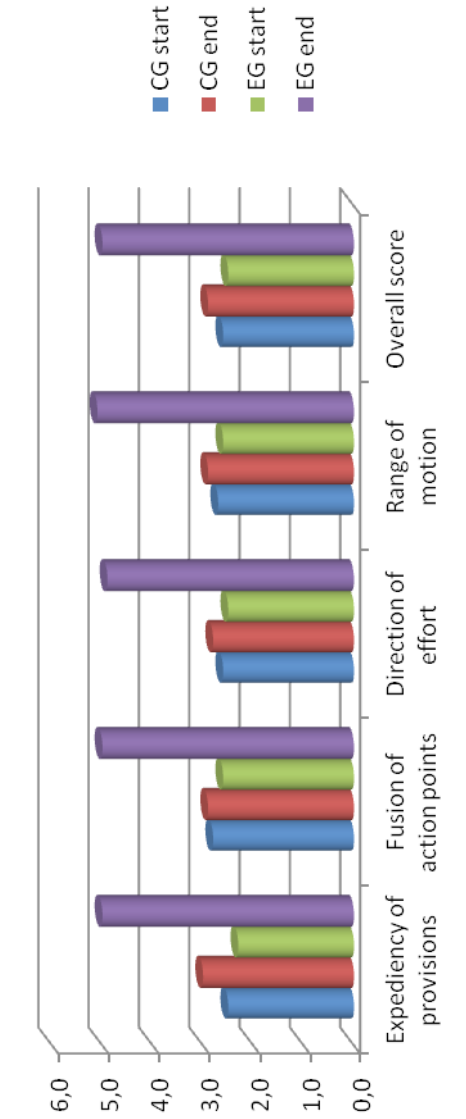

Fig. 1. *Indicators on the criteria for expert assessment of the EG and CG during the study*

教师愿意与资优学生互动（来自萨马拉天才儿童区域中心与RAS体育学院萨马拉分校办公室合作的经验）

THE TEACHER'S READINESS TO INTERACT WITH GIFTED STUDENTS (FROM THE EXPERIENCE OF COOPERATION BETWEEN SAMARA REGIONAL CENTER FOR GIFTED CHILDREN AND SAMARA BRANCH OFFICE OF PHYSICAL INSTITUTE OF P.N. LEBEDEV OF RAS)

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注解。 本文论述了与资优学生合作的教师专业能力现代教育的热点问题。作者认为教师愿意与资优学生互动，在与资优学生互动时描述教师的主要活动点，并介绍萨马拉资优儿童区域中心与体育学院萨马拉分校之间合作的经验。 PN RAS的Lebedev。

关键词：资优，有天赋的学习者，教师准备，合作，认同，伴奏。

Annotation. *The article deals with topical issues of modern education of professional competence of teachers working with gifted students. The authors consider the readiness of teachers to interact with gifted students, characterize the main points of activity of teachers when interacting with gifted students, and also present the experience of cooperation between the Samara Regional Center for Gifted Children and the Samara Branch o of Physical Institute of P.N. Lebedev of RAS.*

Keywords: *giftedness, a gifted learner, teacher readiness, cooperation, identification, accompaniment.*

In the next decade, Russia needs to make a powerful technological breakthrough to minimize its gap with the technologically advanced countries. Accordingly, the issue of professionalism of future specialists, as well as the quality and

level of their training, the creation of the necessary conditions for the development of students' ability to set and solve essentially new tasks, clearly orient themselves in a large flow of scientific information and at the same time maintain creativity, the desire for self-development and self-improvement Throughout his life, faces Russian education as never before.

Progressive scientists of the world believe that our humanity can get away from many global problems and continue to exist thanks to the achievements of gifted and talented individuals. And, according to V. Yurkevich, "... the prosperity of society depends on the development of spiritual, personal human resources, the effectiveness of establishing a creative space for the development of children's abilities, their constructive and personal capabilities" [26].

The modern Russian school is often faithful to the old traditions, trying to convey to students only a large amount of information. The ability to independently identify a problem and find ways to solve it, to respond flexibly to new information, that is, the ability to put into practice the received theoretical knowledge, is poorly developed among schoolchildren.

In addition, on the part of the developers of such technologies, in order to preserve the quality, systematic work is needed, which includes training, practice and internships for teachers, methodological support, a system for testing of acquired skills, and author support.

But it is impossible only to recognize the talent, to develop and preserve its creativity, it is required to create a system of its support, a system of special conditions for expanding the capabilities of a given person, for its further effective self-realization in its professional activity in each individual case.

When interacting with gifted students, just algorithms are not enough, it is necessary that the teacher can adapt the obtained theoretical information for each gifted student.

Gifted students are expected to develop constructively and maximize returns in various spheres of human activity, which is the source of requirements for scientists to create identification methods and ensure effective development, training and education of gifted students [27].

Based on the available research, A. Melnikova proposed a psychological model of preparing a teacher for interaction with gifted students [14].

D. Bogoyavlenskaya, N. Leites, J. Renzulli, K. Rogers, A. Khutorsky conducted research on the personal qualities of teachers who promote successful cooperation with gifted students [1,6,7,8,20,23].

The phenomenon of giftedness as an object is studied by D. Bogoyavlenskaya, E. Ilyin, V. Molyako, A. Savenkov et al. [1,4,15,21].

Teachers are expected to have quality actions to ensure the development of students' abilities. Implementation of this is impossible without special training. At the same time, a global synthesis of science and practice is needed, as a result

of which appropriate strategies will be created to shape the teacher's readiness to interact with gifted students.

The projection of a teacher's readiness to teach a gifted student is determined by the ability to effectively carry out professional activities to create comfortable conditions for the full, harmonious development of a gifted child.

The teacher's readiness is based on his personal talent, special knowledge, skills and abilities, intrinsic motivation, certain character traits that allow him to search, develop and implement students' abilities at an optimal and sufficient level [27].

It should be noted that the teacher's willingness to interact with gifted students is characterized as a system of psychological and pedagogical relations of a subject-subject nature, which is aimed at developing the abilities of the gifted student and improving the professionalism of the teacher.

Consequently, the teacher's willingness to interact with a gifted student is reflected in a system that contributes to the intellectual, creative, spiritual development of the student, as well as providing the necessary learning and education conditions for the implementation of this development. The creation of certain conditions is possible with the appropriate professional activity of the teacher, the availability of the necessary material base for its implementation, support for relatives. In turn, the effectiveness of professional activity depends on the availability of appropriate theoretical training. Knowledge of pedagogical laws is the basis of teacher creativity, without knowledge of the theory of learning there is a danger of amateurism in the profession. In the pedagogical interaction with gifted students, the special personal qualities of the teacher are important [27].

In technologically advanced countries, seeking and supporting gifted children is a national priority. In different countries, given their different economic opportunities, history, culture and mentality, the ways to solve this problem will certainly be different. Moreover, even on the scale of one country, the solution of a problem for its different regions may be different. Russia in this sense is no exception.

Before looking for ways to find and support gifted students, it is important to understand the reasons that impede the student's creative development. Such reasons can be many. With this approach, it is important to pay attention to one well-known fact: the creativity of middle school students is higher than that of high school graduates and significantly higher than that of university students. An analysis of the reasons for this may provide an answer to the question of how to identify a gifted learner and, most importantly, how to preserve and develop his creative potential. Moreover, the life course of the student, and not only gifted, at the present time in most cases looks fairly standard: "school → university → chosen place of work".

As for the natural sciences, the gifted student in this period of his studies easily masters his favorite subject and at the same time absorbs a huge amount of information on the subject outside the school. Currently, popular science programs on television and Internet sites have become such external sources of information for the child.

It is important to emphasize that the sources from which gifted students draw interesting information for them may be completely different and completely unknown to the teacher to whom the student addresses for clarification. Because at this stage of development the teacher should be the main authority for the gifted learner. In this situation, the teacher must have the highest qualifications in order to be able to answer any student's question within the framework of the knowledge that the student already has. Moreover, the answer should be such that not just to support the student's interest, to the topic that interests him, but to "load" him with new information and suggest to sort it out. A gifted learner must constantly be "loaded" to preserve and improve his creative potential.

One of the ways to develop a creative personality is to participate in various kinds of competitive events: competitions, contests, and conferences. Obviously, this is practically the only current activity of a teacher that can contribute to the development of a student's creative potential. However, all these activities within the school can only contribute to the creative development of the individual, but they can not be completely sufficient to develop and support the creative personality.

Training graduates of some universities often do not meet modern requirements of employers. In this situation, if university graduates do not represent the requirements of modern production, then schoolchildren are simply completely cut off from the problems of employers, and hence the industries of the region. For research institutes and universities, the results of those "research" works that are performed by modern schoolchildren are absolutely not relevant.

It should be noted that research activities in education have been studied by a number of scientists and teachers. A description of the approaches to this type of activity of students can be found in the works, L.P. Gurieva, E.N. Kikot, A.V. Leontovich, E.M. Muraveva, V.S. Mukhina, P.I. Pidkasisty, and others [3,5,9,10,16,19]. Project activities in education are also a popular topic for scientific and methodological work in the field of pedagogy. Theoretical and methodical recommendations can be found in the works of V.I. Slobodchikova, I.D. Chechel, practical solutions are proposed in the works of N.V. Matyash, A.M. Novikova, N.Yu. Pakhomov and other authors [12,13,17,18,22,24].

Analyzing the problems outlined above, the Samara Regional Center for Gifted Children is working in cooperation with the Samara branch of the P.N. Lebedev Physics Institute of RAS in the direction of preparing students for project activities (Figure 1) with the active participation of leading universities in the region: Samara State Technical University, Samara National Research University named after S.P. Korolev, Samara State Medical University, Volga State University of Telecommunications and Informatics.

The result of the active and fruitful interaction of the Samara Regional Center for Gifted Children and SB FIAS was the inclusion of four SRTSOD students in the Russian team and their presentation at international conferences INTEL – ISEF (USA) in 2016, 2017, 2018.

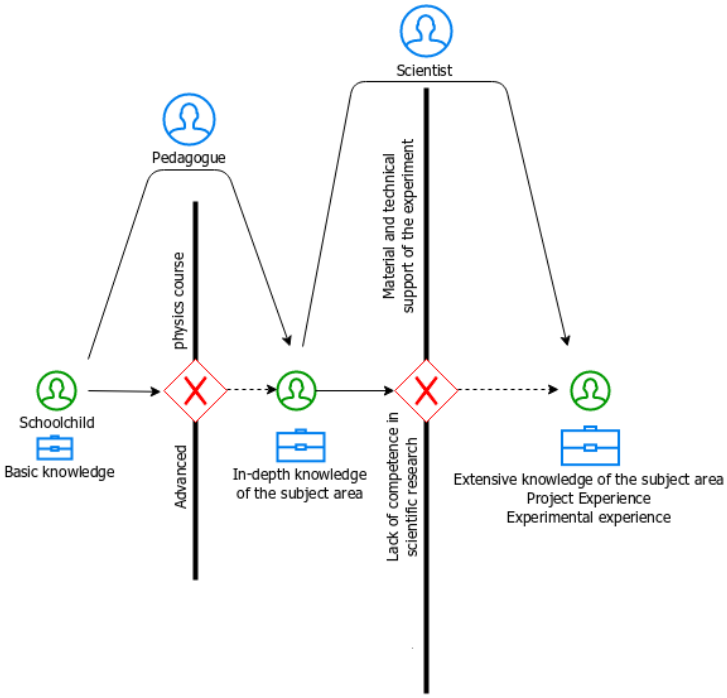

Fig.1. *Scheme of preparing students for project activities in conjunction "Samara Regional Center - SB FIAS"*

This interaction is carried out as follows. At the first stage, the learner interacts with his teacher, and reveals his creative potential, and then passes under the patronage of a scientist working at an academic institute. From this point on, the student's knowledge and skills are subject to significantly higher requirements. In his possession, to a certain extent, the entire scientific and technical potential of the institute is rendered. But the requirements for the choice of the subject of research and development and results are significantly higher than those that are shown in most contests and conferences at the present time.

The experience of interaction between the Samara Regional Center for Gifted Children and SB FIAS allows gifted students to gain access to a modern complex of research and engineering equipment, to integrate into the work of promising child-adult project groups, to access a systematic database of topical scientific and technical problems of the region, by Consolidation of resources of science, education, production, business and the Government of the Samara Region for solution of topical issues of the region.

The task of modern education is to introduce the learner to the content of the concept of the modern scientific and technological revolution and to engage in the problems and development processes of modern science and technology. In this regard, the themes of design and research works that students of the Center carry out, as well as the requirements for the level of these works, necessarily meet the meaning and content of the current scientific and technological revolution.

As a rule, is very difficult for a student to choose the theme of their project work. They does not know and, accordingly, cannot navigate in the spectrum of pressing problems and tasks facing the organizations of the Samara region. And even if large enterprises are well known, the schoolchild cannot articulate his professional attitude towards them due to his more than modest personal life experience.

Thus, the teacher's willingness to interact with gifted students is characterized by his ability to create such conditions for the development of a gifted student, under which his intellectual, creative, and spiritual development takes place. At the same time, the teacher’s personal qualities, intrinsic motivation, theoretical training and personal talent are important.

The article describes the positive experience of interaction of teachers with gifted students in the framework of cooperation between the Samara Regional Center for Gifted Children and the Samara Branch of Physical Institute named after P.N. Lebedev.

Cooperation with SB FIAS is relevant and important not only in organizing the research activities of students, but also from the point of view that the institute has extensive experience in working with leading enterprises of the Samara region to identify production problems that can be solved together, because it has the base of current tasks of enterprises and organizations of the Samara region.

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当代语言的语言和文化“肖像”：全球化背景下的协同作用和整合
LINGUISTIC AND CULTURAL “PORTRAIT” OF CONTEMPORARY LANGUAGE: SYNERGY AND INTEGRATION IN CONTEXT OF GLOBALIZATION

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The modern world is moving more and more actively in the direction of globalization, and this is statement, which does not require additional argumentation! In fact, even before the globalization process itself began, futurologists and forecasters, such as, for example, Jacques Attali, at the very beginning of the last decade of the 20th century, formulated the main directions of globalization, which, in their opinion, consisted in the globalization of information that is, in the formation of a single global system of genesis; in the storage and transmission of information and information exchange; in the globalization of the entire financial system until the emergence of a single world currency; in the sharp and sustainable intensification of cross-border mobility of citizens, up to the formation of the so-called corps of “citizens of the world” (fr. citoyen du monde), a-la Homo Faber, Max Frish.

It is obvious that today we live in conditions of intensive flow of these processes, which, besides the possibilities for modern and future world society, carry a very serious range of challenges and trends, the question of finding adequate answers to which attracts more and more attention at the level of the whole civilization generally. One of these objective trends that give rise to a wide range of issues is the trend of the absence or poor understanding between representatives of different countries and peoples, caused by language differences and, more deeply, by the difference of mentalities. A way out of this situation has long been proposing the formation of a single world language, which, if not erased, would minimize the linguo-mental differences between representatives of countries and peoples, significantly advancing them along the path to the formation of a single global society.

Turning to the linguistic history of modern civilization, it should be noted that the issue of forming a universal means of communication and information exchange has been standing for a very long time. There were several practical approaches to the development of human society. One of the first that could be called the formation of a single inter-dialect language Koine in ancient Greece (Greek: κοινὴ διάλεκτος).

Its genesis is not completely clear, but, most likely, it took shape in the Hellenistic period of the 4th — 3rd centuries. BC er on the Ionian-Attic dialect basis and served as a single language of business, scientific and fiction of the Greeks until the II-III centuries. AD The second forced attempt to create a common language was the formation of the lingua franca, which developed in the Middle Ages in the Mediterranean and served mainly for the communication of Arab and Turkish merchants with Europeans. With the Venetian dialect of Italian as the most powerful lexical base, combined with significantly smaller volumes of Spanish and Provençal vocabulary, as well as interspersed with elements of Greek, Arabic, Persian and Turkish, the Mediterranean language (lingua franca) functioned as a means of communication with doing business in the Mediterranean region almost until the XIX century. Also, the broadest process of forming pidgin as simplified linguistic means of information exchange between carriers of partially understandable or completely incomprehensible languages fit into this outline. Vivid examples of pidzhinov are fanagalo, Russenorsk, Kyakhta language and a number of others. Developing in the conditions of demographic growth of carriers and not passing value of pidgin as a means of communication and information exchange, over time, some of them, such as Creole, became independent languages based on regular (everyday, routine), rather than episodic contacts of speakers of different languages.

In the second half of the 19th century, world linguistics began to address the issue of the scientifically based formation of a single language, designed to become a universal worldwide means of communication and information exchange. The pioneer here was L.-M. Zamenhof, who proposed in 1887, after a decade of work, the so-called Esperanto language, which he expounded in the brochure "Lingvo internacia. Antaŭparolo kaj plena lernolibro "(" International language. Preface and full textbook "). Having become a world-wide lingosphere phenomenon, Esperanto spawned a wide range of artificial languages similar in its genesis, claiming to be universal and worldwide. So, already in 1907, the Ido language was created, which became the most prominent branch of the descendants of Esperantoids. The creation of this language gave rise to the split of the Esperanto movement, when some of the former Esperantists switched to Ido. However, most Esperantists remained faithful to their original language. Identical, 20 years later, in 1928, survived the split and the Ido language, when another Esperantoid was created - Novial, defined as "improved Ido". Less visible options - the languages of neo, esperantido and others, currently, are practically not used in live communication.

From the above analysis it can be seen that none of the methods considered could ever become the basis for the formation of a universal language beyond the limits of one or another region or group of speakers. However, the tendency to form, in perspective, a kind of single global language is obviously objective. Claims to occupy this place today expressed in respect of English, Chinese and

Spanish, according to the principle of statistical evaluation of the number of speakers. Nevertheless, according to the author, the globalized means of international communication will be the new language, where the paradigm of linguo-culturological portraying can act as an approach to determining its possible promising features. Consider it in more detail.

The basis for the formation of a linguistic-cultural portrait of a language, at this stage of the development of civilization, in general, are the differences in the ways in which people express their thoughts in writing and orally. At the same time, individual differences of expression do not exclude even the identity of the content of the message. Under these conditions, it becomes possible to formulate some conclusions regarding the specific features of a particular language, based on the analysis of oral speech or the written language of its speakers at a specific point in the time period. Research in this direction has been done in world linguistics for a long time. Consider them in more detail.

One of the first to solve this problem came close to American researchers in the late 50s of XX century. The starting point, in their paradigm of the formation of a linguistic-cultural portrait of the language at that time, was a statistical and frequency analysis of the use of words or idiomatic expressions, which was quickly carried out using computers and special programs. However, the limitation here was the complete absence of thematic and social contexts in which a particular text was expressed or written. They tried to search for a solution to this problem in two main ways: by deepening the mathematical (frequency-statistical) text analysis and trying to form a comprehensive text analysis methodology, designed to take into account, if not all, most of the factors.

Later, rather quickly, two main analysis strategies were lined up. The first was formed under the influence of the works of the famous American psychiatrist Lewis A. Gottschalk, who, having accepted psychoanalysis as the basis of his methodology, suggested evaluating each item in the proposal from the point of view of mental orientation. The control procedure for the Gottschalk method was the analysis of the voiced stream of consciousness, when within 5 minutes the individual voiced the thoughts that were currently in his mind. In consequence, on the basis of the analysis of the recording of this text, coherent or incoherent, by means of the same frequency-statistical analysis, key words and phrases were revealed that were given a psychoanalytic interpretation. Developing this approach, by the end of the 1980s, another American psychiatrist, Walter Weintraub, proposed to divide words and phrases into 15 categories, each of which was given a psychoanalytic interpretation and based on the frequency of use of which, the speaker’s speech portrait was built. In the same perspective, V. Styles acted as well, who in the early 90s of the last century accepted the above method as a basis, but turned it towards recognizing the speaker's intentions based on the taxonomy of the utterance forms.

The second analytical strategy was the analysis of the conceptual framework. This approach assumes that one or several general concepts through which a person tries to express his thoughts can be analyzed by examining the specific words that an individual uses to express these general concepts outside. Thus, in relation to each such general concept, complexes of words and expressions were selected, through the use of which the individual not only expressed a particular concept, but also revealed his psychological state, his personality traits. The main tool for implementing this strategy was a special questionnaire, formed in the traditions of the Harvard school. Quickly enough, it was used to determine the characteristics of specific individuals, the lingual social and linguistic cultural roles they implement and to predict various aspects of their behavior and activities. By the end of the 70s of the twentieth century, this technology, equipped with computer programs, began to come to the fore on the broadest front: it is used and used to identify mental illness, analyze the interrogations of arrested offenders and, of course, to form a complete picture of the link-cultural-cultural portrait language in general.

From the above analysis it can be seen that the last 35-40 years, and even today, the main focus in the theoretical rationale for constructing a speech portrait is either the frequency-statistical or psychoanalytic paradigm, which opens up a wide field for research in terms of the formation of an integrated approach to identify those or other linguocultural traits. They are already actively used in practice in foreign media, primarily American, where for several generations research has been conducted on anonymous messages that contain both criticism of political figures and their support. That's how the American press, represented by The New York Magazine's Donald Foster, a reviewer, managed to find out that Joe Klein is the author of the Anonymous political bestseller Basic Colors, which reveals the essence of the work of President Clinton's office in conducting an electoral company.

Considering the above, the author states that these techniques, with all their effectiveness, are sufficiently cumbersome and require extensive statistical material, powerful hardware, software and methodological support. In such conditions, the author would like to propose her own method of forming a linguistic-culturological portrait, where, starting from the Aristotelian methodology, she proposes to identify three enlarged groups of language features - "ethos", "pathos" and "logos". They can be tied to specific linguistic characteristics (syntax, morphology, etc.), which, together with socio-cultural features, will allow to form a comprehensive linguocultural urological portrait of the language of a particular epoch and forecast its transformation for the future.

Considering them in more detail, it should be noted that the basis of this technique is the three-term concept proposed by Aristotle, including "ethos", "pathos" and "logos", to which the author gives a slightly different content. Initially, the

concept of "ethos" came to us from ancient Greek philosophy (Greek ἦθος) and, in literal translation, it means character, character, and emotional warehouse. In the discourse of ancient Greek philosophy, this term defined the habits, morals, character, temperament, customs. In fact, he acted as a special cut of human reality - a certain class of individual qualities correlated with specific habitual forms of social behavior. Generally, in the structure of the linguistic "ethos", Aristotle, in the end, distinguished the following components:

- phronesis (Greek φρόνησις) - practical skills and wisdom;
- arête (Greek ἀρετή) - dignity, perfection;
- eunoia (Greek εὔνοια) - goodwill to the audience.

“Paphos” (Greek πάθος), literally meaning suffering, passion, excitement, enthusiasm, is, according to Aristotle, a way of speaking that “arouses the emotions of the listeners in order to encourage them to side with the opinions expressed by the speaker.” In these conditions, he defines “pathos” as one of the three essential methods of proof, realized by giving the speaker an emotional voice, which, in turn, should arouse identical emotions in listeners. So, in the words of Aristotle himself, “in order to understand emotions, then b, to name and describe them, it is necessary to know the reasons giving rise to them and the ways in which they come to the listener. ”Therefore, the“ pathos ”is organically linked to the“ ethos ”, which is intended to define positive and negative ideals for the listeners.

In turn, "logos" (Greek. Λόγος), means literally a word, thought, meaning, concept. From the perspective of Aristotle's rhetoric, “logos” represents the semantic meaning of what has been said, for it concerns the speech itself, where words and phrases prove the position of the speaker or must prove. In his rhetorical system, Aristotle put the "logo" in the first place as the most controlled and, at the same time, effective means of communicating his position to the listener (interlocutor). In turn, "logos" (Greek. Λόγος), means literally a word, thought, meaning, concept. From the perspective of Aristotle's rhetoric, “logos” represents the semantic meaning of what has been said, for it concerns the speech itself, where words and phrases prove the position of the speaker or must prove. In his rhetorical system, Aristotle put the "logo" in the first place as the most controlled and, at the same time, effective means of communicating his position to the listener (interlocutor).

Transposing the modification of the method for constructing a speech portrait of a person set forth in the author’s, we shall set it out in more detail. So, the starting point for constructing a speech portrait of a language is the formation of its “ethos”. It will include two important parts: first, these are the individual psychophysical qualities of its carriers - character, temperament, excitability threshold, physiological pitch of the voice, given speech speed, etc., secondly, national-historical experience, directly determining Which of the individual physiological qualities are most pronounced in language and speech.

The second component is the "pathos". Its definition begins with a simple reflection of emotionality in the speech of speakers of the portrayed language, which at the initial stage is determined by a three-dimensional scale - high-medium-low. Further, those themes of monologue and dialogical speech that correspond to a specific type of emotionality are identified. Vocal-phonetic features of speech that directly depend on emotionality are identified, individual or geographical dialects and dialectisms are determined.

Finally, the third stage of speech portraying is the logical-semantic analysis of the speech of an individual speaker of the language from the perspective of how the lexemes and idioms used by him to express his thoughts and reason the judgments show psychophysical and social features characteristic of the speaker of the language, and also, his inherent emotionality, expressed in vocal and phonetic features.

Based on the foregoing, and taking into account the current situation of linguistic cultural studies throughout the world community, complex studies of the "portrait" transformations of the modern language are needed in the context of both synergy and integration in the process of globalization.

医科大学生体育活动的研究
STUDY OF PHYSICAL ACTIVITY OF MEDICAL UNIVERSITY STUDENTS

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注解。 本文介绍了I.M. Sechenov之后我莫斯科国立医科大学学生运动活动的研究数据。 我们通过询问牙科，医学和医学预防学院的学生来使用调查方法。 对920名受访者进行访谈的结果显示，他们的身体活动水平与平均负荷的普遍程度不同。 根据我们开发的量表和主观感受对身体活动进行的比较分析表明学生对他们的身体活动进行了过度的自我评估。 学生的人体测量参数明显依赖于他们的身体活动水平。

关键词：体育活动，学生调查，体重指数。

Annotation. *The article presents the data of own research of the motor activity of students of Sechenov First Moscow State Medical University. We used the survey method by questioning students at the dental, medical, and medical-preventive faculties. The results of interviewing 920 respondents revealed different levels of their physical activity with the prevalence of average loads. Comparative analysis of physical activity according to the scale developed by us and subjective percep-*

tions showed an excessive self-assessment by students of their physical activity. There is a clear dependence of the anthropometric parameters of students on the level of their physical activity.

***Keywords**: physical activity, student survey, body mass index.*

In accordance with the WHO Global Plan of Action 2013–2020. For the prevention of non-communicable diseases, an increase in the physical activity of the population is required [1].

According to the WHO definition, physical activity is any kind of body movement produced by skeletal muscles that requires energy consumption, including activity during work, play, homework, travel and recreational activities [3].

Physical activity is considered as the leading mechanism of integration of the whole organism. Regular exercise increases its adaptive and protective properties, normalizes metabolic processes, optimizes the work of all organs and systems.

Prolonged limitation of movements causes a violation of the processes of nervous and humoral regulation, the emergence of trophic and regenerative changes in the musculoskeletal system, its neuromuscular and bone components, an increase in adipose tissue, a decrease in the functional activity of the cardiovascular, respiratory, endocrine and other systems of the body, development of depression, neuropsychiatric disorders.

Negative consequences of motor activity deficiency can affect the health of students, including studying youth, due to the large amount of time spent on training activities. Forced hypokinesia at this age is a risk factor for the deterioration of the adaptive mechanisms of the circulatory system to physical exertion, reduced muscle tone, elasticity of ligaments and tendons, disruption of complex cortical-subcortical interactions and, as a result, development of rapid fatigue, reduced mental performance, functions of attention, thinking, memory, the formation of emotional instability [2].

Given the urgency of this problem, at the Department of General Hygiene I.M. Sechenov FMSMU study the physical activity of students as one of the elements of a healthy lifestyle.

Studies were conducted by the survey method using a questionnaire developed by the department staff.

The questionnaire questions provided an idea of the degree of physical activity of 920 students of the 2nd and 4th courses of the dental, medical and preventive medical faculties both at the University, including all movements and physical education classes on schedule, as well as additional types of physical activity (classes in sports sections or independently, their regularity, duration, frequency, various movements during the day / week and other physical activities). The results of a sociological survey were used to analyze the students' subjective assessment of the level and sufficiency of their physical activity, their motivational attitude (both positive and negative) to physical culture.

According to anthropometric studies, for each respondent, a mass- height rate was calculated - body mass index (BMI) and the percentage of body weight from the ideal.

As a result of the analysis of the questionnaires, the following results were obtained: 89% of respondents believe that the doctor is obliged to maintain an adequate level of their physical activity. It was established that 27.6% of respondents regard their locomotor activity as optimal, 47.8% as average, 15.2% as high, and 9.4% as low. About half of the students (48.6%) consider the amount of physical activity for themselves insufficient and would like to increase it, however 29.9% of them do not currently have such an opportunity (a large classroom and extracurricular study load, scientific activity).

At the time of interviewing, 66% of students were involved in additional sports (38% - regularly, an average of 5 hours per week), of which 63% - independently (at home, in the hall, in the pool, on the street). Group classes were attended by 29% of respondents; 8% engaged with a personal trainer. The motivation for the majority of students (76%) is the desire to be fit, maintain a level of health, relieve stress, strengthen their will, get positive emotions, improve their leisure time, the need for movement. Dancing, swimming, athletics (running), football, volleyball and basketball were considered the most popular sports.

34% of students limit their physical activity to 2-hour classes at the University, provided by the curriculum. Among the reasons for the negative motivations for classes, the following were most often indicated: lack of free time - 62%, general unwillingness - 22%, lack of sports facilities near the house - 5%.

In the morning gymnastics, from time to time 73% of the students are engaged, but only 5% regularly (5-7 times a week). The average gymnastics time was 5 minutes.

Physical activity during the day is also assessed by such activities as cleaning apartments, walking with children, animals, shopping, working on the garden, hand washing, ironing. 44% of respondents noted these activities. About 85% of students work in addition to their studies. 75% of respondents rated as medium and high.

To quantify the degree of motor activity, as a rule, use the indicators of energy consumption during exercise and the number of locomotion per day. Physical activity is also classified according to the total (weekly) time spent on physical education or the nature of motor regimes from passive (low) level of motor activity in the absence of elements of purposeful use of physical exercises to a high level characterized by regular intense physical exertion [4].

In our work, in order to obtain a more objective picture of the students' movement regime, a conditional ball scale was used with assigning to each type of physical activity a certain number of units (points). This allowed classifying levels of motor activity, including:

• low level of activity - up to 11.4 points, which is no more than 30% of the maximum of motor activity;
• activity level is below average - 11.4-17.1 points (up to 45% of the maximum motor activity);
• average level of activity - 17.1-22.8 points (up to 60% of the maximum motor activity);
• activity level is above average - 22.8-30.4 points (up to 80% of maximum motor activity);
• high level of physical activity - more than 30.4 (above 80%).

The results of processing the questionnaires according to the presented point system indicate some overestimated subjective assessment by students of their physical activity. Thus, the percentage of respondents with low motor activity was 25.7, in contrast to the subjective assessment of 9.4%. The level of average motor activity on a scale was detected in 30.8% of students (subjectively - 47.8%). Physical activity above the average level was observed in 7.4% of their subjective representations interviewed against the background of subjective judgments - 27.6%. A high level of motor activity was registered only in 0.74% of respondents, which is 20.5 times lower than subjective indicators. At the same time, the lower the objectively physical activity of students, the more the results of their subjective assessment of physical activity are overestimated. In particular, in groups with low and low motor activity, only 14% of respondents adequately assessed their physical activity. 53% of students attributed themselves to the group of the average level of exercise, 24% to the group of increased motor activity, and 8.4% to the group with high rates of physical activity. In the group with an average level of physical activity, 40.4% of students adequately rated their motor load.

The results of anthropometric studies showed that 63.5% of the students surveyed had normal body weight with a BMI in the range of 18.5 - 25.0. 19.7% of students revealed the first degree of energy deficiency - their BMI was in the range of 17.5-18.4. 16.8% of respondents at the time of the survey were overweight, with a BMI of more than 25.0 and a percentage of body weight from ideal more than 110. Of these, 26% had grade I obesity (BMI over 30).

Analyzing the causal relationships depending on the actual body weight on the degree of physical activity, it was found that 52% of students with overweight, the level of physical activity was low and lowered. Subjectively, only 8.6% of respondents with a BMI of more than 25 rated their physical activity as low. 65% of the interviewed believed that their physical activity was at the level of the average, and 13% of the students indicated a high level of their physical activity. Although in the same group, 86.9% of respondents agreed that their physical activity was still insufficient.

According to the quantitative point score, an average level of physical activity was registered in 43% of overweight students. One of the reasons for this discrepancy, in our opinion, may be an insufficient amount of physical activity and their irregularity. Systematic training provides adaptation of the body to physical stress, helps to enhance its maximum functionality. The volume of training sessions includes their duration, frequency and intensity, taking into account the age and degree of functional fitness. Only by observing all the above principles of organizing physical education and sports can the necessary positive result be achieved to maintain health, fitness of the body and its physical form.

Conclusions

1. The results of the survey of students at the Medical University revealed different levels of their physical activity with the prevalence of loads approaching the average.

2. Comparative analysis of the survey questionnaires using a scale of points and subjective views showed a somewhat overestimated self-esteem by students of their physical activity, an explanation of which may be, including their lack of competence in the criteria for grading motor activity levels.

3. According to anthropometric studies, more than half of the students (63.5%) had normal BMI values. In the group of respondents with an overweight, 52% of them had reduced levels of physical activity. The presence of high rates of BMI in the same group against the background of moderate physical exertion may indicate a possible inadequate amount of training sessions and their irregularity.

4. To improve the level of health, physical activity, to achieve optimal physical fitness, proper organization of the physical activity regime is required in accordance with the recommended regulatory documents for young people (WHO Global Recommendations on Physical Activity for Health, requirements of the All-Russian Sports Complex "GTO" [2]).

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骨 – 肌肉系统和结缔组织一般和主要病态疾病趋势指标在北奥塞梯共和国 – 阿拉尼亚

BONE-MUSCULAR SYSTEM AND CONNECTIVE TISSUE GENERAL AND PRIMARY MORBIDISM DISEASES TREND INDICATORS IN THE REPUBLIC OF NORTH OSSETIA-ALANIA

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抽象。 根据该研究，揭示了北奥塞梯 – 阿兰尼亚人群中肌肉骨骼系统和结缔组织的一般和主要发病率。 在共和国的某些地区，肌肉骨骼系统疾病的发病率和患病率超过了共和党的平均水平。 大龄儿童（15–18岁/年）的总体发病率显着增加。 统计分析表明肌肉骨骼系统疾病结构发生了严重变化，这是彻底研究这些疾病传播的合理理由。 确定的指标将允许继续这方面的研究，更深入地研究北奥塞梯 – 阿兰尼亚人口中肌肉骨骼系统和结缔组织疾病的问题，目的是有效规划和提供专业医疗，包括高-tech。

Abstract. *According to the study, high rates of general and primary morbidity of the musculoskeletal system and connective tissue among the population of North Ossetia-Alania were revealed. In certain regions of the republic, the incidence and prevalence of the musculoskeletal system diseases exceed the average republican level. A significant increase in the overall incidence was noted in the group of older children (15-18/ year). The statistical analysis indicates serious changes in the structure of diseases of the musculoskeletal system, which is a rational justification for a thorough study of the spread of these diseases. The identified indicators will allow to continue research in this direction, to study more deeply the problem of diseases of the musculoskeletal system and connective tissue among the population of North Ossetia-Alania with the goal of effective planning and provision of specialized medical care, including high-tech.*

Background. Diseases of the musculoskeletal system and connective tissue occupy one of the leading places in the structure of the incidence and prevalence of the population of the Russian Federation and other countries of the world, representing, in most cases, chronic pathology [1]. At the present stage, diseases of the musculoskeletal system and connective tissue are a topical medical and social problem not only of national, but also of global importance. Medico-social significance of this pathology is determined by their prevalence, chronic progressive course, the increase in the rates of newly diagnosed morbidity, temporary and permanent disability, as well as a decrease in the quality of life and a reduction in its duration [2]. Musculoskeletal diseases, including more than 100 diseases and syndromes, are the most common cause of long-term pain and disability, affecting hundreds of millions of people around the world. Effective organization of preventive care and rehabilitation for patients with the musculoskeletal system (MSS) disorders aimed at the direct and indirect mitigation of society losses by reducing morbidity, temporary disability and disability is a priority of health care and social services. Effective planning and provision of specialized medical care, including high-tech, for patients with MSS and connective tissues diseases is impossible without specifying the epidemiological and medico-social aspects [1].

Purpose of the study. To study the incidence dynamics and prevalence of diseases of the musculoskeletal system in the Republic of North Ossetia-Alania, to identify structural and age-sex characteristics.

Material and methods of research. To determine the trends of indicators characterizing the dynamics and structure of the incidence of the musculoskeletal system of the entire population of RNO-Alania, the annual statistical reports of the Republican Medical Information and Analytical Center of the Ministry of Health of the Republic of North Ossetia-Alania (F-12) and State Bureau of Medical and Social Expertise (F-7. F-7d) for 2010-2016 were analyzed. Indicators of total morbidity are calculated for 100 thousand of the relevant population, disability - for 10 thousand of the population. Statistical processing of the data was carried out on the basis of a complex of modern methods of automated information storage and processing on personal computers using MS Excel and the standard software package «Statistical 6.0».

R**esults and discussion**. The analysis of annual statistical reports of the Ministry of Health of the North Ossetia-Alania Republic for the period 2010-2016 on citizens' appeals to medical institutions regarding diseases of the musculoskeletal system and connective tissue (BCMS and CT) was carried out. According to the study, consistently high rates of overall morbidity in diseases of the musculoskeletal system have been shown to increase (from 6830.3 in 2010 to 6844.5 in 2016 per 100 thousand of the total population). In the Capital District, the increase was by 3.0% (from 7041.2 in 2010 to 7251.8 in 2016, respectively), while the indicators are 1.1 times higher than the national average. The data obtained show an increase

in the overall incidence in certain areas of the republic for the study period (2010-2016): Kirovsky by 23.8% (from 3883.6 in 2010 to 4808.3 in 2016 per 100 thousand population); Prigorodny by + 16.9% (from 8727.0 in 2010 to 10201.4 in 2016, respectively); Irafsky by + 9.8% (from 4,782.8 in 2010 to 5,250.1 in 2016 per 100 thousand population). In other areas, there was a decrease in the overall incidence of the pathology under consideration: Pravoberezhny -28.4% (from 8307.0 in 2010 to 5950.5 in 2016 per 100 thousand of population); Digorsky -18.6% (from 5626.9 in 2010 to 4583.1 in 2016, respectively); Mozdoky - by 14.6% (4766.4 in 2010 to 4069.3 in 2016); Alagirsky - by -14.1% (7700.6 in 2010 and 6,613.4 in 2016 per 100 thousand of population); Ardonsky (from 4522.5 to 4021.4, respectively), the rate of decline was -11.1%. This phenomenon does not reduce the relevance of the problem being studied, since during the analyzed period (2010-2016) the general morbidity in the republic has high rates with a wave-like pattern of growth. In terms of growth rates, the Kirovsky district is ranked first (+23.8%), the Prigorodny district is second (+16.9%), and the Irafsky district is third (+9.8%) (Table 1).

Table 1

Indicators of the overall incidence of MSD and CT of the population of the Republic of North Ossetia - Alania for 2010-2016 (per 100 thousand total population)

	Observation period (year)							Rate of increase %
	2010	2011	2012	2013	2014	2015	2016	
RNO-Alania	6830,3	6311,1	6955,4	6793,7	6912,4	6232,5	6844,5	+0,2
Vladicaucas	7041,2	6274,2	7435,1	7295,6	7436,8	6048,9	7251,8	+3,0
Alagirsky distr.	7700,6	6513,0	5615,0	5866,4	6057,0	6099,9	6613,4	-14,1
Ardonsky distr.	4522,5	4790,6	4062,8	4209,1	3664,3	3423,3	4021,4	-11,1
Digirski distr.	5626,9	7515,3	5886,4	2867,2	4214,7	5467,2	4583,1	-18,6
Irafski distr.	4782,8	5137,6	5512,3	4939,1	4991,8	4850,3	5250,1	+9,8
Kirovsky distr.	3883,6	2441,8	7159,6	2638,5	3957,4	5105,0	4808,3	+23,8
Mozdoksky distr.	4766,4	4495,6	5679,6	4507,3	4083,7	3949,0	4069,3	-14,6
Pravoberezhny distr.	8307,0	6964,2	6906,3	7183,7	7598,6	6295,7	5950,5	-28,4
Prigorodny distr.	8727,0	8798,6	9535,4	10035,9	10030,3	10164,9	10201,4	+16,9

For the analyzed period (2010-2016), areas with a high average values (per 100 thousand population) exceeding the average republican level (6697.1) were revealed: Prigorodny (9641.9), 1.4 times exceeding the average national level; Pravoberezhny (7029.4) - 1.1 times; indicators are somewhat lower - in Alagirsky (6352.2), Digorsky (5165.8), Irafsky (5066.3), Mozdok (4507.3), Kirovsky (4284.9), Ardonsky (4099.1) districts. In the capital district, the average value of indicators (6969.1) for the period under study exceeds the national average (6697.1) by 1.0 times (Fig. 1).

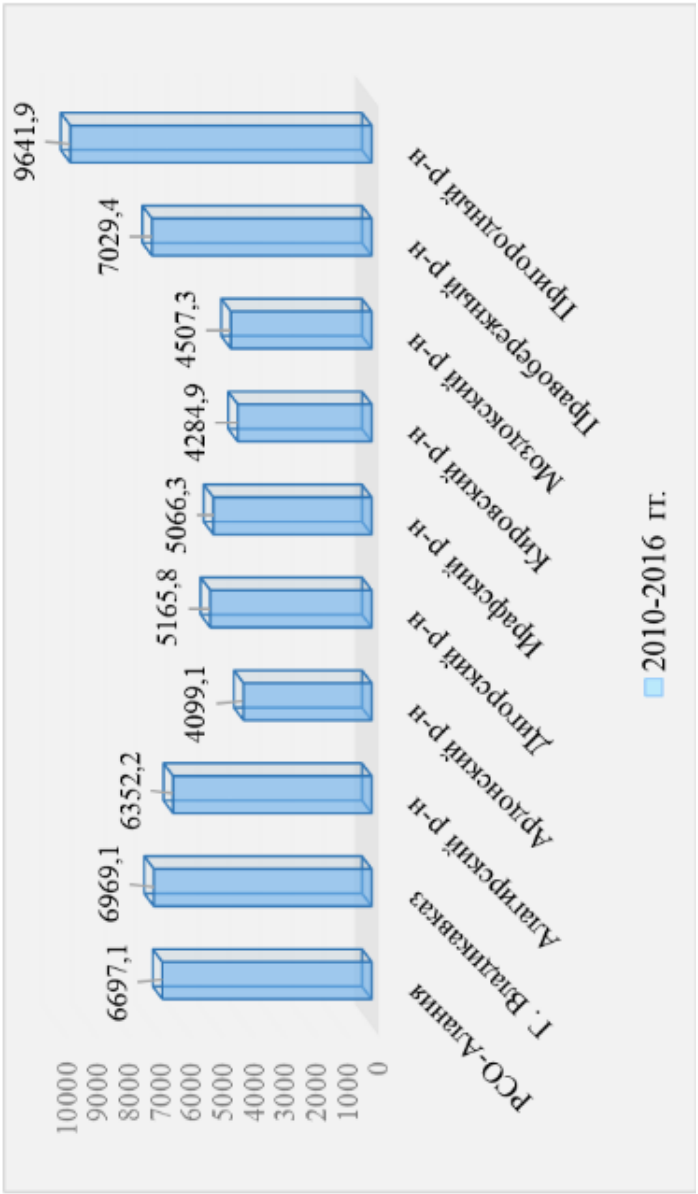

Fig. 1. *Comparative characteristics of the average values of the overall incidence of diseases of the musculoskeletal system and connective tissue in rural areas among the population of North Ossetia-Alania for 2010-2016 (per 100 thousand population)*
РСО-Алания - RNO-Alania, Владикавказ - Vladikavkaz, Алагирский район - Alagirsky district, Ардонский район - Ardon district, Дигорский район - Digorsky district, Ирафский район - Irafsky district, Кировский район - Kirovsky district, Моздокский район - Mozdok district, Правобережный район - Pravoberezhny district, Пригородный район - Prigorodny district.

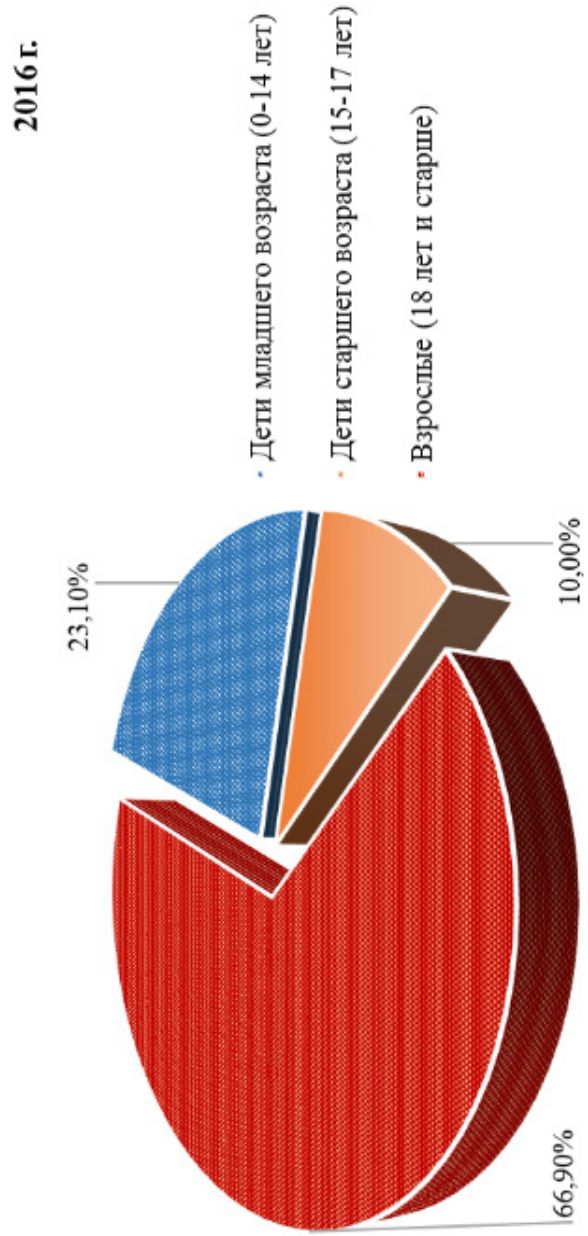

Fig. 2. *Structure of diseases of the musculoskeletal system by age groups for 2016*

Analysis of the overall incidence rate of CMS and STD diseases by age groups showed a tendency to increase among young children (0-14 years old) by +2.3% (from 7882.2 in 2010 to 8062.9 in 2016 by 100 thousand of the relevant population) and a decline in the adult population of -3.8% (from 6193.0 in 2010 to 5958.6 in 2016). A significant increase was noted in the group of older children (15-17 years old) by + 30.4% (from 14912.1 in 2010 to 19438.3 in 2016 per 100 thousand of the corresponding age). The largest increase in primary incidence in the pediatric population (0-14 years) was recorded in 2012 (8274.9), the smallest (7508.8) - 2015; among older children over the study period, the indicator is higher (24,267.8) in 2015, lower (14,912.1) - in 2010; in the adult population, the highest growth (6193.0) was observed in 2010, the smallest (5080.9) in 2015.

In the age structure of the overall incidence of diseases of the musculoskeletal system in the Republic of North Ossetia-Alania, the adult population (18 years and older) is 66.9%, older children (15-17 years old) make up 23.0%, younger children - 10 , 0% (Fig. 2).

Analysis of the overall incidence rate of BMS and CT diseases by age groups showed a tendency to increase among young children (0-14 years old) by +2.3% (from 7882.2 in 2010 to 8062.9 in 2016 by 100 thousand of the relevant population) and a decline in the adult population of -3.8% (from 6193.0 in 2010 to 5958.6 in 2016).

A significant increase was noted in the group of older children (15-17 years old) by + 30.4% (from 14912.1 in 2010 to 19438.3 in 2016 per 100 thousand of the corresponding age). The largest increase in primary incidence in the pediatric population (0-14 years) was recorded in 2012 (8274.9), the smallest (7508.8) - 2015; among older children over the study period, the indicator is higher (24,267.8) in 2015, lower (14,912.1) - in 2010; in the adult population, the highest growth (6193.0) was observed in 2010, the smallest (5080.9) in 2015.

Table 2

The overall incidence of BMS and CT diseases in different age groups in North Ossetia - Alania for 2010-2016. (per 100 thousand of the corresponding age)

	Observation period (year)							Rate of increase %
	2010	2011	2012	2013	2014	2015	2016	
Younger children (0-14 years old)	7882,2	7567,5	8274,9	7760,3	7598,9	7508,8	8062,9	+2,3
Older children (15-17 years old)	14912,1	14917,6	18745,4	19314,2	23678,0	24267,8	19438,3	+30,4
Adults (18 years and older)	6193,0	5561,4	6028,7	5936,7	5973,6	5080,9	5958,6	-3,8

The results of the study demonstrate high rates of primary incidence of diseases of the musculoskeletal system and connective tissue in the Republic of North Ossetia-Alania, comparable to those of the Russian Federation. So, in RNO-Alania, the primary incidence rate (per 100 thousand of the total population), in 2016 was 3095.7, exceeding 1.1 times the average Russian level (2953.2). At the same time, in RNO-Alania, a decrease in incidence was recorded from 3,551.9 in 2010 to 3,095.7 in 2016. In the Metropolitan Okrug, the decrease was by 8.5% (from 2831.7 in 2010 to 2591.2) 2016 (per 100 thousand of the total population). In seven of the 8 districts, there was also a decrease in the rates of newly diagnosed morbidity in BMS diseases. The largest decline in the incidence (per 100 thousand population) was recorded in three rural areas: Digorsky by -80 % (from 2730.3 in 2010 to 544.3%) and Pravoberezhny -59.3% (3671.8 in 2010 to 1494.6 in 2016 per per 100 thousand of the total population of RNO-Alania), Alagirsky by -39.8% (from 5381.1 to 3237.9 respectively). In four districts (Mozdok, Irafsky, Ardonsky, Kirovsky), the rates of decreasing incidence are slightly lower (-27.4, -24.1, -22.8, -17.1%, respectively). In one of the regions, an increase in the incidence of diseases by + 10.1% was observed (from 7482.6 in 2010 to 8237.0 in 2016). The data of the average values of Prigorodny (8043.7) and Alagir (3699.7) districts exceed the average republican level (3453.6) (Table 3).

Table 3

Dynamics of indicators of primary incidence of BCMS and ST of the entire population RNO - Alania for 2010-2016

	Observation period (year)							Average	Rate of increase %
	2010	2011	2012	2013	2014	2015	2016		
RNO-Alania	3551,9	3405,8	3748,9	3304,4	3652,3	3416,3	3095,7	**3453,6**	-12,8
Vladicaucas	2831,7	2721,5	3343,4	281,3	3277,0	3079,1	2591,2	**2589,3**	-8,5
Alagirsky distr.	5381,1	4251,9	3178,8	3446,8	3348,7	3052,6	3237,9	**3699,7**	-39,8
Ardonsky distr.	2560,6	2968,9	2154,7	2402,0	2359,7	1705,3	1977,6	**2304,1**	-22,8
Digirski distr.	2730,3	2958,5	487,5	478,7	1758,8	827,9	544,3	**1398,0**	-80,0
Irafski distr.	1299,0	1268,6	983,6	682,6	732,7	562,2	986,0	**930,7**	-24,1
Kirovsky distr.	2584,2	1075,3	5876,2	1082,2	2249,4	3365,7	2141,5	**2624,9**	-17,1
Mozdoksky distr.	1990,3	2111,4	2499,6	1204,2	1391,5	1364,6	1444,4	**1715,1**	-27,4
Pravoberezhny distr.	3671,8	2928,3	3006,6	3052,2	3436,1	2282,8	1494,6	**2838,9**	-59,3
Prigorodny distr.	7482,6	7558,1	7976,6	8341,5	8398,2	8312,0	8237,0	**8043,7**	+10,1

No less significant is the persistent loss of working ability among the adult population, which occurs so often and early in patients with this pathology and is determined by indicators of disability in the population. In terms of the primary disability rate of residents of the Republic of North Ossetia-Alania, calculated for 10 thousand of the adult population of the country, this pathology ranks third among other causes of disability and is 9.6% among other classes of diseases. Ahead of it are only diseases of the circulatory system (34.3%) and malignant neoplasms (22.1%).

Conclusion. In the Republic of North Ossetia-Alania as a whole and in its administrative districts, there are high rates of both general and primary morbidity of the musculoskeletal system and connective tissue with a tendency to decrease which does not reduce the urgency of this problem. Attention is drawn to the increase in the overall incidence among the younger generation against the background of a decrease in the incidence among the adult population. Diseases of the musculoskeletal system occupy the third place in the Republic of North Ossetia-Alania among all causes of disability.

The analysis of statistical indicators shows a serious change in the structure of the BMSCT diseases, which is a rational justification for a thorough study of the spread of these diseases. The obtained data will allow to carry out purposefully the prevention of the musculoskeletal system diseases, as well as most effectively to plan the work of the rheumatological service.

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哈萨克斯坦脑膜炎球菌感染病例的流行病学评估及其预防的实用建议
EPIDEMIOLOGICAL ASSESSMENT OF CASES OF MENINGOCOCCAL INFECTION IN KAZAKHSTAN AND DEVELOPMENT OF PRACTICAL RECOMMENDATIONS FOR ITS PREVENTION

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注解。 脑膜炎球菌感染仍然是成人和儿童中最常见的中枢神经系统损害之一[1]。 急性细菌性脑膜炎是全世界死亡和残疾的常见原因之一，每年影响超过一百万人。 由于工作年龄人口，儿童和青少年的发病率显着增加，化脓性和浆液性脑膜炎问题的紧迫性更加严重。 根据官方统计，自2013年以来，脑膜炎的发病率呈波浪状.2014年有所增加（2015年），然后有所下降（2017年），比2017年减少4例。阈值发病率为 哈萨克斯坦的脑膜炎是每10万人口2.1例。 在2018年，该值处于每10万人口0.3个案例的水平，即比阈值水平低7倍[2]。

关键词：脑膜炎球菌感染，发病率，死亡率，预防

Annotation. *Meningococcal infections continue to be one of the most common forms of central nervous system damage in adults and children [1]. Acute bacterial meningitis is one of the common causes of death and disability worldwide, affecting more than a million people every year. The urgency of the problem of purulent and serous meningitis is aggravated by a significant increase in morbidity among people of the working-age population, children and adolescents. According to official statistics, the incidence of meningitis has a wave-like character since 2013. There was a rise (in 2015) and then a decline (in 2017), in 2018. 4 cases less than*

in 2017. The threshold incidence rate of meningitis in Kazakhstan is 2.1 cases per 100 thousand population. In 2018, the value was at the level of 0.3 cases per 100 thousand population, that is, seven times lower than the threshold level [2].

Keywords: *meningococcal infection, morbidity, mortality, prevention*

Purpose of the study: analysis of the epidemiological situation of the incidence of meningococcal infection in the Republic of Kazakhstan for 2015-2018 with their distribution by serotypes, clinical forms, by age, by contingent, by region and the development of practical recommendations for its prevention.

We studied and analyzed the epidemiological situation on the incidence of meningococcal infection in the Republic of Kazakhstan for 2015-2018 on copying the annual reports of the Committee for Public Health Protection of the Ministry of Health of the Republic of Kazakhstan for 2015-2018. and RSE on REU "Scientific and Practical Center for Sanitary-Epidemiological Examination and Monitoring" KZPP MNE RK for 2015-2018 and used the following materials and methods: a retrospective analysis of the incidence of meningococcal disease, statistical data analysis, questioning.

The research work was carried out in the following stages:

1. **Review of available literature on this topic:** Today, studies of meningococcal infections of various etiologies are mainly devoted to the study of meningitis in children. At the same time, up to 25-30% of meningitis occurs in adults, who still have insufficient coverage of the etiological structure, clinical features and outcomes, depending on the background and associated diseases. The most formidable form of meningococcal infection is a generalized form that occurs at lightning speed for 6-8 hours as meningococcemia, or it is called meningococcal sepsis or meningococcal meningitis. (based on data of https://ru.sputniknews.kz/society/20180530/5821448/meningit-informaciya.html). By the nature of the inflammation, meningitis can be serous, when in the cerebrospinal fluid (the fluid washing the brain) lymphocytes predominate, or purulent, when the prevalence of neutrophils in the cerebrospinal fluid creates purulent exudate. The prevalence of inflammation is generalized (ubiquitous) or limited meningitis (for example, only in the region of the hemispheres or the base of the brain). By the rate of development of the disease, meningitis is divided into fulminant, acute, subacute, chronic. Chronic meningitis is most often secondary, that is, caused by an infection that already existed in the body and moved to the meninges. Such, for example, is meningitis in tuberculosis or neurosyphilis. In severity, meningitis can be: mild; moderately severe; heavy; extremely heavy (original article https://www.kp.ru/guide/meningit.htm).

Thanks to effective prevention of the last 25 years, the incidence of meningococcal infection in Kazakhstan decreased 1.75 times, from 743 cases per 100

thousand in 1991 to 424 cases (273 cases among children) in 2015 (according to the press service of the Ministry of Health and social development of Kazakhstan). In general, the incidence of meningitis is undulating. In 2013, we had 117 cases, in 2014 - 119. The highest peak was in 2015 - 424 cases, in 2016 - 120 cases, in 2017 - 62 cases. It is about the incidence of bacterial meningitis. The rise in the incidence of meningococcal infection occurs every three years [3].

There were 18 people who died in 2013, in 2014 - 15 people, in 2015 - 21 people, in 2016 - seven, in 2017 - 11. Mortality is associated with an untimely request for medical care: on the 2nd, 4th , 8th day, as well as that in all cases a severe form of meningococcal infection was revealed.

2. The study of the annual reports of the Committee of Public Health of the Ministry of Health of the Republic of Kazakhstan, RSE on REU "Scientific and Practical Center of Sanitary and Epidemiological Examination and Monitoring" of the KPP MNE RK for 2015-2018 and epidemiological analysis of the situation with the assessment of the effectiveness of ongoing activities.

3. Retrospective analysis of the incidence and mortality of meningococcal infection and purulent meningitis of a different etiology. The characteristics of the epidemiological situation in a particular territory are made up of an analysis of the incidence rate in general, as well as by individual age groups, by population, by region.

4. Development of preventive measures

Research results and discussion: we carried out a research work in several stages and obtained the following results on the distribution of cases of meningococcal infection:

As shown in diagram 1, the clinical form of meningoccemia prevails in the structure of meningococcal infection — 51.9% of cases, then the mixed form — 23.1%, meningitis — 16.7%, nasopharyngitis — 6.4%, and meningoencephalitis — 1.9 %

As can be seen from chart № 2, 3 serotypes A, B, C are registered, but more often people are infected with serotype A meningococcal infection, which is fatal.

As can be seen from chart № 3, meningococcal infection is more common among children under 14 years (250 cases in 2015 and 54 cases in 2016)

As shown in chart No. 4, the main contingent of cases for 2015 is 39.4% - unorganized children of preschool age (167p.), 17.7% of students (75 people)), the share of children's pre-school organizations is 10.6% (45 people), not working-9.9% (42 people).), Workers / employees-8.3% (35 people)), another contingent-7.5% (32 people)), students-6.6% (28 people)), medical workers-1.2% (5 people)) and teachers - 0.5% (2 people).

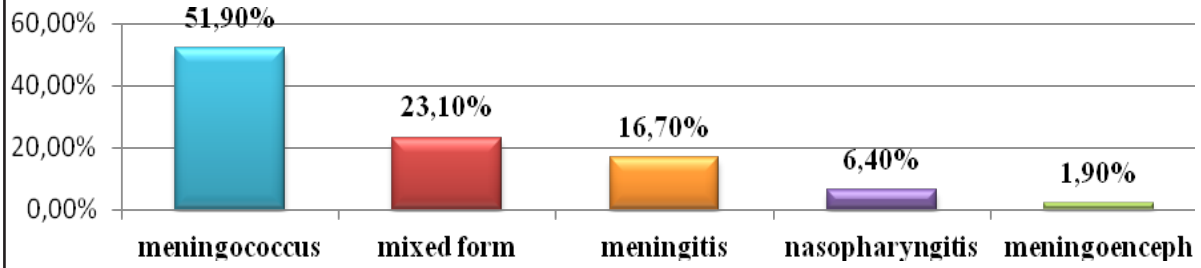

Figure No. 1 *Structure of meningococcal infection for 2015-2018, according to clinical forms*

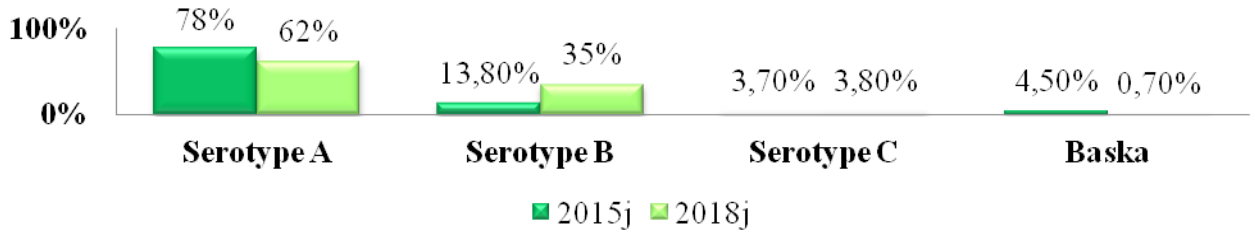

Figure number 2 *Differentiation of cases of meningitis in 2015 and in 2018 by serotypes*

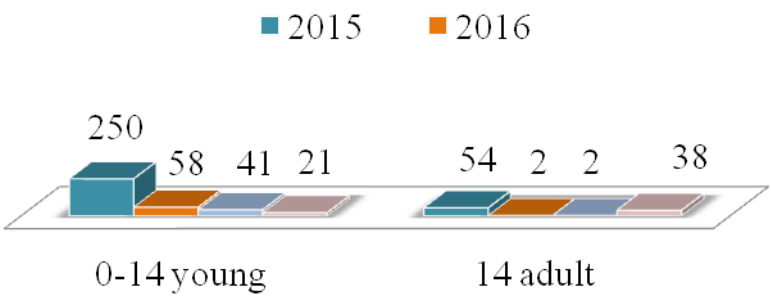

Figure № 3 *The distribution of patients with MI by age*

Figure № 4 *The distribution of patients with MI by contingent in 2015*

As shown in chart number 5, the highest incidence rate is 2015-2016 in the city of Nur-Sultan (211 and 57 cases), and in 2017 in Nur-Sultan, in 2018 in the city of Almaty (33 cases).

As shown in chart number 6, the highest mortality rate in 2015-2016. in South Kazakhstan (5 and 3 cases), and in 2017. in Almaty region, in 2018 in the city of Almaty (6 cases).

Thus, we have analyzed the epidemiological situation of the incidence of meningitis in the Republic of Kazakhstan and found that the threshold incidence rate of MI in Kazakhstan is 2.1 cases per 100 thousand population. In 2018, the value was at the level of 0.3 cases per 100 thousand population, that is, seven times lower than the threshold level; meningococcal infection is registered during the year, with characteristic winter and spring seasonality; the incidence of MI has a wave-like character since 2013. There was a rise (in 2015) and then a decline (in 2017 and in 2018), cyclical in three years; 3 serotypes of meningococcal infection were registered - A, B, C., but 62% were infected with meningococcal infection of serotype A. That it most often leads to death. According to clinical forms, meningococcemia is diagnosed - 51.9%, about 80% of cases of the disease occur in chil-

dren and adolescents from 0-14 years old, of which 50% are children at the age of 1 year - 5 years. The main contingent of cases is unorganized children of preschool age, up to 39.4%, among adults the largest number of cases of the disease occurs at a young age (15–30 years), the most unfavorable epidemiological situation with MI is observed in Nur-Sultan, Almaty, South-Kazakhstan [3].

Practical recommendations for the prevention of meningitis: be especially careful when traveling to potentially dangerous areas; Some types of meningitis are carried by animals and insects, so do not forget to use a means of protection against insects; at the first symptoms - fever, severe headache (especially in children) - urgently call an ambulance, do not self-medicate; in order to avoid infection of the others, timely treatment is necessary for chronic nasopharyngeal diseases - pharyngitis, tonsillitis, laryngitis; complete and balanced nutrition, enriched with vitamins and microelements, exercise, hardening of the body, the absence of bad habits (smoking) contributes to the body's resistance to infection [4].

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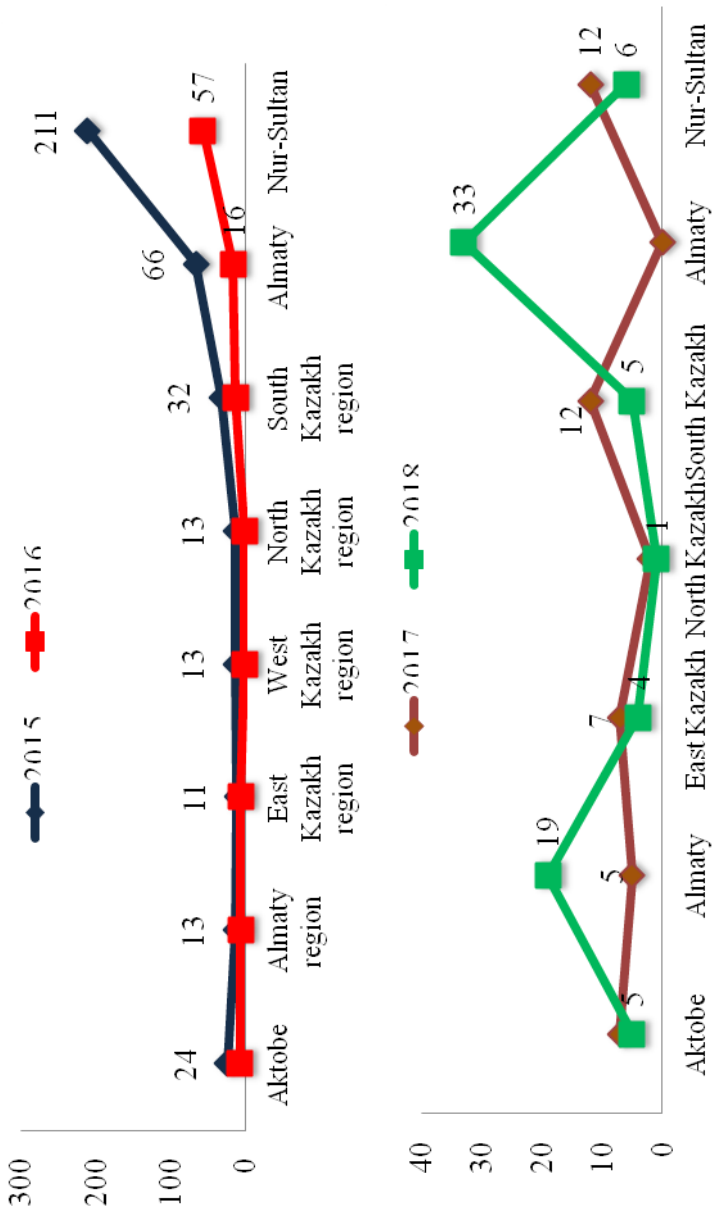

Figure number 5. *Distribution of cases of meningococcal infection in the regions of the Republic of Kazakhstan for 2015-2018*

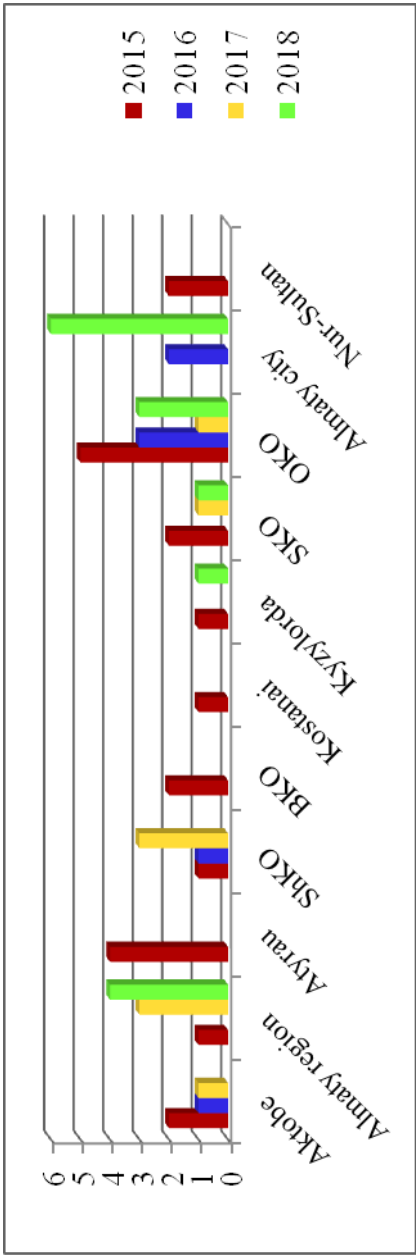

Figure №6. *Distribution of lethal cases of meningococcal infection in the regions of Kazakhstan for 2015-2018*

药用植物材料的现代保存方法

MODERN METHODS OF CONSERVATION OF MEDICINAL PLANT MATERIALS

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注解。 以形象组“水果”的药用植物原料为例，采用冷冻和冷却保存原料中的生物活性物质，干燥，进一步生产基于冷冻的对抗疗法和顺势疗法草药的相关性和前景 显示了原料作为新鲜和干燥原料的替代品。

关键词：保存方法 – 冷却，干燥，冷冻，生物活性物质，药用植物原料 – 水果。

Annotation. *Using the example of medicinal plant raw materials of the morphological group “fruits”, the relevance and prospects of using freezing and cooling to preserve biologically active substances in raw materials, along with drying, and further production of allopathic and homeopathic herbal medicines based on frozen raw materials as an alternative to fresh and dried raw material is shown.*

Keywords: *methods of preservation - cooling, drying, freezing, biologically active substances, medicinal plant raw materials - fruits.*

Medicinal plant materials (MPM) and herbal medicines (HM) are used in medical practice and have pharmacological properties due to their biologically active substances (BAS). Plant metabol has a different chemical structure, therefore, to varying degrees, they react to environmental factors such as temperature, sunlight, moisture [1, 4].

Medicinal plants and their parts are harvested fresh. Fresh MPM contains a complex of active substances that are part of plants in their natural state, which are not susceptible to hydrolytic decomposition and the effects of enzymes. In allopathy about 10% of fresh MPM has developed regulatory documentation (RD): aloe vera leaves, the fruits of chokeberry Aronia, collar croissants, rhizomes with valerian roots, kalanchoe shoots, sea buckthorn fruits, grass of stonecrop large, shoots of eucalyptus, leaves of large plantain, grass of planus blaspheus, grass of jaundice gray, garlic bulbs, ginseng roots. Fresh MPM is the source of juices that are used as ingredients in the complex preparations and formulations extraction - tinctures. In homeopathy, for the manufacture of homeopathic preparations, newer MPM are also used as raw materials [2,3].

However, fresh plant materials did not find wide application in allopathic practice. Mainly, this is due to the impossibility of long-term storage of fresh MPM and the need for its rapid processing. During the first days after the collection, MPM must be delivered to the place of processing, as it involves physical, chemical and biological processes that contribute to the destruction of BAS. Due to the effects of such processes, MPM cannot be used in medical and pharmaceutical practice.

Therefore, in order to preserve the quality of MPM, conservation is used, the purpose of which is to obtain a product that can be stored for a long time without significant changes in quality. The traditional method of canning MPM is drying (heat, freeze-drying). Most types of medicinal plant materials included in the State Pharmacopoeia of the Russian Federation of the XIV edition, after the procurement process, are subjected to drying. Drying can be considered as the most simple, cost-effective method of preserving medicinal raw materials, which preserve the appearance and content of BAS in raw materials [3,8,10].

Cooling and freezing are considered to be actively developing and introducing methods. The essence of these methods of preservation is that at low temperatures the vital activity of microorganisms is suppressed, the activity of enzymes decreases, the flow of biochemical reactions slows down. At lower temperatures, characteristic for cooling, the fruits continue to have, albeit slowly, respiration processes that allow them to remain fresh for several weeks or even months [6]. Cooling is carried out using artificial or natural cold. When stored in glaciers or chambers with artificial cold, the temperature of the product drops to 0 ° C (with fluctuations of ± 2–3 ° C). At this temperature, cell sap does not freeze. Freezing is a method of preservation in which low temperatures are used, ensuring the complete or partial conversion of cell sap into ice. Due to the absence of a liquid phase, the activity of enzymes ceases, as a result of which biochemical processes are suspended. The generally accepted temperature level to which freezing is brought is -18 ° C [5.7].

Numerous scientific studies assessing the impact of freezing on the quality of food products allow us to assert with certainty about the prospects of the low-temperature method of preserving edible plant raw materials [7,9]. In pharmacy, this method is practically not used, which makes research on the effect of low temperatures on the composition of the metabolome of medicinal plant materials and its quality relevant and interesting.

Fruits is one of the morphological groups of MPM, which is widely used in allopathy and homeopathy. Fruits come to the pharmacy and to pharmaceutical companies to obtain aqueous extracts, tinctures and extracts. In accordance with the requirements of the GF RF XIV edition officially authorized the use of fruits of both dried and fresh. The richest metabolic composition have fresh fruit. Therefore, the acute problem of choosing the method of conservation is in respect of

juicy fruits. Due to the high moisture content, drying of fruits takes a lot of time, and during storage, dried fruits more often than other types of plant raw materials are exposed to granary pests. Freezing and cooling the fruit is devoid of these disadvantages [7].

However, when using any preservation method, there are changes in the content of BAS. On the example of the fruits of medicinal plants of the Rosaceae family - hawthorn (*Crataegus sanguine Pall*), mountain ash (*Sorbus aucuparia L.*), raspberries (*Rubus idaeus L.*), wild rose (*Rosa cinnamomea L.*), collected in the Botanical Garden of the First MGMU. IM Sechenov, studies of the variability of the chemical composition depending on the MPM preservation method were carried out in order to identify the most effective way to preserve the quality of the MPM, as well as expand the raw material base by introducing new raw materials. Drying of the studied samples was carried out in a drying cabinet at a temperature of 60–80 ° C, cooling in the conditions of a refrigerating chamber at a temperature of 0 + 1 ºC. The freezing of samples of raw materials was carried out according to GOST R 53956-2010 "quick-frozen fruits". Fruits were stored in a freezer at -18 ºC.

When performing the work, the methods of pharmacognostic MPM (macroscopic and microscopic), a complex of physicochemical methods (chromatography in a thin layer of the sorbent, HPLC, spectrophotometry, types of titrimetric analysis) and processing of results [2,3,8] were used.

During the qualitative analysis of BAS of preserved fruits, it was found that the main marker compounds for the studied raw materials are favonoids (rutin, quercetin, hyperoside and luteolin), phenol carboxylic acids (chlorogenic, caffeic, gallic), organic acids (malic, citric, sorbic, amber, ascorbic, salicylic) are present in both dried and frozen samples of the raw materials: drying and freezing do not change the component composition of the BAS objects studied

When determining the content of flavonoids, tannins, anthocyanins, organic acids, polysaccharides in fresh, frozen and dried fruits, it was found that changes in the content of BAS, both during drying and during freezing, occur in the direction of reducing their quantity. A relative decrease by 5–15% was observed in such groups of substances as ascorbic acid, tannins and flavonoids. The amount of polysaccharides, organic acids practically does not change, the content of anthocyanins falls by 20-30%.

Drying hawthorn, wild rose, mountain ash fruits led to significant losses of organic acids (50–60% reduction in the amount), tannins, ascorbic acid and anthocyanins were destroyed to a greater extent, their content did not exceed 40, 50 and 20% (respectively) of the amount in fresh raw materials. Drying reduced the content of polysaccharides and flavonoids in the studied fruits by 15-20%. The content of anthocyanins and ascorbic acid in the dried fruits of raspberries was reduced by almost 10 times compared with fresh raw materials.

When studying the stability of the observed BAS groups in fresh, frozen and dried hawthorn, ashberry, dogrose and raspberry fruits during storage (the fresh fruit was stored at +16 - + 18 ° C, as well as in the refrigeration chamber at 0 - + 1 ° C) it was found that ascorbic acid is subject to the greatest destruction during the storage of fresh fruits at a temperature of +16 - + 18 ° C. On the 4th day of storage, in the hips, the amount of ascorbic acid was reduced to 60% of the original, and in the hawthorn fruits, its content on the 3rd day was only about 10% of the original. Also, in all objects, a decrease in the content of organic acids and tannins by an average of 7–9% was observed by the final storage period. The content of anthocyanins in raspberry fruits after 24 hours decreased by 6% from the original. The amount of flavonoids and polysaccharides changed only slightly.

Storing fresh fruits under cooling conditions (at a temperature of 0 - + 1 ° C) ensured a satisfactory quality of the raw materials for a longer period. A noticeable decrease in the content of ascorbic acid, organic acids and tannins was observed in hawthorn, mountain ash and wild rose fruits on the 5th day of storage, in raspberry fruits - on the 3rd day of storage. Moreover, it is possible to trace the relationship between storage and the morphological structure of fruits: in fruits with thin exocarpium (raspberry), the loss of substances is higher. Based on the conducted research, the storage times for fresh fruits at a temperature of +16 - + 18 ° C and in a refrigerating chamber (0 - + 1 ° C) are recommended: for hawthorn, mountain ash and rosehip fruits - 2 and 5 days, for raspberry fruits –12 hours and 2 days (respectively).

A study of the stability of BAS in frozen and dried hawthorn, wild rose, rowan and raspberry fruits was carried out for 1 year. The baseline data were taken as control points, as well as intervals of 1, 3, 6, 9, and 12 months (Fig. 1.2). Frozen fruits were stored in a freezer at –18 ° C, dried - in paper bags at room temperature.

It was determined that during storage of frozen fruits, the content of flavonoids, polysaccharides did not change after 12 months, and the content of organic acids even increased. Ascorbic acid and tannins showed a tendency to a constant decrease in the amount: in the first 6 months, on average, by 15% and 12%, respectively, for the period from 9 to 12 months, losses in ascorbic acid fruits were 28%, tannins - 24%.

During storage from 1 to 12 months of dried fruit, the content of organic acids, polysaccharides, flavonoids and tannins remained almost unchanged. Ascorbic acid is characterized by a decrease in its amount after 12 months of storage of dried fruit from the initial content by 40-50%. Also, by the end of storage, the amount of anthocyanins was reduced by 15% in dried raspberry fruits. Based on the obtained experimental results, it is possible to recommend the shelf life of frozen fruits - 12 months.

Thus, the results of studying the effect of low temperatures on the composition and content of BAS in MPM show the promising practical use of freezing and cooling to preserve the quality of raw materials and to obtain new allopathic and homeopathic medicines.

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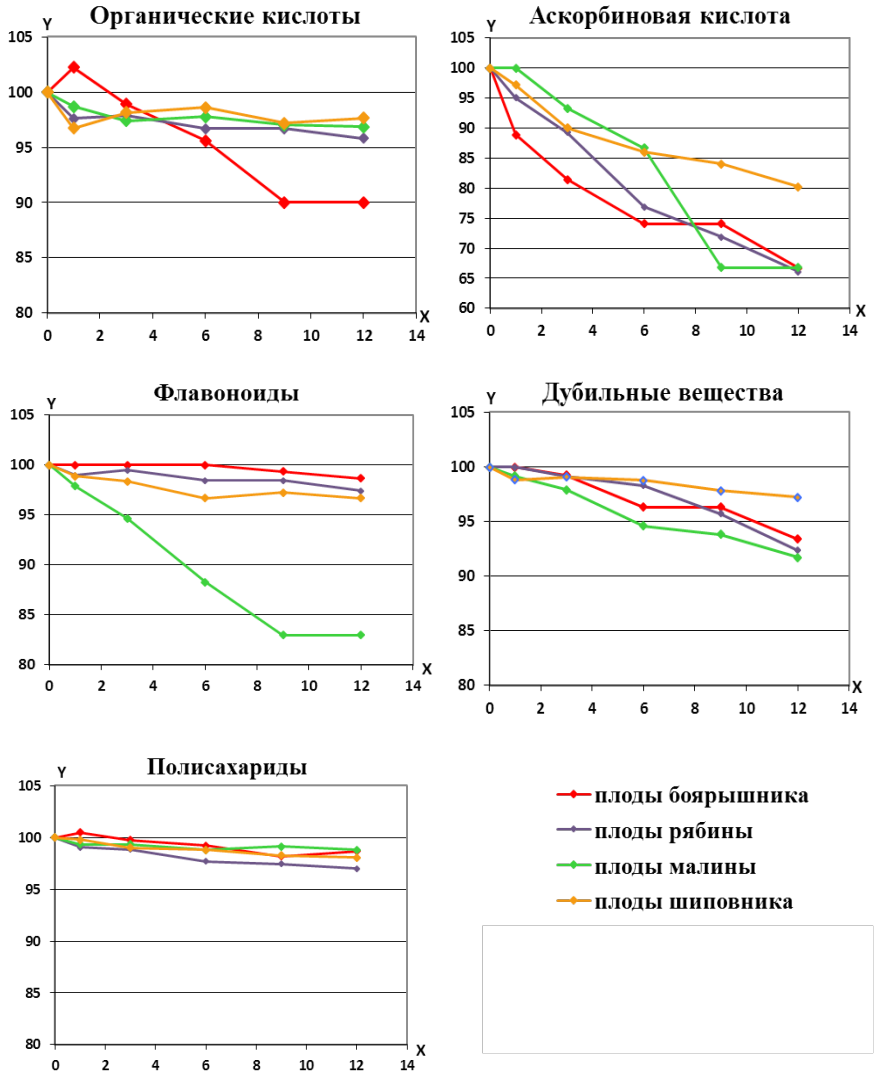
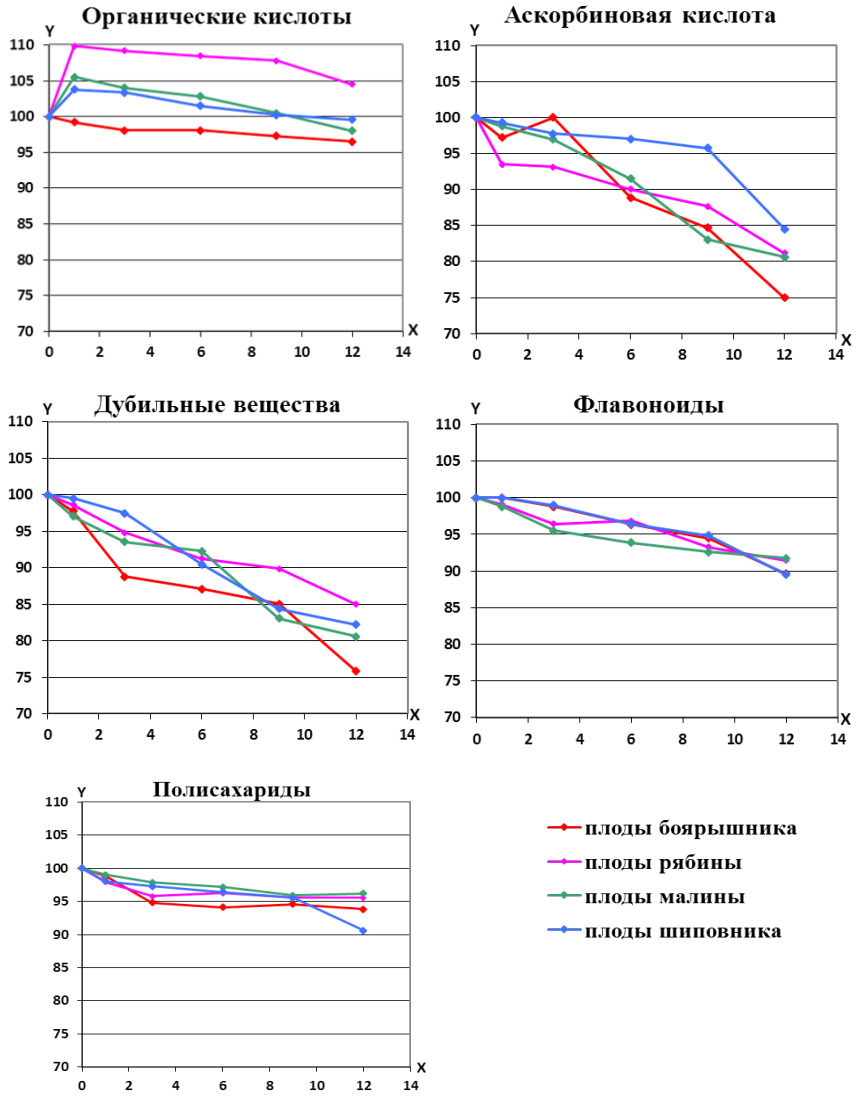


Fig.1. *BAS stability in dried fruit*



Ось Y - доля БАВ от исходного содержания, %

Ось X – время, месяцы

Fig. 2. *Stability of BAS in frozen fruits*

开发植物原料中活性物质提取的理论依据及实验验证

DEVELOPMENT OF THEORETICAL BASIS FOR THE EXTRACTION PROCESS OF ACTIVE SUBSTANCES FROM PLANT RAW MATERIAL AND THEIR EXPERIMENTAL VERIFICATION

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摘要。我们的研究目的是为植物原料（PRM）中活性物质的提取过程及其实验验证开发理论基础。

材料和方法。 PRM /萃取剂比例为1：5,1：10,1：20和1:40 m / v;温度4,20,24,40和60±1° C； PRM颗粒分数0.1-0.5毫米;乙醇浓度26,43,60,72,82,97±1％v / v。分析方法：反相高效液相色谱（RP HPLC）。 PRM：甘草，金丝桃，黄连，黄芩，叶桉等。我们假设如下：1）提取系统中活性物质分子的分布依赖性与其中吉布斯能量的变化有关。由亨利的吸附/解吸和物质平衡定律或费米 - 狄拉克定律量子统计量的描述; 2）溶剂在萃取系统中的介电常数的影响可以通过分子间能量来解释。结果。在两种类型的研究中，所研究范围内的实验点通过在由方程理论预测的坐标中绘制的线性方程具有良好的近似，这通过确定系数R2≥0.99和R2≥0.94的高值来证明。结论。已经提出了解释萃取系统中的平衡状态的工作假设以及溶剂介电常数对其的影响。基于工作假设，我们开发了数学模型，连接提取系统的主要参数并描述其行为。他们的充足性通过实验验证。

关键词：提取过程，理论基础，植物原料，数学模型，平衡。

Summary. The **aim** of our studies was to develop the theoretical basis for the extraction process of active substances from the plant raw material (PRM) and their experimental verification.

Materials and methods. PRM/extractant ratio 1:5, 1:10, 1:20, and 1:40 m/v; temperature 4, 20, 24, 40 and 60±1 °C; PRM particle fraction 0.1-0.5 mm; ethanol concentration 26, 43, 60, 72, 82, 97±1 % v/v. Method of analysis: reverse phase high performance liquid chromatography (RP HPLC). PRM: *Rhizoma Glycyr-*

rhizae, Herba Hyperici, Folia Uvae ursi, Rhizoma Scutellaria, Folia Eucalyptus, etc. We hypothesize as follows: 1) dependence of distribution of active substance molecules in the extraction system is connected with the change of Gibbs energy in it and is described by Henry's Law of adsorption/desorption and material balance or by Fermi-Dirac law analog of quantum statistic; 2) the influence of the solvent's dielectric constant at the extraction system can be explained through intermolecular energy. **Results.** In both types of studies experimental points in the range studied have good approximation by linear equations plotted in the coordinates theoretically predicted by equations, which is demonstrated by the high value of determination coefficient $R^2 \geq 0.99$ and $R^2 \geq 0.94$. **Conclusions**. The working hypotheses that explained the equilibrium state in the extraction system and the influence of the solvent's dielectric constant on it have been suggested. Basing on the working hypotheses, we developed mathematical models which connected the main parameters of the extraction system and described its behavior. Their adequacy was verified experimentally.

Key word: *extraction process, theoretical basis, plant raw material, mathematical model, equilibrium*.

Introduction. Active substances from the plant raw material (PRM) are highly-valued active pharmaceutical ingredients and are included into many drugs. However, despite intensive development of science and technologies over the past hundred years, the static side of the extraction process is practically undeveloped, which explains and describes the dependency of active substances equilibrium concentration in the extract on the volume and temperature of the extractant, as well as the influence of its dielectric constant on the state of the extraction system. Therewith, knowledge of these dependencies gives us the possibility to forecast both, optimal conditions for extraction of active substances from the PRM and the quality of the product, which are important tasks in the technology of any type of phytodrug.

To explain the possible mechanism of the equilibrium state in the extraction system and development of the mathematical model, we assumed the postulates of molecular-kinetic theory and laws of statistical physics, thermodynamics, physical and colloid chemistry. Considering that the extraction system may be represented as a macroscopic system consisting of a tremendous quantity of different types of molecules (active substances, extractant, and matrix of the PRM), their behavior should be described by the laws of the above-mentioned disciplines.

At the beginning of the XX century, Russian scientist M.S. Tsvet was the first to mention that the process of pigment adsorption is observed in the plant tissue, but in phytotechnology, this assumption did not go any further and was forgotten for more than one hundred years [1].

The **aim** of our studies was to develop the theoretical basis for the extraction process of active substances from the plant raw material and their experimental verification.

Materials and methods. The study of the distribution process of active substance molecules in the extraction system was carried out under the following conditions: PRM/extractant ratio 1:5, 1:10, 1:20, and 1:40 m/v; temperature 4, 20, 40 and 60±1 °C; PRM particle fraction 0.1-0.5 mm; ethanol concentration 72 and 82±1 % v/v. The study of solvent's dielectric constant influence on the extraction system was carried out under the following conditions: PRM/extractant ratio 1:10 m/v; temperature 24±1 °C; PRM particle fraction 0.1-0.5 mm; ethanol concentration 26, 43, 60, 72, 82, 97±1 % v/v. Method of analysis: reverse phase high performance liquid chromatography (RP HPLC) using a diode array detector. PRM: *Rhizoma Glycyrrhizae, Flores Helichrysi Arenarii, Herba Hyperici, Flores Calendulae, Rhizoma cum radicibus Rubiae, Folia Uvae ursi, Rhizoma Scutellaria, Folia Eucalyptus, etc.* Standards: alizarin, arbutin, glycyram, spissum extract of Chlorophyllipt, isosalipurposide, licuroside, salipurposide, rutin, chlorogenic acid, etc.

Theoretical methods: sorption concept of active substances at the PRM matrix from Henry's Law, material balance, Fermi-Dirac equation, intermolecular energy interaction equations (dipole-dipole and dispersion interaction) with a dielectric constant of the extractant in these equations.

We hypothesize as follows: 1) dependence of distribution of active substance molecules in the extraction system is connected with the change of Gibbs energy in it and is described by Henry's Law of adsorption/desorption and material balance or by Fermi-Dirac law analog of quantum statistic; 2) the influence of the solvent's dielectric constant at the extraction system can be explained through intermolecular energy.

Equation (1) that describes the equilibrium state of the extraction system in the coordinates predicted by the theory for experimental verification [2]:

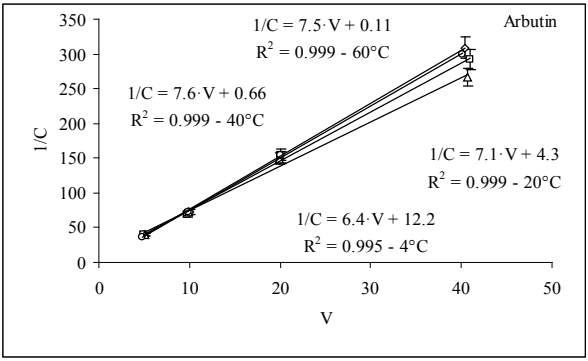
$$\frac{1}{C} = \frac{1}{m_0} \cdot V + \exp\left(\frac{\Delta G}{RT}\right) \cdot \frac{1}{m_0} = a \cdot V + b \qquad (1)$$

where C is the concentration of active substances in the extract, g/ml; m_0 is total (initial) amount of active substances in the extraction system, g; V is the volume of the extract, taken as equal to the extractant volume in the extraction system for simplicity, ml; ΔG is Gibbs energy, J/mol; R is gas constant, J/(mol·K); T is absolute temperature, K; a, b are empirical constants.

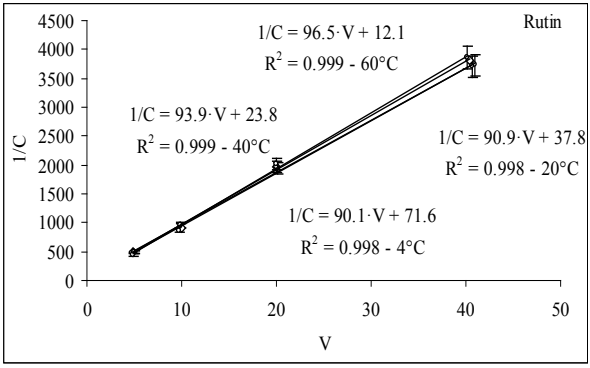
Equation (2) that describes the influence of extractant's dielectric constant (ε_x) on the equilibrium state in the extraction system in the coordinates predicted by the theory for experimental verification [3]:

$$\ln\left(\frac{m_0}{C \cdot V} - 1\right) = \frac{1}{\varepsilon_x^2} \cdot a + \frac{1}{\varepsilon_x} \cdot b + d \qquad (2)$$

Results and discussion. The results of the study of arbutin and rutin dependency in the extracts on the volume of the extractant at different temperatures in coordinates 1/*C*=*f*(*V*) for Uva-ursi leaves are presented in Fig.1.



Arbutin from Uva-ursi leaves



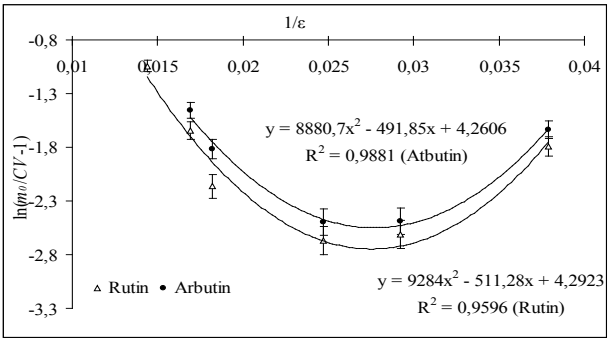
Rutin from Uva-ursi leaves

Figure 1. *Regression equations of dependencies of arbutin and rutin concentration in the extract on the volume and temperature in coordinates 1/C=f(V)*

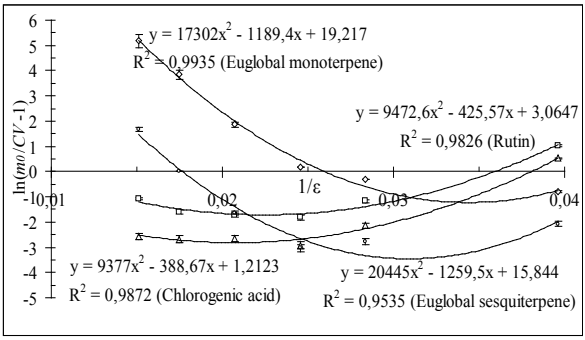
As seen from the data in Fig.1, the experimental points in the range studied have good approximation by linear equations plotted in the coordinates theoretically predicted by equation (1), which is demonstrated by the high value of determination coefficient $R^2 \geq 0.99$.

Therefore, the results obtained have a good correlation with the mathematical model suggested theoretically. Herewith, working hypothesis 1 that was suggested by us for an explanation of a possible mechanism of active substances' distribution in the extraction system is not disapproved.

The results of the study of dependency of active substances' concentration in the extracts on the solvent's dielectric constant in coordinates $\ln(m_0/CV\text{-}1)=f(1/\varepsilon_x)$ for *Uva-ursi* and *Eucalyptus* leaves are presented in Fig.2.



Active substances from *Uva-ursi* leaves



Active substances from *Eucalyptus* leaves

Figure 2. *Regression equations of dependency of active substances' concentration in the extracts on the solvent's dielectric constant in coordinates ln(m0/CV-1)=f(1/εx) for Uva-ursi and Eucalyptus leaves*

As seen from the data in Fig.2, the experimental points in the range studied have a reasonable approximation by quadric equations plotted in the coordinates theoretically predicted by equation (2), herewith, the determination coefficient was equal to $R^2 \geq 0.94$. This can be explained by serious simplifications, which were used during the equation construction.

Therefore, the results obtained have reasonable correlation with the mathematical model theoretically suggested. Herewith, working hypothesis 2 suggested by us for an explanation of a possible mechanism of influence of the solvent's dielectric constant on the extraction system is not disapproved.

Conclusions. The theoretical basis of the extraction process of active substances from the plant raw material has been developed. The working hypotheses that explained the equilibrium state in the extraction system and the influence of the solvent's dielectric constant on it have been suggested. Basing on the working hypotheses, we developed mathematical models which connected the main parameters of the extraction system and described its behavior. Their adequacy was verified experimentally.

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植物生物量臭氧化。 利用热分析研究松木转化
PLANT BIOMASS OZONATION. STUDY ON PINE WOOD TRANSFORMATIONS BY MEANS OF THERMAL ANALYSIS

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Lignocellulosic materials (LCM) mainly consist of cellulose (CL), hemicelluloses (HC), and lignin (LG). Ozonation is a method of plant biomass delignification at the pretreatment stage of polysaccharides and monosaccharides processing [1-8]. Cellulose-containing materials (CM) obtained from the ozonated wood were studied by means of a number of physicochemical and chemical methods. Researches of pine and aspen wood transformations under ozone exposure showed a deep delignification of LCM. The delignification is accompanied by a destruction of HC [3]. It was observed in [2, 3], a decrease of polymerization degree of CL obtained from ozonated aspen and pine wood.

Simultaneous thermal analysis (TA) is a classical method of studying the structure of various types of plant biomass [9-13]. Both TA and mass spectrometry (MS) analysis of gaseous pyrolysis products give a lot of information about lignin and plant biomass structure [14-18].

In a combination with other physical and chemical methods, TA is widely used for a study on biomass transformations as a result of different pretreatment procedure (treatment by means of ionic liquids, thermal treatment, ozonation, etc.) [5, 6, 11-13]. It was shown [11, 12] a decrease of the biomass thermal stability while cellulose de-polymerization. According to [5, 12, 18], lowering of LG content is accompanied by a decrease in thermal stability of biomass. So, TA is sensitive in relation to changes in the composition and structure of biomass and in a combination with other techniques can be useful for wood transformations analysis.

The aim of research: to study transformations of wood after treatment by ozone using the simultaneous thermal analysis combined with mass-spectrometry of non-condensable pyrolysis products; to establish a relationship between the known characteristics of CM from ozonated wood and the results of TG/DTG and MS analysis. To solve this task, profiles of non-condensable thermal destruction products of biomaterials in an inert atmosphere are obtained.

Experimental

The sawdust of pine wood (*Pinus silvestris*) with a particle size of 0.315 – 0.63 mm and moisture content of 60-65% was used for the research. Wood samples preparation, ozone treatment procedure and specific ozone consumption (OC, mmol/g) calculation were described in [3, 8]. Several experiments on variable ozonation time were carried out. After ozonation wood samples were washed to remove water-soluble ozonation products. LG content (Klason LG) in air-dried samples was determined according procedure [19].

Thermal analysis of the samples was carried out on thermal analyzer Netzsch 449 C Jupiter, combined with mass spectrometer Netzsch-409 Aoelos. Samples were analyzed at a heating rate 10 °C/min in the range of 40°C–1000°C in argon atmosphere, gas flow rate 8 mL/min, the sample mass 7 mg. Integrating of mass spectra (MS) for different masses was conducted using the reference intensity of ion current for the each mass. The results of integration were normalized to the initial mass of the sample.

Results and discussion

TGA and DTG curves obtained for samples of ozonated pine wood in argon atmosphere are shown in Figure 1. DTG curve of the original pine wood is characterized by the first peak of mass loss rate, in the range of 40 ÷ 149° C with a maximum at a temperature of 96.1°C. The mass loss is 1.6%. The second peak of the DTG curve is seen between 149 ÷ 402°C with a maximum at 364°C. Weight loss amounts to 64.4%. DTG curve of the original sample has a shoulder at ~ 300° C of HC thermal decomposition, while at this temperature interval the main contribution to the mass loss corresponds to cellulose.

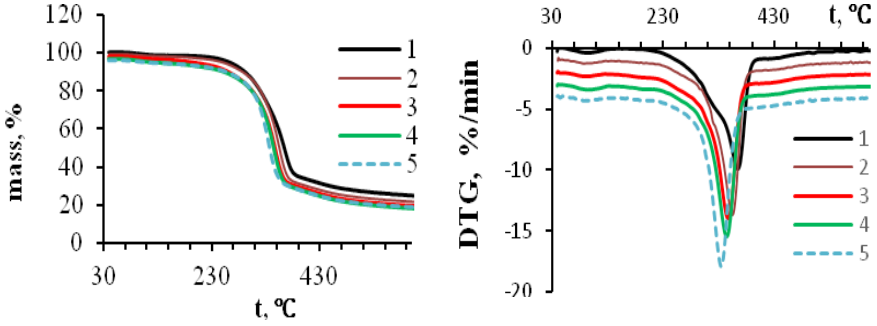

Fig. 1. *TG (A) and DTG (B) data on pine wood and CM from ozonated wood. OC, mmol/g: 0 (1), 0.6 (2), 1.4 (3), 1.9 (4), 3.3 (5).*

For the samples of LCM, derived from ozonated wood, the position of the first weight loss maximum practically does not change because it is caused by losses of physically bound water in CM samples. The second interval of the mass loss of CM samples is narrowed and shifted to the region of lower temperatures, the maximum (t_{2max}) of DTG curves is noticeably shifted (fig. 1B). For samples of OC 0.6 and 1.4 mmol/g, t_{2max} is seen at 347 and 354°C, respectively; the weight loss is 67.2 and 67.3%, correspondingly. At higher OC, the shift of the maximum continues. The dependence of the DTG maximum position on the specific ozone consumption is shown in Fig. 2.

Thermal decomposition of structural components of wood, namely, HC, CL and LG occurs at intervals of 225-325, 305-375 and 150-500°C [10]. With an increase in ozone consumption, a content of the most thermally stable structure (lignin) in the sample decreases, therefore the DTG curves shifting to lower temperatures is understandable.

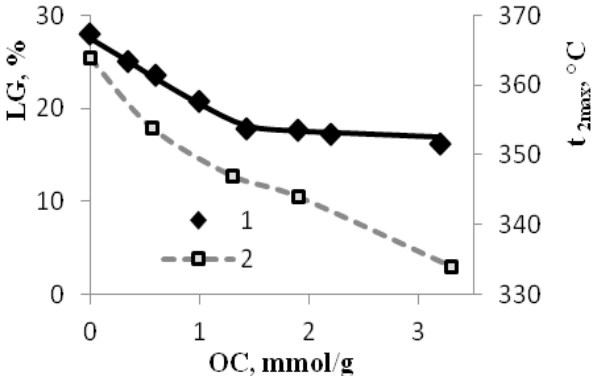

Fig.2. *LG content (1) and the temperature of DTG maximum (2) according to ozone consumption by pine wood.*

When studying the transformation of LCM after ozone treatment it was marked [5,6] the correlation between the content of LG in biomass and the temperature intervals of weight loss at TGA and DTG curves. A comparison of the LG content and t2max versus OC shows that the OC and t2max dependences are not parallel. The t2max position continues to decrease, even when the content of LG does not change (Fig.2). Therefore, the thermal stability of the CM is due to not only decrease of LG content but also a destruction of polysaccharides. It is seen in Fig.1 B that the shoulder at 300° C (relating to thermal destruction of HC, in softwood consisting of glucomannan structures), in DTG curves of ozonated samples is absent. This result indicates to degradation HC when a consumption of the first portions of ozone.

The delignification of pine wood in ozonation is accompanied by reducing of polymerization degree (PD) of cellulose obtained from ozonated samples [3]. For example, when OC = 2.0 mmol/g the PD of pulp is 520, compared with cellulose in original sample (PD = 760). Cellulose de-polymerization is a factor, lowering the thermal stability of LCM [12], so the observed changes in the DTG peak are largely due to the destruction and polysaccharides.

The MS data show that in the course of thermal decomposition of wood in inert atmosphere non-condensable products are released. Among them, water (M/z = 18), CH_4 (M/z = 16), CO_2 (M/z = 44), CO (M/z = 28), formaldehyde (M/z = 30). These compounds are typical for thermal destruction of plant biomass and lignin [15-19]. Profiles of pyrolysis products release for the original wood and CM of ozonated samples are given in Fig. 3.

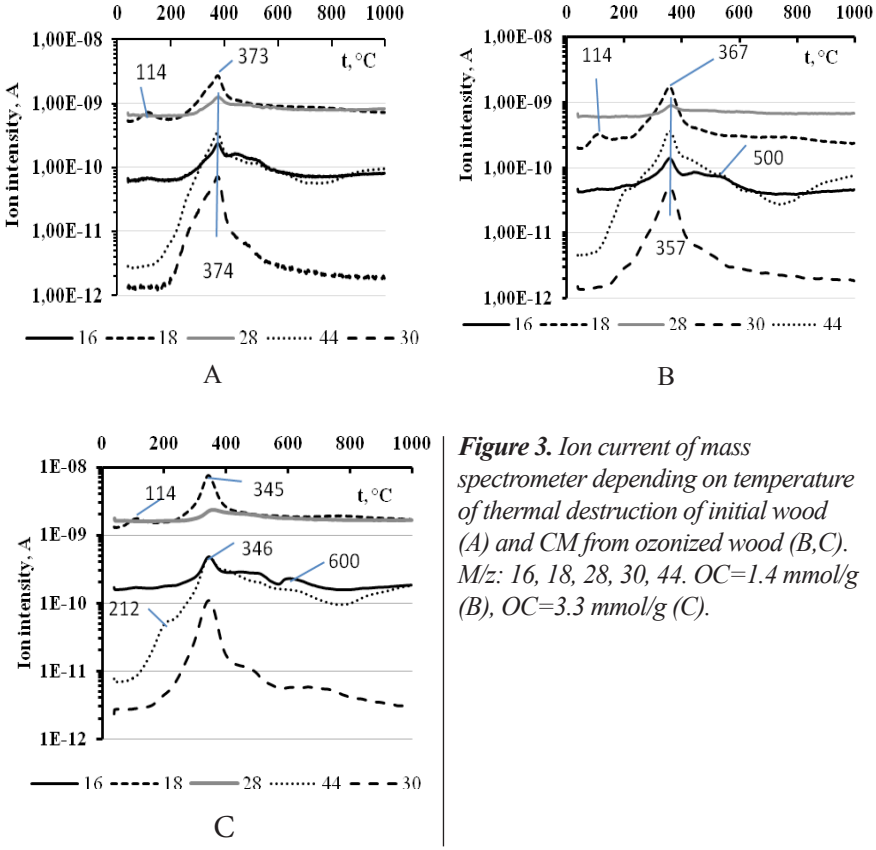

Figure 3. *Ion current of mass spectrometer depending on temperature of thermal destruction of initial wood (A) and CM from ozonized wood (B,C). M/z: 16, 18, 28, 30, 44. OC=1.4 mmol/g (B), OC=3.3 mmol/g (C).*

For the original wood, MS of water has maxima at 114° C and 373° C (Fig. 3A). The first maximum refers to the evaporation of physically adsorbed water, and the second one is associated with the formation of water as a product of chemical reactions accompanying the thermal destruction. The second peak of water release for ozonated samples shifts to lower temperatures. (Fig. 3B, 3C). The product profiles of ozonated samples have a shoulder at 190° C -220°C, which can be attributed to the thermal destruction of low molecular LG oxidation products formed at the ozonation stage (formic, oxalic, glyoxalic acids, etc. [8]), and remained in pores of the sample.

Profiles of other products of thermal destruction of original and ozonated samples are also characterized by high maxima in the second temperature interval of the mass loss. The temperature maximum of the products release of ozonated samples is shifted into the region of the lower temperatures. For the ozonated samples, CO2, CO and HCHO release interval is broadened into high-temperatures. The MS of CH4 and HCHO for the sample of OC = 1.4 mmol/g (Fig. 3B) are characterized by higher temperatures (450-550° C) and for the sample of OC= 3.3 mmol/g there are maxima at temperatures of about 600° C (Fig. 3C).

Amount of products (in arbitrary units) versus the OC is presented in Fig.4. The amount of adsorbed water (the first interval) increases, passing through a small minimum. The amount of water released in the second interval also increases markedly with OC. Similar dependences are observed for other products.

The data above are explained by changing a composition of ozonized material according to different OC values. When ozonation, delignification of biomaterial occurs; both LG and HC content decreases, and CL content increases [3]. It was shown by means of IR-spectroscopy [3, 7, 8] that a content of aliphatic structures on the surface of the ozonized CM grow as OC increases. A lot of aliphatic structures contain carboxyl- and carbonyl-groups. The combination of mentioned processes results in the complex character of the observed dependencies.

Reduction of water release in the first interval is related to a change of hydrophilic properties of CM with increasing OC. Amounts of water reduce if destruction of LG and, especially, hemicelluloses, which contain significant amounts of hydroxyl groups, linking the water molecules by means of hydrogen bonds. On the contrary, increase of CL content and oxygen-containing products of oxidation creates preconditions for water molecules to be bound by hydrogen bonding. With this, at high OC values the quantity of water in the pyrolysis products increases significantly.

Destruction of LG and HC at low OC values explains decrease in CH_4, H_2O (second interval), CO, HCHO when OC ≤ 1.4 mmol/g. This consideration is based on the data [15-17] that LG is the source of these compounds, and HC produce CO2 and H2O. Increase of CL content in the delignified CM samples results in increase of CO_2 and CO amounts. In OC range of 2.0 - 3.3 mmol/g a presence of oxygen- containing products of LG oxidation by ozone promotes CO_2 and CO release when pyrolysis.

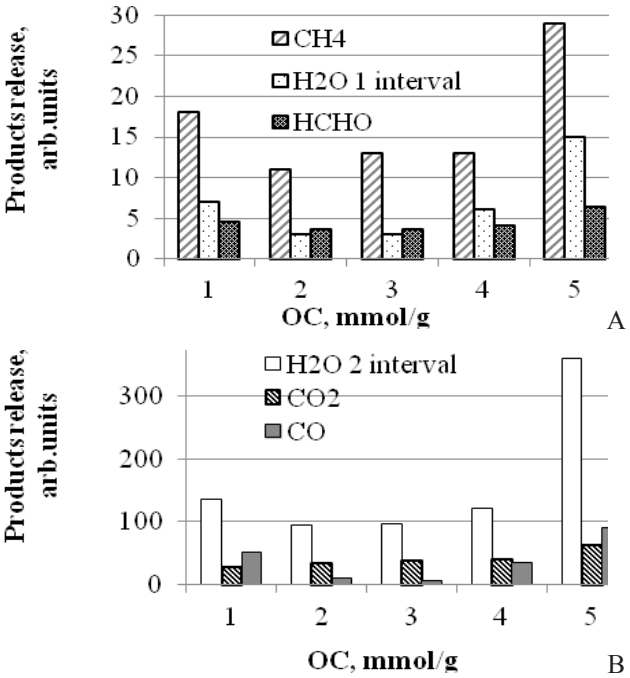

Figure 4. *Products release (in arb. units) when CM pyrolysis according to specific ozone consumption.*
CH_4, H_2O (first interval), HCHO (A);
H_2O (second interval), CO_2, CO (B).

Determination of total aromatics content in CM of ozonated samples using Klason procedure showed that LG content decreases at OC ≤1.4 mmol/g and practically does not change for OC > 1.4 mmol/g (Fig. 2). Accordingly, one would expect a reduction of CH4 for OC ≤ 1.4 mmol/g with a subsequent constancy of values, because CH4 is produced LG. As one can see from Fig. 4, when increasing OC, CH_4 release firstly falls and then rises markedly. The data obtained allow suggestion that, in addition to the LG destruction, aromatic structures are partially polymerized when wood ozonization. This assumption is consistent with the increase in amount of the released CH4, CO and HCHO and a significant broadening of temperature interval of their release at high temperatures, for the samples of OC 1.4 - 3.3 mmol/g (Fig. 3, 4). Thus, the results of thermal analysis CM of ozonated wood are in agreement with the .previous data on pine wood transformations under ozone impact. TG/DTG data showed destruction of HC, a decrease of thermal stability of ozonated CM resulting from de-polymerization of CL and a formation of oxidation products when ozonation of wood. Results of TG/DTG and MS analysis show that wood delignification by ozone causes not only destruction, but also a polymerization of lignin.

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研究通过强化方法提高切削工具耐磨性的可能性

STUDIES OF THE POSSIBILITY OF IMPROVING THE WEAR RESISTANCE OF CUTTING TOOLS BY STRENGTHENING METHODS

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注解。 进行了一项研究，通过使用添加剂技术的硬化方法来改善切削工具的耐磨性。

关键词：耐磨性，切削工具，等离子喷涂，添加剂技术

Annotation*. A study was conducted to improve the wear resistance of the cutting tool by hardening methods using additive technologies.*

Keywords*: wear resistance, cutting tool, plasma spraying, additive technologies*

A necessary condition for achieving high cutting properties of tools is the low physicochemical activity of tool materials with respect to the materials being processed. Therefore, the crystal chemical properties of tool materials should differ significantly from the corresponding properties of the materials being processed. The degree of such a difference strongly influences the adhesion-fatigue, oxidation processes, wear of the working surfaces of the instruments and the quality of the treated surfaces. It is recommended to use such tool material in the cutting tool that has no affinity with the material being processed.

In the process of metal cutting, the working surfaces of the instruments are subjected to intense exposure to high contact pressures and temperatures. Interaction with the processed material and environmental reagents leads to intense physicochemical processes in the form of adhesion, diffusion, oxidation, corrosion, etc. In order for tools to resist the loads acting on them, instrumental materials must meet a whole range of requirements and properties: hardness, mechanical strength, heat resistance, wear resistance, thermal conductivity, manufacturability.

In order for the tools to cut the required volumes of the materials being processed, the hardness of the HVИM tool materials must significantly exceed the hardness of the HVOM materials being processed. Therefore, one of the main requirements for tool materials is their high hardness. However, an excessive increase in hardness, as a rule, leads to an increase in brittleness, a decrease in viscosity and the formation of cracks in tool materials. Practice shows that, depending on the processing conditions, there is an optimal ratio of HVИM / HVOM, which provides the best combination of hardness and toughness of tool materials.

The ability of tools to resist large mechanical loads without brittle fracture and noticeable plastic deformation is determined by their mechanical strength. Therefore, instrumental materials must have sufficient values of mechanical strength in tension and bending (s bending (σ_u). Very important is the so-called impact toughness, which is especially important when working cutting tools with intermittent cutting, impact load and variable depth. Tool steels have a toughness several times larger than hard alloys, mineral ceramic, etc. Since tools can be operated under cyclic loads, along with mechanical strength, tool materials must have high resistance to fracture under cyclic loading, usually called endurance limit. ($\sigma_в$). Very important is the so-called impact toughness, which is especially important when working cutting tools with intermittent cutting, impact load and variable depth. Tool steels have a toughness several times larger than hard alloys, mineral-ceramic.

This property determines the ability of cutting tools to retain their hardness at elevated temperatures that occur during the cutting process. It is the heat resistance of tool materials that primarily determines the maximum allowable cutting speed at which tools can work. Taking into account the need to use tool materials under conditions of periodic changes in temperature, tool materials should be insensitive to cyclic temperature changes.

The surfaces of the cutting tools must resist the removal of particles from their working surfaces when interacting with the materials being processed, and the tool materials must have high wear resistance. This indicator is a complex property and depends on all the above properties.

The ability to remove heat from the cutting zone in order to reduce the likelihood of overheating of the cutting edges is an important condition for normal operation of the cutting tools. Therefore, instrumental materials must have sufficient thermal conductivity.

The manufacturability is understood as a complex of properties that characterizes the behavior of tool materials in the manufacture of cutting tools. Manufacturability determines the possibility of using the brand of tool material in the design of a particular cutting tool. For example, materials with poor grindability are inconvenient in the manufacture and regrinding of complex-shaped tools, and too narrow a temperature interval for heating the material during heat treatment can lead to scrap and reduce the overall quality of the tool. It is recommended to use such tool material for the cutting tool that has no affinity with the material being processed.

Let us analyze the known methods of hardening the cutting tool and its effectiveness.

Hardening methods are divided into six main classes: hardening with the formation of a film on the surface; with a change in the chemical composition of the surface layer; with a change in the structure of the surface layer; with a change in the energy reserve of the surface layer; with changing surface microgeometry and working hardening; with a change in structure throughout the volume of the material.

Currently, a wide range of methods and techniques to improve wear resistance is known, but the most relevant will be the combined treatment.

Consider magnetic impulse processing (MIP). In the process of conducting experimental studies of combined MIP of various metal-cutting tools from high-speed steels, the increase in wear resistance of machined tools was respectively: 158% for drills, 202% for cutters and 161% for taps regarding the durability of untreated tools.

To date, a promising direction for creating reliable, durable and wear-resistant coatings is plasma spraying.

Plasma spraying is one of the methods of gas-thermal coating. The basis of this process is heating the sprayed material to a liquid or plastic state, transferring it to the substrate with a high-temperature plasma jet with the subsequent formation of a coating layer [1].

Plasma spraying technology can be used to apply a huge range of manufacturing powders in order to obtain sprayed surfaces with the necessary structure and properties. It provides the ability to apply coatings on local surfaces, the absence of restrictions on the size of the parts to be machined, the possibility of applying multilayer coatings, a positive effect on the fatigue area of the substrate, minimum allowances, coating without subsequent machining, high productivity and the ability to automate the process.

The disadvantages of plasma-sprayed coatings are low adhesion strength to the base, adhesive strength and heat resistance of the coating, which is associated with different coefficients of thermal expansion of the coating and the base. Possessing significant porosity, plasma-sprayed coatings do not protect the surface from oxidation, which leads to accelerated destruction of the coating.

To eliminate the above disadvantages, a powder coating is sprayed onto the metal surface of the product.

For spraying coatings by the plasma method, powders are used predominantly of granulation 0.04–0.10 mm. Outside of this granulation range, the plasma spraying process is not effective, since particles of small size less than 0.04 mm evaporate, and particles larger than 0.10 mm do not melt (their partial melting does not allow to obtain a high-quality coating).

Thus, it is economically and technically feasible to create an expensive complex cutting tool with 3D prototyping followed by surface hardening with plasma spraying.

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组织和技术因素对矿用自卸车使用效率的影响
INFLUENCE OF ORGANIZATIONAL AND TECHNICAL FACTORS OF OPERATION ON THE EFFICIENCY OF USE OF MINING DUMP TRUCK

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注解。本文介绍了主要组织和技术因素对自卸车运行效率影响的研究结果。对采矿自卸卡车运行的分析表明，在工业和技术运行条件下，可以提高机器的效率。研究已经引导时间观察观察在别列佐夫斯基部分运行的自卸卡车。计算了岩体输运的合理参数。评估了偏离合理参数的运输周期的操作，并找到了这些偏差的原因。确定了采矿，地质和气候因素对岩体运输周期持续时间的影响。考虑到废品数量对自卸车制造时间的依赖性，维修单位成本变化模型有助于计算出实际运行条件下自卸车运行效率的合理参数。

关键词：工业运作;垃圾车;理性参数;组织和技术因素;维护和修理系统。

Annotation. *The article presents the results of the study of the influence of the main organizational and technical factors on the efficiency of operation of dump trucks. The analysis of mining dump trucks operation showed that it is possible to increase the efficiency of the machines in condition of industrial and technical operation. Researches have led the timing observations to watch the dump trucks in operation on the Berezovsky section. Rational parameters of rock mass transportation were calculated. The operations of the transport cycle deviated from rational parameters were assessed and the reasons of these deviations were found. The influence of mining, geological and climatic factors on the duration of the rock mass transportation cycle was determined. The model of changes of unit cost of maintenance and repair which consider the dependence of the amount of rejects on manufacturing time of dump trucks helps to calculate rational parameters of operating efficiency of dump trucks in real conditions of operation.*

Keywords: *industrial operation; dump truck; rational parameters; organizational and technical factors; system of maintenance and repair.*

Intensive development of the open method of mineral production, as a rule, causes the deepening of the quarries, makes other mining conditions more complicated hence the quarrier auto-transport becomes more important. Transport expenses are 35-40% of the cost of all expenses of mineral production on the depth of 50-70 m, if the depth is 250-300 m, transport expenses are 50-55% and they may grow up to 70% in the quarries with the project depth of production of 560-700m.

Analysis of quarry vehicles operation showed the following: 1 hour of productive work in the system of production contains 0.4-1.2 unproductive hours. Labor costs for maintenance and repair of dump trucks in the industry are approximately 4,0-6,0 pers.-h/Mach.-h and unit cost of repair and maintenance are 2500-4200 RUB/mach.-h, what is 4.5 and 3.4 times, respectively, more than in the advanced Russian mining enterprises. The current situation caused by different factors which influence industrial and technical operation of quarry auto-transport.

Production operation of quarry vehicles is characterized by some specific features inherent in the development of minerals in an open way:

- change of places of loading and unloading developing the front of mining operations;
- repeatability of the cycle of loading and transportation of rock mass;
- frequent changes in the distance of transportation of rock mass in complex roads and steep (8...10%) slopes.

The reliability of quarry vehicles in its production operation largely depends on the mining, climatic and road conditions of the machines, the organization of maintenance and repair, equipment of road transport workshops GOKov, as well as the perfection of the design, quality of manufacture and Assembly. Changing the level of reliability in the operation of machines entails the need to increase the cost of maintaining them in good condition and a significant consumption of resources.

On the basis of an objective assessment of the efficiency of operation and technical condition of quarry vehicles depending on the conditions of its operation, the analysis of the main factors that have a significant impact on performance, reliability of quarry vehicles and resource consumption.

The study and analysis of the scientific and methodological base allowed to group the factors that have a significant impact on the reliability and performance of quarry vehicles [1] (table. 1).

Table 1. *Factors affecting the reliability and performance of quarry vehicles*

Factors	Characteristic
Technical condition	Maintenance and repair strategy: • service life; • frequency, completeness and duration of repairs; • quality of spare parts; • qualification of maintenance personnel; • repair method
Mining and technical	Changing work area settings; The condition and profile of haul road
Organizational	Organization of loading and transportation process; Maintenance and repair strategy: Modes of motion for transport schemes, the rhythm of the work
Climatic	Environmental parameters (temperature, precipitation, wind speed, etc.))

As a result of the research activities of mining enterprises of the North-West region (OOO "Karelsky Okatysh", OOO "Kovdorsky GOK") and expert assessment (27 people) the influence of factors that cause resource consumption in the operation of mining vehicles, their importance is found out (table. 2).

In order to identify deviations of the transport cycle from the rational values and to establish the causes of these deviations, to assess the impact of mining, geological and climatic factors on the duration of the cycle of transportation of rock mass by Komatsu HD-785 dump trucks (carrying capacity of 90 tons) operated by JSC "Berezovsky Section", a series of time-lapse observations was carried out in the following conditions: the air temperature was in the range from +15 to +19 °C with heavy rainfall and wind speed up to 8 m/s; the mode of operation of drivers – 2 - shift for 12 hours; loading of rock mass was carried out by an EKG-10 excavator with a bucket capacity of 10 m^3.

To calculate the time of operations of transportation of rock mass with rational parameters, the indicators presented in table 3 were adopted.

Table 2. *The importance of the factors causing the consumption of resources, (%)*

№ p/p	Name of resource, material, part, etc.	Factors													
		The quality of the roadway	Qualification of drivers	Organization of loading and transportation process	Mode of motion	Qualification of maintenance personnel	The organization of repair	Repair technology	Quality of spare parts	Seasonality	The wear on the base and mating parts	Constructive defects of equipment	Tire quality	Overstated approved standards	Low financing of the repair Fund	IN TOTAL
1	Diesel fuel	29		41	4					13				13		**100**
2	Tires	50	26	4	4					8				8		**100**
3	Engine oil	50	17	33												**100**
4	Transmission oil	25	8	17				25	17		8					**100**
5	Hydraulic oil		25					21	33		17				4	**100**
6	Shell Lubricant	32			6	6			50		6					
7	Finger steering rod, jet rod, rear axle central hinge	50	8		17				25							**100**
8	Roller bearing	38	4		29			8	17		4					**100**
9	Brake mechanism	34	50		8				8							**100**
10	Brake pad	26	33		8				33							**100**
11	BelAZ suspension cylinder	42	8		4				38	4		4				**100**
12	BelAZ suspension cylinder	42	8		8				38			4				**100**
13	Tie rod steering	42			17				29	8		4				**100**
14	Cooling liquid		14				4	8	33	33		8				**100**
15	BelAZ side reducer	38	8		13				29	4		8				**100**
16	Frame power structures	38	4		17				25	8		8				100

– significance of the factor is more than 30%

Table 3. *There are indicators for the calculation of the time of operations of transportation of rock mass dump trucks Komatsu HD-785 with rational parameters [2]*

Indicators	Values
Given the speed Laden / unladen km/h*:	
l_{fact}=2.0 km, Σ_{hp}=0,018 km, Σ_{hs}=0,03 km	41,6 / 44,7
l_{fact}=2.1 km, Σ_{hp}=0,018 km, Σ_{hs}=0,03 km	41,6 / 44,3
l_{fact}=2.4 km, Σ_{hp}=0,022 km, Σ_{hs}=0,079 km	41,6 / 49,5
l_{fact}=3.3 km, Σ_{hp}=0,048 km, Σ_{hs}=0,079 km	41,6 / 50,2
The number of buckets of rock mass in the pillar in the back of a dump truck (EKG-10 excavator).item**	6.0
The cycle time of loading a single bucket excavator, min.***	0.55
Unloading time, min***	0.8
Installation time for loading / unloading, min***	0,7 / 0,6

l_{fact} – the actual distance of transport; Σh_p – lifting height; Σh_s – the height of descent.

* Calculation of reduced speed:

$$V_{reduced} = (l_{reduced} / l_{actual}) \times V_{actual} \quad (1)$$

where $l_{reduced} = l_{actual} + k_{red} \times \sum h_{red} + k_{red} \times \sum h + 0{,}1$.

If $(l_{reduced} / l_{act}) \times V_{\lim} \geq k_{CPA} \times V_{\max}$, then

$$V_{привед} = k_{КПД} \times V_{\max} . \quad (2)$$

If $(l_{reduced} / l_{act}) \times V_{\lim} < k_{CPA} \times V_{\max}$, then

$$V_{привед} = (l_{привед} / l_{факт}) \times V_{огр}, \quad (3)$$

where k_{CPA} = 0,8 – when moving empty;

k_{CPA} = 0,64 – when driving loaded;

V_{limit} = 35 km/h – speed limit when driving a dump truck in the quarry;

V_{max} = 65 km/h – the maximum speed of the dump truck.

** Loading passport of Komatsu HD-785-7 dump trucks by overburden excavator EKG-10, approved May 21, 2013 in AO "Razrez Berezovsky".

*** The W1.3.03-2008/1.0 standard of the OAO "SUEK" company. Transportation of rock mass by quarry dump trucks.

During the obseration, the data were collected and systematized to calculate operation parameters of dump trucks. The structure of the main operation time of Komatsu HD-785 dump truck is presented in the table 4.

Table 4. *The structure of the main operation time of dump trucks Komatsu HD-785 (100% – 4 h 11 min)*

№ p/p	Transport cycle operations	Prod time. of work, % (min)	Unprod time. of work, % (min)
1	Empty moving	20.5% (51.5 min)	10.5% (26.3 min)
2	Unloading	4.3% (10.7 per min.)	-
3	Installation for unloading	3.6% (9.0 min)	0.9% (2.2 min)
4	Loaded moving	22.0% (55.3 min)	13.6% (34.1 min)
5	Loading	18.9 % (47.6 per min.)	-
6	Installation for unloading	4.2% (10.5 min)	1.5% (4.0 min.)
TOTAL:		**73,5%**	**26,5%**

Время производительной работы – расчетное время выполнения основных операций транспортного цикла с рациональными параметрами. Они определяются как устойчиво достигаемые лучшие значения, обусловленные организационными, техническими и технологическими возможностями эксплуатации оборудования на данном предприятии

Время непроизводительной работы – расчетное время выполнения основных операций, определяемое как разница между фактическим и функциональным временем выполнения операций

* В качестве функционального времени принято фактически освоенное время выполнения операций

As a result of timing observations the biggest deviation of the average factual time of operation from the rational time was observed at the operations "movement of loaded dump truck" - 1.3-1.6 times more and "movement of empty dump truck" - 1.4-1.6 times. The average actual time of dump trucks movement exceeded the time with rational parameters by 1.2-1.4 times (table. 5).

The results indicate poor road quality and the impact of adverse weather conditions.

Thus, the calculations showed that:

• time of productive work (time of performance of the main operations with rational parameters) makes from 24% to 67% in change (from 3 h to 8 h);

• non-productive time (time operations, unforeseen by the rules; irrational actions; inaction; downtime climatic conditions) is 23-63% (7.5 h) shift of the Fund, including:

- downtime due to rain – 39-40% (up to 4.5 hours);
- waiting in line for loading dump trucks – 4-10% (up to 1 hour);
- irrational actions of performers when performing operations of the transport cycle – 7.5-15% (up to 2 hours);
- repair of excavator from 2 to 4% (up to 0.5 h);
- waiting for the dispatcher's team to start work – 3-4% (up to 0.5 h);
- late start/ early end of work – 1% (up to 0.1 h);
- irrational actions of subcontractors – 0.5% (up to 0.1 h).

This fact indicates that there are reserves to increase the productivity of dump trucks by improving the organization of the process of production operation [3]. Thus, in the process of production operation of dump trucks it is necessary to take

into account: the intensity of traffic on technological roads, the rhythm of operation, operating conditions – the height of the lifting of the rock mass, the slope of the route, the distance of transportation, as well as the actual technical condition of the units and units of dump trucks.

Table 5. *The duration of the transport cycle operations of Komatsu HD-785*

№ of trip	Transport cycle operations						Total trip time, min.	Distance during the movement of loaded km
	Installation for unloading	Loading	Loaded moving	Installation for unloading	Unloading	Empty moving		
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	1.2	2.8	6.1	0.8	0.9	5.7	**17.5**	2.00
2	0.7	3.1	5.5	0.8	0.8	5.2	**16.2**	2.00
3	1.0	4.3	5.7	0.8	0.9	6.8	**19.6**	2.00
4	1.1	3.6	5.5	0.7	0.8	5.5	**17.3**	2.00
5	1.3	2.8	6.5	0.7	0.7	5.4	**17.5**	2.00
6	1.4	2.8	6,2	0.8	0.7	5.8	**17,7**	2.00
7	0.8	2.8	6.3	0.7	0.8	5.3	**16.6**	2.00
8	0.8	3.2	5.9	0.6	0.7	4.8	**16.0**	2.00
9	0.7	3.9	5.0	0.7	0.5	5.2	**16.0**	2.00
10	0.8	2.9	6.3	0.7	0.6	5.0	**16.3**	2.00
11	0.9	2.7	6.0	0.8	0.6	5.1	**16.1**	2.00
12	0.8	3.9	6.0	0.7	0.7	5.2	**17.3**	2.00
13	0.7	2.9	5.9	0.7	0.7	5.2	**16.1**	2.00
14	1.4	3.2	6.4	0.7	0.7	5.8	**18.3**	2.00
15	0.8	2.8	6.0	0.7	0.7	1.8	**12.8**	2.00
average.	**1.0**	**3.2**	**6.0**	**0.7**	**0.7**	**5.4**	**17.0**	2.00
max.	**1.4**	**4.3**	**6.5**	**0.8**	**0.9**	**6.8**	**19.6**	
min $_f$	**0.7**	**2.7**	**5.0**	**0.6**	**0.5**	**4.8**	**16.0**	
minutes$_p$							14.3	

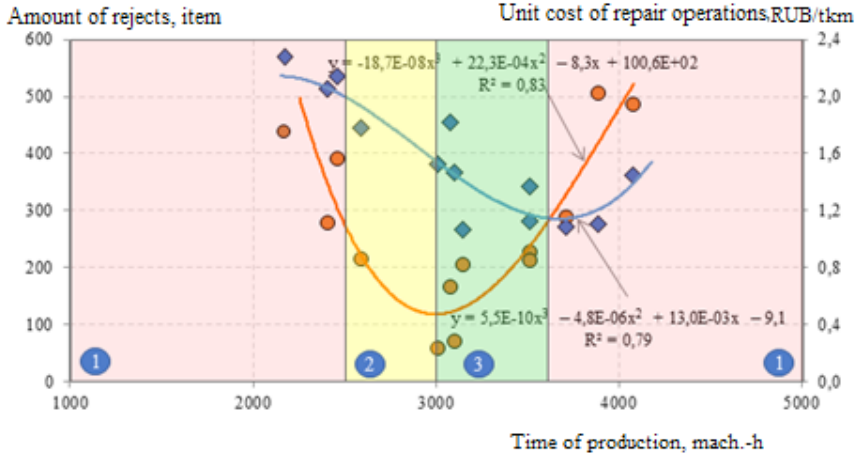
min $_f$, min $_p$ − minimal factual and possible (calculated by minimum values) value, respectively.

▭ − values which were not taken to the calculation of the maximum, average and minimum indicators in connection with the overtaking dump truck at the end of the shift to the shift site.

Timely maintenance and repair of quarry vehicles is as important a condition of operation as compliance with operating conditions. Planning of current repairs should be carried out taking into account both the standard terms of repair work and the needs of the production process. It is most advisable to form a production program taking into account the existing fleet of machines and its maintenance schedules, and not to plan repairs based on the production program. The frequency

of failure of the unit, the unit is one of the most important criteria for their performance, the intensity of failure growth characterizes the technical condition of the units.

To calculate the rational parameters of operation and maintenance and repair systems it is necessary to have a reasonable model of changing the unit cost of maintenance and repair, taking into account the dependence of the number of failures on the time of productive operation of dump trucks (Fig. 1).



operation of dump trucks:
1 – unreasonable (<2500 Mach.-h; >3600 mash.-h);
2 – with low productivity (2500-3000 Mach.-h);
3 rational performance (3000-3600 mash.-h.)

Fig. 1. *Dependence of change of unit cost of repair service and number of failures on time of productive work of dump trucks*

The results of the research carried out on the basis of an enterprise of North-West region show that increasing time of production operation of dump trucks from 2200 to 3100 mach.-h., the unit cost of maintenence and repair operations decreases from 2.5 to 1.4 RUB/tkm that means by 1.8 and the amount of rejects from 460 to 130 - by 3.5 times. Further increase of productive work time up to 3600 machines.-h is accompanied by a slight increase in the number of failures

with an acceptable cost of repair. With a slight increase in the load over 3600 cars.-h there is a sudden change in the number of failures in the direction of increase, while the growth rate of the number of failures significantly exceeds the growth rate of financial costs for maintaining the machines in working condition. In the future, this leads to an increase in financial costs and a significant reduction in the time of productive work of machines on the line [4].

Based on this, it follows that the necessary condition for ensuring the efficiency of quarry vehicles is a rational combination of time of productive work, operating conditions and acceptable cost of maintenance and repair. The proposed model of changing the unit cost of maintenance and repair, taking into account the dependence of the number of failures on the time of productive operation of dump trucks, allows us to estimate the range of values of rational parameters of operation of machines, thereby providing the required level of reliability of dump trucks at an acceptable cost.

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采矿企业维修服务综合评估方法

METHODS OF INTEGRATED ASSESSMENT OF THE REPAIR SERVICE OF THE MINING ENTERPRISE

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注释：本文介绍了作者关于提高采矿企业维修服务效率的研究成果。基于对采矿设备维护组织有效性的分析，评估其运行在“结果/成本”方面的可行性，维修人员结构研究的系统综合评估维修服务的方法，以及评估模式和操作条件对机器性能的影响。该方法允许识别企业的组织，技术，技术和经济系统中的隐藏储备。评估采矿设备经济合理运行和维修的系统方法，允许对每件设备做出管理决策。提出了提高企业维修服务效率的建议。

关键词：系统集成方法，模式和操作条件;储备;技术条件;经济可行性;维修服务。

Annotation. *The article presents the results of the study of the authors about the improvment of the efficiency of the repair service of the mining enterprise. A system-integrated approach to the assessment of the repair service based on the analysis of effectiveness of mining equipment maintenance organization, assessing the feasibility of its operation in terms of "result/cost", the study of the structure of the repair staff, as well as assessing the impact of modes and operating conditions on the performance of machines. This approach allows to identify hidden reserves in the organizational, technical, technological and economic systems of the enterprise. A systematic approach to assessing the economic reasonable operation and repair of mining equipment, allowing to make management decisions regarding each piece of equipment. The recommendations to improve the efficiency of the repair service of an enterprise are presented.*

Keywords: *system-integrated approach, modes and operating conditions; reserves; technical condition; economic feasibility; repair service.*

Material for the article is the researches which mean to improve the efficiency of repair service of a mining enterprise. The experience allows to claim that the efficiency increase oriented both on technical re-equipment and increase of separate technique capacity, which is carried out without necessary change of repair

process order, leads to unreasonable use of resources including working time by operating and repairing personnel, what affects the amount of final product.

The problem of repair service of mining equipment is relevant because the use of labour, material and financial resources is high and increases constantly. The cost of production of non-core actives (the repair of mining equipment) is 30...40% The amount of financial expenses for the entire service life of the equipment, as a rule, is many times higher than their initial cost. [1]

The situation has set the owners and managers of mining companies the task of qualitative analysis of the problems of the repair service in order to develop specific solutions to ensure the growth of its efficiency.

Scientific statements and practical recommendations for the maintenance of mining equipment, set out in the writings of G.A. Boyarskih, A. S. Dovzhenka, L. I. Kantovich, A. A. Kuleshov, V. I. Morozov and other scientists served as the basis for further research of the repair service of the mining enterprise.

In this regard, the use of expert methods (audits) analysis of the repair industry is really important, as it allows to study the repair service in more detailed and qualitative way and on the basis of the results to make appropriate management decisions.

The system-integrated method to asses the efficiency of the repair service makes it possible to find the "drawbacks" and hidden reserves in organizational, technical, technological and economic systems. [2,3]

Considering mentioned above, a lot of mining enterprises which are interested to improve their efficiency, initiate an industrial and technical audit to discuss problematic issues and involve the specialists from the third parties.

Institute of efficiency and safety of mining (IESM) has a fairly extensive experience of such works at the enterprises of mining industry in Yakutia, Kuzbass, Kazakhstan, North-Western region of Russia to make the following works:

- the assessment of organizational and technique system of repair industry (repair capacity);
- the assessment of feasibility of mining equipment operation by the balance: "results-expenses";
- finding out the order to withdraw the equipment from the operation;
- the study on the structure and efficiency of the maintenance personnel;
- the assessment of interaction of structural divisions of the enterprise;
- assessment of the impact of modes and operating conditions on the performance of mining equipment.

The structure of the production and technical audit at the mining enterprise is shown in Fig. 1.

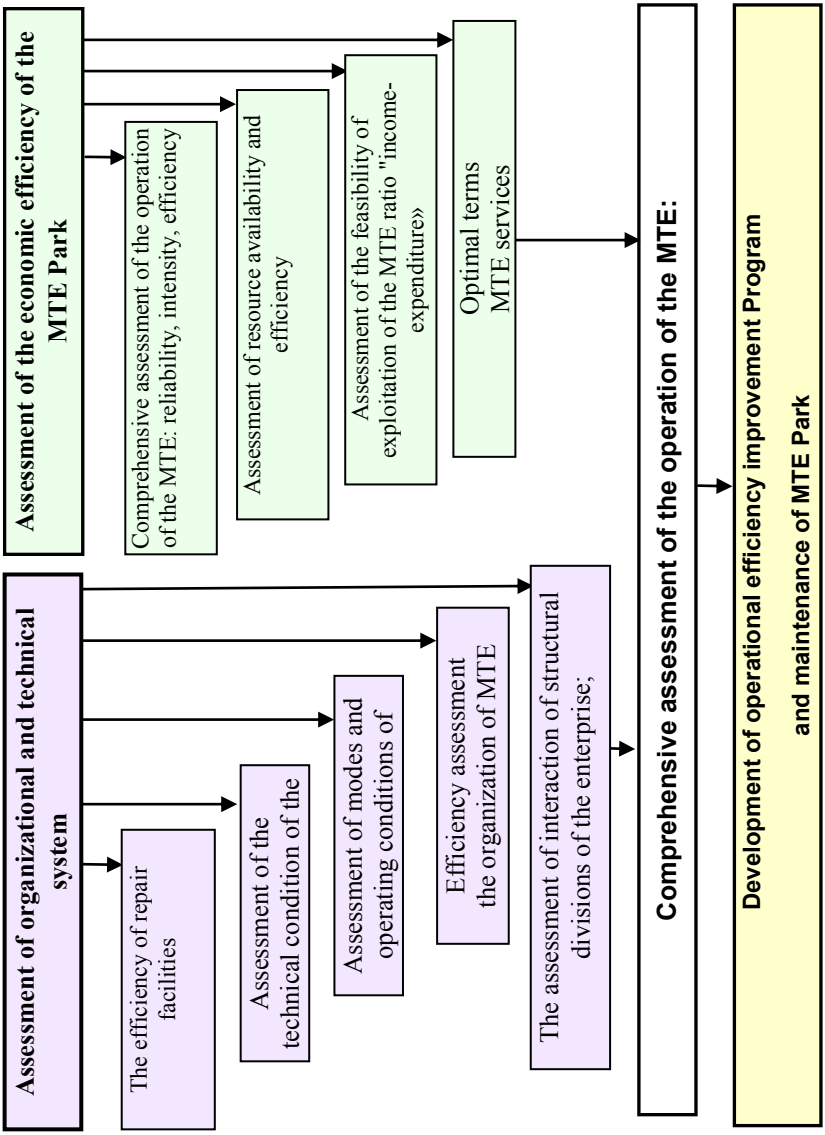

Fig. 1. *Structure of production and technical audit of mining enterprise*

The main principles of a comprehensive study of the repair service are [4]:

- relevance of the results for the Customer and the willingness of staff to go through all stages: from problem setting to problem solving;
- the aim of work;
- communication effectiveness while doing the work.

The article presents the results of a system-integrated study (audit) of the repair service of one of the mining enterprises of the Republic of Kazakhstan.

The carried out researches allowed to establish that factors, both from operation, and from repair service of mountain equipment influence efficiency of repair production (Fig. 2)

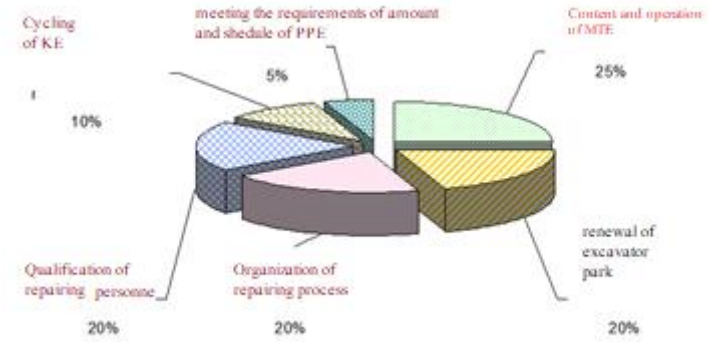

Fig. 2. *Factors affecting the efficiency of repair production*

Analysis of the time allocation for planning, preparation and repair work in the shops of the enterprise showed the following: repair planning takes 1.3-3.8 times more time, the preparation takes 1.5-2.0 times less time, repair operations take 1.5-3.0 times more time in comparison to the values recommended by the Regulations on plan and preventive maintenance. Nevertheless, the specialists of the repair service consider it necessary to increase the period of time for repairs by reallocating the time allotted for its preparation. Practice shows that this approach will lead to a reduction in the overhaul period and, accordingly, to a decrease in the volume of mining.

Analysis of downtime of mining equipment showed that of the 8760 hours of the calendar time Fund (TF) planned and downtime for equipment failure amounted to 37% and 24%, respectively. According to the calculations for 1 hour of planned downtime accounts for 0.2-3.0 hours of downtime (Fig. 3).

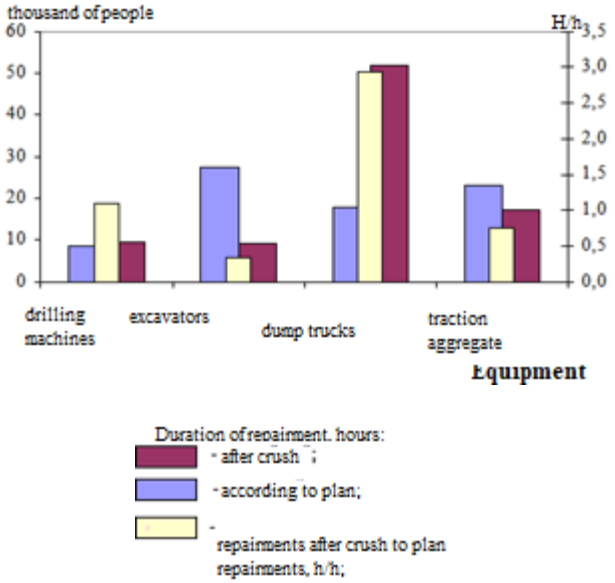

Fig. 3. *Equipment demurrage in plan repair and in case of failure of equipment*

The audit of the technical condition of the excavators, carried out taking into account the intensity of the operational load and the applied system of preventive maintenance showed that it largely depends on the conditions in which the machine is operated and the operating modes (qualification of drivers, the degree of adjustment of the drives), which has a significant impact on the origin and development of defects in the units and assemblies of the machine (table 1).

Table 1. *The number of defects identified during the inspection of excavators*

Division	Number of excavators surveyed, units.	Number of defects, units.			Total number of defects, units	Number of defects per a machine on average, units.
		Working equipment	The mechanisms of the turntable	Carriage		
Quarry 1	5	11	5	11	27	5.4
Quarry 2	11	15	15	12	42	3.8
Quarry 3	9	17	27	19	63	7.9
In total	**25**	**43**	**47**	**42**	**132**	5.5

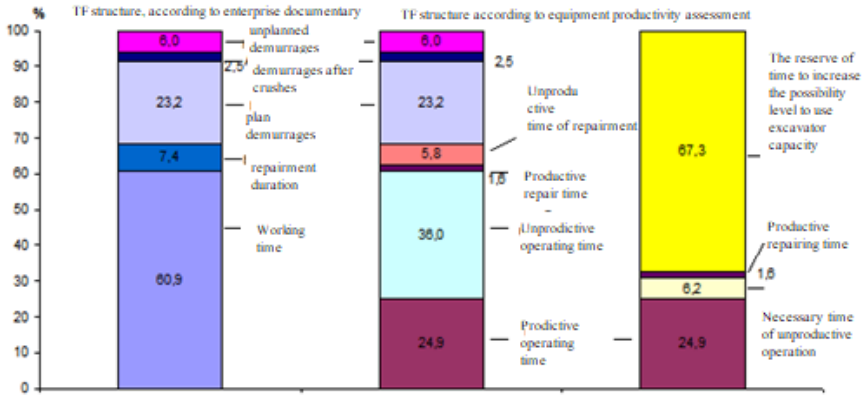

Fig. 5. *Structure of calendar time fund of excavator use*

The specificity of the repair service is that it is closely related to the operation service, since mining equipment must be in working condition to perform the planned volumes of extraction of minerals. In regard of this, according to the methodology developed by the Institute, the criteria determining the effectiveness of the repair service were applied in the analysis:

- **intensity** of operation – productive (estimated) time for which the standard performance is provided;
- equipment **reliability** (demurrages due to equipment failure);
- **economy** – the cost of operation and repair.

Based on the efficiency of excavator operation by the offered criteria and use of visualisation with the "traffic light" system it becomes possible to divide the excavators according to the areas of efficiency, regarding the calculated indicators (fig.6).

Inefficient operation area is characterized by low productivity, high frequency of emergency downtime, the presence of unproductive time, as well as unacceptable repair costs. As a result, it was found that out of 112 excavators 67 work in a low-efficiency and high-cost zone.

Excavator mark №	Operation intensity				Equipment reliability		Efficiency of service	
	Productivity thous. м³/м³		Productive time mach.-h		Demurrage, failure due to crash, h		Unit cost of service, c.u./mach.h	
ЭКГ-8И, №2 ЭКГ-8И, №3 ЭКГ-10,№5 ЭКГ-10,№7 ЭКГ-10,№8 ЭКГ-10,№9 ЭКГ-8И, №13 ЭКГ-8И, №15 Hitachi3600, №38 Cat 385, №32 Cat 385, №33 Cat 385, №35 Cat 385, №36 Cat 385, №37 Bucyrus, №39 Bucyrus, №40 Bucyrus, №41 Bucyrus, №42 Bucyrus, №43	From 270 to 350	-	More than 5000	-	Up to 170	№38	From 20 Up to 50	№№5, 38,41,17,39,40,41,43
	From 90 to 250	№№ 9,38	From 1600-4000	№№23,5,7,8, 9,1315,38,40	From 350	№№2,3,5, 13,35,43	From 55-115	№№2,7,9,13,37,42
	Up to 150	№№ 2,3,5,7,8,13, 15,32,33,35, 36,37,39,40, 41,42,43	Less than 1500	№№32,33,35, 36,37,39,42,4 3	More than 400	№№7, 8,9,15,32,33,36 ,37,39,42,43	More than 120	№№3, 8,15,35,36,

- effective area of equipment operation
- transferring area of equipment operation
- ineffective area of equipment operation

Fig. 6. *Distribution of excavators in terms of efficiency*

Based on the results of the study, the company was recommended priority measures:

1. Within carrying out preventive maintenance of excavators to make the schedule of control of technical condition of knots and units, to personify responsibility for its performance.

2. To develop the instruction of quality control of the repair work carried out by forces of repair crews.

3. Conduct an audit (availability and quality) of technical documentation (maintenance regulations, maintenance) on each excavator. If necessary, complete.

4. Organize the control of the face, modes and operating conditions. Responsibility to assign to the crew and mechanic.

5. Make certification of each piece of equipment (characteristics, technical condition, consumption of materials and spare parts, failure statistics, maintenance and repair planning, their cost, etc.).

Managers of mining companies often face a choice: what equipment to buy and what to decommission. The methodical approach based on calculation of costs of operation (technical and production) and also the income received from realization of volumes of mineral allows to make administrative decisions concerning each piece of equipment (Fig. 7).

Industrial and technical audit of repair operations at the enterprises: "UK "Kuzbassrazrezugol", AK ALROSA (ZAO), AO "Sokolov-Sarbai mining and processing production Association" and AO "Eurasian Energy Corporation" (Republic of Kazakhstan), AO "Kovdor GOK" using a system-integrated approach allowed us to reach businesses in the following results, presented in table 3.

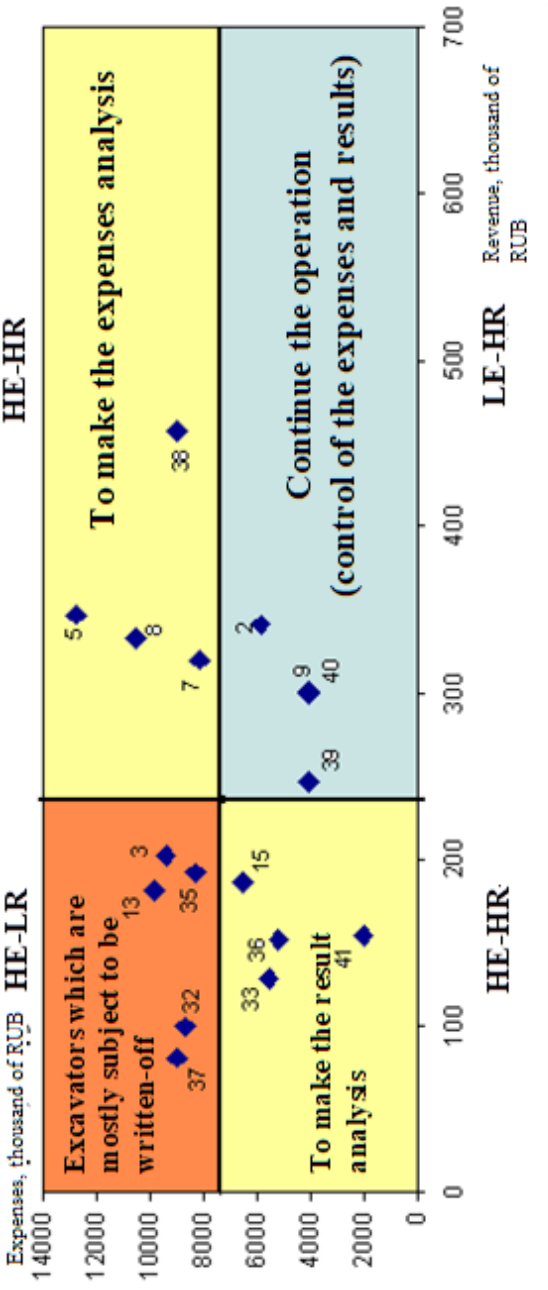

Fig. 7. Distribution of excavators by "cost - income" ratio

Table 3. *Recommendations for enterprises*

Excavation	Ore preparation	Enrichment
• it was decided to decommission part of the mining equipment according to the criteria: - reliability; - intensity; -efficiency.	• the technical condition and productivity of the crushing and grinding equipment (CGE) were assessed;	• the possible productivity of the enrichment equipment was calculated
• five projects of the effective organization of works of repair sites were developed	• recommendations on replacement of CGE considering its technical condition and productivity were developed	• the knowledge of operating and repairing personnel about equipment functionning was assessed
• technological regulations for the excavator repait (standards) were elaborated	• technological regulations for CGE repairment were elaborated	• analytical modeling seminars on motivation and interaction of personnel were held
• certification of drivers of excavators is carried out	• conducted training workshops for the development of personnel, production schedules	• developed technological regulations for the repair of processing equipment
• carried out certification of repair personnel	• check of knowledge of repair and operating personnel concerning knowledge of safety measures is carried out	• the timing of working time managers and specialists of the shop. Losses of working time were revealed – 35%
• route maps of inspection of mining machinery and equipment (check-lists) were developed	• "Regulations on the interaction of units» was developed	• the timing of the working time of the repair personnel was made. Losses of working time were revealed– 35%
• Regulation of motivation of operating and repairing personnel was elaborated	• "Regulations of personnel motivation" were elaborated	

After the analysis of the repair service activities was done the methodological materials were transferred to the enterprise, Regulations of PPE, maintenance-technological and regulatory documentation, procedures and guidelines, contain the analytical calculations which allow, with appropriate organization and commitment of key personnel of the company to go to another level of efficiency of maintenance service, optimizing resource consumption and improve the reliability of mining equipment. [5]

Summarizing the results of the study, it is important to pay attention to the need for continuous improvement of the methodology of calculations and assessments of the repair service of the mining enterprise, which will allow to respond in a timely manner to negative changes and make appropriate management decisions.

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干化学粉末颗粒在非固定气流横截面中的质量分布规律
REGULARITIES OF DRY CHEMICAL POWDER PARTICLES MASS DISTRIBUTION IN CROSS SECTIONS OF A NON-STATIONARY GAS STREAM

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注解。 通过实验确定粉末颗粒在非稳态气流的横截面中的质量分布。 根据灭火器模型与所考虑的部分之间的距离，确定流动横截面中粉末质量分布的规律。 提出了控制非定常气流截面中灭火粉末质量分布的方法，以提高粉末灭火器的灭火效率。

关键词。 粉末组合物，分散组合物，非静止流动，颗粒分布。

Annotation. *The mass distribution of the powder particles in the transverse sections of the unsteady gas flow was experimentally determined. The laws of the distribution of the powder mass in the cross sections of the flow are established depending on the distance between the fire extinguisher model and the section under consideration. Methods are proposed for controlling the mass distribution of fire extinguishing powder in cross sections of unsteady gas flow in order to increase the fire extinguishing efficiency of powder fire extinguishers.*

Keywords. *Powder composition, dispersed composition, non-stationary flow, particle distribution.*

The fire-extinguishing efficiency of the powder composition correlates with its dispersion composition - the greater the value of the specific surface of the powder, the higher its fire-extinguishing ability. For particles with a size of less than 20 microns, difficulties arise in their delivery to the fire site. The length of the jet of powder is ensured by the presence of large fractions in the composition of the fire extinguishing powder composition (EPC) [1].

The purpose of this work is to increase the fire extinguishing efficiency of powder fire extinguishers by regulating the mass distribution of the fire extinguishing powder in cross sections of unsteady gas flow. To achieve this goal experimentally solved the problem of establishing patterns of mass distribution of fire extinguishing powder in the cross sections of unsteady gas flow, depending on the distance between the fire extinguisher model and the section in question.

As a model of a fire extinguishing powder, when solving a research problem, salt edible cooker TU 9192-001-90844204-2011 (hereinafter - salt) was used. The granulometric composition of the salt is determined by sieve analysis and is presented in Table 1.

Table 1 - *The particle size distribution of salt*

Interval of particle diameters of fractions, mm	More than 0,54	0,45...0,53	0,41...0,44	0,34...0,40	0,25...0,33	0,20...0,24	Less than 0,20
Mass content of fraction,%	17,60	22,08	7,06	20,57	19,60	7,79	5,30

To substantiate the possibility of using salt as a model of a fire extinguishing powder, the characteristics of fire extinguishing powders are analyzed, the requirements for which are presented in [2]:

1) apparent density - for unconsolidated and compacted powders;

2) granulometric (dispersed) composition (the rest of the powder on a sieve with a mesh № 05K according to [3] and on a sieve of 1000 microns during sieve analysis);

3) moisture content;

4) propensity for moisture absorption;

5) caking propensity;

6) water repellency;

7) fluidity;

8) fire extinguishing ability of powder to extinguish a model fire;

9) shelf life.

Characteristics numbered 3-6 and 9 (performance) determine the possibility of long-term storage of the powder. Characteristics at numbers 7 and 8 provide the required expense in the fire center. The motion of the powder in a non-stationary gas flow is influenced by the characteristics numbered 1 and 2, since they reflect the ratio of the mass and characteristic area of the particle. Table 2 lists the requirements [2] for these characteristics, as well as their values for salt.

Thus, the data in Table 2 allow the use of food salt as a model of fire extinguishing powder.

Table 2 - *Powder Characteristics Defining Movement in Unsteady Gas Flow*

Characteristic	Units	Performance Requirements [2]	The actual value of the characteristics for salt	Conclusion
The apparent density of fire extinguishing powders: - unconsolidated - sealed	kg/m^3 kg/m^3	≥700 ≥1000	1300	Suits [2]
Mass amount of powder residue on a sieve of 1000 microns during sieve analysis	% mass.	Absence	Absence	Suits [2]

Description of the experimental setup

An installation for simulating the mass distribution of fire extinguishing powder particles in a transverse section of a non-stationary gas flow (Figure 1) consists of a coordinate table (1) of square shape 270x270 mm in size, equipped with powder collectors (2) that are installed in through holes. The material of the rear end surfaces of the powder collectors ensures the smooth flow of the gas stream and retains the powder particles. The inputs of the powder collections at the coordinate table are used as control points when determining the mass of particles of fire extinguishing powder.

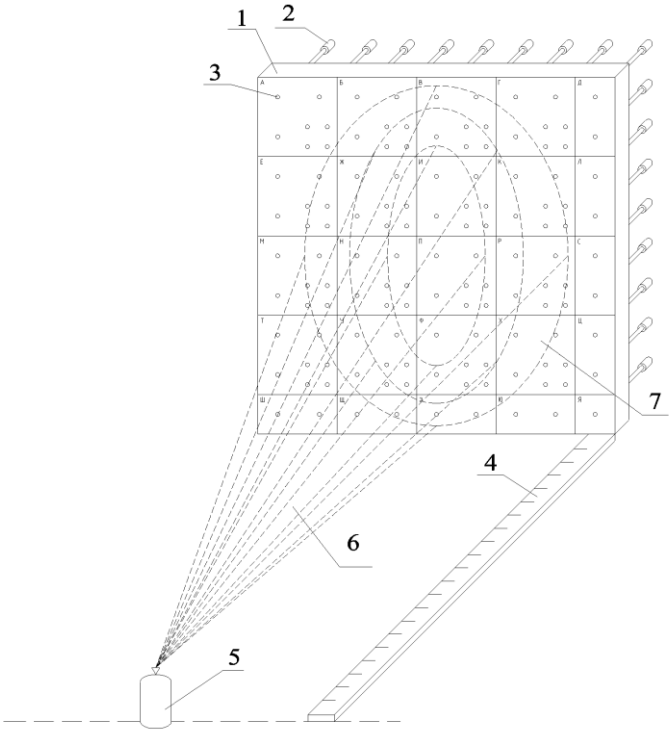

Figure 1 - *Installation diagram for modeling the distribution of fire extinguishing powder in the cross section of unsteady gas flow: 1 - coordinate table; 2 - powder collections; 3 - inputs of powder collections; 4 - measuring ruler; 5 - fire extinguisher model; 6 - powder flow; 7 - conditional distribution lines of equal masses of powder*

The methodology of the experiment

A coordinate table with fixed collections of powder was installed at different distances from the fire extinguisher model. The largest is the distance at which the projected area of the cross-section of the salt flow corresponds to the area of the coordinate table. The layout of the studied sections, denoted by the letters A - D, is presented in Figure 2.

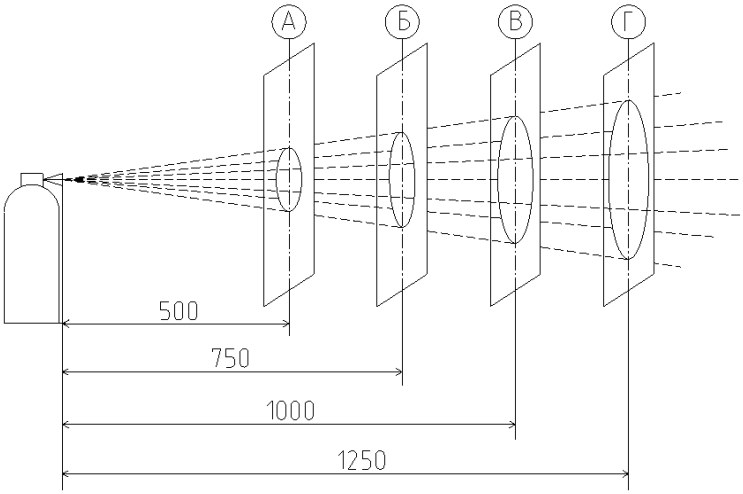

Figure 2 - *Diagram of the relative position of the model of the fire extinguisher and the studied cross-sections of unsteady gas flow*

During the trial experiments, the optimum weight of salt sample was determined to be 150 g (the smallest sample weight, which allows determining the weight of salt retained by separate collections of powder, taking into account the technical characteristics of the weights used). The flow of the powder to the coordinate table was carried out under a pressure of 0.7 MPa. After that, each collection was disconnected from the coordinate table and weighed a sample of salt caught by it. Electronic laboratory scales of the Petves E-2000 brand were used for weighing (the maximum weighing limit is 2000, accuracy class II according to [4]).

According to the results of salt weighing in each collection, the axial point of flow is determined, which corresponds to the collection with the largest mass of captured salt (Figure 3, position O). To find the pattern of salt distribution over the cross-sectional area of the flow, its projection onto the coordinate table is divided into 5 fields (Figure 3, positions P1 - P5), bounded by circles. The diameter of the largest circle is equal to the width of the coordinate table (270 mm). The remain-

ing circles are arranged concentrically with a pitch of a radius of 27 mm from the largest with a center at the axial point.

For each of the flow sections studied, the experiment described was repeated 4 times (in accordance with the requirements of [5]).

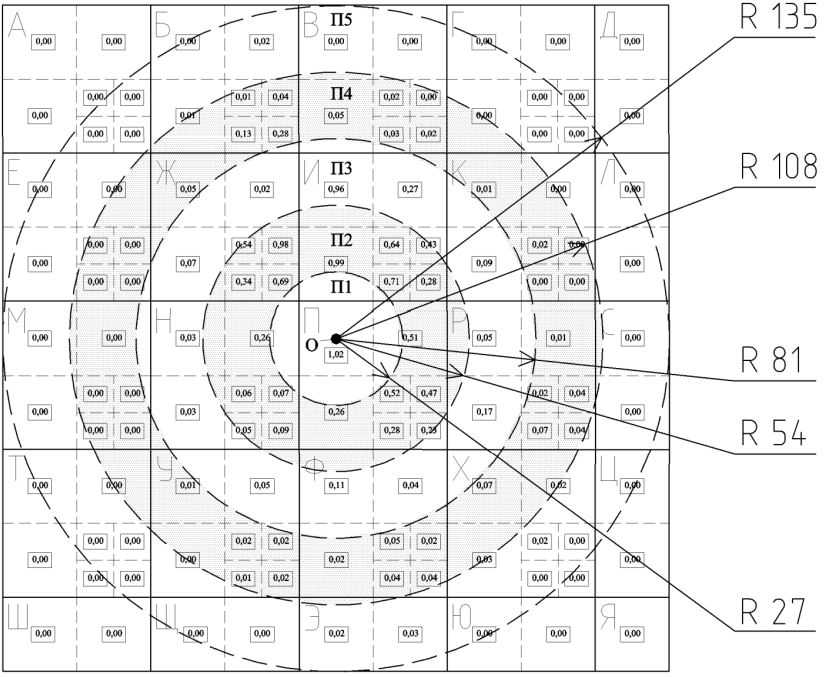

Figure 3 - *Powder mass distribution in the cross section of unsteady gas flow: O - axial point of flow, P1 ... P5 - fields (numbers denote the results of weighing the total mass of powder in each collector)*

The results of the experiments and their processing

For each of the fields (each flow section), the arithmetic average value of the salt powder mass collected by the collectors is determined. The results of the calculations (for example, section A) are presented in table 3.

Table 3. *The average value of the mass of powder of salt, captured by collections of powder, located within the boundaries of the fields*

Section A (L_A = 50 см)						
Field	**Specifications: n_{cell} – the number of collections in the field; mp av - the arithmetic average of the mass of the powder caught by these collections, g**	**Experiment number for this section Weighing results, g**				**The arithmetic average value of the weighing results, g**
		1	**2**	**3**	**4**	
1	*2*	*3*	*4*	*5*	*6*	*7*
F1	n_{cell}	5	6	5	6	-
	$m_{n\,cp}$	0,80	0,86	0,95	0,83	0,86

Continuation of table 3

F2	n_{coll}	10	10	10	10	-
	$m_{p\,av}$	0,55	0,30	0,54	0,47	0,46
F3	n_{coll}	24	25	24	25	-
	$m_{p\,av}$	0,12	0,10	0,13	0,15	0,13
F4	n_{coll}	34	27	24	31	-
	$m_{p\,av}$	0,02	0,04	0,09	0,02	0,04
F5	n_{coll}	33	25	22	29	-
	$m_{p\,av}$	0,01	0,03	0,03	0,01	0,02

Table 4 presents an assessment of the significance of the results (for example, section A).

Table 4. *Evaluation of the statistical significance of the results obtained for the section A*

The distance from the fire extinguisher model to the section A (L_A = 50 cm)						
Field numbers (Fig. 5)	**Experiment number The average mass of powder in the cells of the field, g**				**The arithmetic average of the average mass of powder in the field, g**	**The variance of the arithmetic average of the mass of the powder, S_n^2**
	1	**2**	**3**	**4**		
F1	0,80	0,86	0,95	0,83	0,86	$4{,}0 \cdot 10^{-3}$
F2	0,55	0,30	0,54	0,47	0,46	$1{,}4 \cdot 10^{-2}$
F3	0,12	0,10	0,13	0,15	0,13	$4{,}0 \cdot 10^{-4}$
F4	0,02	0,04	0,09	0,02	0,04	$1{,}1 \cdot 10^{-3}$
F5	0,01	0,03	0,03	0,01	0,02	$1{,}2 \cdot 10^{-4}$

Calculation of the ratio of variances				
Field	**F2**	**F3**	**F4**	**F5**
F1	$F_p = \frac{S_{б2}}{S_{м1}} = 3{,}49$ Insignificant deviation	$F_p = \frac{S_{б1}}{S_{м3}} = 9{,}77$ Significant deviation	$F_p = \frac{S_{б1}}{S_{м4}} = 3{,}71$ Insignificant deviation	$F_p = \frac{S_{б1}}{S_{м5}} = 32{,}34$ Significant deviation
F2		$F_p = \frac{S_{б2}}{S_{м3}} = 34{,}12$ Significant deviation	$F_p = \frac{S_{б2}}{S_{м4}} = 12{,}94$ Significant deviation	$F_p = \frac{S_{б2}}{S_{м5}} = 112{,}96$ Significant deviation
F3			$F_p = \frac{S_{б4}}{S_{м3}} = 2{,}64$ Insignificant deviation	$F_p = \frac{S_{б3}}{S_{м5}} = 3{,}31$ Insignificant deviation
F4				$F_p = \frac{S_{б4}}{S_{м5}} = 8{,}73$ Significant deviation
$F_т$ = 6,39 if $F_т > F_p$ - insignificant deviation; if $F_т < F_p$ - significant deviation				

Conclusions

1) The functional dependences of the particle mass distributions in the cross section of an unsteady gas flow are determined at different distances from its axis. Mass concentration of salt, varying from 0.85 g to 0.55 g, depends on the model of the fire extinguisher. The value of mass depending on the number of population is determined The functional dependences of the mass distribution of the salt powder in the cross section of an unsteady gas flow at different distances from the fire extinguisher model were determined. The graphs of the established functional dependencies are parts of parabolas. The parabola, reflecting the mass distribution of the salt powder for the central portion of the flow with a radius of RF1=27 mm, bends downward, the parabolas for the remaining flow portions — upwards, which reflects an increase in the distribution area of the salt powder with increasing distance from the feeding device.

2) The established patterns are the basis for finding ways to control the change in the mass distribution of fire extinguishing powder in transverse sections of unsteady gas flow to increase the fire extinguishing efficiency of powder fire extinguishers.

Figure 4 shows the mass distribution of salt powder in the cross section of unsteady gas flow at different distances from its axis.

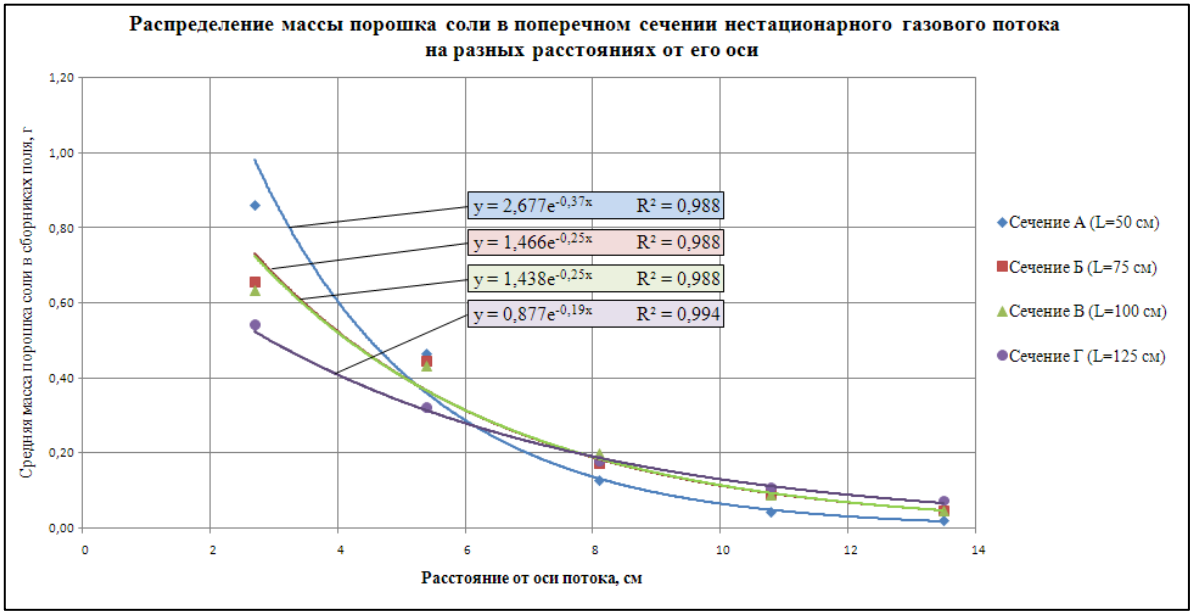

Figure 4 - *Mass distribution of salt powder in the cross section of unsteady gas flow at different distances from its axis*

Figure 5 shows the mass distribution of the salt powder in cross sections of unsteady gas flow at different distances from the fire extinguisher model.

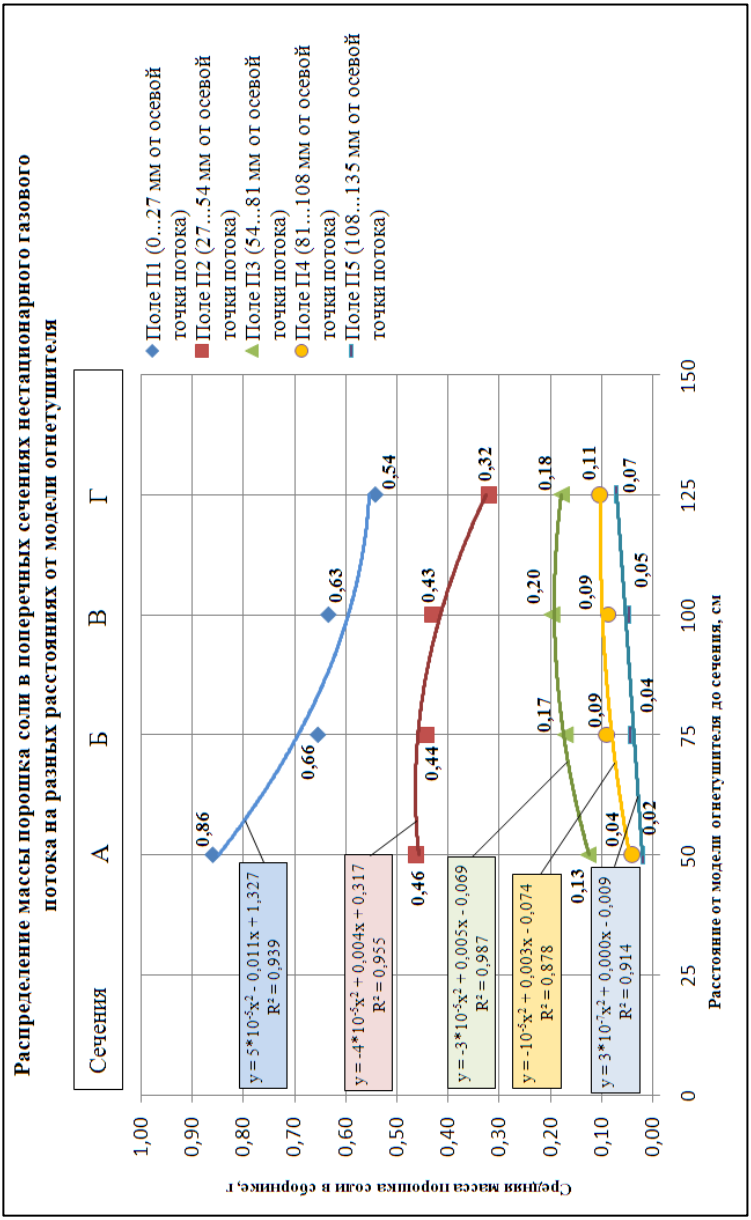

Figure 5 - *Mass distribution of salt powder in transverse sections of unsteady gas flow at different distances from the fire extinguisher model*

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开发一种集成计算和物理实验的方法。 开发用于航空水动力学研究的测试复合体的功能结构。

DEVELOPMENT OF A METHODOLOGY FOR INTEGRATING COMPUTATIONAL AND PHYSICAL EXPERIMENT. DEVELOPMENT OF THE FUNCTIONAL STRUCTURE OF THE TEST COMPLEX FOR AERO-HYDRODYNAMIC STUDIES

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抽象。 已经开发出一种新的方法，用于将计算和物理实验集成到一个综合数据处理系统中，确保以矩阵结构的形式简化信息流，并以基本决策的形式在数学模型的元素之间建立信息链接 系统（第1部分[1]）。 用于气动流体动力学研究的测试复合体的结构由台式设备单元表示： - 低速风洞
（v_{max} = 50 m / s），具有仪表和数据处理模块，压力和重力流体动力管道具有相同的设备组成。

关键词：航空技术质量，计算和物理实验的整合方法，信息流在生命周期阶段的排序，模拟方法的算法化，测试复杂的结构。

Abstract. *A new methodology has been developed for integrating computing and physical experiments into an integrated data processing system, ensuring the streamlining of information flows in the form of a matrix structure, and information links between elements of a mathematical model in the form of elementary decision-making systems (Part 1 [1]). The structure of the test complex for aerohydrodynamic studies is represented by bench equipment units: - low velocity wind tunnel (v_{max} = 50 m / s), with instrumentation and data processing module, pressure and gravity hydrodynamic pipes with the same apparatus composition.*

Keywords: *the quality of aviation technology, the methodology of integration of the computational and physical experiment, the ordering of information flows through the life-cycle stages, the algorithmization of the simulation methodology, the structure of the test complex.*

Ensuring the high quality of aviation technology is a decisive condition for it to increase the domestic market, reduce the costs of its creation and operation, and ensure competitiveness in the global market.

The key point of the integrated quality assurance systems for the aviation industry is the continuous assessment of quality indicators at all stages of the product life cycle and confirmation of their compliance with the requirements (the so-called “pass-through” certification principle).

The information necessary for such “tracking” of the products quality is obtained by conducting a whole range of various tests, ranging from mathematical modeling in the early stages of development to the most complex and expensive field tests.

The complexity and diversity of the problems of creating promising samples of aviation technology, the dynamics of their improvement based on advanced technologies, including information, leads to the need for joint analysis of a huge aggregate of data, different in their physical nature, production methods and processing methods.

In this regard, the direction being developed in the article on creating a system methodology and developing methods for integrating the technologies of computational and physical experiments into a single functional testing system is highly relevant.

The place of physical and computational experiments in the tasks of ensuring the quality of aircraft

The aim of the research is to develop a system methodology and methods of complexing the technologies of computational and physical experiment into a single functional testing system based on the block - modular organization of information and technological procedures. In this case, information is linked to various models (mathematical, physical, informational), hardware and software, which ensures the compatibility of heterogeneous data obtained in the process of creating a product.

A modular approach to solving a wide range of test tasks is based on the structuring of information flows by life cycle stages and aircraft states, automated data processing, and the multidimensional use of information entered once.

Structuring information allows us to describe a set of design and technological procedures in the form of the so-called "electronic" matrix of the product" in the control systems for aircraft design and quality.

A conceptual model has been developed for the formation of a unified information base of an aircraft testing technology in the form of a hierarchically organized matrix structure of decision-making models (Fig. 1), [1], [2], [4]. The ordering of informational links between the elements of the matrix model (in the nodes of the matrix) is described as a decision-making system

$$S \subseteq X \times Y$$

on a set of input X and output Y system characteristics.

Since the decision-making system is formalized by building a hierarchy of input-output models, the main focus is on forming the MX family of tasks in the nodes of the matrix and the methods of in-tegrating them into an integrated data processing system.

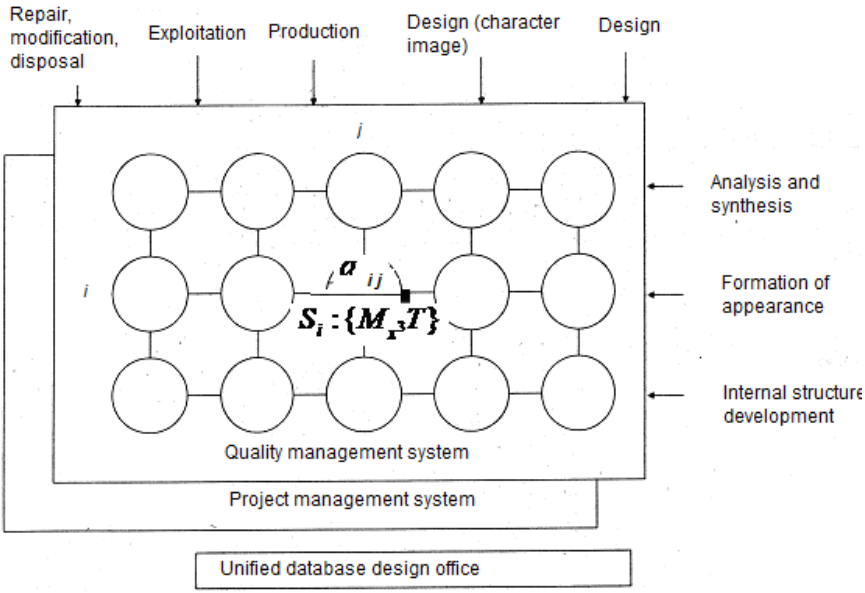

Fig. 1. - *The structure of information processing. Mx is a functional operator, T is a solving rule (algorithm).*

A method is proposed for integrating computational and physical experimentation technologies into an integrated functional system, which creates a unified methodological basis for the information linking of data that are different in nature, production methods and processing methods. The formalism of the structural relationships description follows from the theory of relations; the typical composition of the model is shown in Fig. 2:

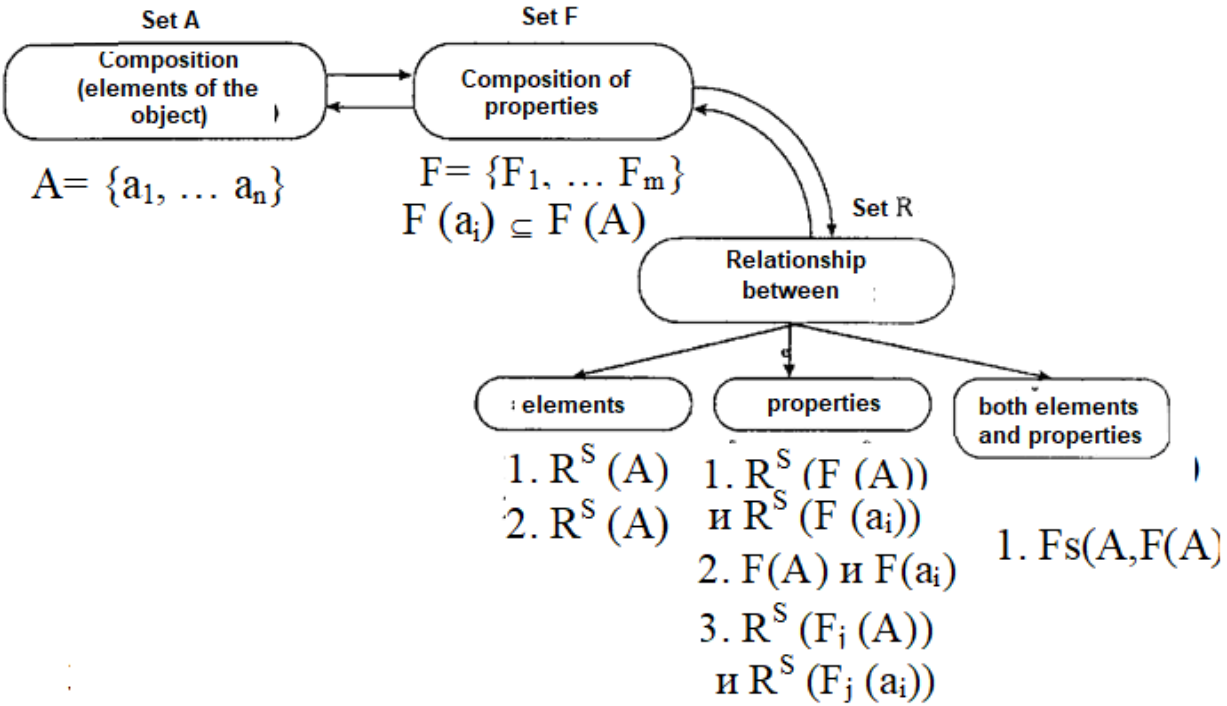

Fig.2. - *Typical composition of the model S(A) to describe structural relationships*

$$S(A) = \{A, F, R\}.$$

A – display of elements of the simulated object,

F – display of contours F (features, properties of elements of an object),

R – mapping relationships between elements and / or object properties

Methodology of a complex experiment on the identification of aerodynamic characteristics

In [1], a method of integrating the technology of computational and physical experiments was presented, which was implemented with the continuation problem. The result of the research was a de-veloped simulation model for the viscous flow of a symmetrical B-12 profile and a computational ex-periment was performed, the initial conditions in which were determined by a physical experiment.

The adequacy of the model of the flow profile of the wing section has been confirmed by a physi-cal experiment in the ГТ-2 МАТИ (МАИ) hydrotube. Integration of computational and physical meth-ods for studying the force interaction of the environment and the body made it possible to expand the "zone of action" of the simulation model for the chosen profile up to . A technology has been developed for an integrated experiment to identify the aerodynamic characteristics of a bearing surface. A distinctive feature of the proposed method is the mechanism of matching the connections, which is defined as a decisive algorithm T in the system S of decision making. A structural model of the algo-rithm T, defining the functional system S (Fig. 3), has been obtained.

The basic structural conditions of the T-model of the decision model (solving algorithm) are: the principle of mechanical similarity, formalized with the help of algebraic operations, the principle of matching physical flow conditions in different media and the actual module to determine the solution of the problem. The latter, in essence, determines the state of the system studied within the framework of the physical modeling. In the work, the definition of the state of an object is supplemented with a parameter ω that takes into account the degree of surface roughness when implementing the principle of geometric similarity between model and nature (the correction factor is estimated as a result of pro-cessing statistical information).

A new element was introduced in the experimental identification of aircraft ADC - “the volume of influence”, reflecting the force interaction of the medium and the body moving in it [4].

A basic scheme has been developed for the structure of the flow around a thin wing of small elongation, which makes it possible to outline the main approaches to the problems of planning and controlling the ADC of the aircraft (Fig. 4).

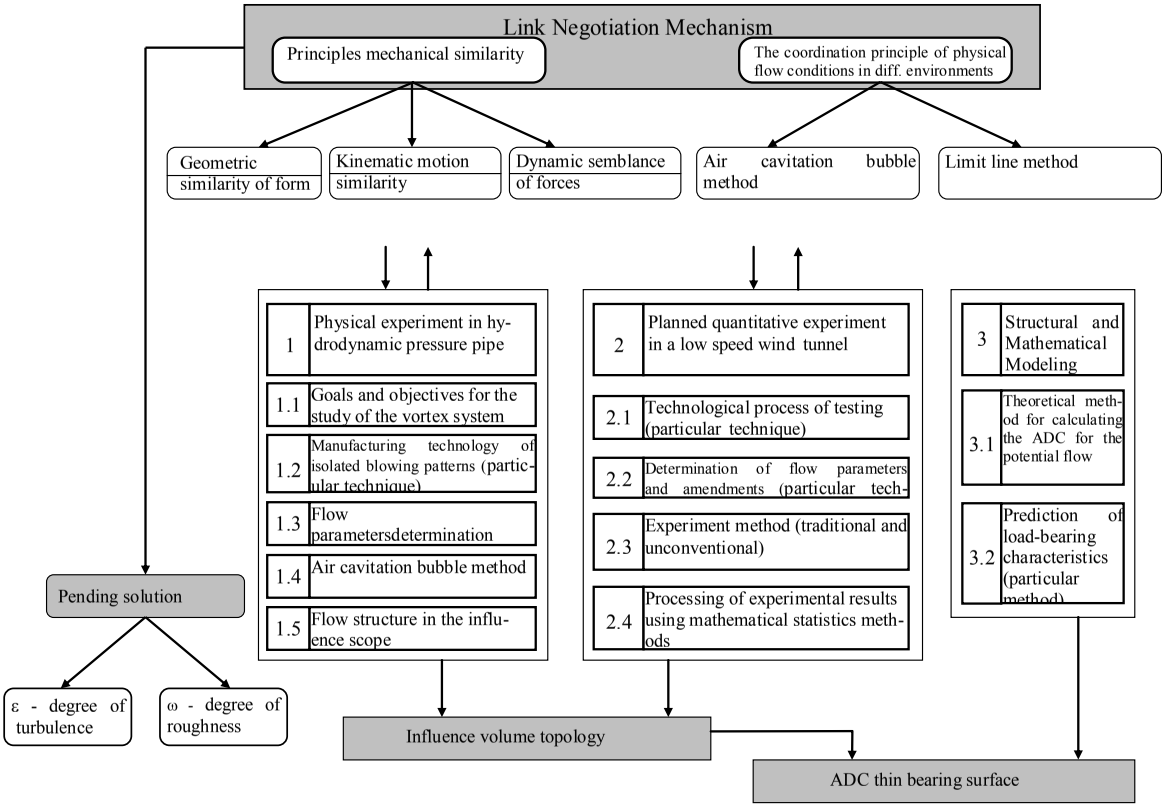

Fig. 3. *- Structural model of the decision algorithm.*

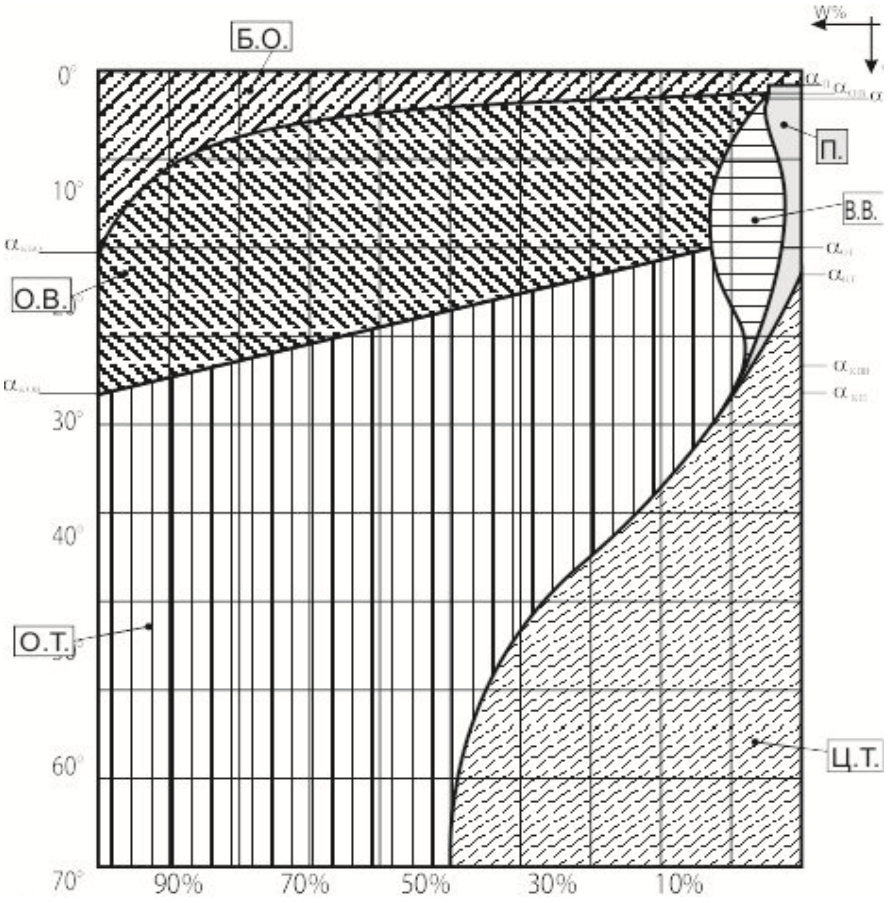

Fig. 4. *The basic scheme of the structure of the flow around a thin wing of small elongation*

The functional structure of the test complex for aerohydrodynamic research

Parameter	Parameter characteristic	Parameter Reference Data
$a_{П}$	Angle of attack at which a bubble occurs (П.)	$a_{П} = a_{0}$; $\Delta a_{max} = \delta \cdot a$
$a_{ОВ}$	Angle of attack at which the main vortex occurs (О.В.)	$a_{ОВ} = a_{П}$; Δa
$a_{ВВ}$	Angle of attack at which the secondary vortex occurs (В.В.)	$a_{ВВ} = a_{П}$; $\Delta a = \delta a$
$a_{ОТ}$	Angle of attack at which reverse flow occurs (О.Т.)	$a_{КбО} = a_{ЦТ} = 23°$
$a_{ЦТ}$	Angle of attack at which circulation flows occur (Ц.Т.)	
$a_{КВВ}$	Angle of attack at which the secondary vortex disappears	$a_{КП} = 39°$
$a_{КОВ}$	Angle of attack at which the main vortex disappears	$a_{ОТ} = 20°$
$a_{КП}$	Angle of attack at which the bubble disappears	
$a_{КБО}$	Angle of attack at which the continuous flow around stops ($\chi = 65°$) at a = var) when in the volume of influence W (Б.О.)	

Based on the proposed results:

- the method of integrating technologies of computational and physical experiments into an integrated functional system;
- a complex method for identifying ADC of a thin bearing surface;
- structural model of the decision algorithm;

a functional structure of the test complex for aero-hydrodynamic studies (Figs. 5, 6, 7) and methodological support for the problem of identifying total and distributed ADC of a thin bearing surface were developed.

A linear method has been developed for calculating the ADC of a thin wing of arbitrary shape in the plan based on the model of a vortex system of a flat thin plate.

The universal equations for calculating dimensionless linear circulations of free vortices are obtained.

$$u_{\nu} = \frac{\gamma_{\nu}(\varphi)\cos\varphi_{\nu}\,\sin\varphi_{\nu}\Delta\varphi_{\nu}}{\pi V \sin\alpha}, \nu = 1,2,\ldots,m, \qquad [4]$$

where:

- γ_{v} - is the linear circulation of the attached vortices,
- φv - is the angular coordinate of the vortex,
- V - is the incident flow velocity,
- α - is the angle of attack of the wing.

Based on the proposed method, engineering methods for calculating the velocity field on the sur-face of a thin wing with non-separating flow and calculating the velocity field of a thin triangular wing with non-separating flow, engineering

techniques for determining the total ADC of the thin bearing sur-face, which essentially use the introduced concept of vortex structures “volume of influence” were de-veloped.

The proposed techniques are also used in the design of aerodynamically effective surfaces of the Kemper type car coupling, and they are also implemented in the development of a spatial model of the movement of an athlete-skater and figure skater and in the optimization of forms of sports equipment.

The latest developments of TsAGI and MATI (MAI) to create an effective wing for local airlines have shown that in the field of simulation modeling of compromise profiles, the use of technologies for combining computational and physical experiments, as well as the technology of integrated experiment to identify aerodynamic characteristics bearing surface is necessary, since a distinctive feature of these proposed technologies is the mechanism of matching the links and the structural model of the algo-rithm, present functional task.

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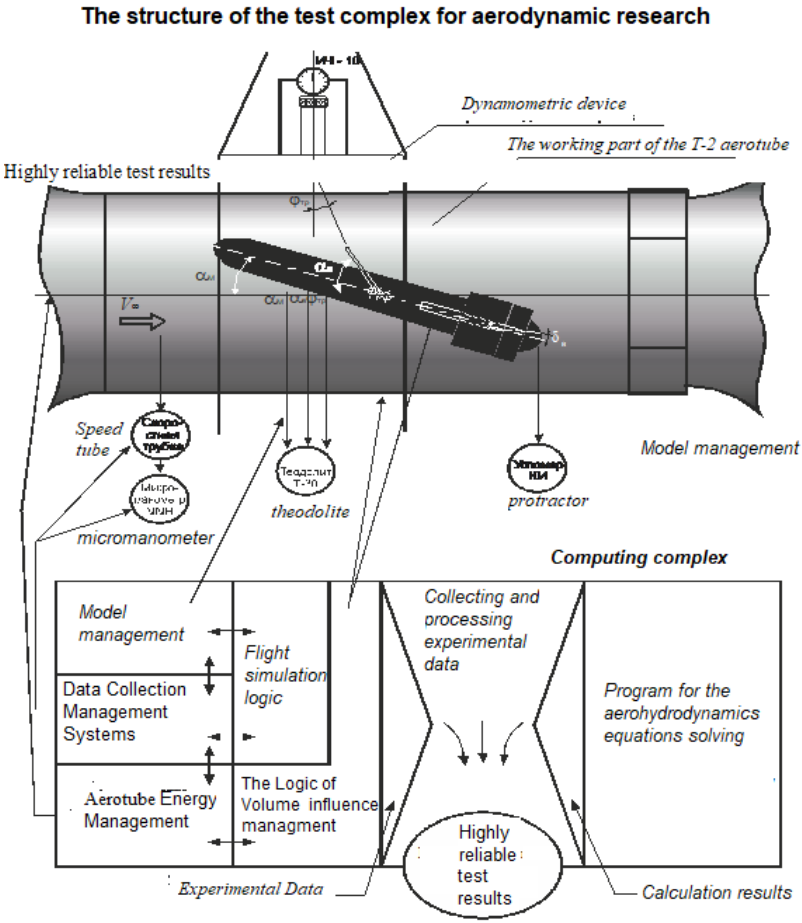


Fig. 5. - *Functional diagram of tests in a low-speed wind tunnel*

The structure of the test complex for hydraulic studies

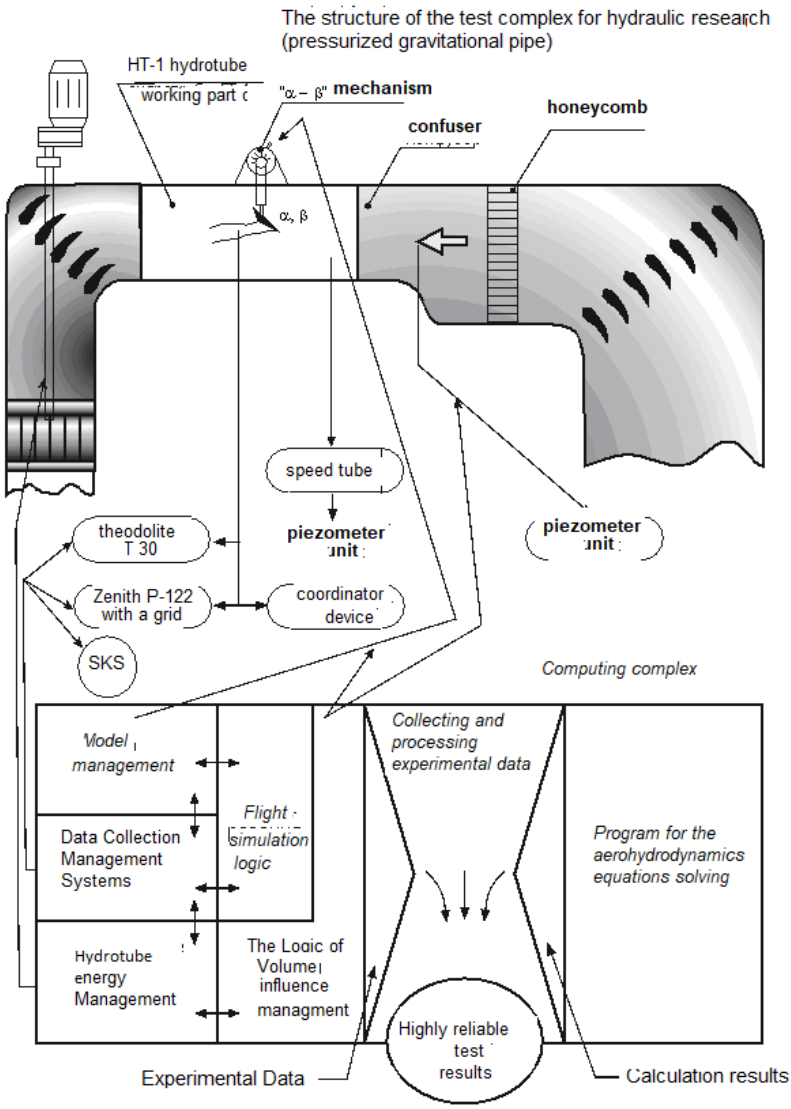
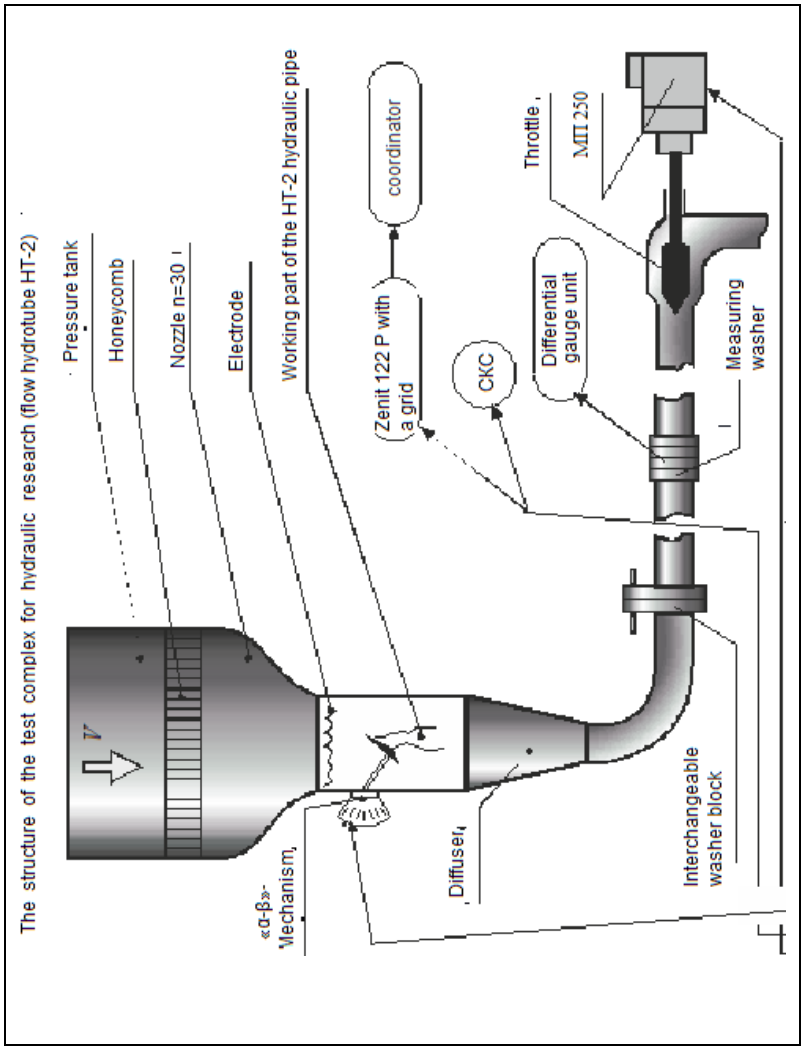


Fig. 6. - *Functional scheme of testing in pressure cavitation hydrotube*


The structure of the test complex for hydraulic research (flow hydrotube HT-2)
Pressure tank
Honeycomb
Nozzle n=30
Electrode
Working part of the HT-2 hydraulic pipe
coordinator
Zenit 122 P with a grid
CKC
Differential gauge unit
Throttle, MП 250
Measuring washer
«α-β»-Mechanism
Diffuser
Interchangeable washer block
V

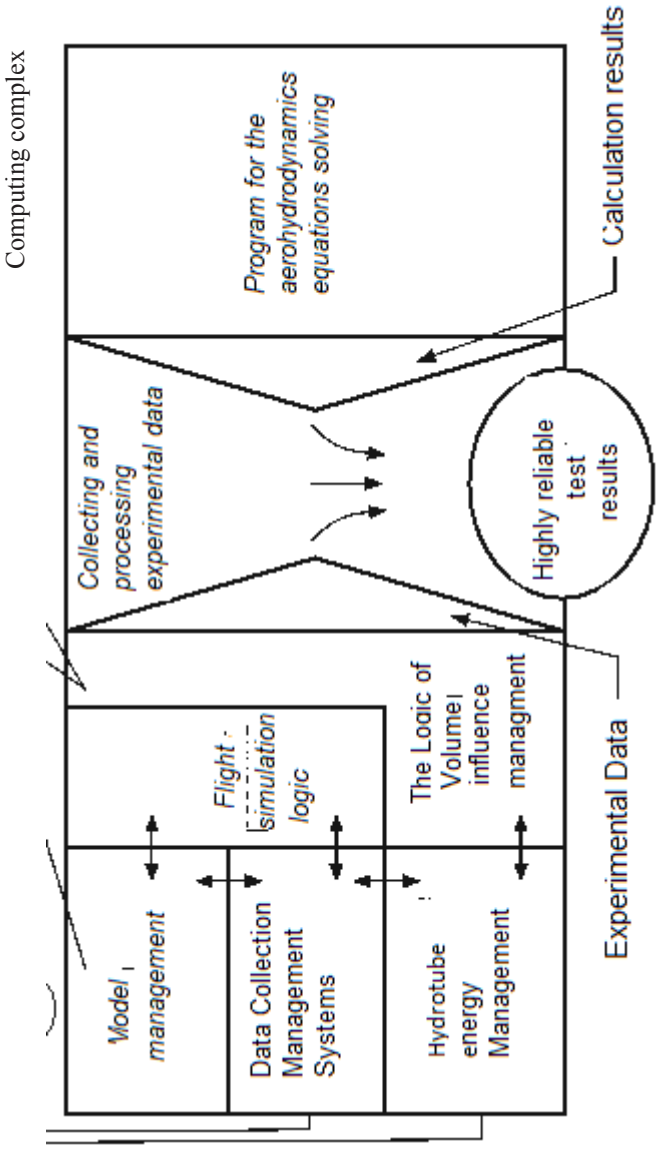


Fig. 7. *- Functional scheme of testing in gravity flow tube ГТ-2 МАТИ (МАИ).*

评估克里米亚半岛的旅游和休闲舒适条件
EVALUATION OF THE TOURISTIC AND RECREATIONAL COMFORT CONDITIONS OF THE CRIMEAN PENINSULA

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注解。 利用2005 – 2017年克里米亚主要度假区五个气象站的四期观测资料的每日数据，计算了沿海休闲区气候条件舒适条件的生物气候指标：等效温度，正常当量 – 有效温度，生物活性温度，空气中氧气的重量含量，临床天气指数。已经获得了对一年中每个季节的生物气候指标空间分布特征的估计，并确定了组织休闲度假和旅游的最有利时期。 确定了在今年有利气候时期之外克里米亚旅游部门发展的机会。

关键词：克里米亚，气候疗法，生物气候指数，娱乐，舒适度，活动旅游

Annotation. *Using daily data of four-term observations at five meteorological stations of the main resort areas of the Crimea for the period 2005-2017, the bioclimatic indicators of comfort conditions of climatic conditions of coastal recreational areas were calculated: equivalent-effective temperature, normal equivalent-effective temperature, biologically active temperature, weight content of oxygen in the air, clinical weather index. An estimate of the features of the spatial distribution of bioclimatic indicators for each season of the year has been obtained and the most favorable periods for the organization of recreational vacation and tourism have been identified. Identified opportunities for the development of the tourism sector in the Crimea outside the favorable climatic period of the year.*

Keywords: *Crimea, climatotherapy, bioclimatic indices, recreation, comfort level, event tourism*

Introduction.

The main components of the tourist and recreational activities of any territory are natural-geographical, cultural-historical, socio-economic and material and technical factors influencing the choice of potential visitors to the region and creating conditions for satisfying their material and non-material needs, including rest and restore or maintaining of health [1].

More than 5 million tourists [2] from different regions of the country come to Crimea annually. Due to the changing political and economic climate in the region since 2014, the tourist flow is growing rapidly. According to the Ministry of Tourism of the Crimea and later the Ministry of Tourism and Recreation of the Republic of Crimea, the number of people who visited the peninsula varied from 2014 to 2018 as follows: 2014 - 4 million people. [3], 2015 - 4.6 million people [4], 2016 - 5.6 million people [5], 2017 - 5.4 million people [6], 2018 - 6.8 million people [2]. In order to maintain positive changes in the tourist flow, one should pay attention to the competent organization of the formed offer and the use of the natural-geographical potential of the region.

Due to the presence of a favorable combination of climatic factors and their healing properties, the Crimea is widely known as a climatic health resort. The main approach to recovery there is climatotherapy. It includes a set of treatment methods that use the metered effect of meteorological factors on the human body [7]. Mild weather and climatic conditions (wet and mild winters and dry hot summers) contribute to the organization of therapeutic and recreational holidays in the resorts of the Crimea and tourist activities for almost a year round. However, the negative reactions of the human body are not caused by the usual seasonal fluctuations of meteorological conditions, but by their sudden changes. Therefore, when planning a tourist offer and a holiday season, attention should be paid to the fact that any transfer from one climate zone to another is accompanied by a short-term adaptation of the organism to new climatic conditions.

Resort areas of the Crimea on climatic conditions differ from each other. Therefore, for the rational development of recreational and tourist activities, it is important to have a bioclimatic characteristic of each locality. In practice, various bioclimatic indicators (indices) are used, including certain sets of hydrometeorological parameters in the integral assessment.

This paper is devoted to the analysis of the recreational comfort of the seaside resorts of Crimea with the aim of subsequent use of the obtained estimates when planning the sustainable development of the tourist and recreational complex.

Data and methods. As a baseline, we used data from standard 4-hour observations on air temperature, relative humidity, atmospheric pressure, partial pressure of water vapor, wind speed, clouds at the weather stations of Yevpatoria, Sevastopol, Yalta, Feodosia and Kerch for 2005 - 2017 from the site "Weather Schedule. The assessment of the comfort level of weather conditions was carried out on the basis of five calculated bioclimatic indicators for each day, and then for each month and season. The following indicators were calculated:

- Equivalent-effective temperature (EET) takes into account the complex effect of temperature, relative humidity and wind speed on a person [8]. This indicator is usually used to assess the heat sensations of a half-naked (waist-deep) person

in the warm season. EET calculations are more often made using the A. Missenard formula [9]. Comfortable index values: from +12 to 18ºC («comfort (moderately warm)») and from +18 to 24 ºC («comfort-warm»).

- Normal equivalent-effective temperature (NEET) – an indicator of thermal sensitivity takes into account the complex effect of temperature, air humidity, wind speed and is used to assess the heat sensations of a dressed person. To determine the NEET formula [10] has been proposed I.V.Buteva. Comfortable conditions: from +12 to 24 ºC («moderately warm (comfortable)»).

- ***Biologically active temperature*** (BAT) takes into account the complex effects of temperature, humidity, wind speed, total and long-wave radiation of the underlying surface. BAT is calculated by the formula E.V. Tsitsenko [11]. Comfortable values of BAT: from 10 to 20°C.

- The weight content of oxygen in the air (ρO_2) according to the method of V.F. Ovcharova [12], is widely used to make medical forecasts. Depending on the values of the indicator, one can determine the thresholds when the effect of stuffiness is felt. Favorable to the human values are considered to be ρO_2 from 240 to 300 g/m ^{3} [13].

- The clinical index of weather (I) consists of partial indices of pathogenicity of meteorological variables, reflecting the dynamics of weather according to air temperature, wind speed, relative humidity, cloudiness, inter-day changes in atmospheric pressure and temperature. For the calculation of this total indicator, the formula V.G. Bokshi and G.D. Latysheva is used [14].

ased on the calculated series of five bioclimatic indices for each month and season, the annual progress graphs were constructed, an analysis was carried out and their generalized characteristics were given for each locality on each indicator.

To assess the popularity of the Crimea for the development of a climatic resort, an analysis of attractiveness in the high and low season, including using data from a sociological survey, was conducted. For this, the main factors were identified that form the conditions for the development of the image of the region as a climatic health resort, as well as an innovative tourist region, characterized by an attractive tourist offer both in cold and warm periods.

Results. In the winter months, in terms of EET indicators in the Crimea, recreational conditions are characterized by values from -12 to -6°C and from -6 to 0°C. Lower than -12°C is registered in Kerch in January and February. Spring comfortable indicators of EET is >+12°C for active recreation, come only in May. Then the holiday season begins in Crimea. It lasts until September with a daily average of +18-24°C. From October, on the Southern Coast of Crimea (SCC), as well as in Sevastopol and Feodosiya, under the terms of comfort of heat sensations, the EET declines to +6 °C, and in some places to (-6-0°C), that will last until winter.

The indicators of NEET are related to EET, their annual progress in dynamics coincides. However, the values of NEET significantly exceed the values of EET, since they take into account the warm sensations of a dressed person. This makes NEET more informative when analyzing the comfort of cold seasons. In winter, it varies from -3.5 (Kerch - in January) to +7.9°C (Yalta - in December). At the beginning of spring days are dominated with moderately cool a year with NEET 6 - 12°C. Favorable conditions continue from May to early October with a maximum average of +23,6°C (in Yalta) in August, and the minimum +15,1°C in Evpatoria in May. The autumn period is also characterized by prolonged high NEET values (+12-24°C). In November, cool, in some places moderately cool conditions are coming.

The values of BAT from December to April in all resorts of the Crimea are from +10 (Theodosius - in February) to 18,1°C (Yalta - in April). Noticeably lower +10°C index is typical for Kerch, Evpatoria and Theodosia. From May to the end of the summer BAT exceeds +20°C and weather conditions become uncomfortable due to thermal effects. By mid-autumn, the spatial distribution of BAT values is close to the spring season. This May inclusive period in Crimea can be used for tourist activities and events.

Analysis of the concentration of oxygen in the air showed that in the autumn, winter and spring months, favorable weather conditions are observed at all resorts. ρO_2 considerably exceeds 285 g/m^3. With the onset of summer at all coastal resorts, the weight content of oxygen in the air decreases by 5-10 g/m^3. The lowest values of oxygen concentration are observed in July and August. At this time unfavorable ρO_2 conditions are characteristic of all investigated resorts of the Crimea. Since October, ρO_2 rises, and therefore favorable weather conditions are felt at all resorts. In November, the oxygen content in the air reaches 300 g/m^3 or more.

According to the clinical index of weather in the winter season, irritating (I=10-24 points) and acute (I>24 points) meteorological conditions prevail in the resorts of Crimea. Acute meteorological conditions in December occupy the eastern part of the peninsula, including Kerch. Irritating conditions are typical in the south, southeast and west of the peninsula. In January and February, the region with prevailing acute meteorological conditions expands, capturing the region of Evpatoria in the west. In March, the boundaries of zones with annoying conditions expand, displacing acute meteorological conditions. In April, zones with comfortable (I = 0–9 points) meteorological conditions (Yalta, Theodosia) appear on the territory of the southeastern part of the peninsula. In the rest of the territory of Crimea, annoying conditions remain. From May to September, the comfort zone expands to the south-west and east, covering the territory from Sevastopol to Kerch. In October, the optimal meteorological conditions remain in a small area, in the area of the South Coast. In November, the spatial distribution already cor-

responds to the winter season. Comfortable meteorological conditions change to annoying. Among other important conditions that form the tourist potential for the Crimea, can be identified as follows:

1) Measures to preserve the natural and climatic riches of the region and maintain a clean environment. Discussing in [14] the problems of tourism development in the Crimea, A.V. Tsimbal and Odarenko note that when working with increasing tourist attractiveness and a favorable investment climate, experts bypass the key issue - the preservation of the region's natural wealth. But with the increase in tourist flow, the load on the nature and ecology of the region grows, weakening its recreational potential [14]. Evidence of this is mindless building for potential accommodation facilities. As an example, we can give a vivid instance of building in Livadia, which affected the so-called "royal path" along the South Coast Arboretum South Park, which was an important procedure for the restoration of respiratory and cardiovascular systems, and was also of great interest to tourists. At the same time, pollution of the territory of Crimea as a result of the same construction or the number of visitors disproportionate to the infrastructure capacity leads to the disappearance of valuable natural resources. For example, by 2016,only 35 of 40 medical lakes of the Crimea remained [15]. Similar examples can be given in relation to the rivers, forests and beaches of the Crimea. But it should be understood that the unique climatic conditions, natural resources and many-sided objects of the tourist show will revive the market of business and event tourism. [16] Hence the next element of the system of conditions for the development of tourism.

2) ***Potential for the development of event tourism.*** Considering the issue of the impact of event tourism on the development of the tourism sector in the regions of the Russian Federation, it is shown in [17] that in any economic and political environment, its role is currently leading and only gaining momentum due to its innovative nature [16]. Based on the connection of the current state of tourism with the concept of the image of the region, it follows that with the development of event tourism, the city and the region develop and a positive image of the territory is formed.

3) Opportunities to extend the tourist season. According to Russian standards, Crimea is distinguished by favorable natural and climatic conditions at any time of the year. Therefore, the concept of high and low season suggests that there is all the data for the formation of a sustainable tourist flow, regardless of climatic conditions. Expansion of the season is possible due to the innovative development of event tourism.

Conclusion

The unique natural and climatic potential of Crimea provides favorable conditions for the formation of a sustainable tourist flow regardless of the season.

The distribution of the main bioclimatic indicators on the coastal territory of the Crimean peninsula is characterized by spatial heterogeneity in different periods of the year with the formation of individual local sources of their intensification. Longer periods of the year with comfortable values of the bioclimatic parameters of weather comfort are characteristic of the South Coast. It is advisable to develop this territory as a year-round climatic resort. Conducting climatotherapy in the winter months at other resorts will not bring significant effect. In this case, it is worthwhile to form a favorable tourist climate based on other types of tourist potential of the region, in particular, the development of innovative-event tourism.

The results can be used in the preparation of medical forecasts for the recreational period, to improve the existing methods of rehabilitation therapy, as well as to develop methods to expand the tourist season. The presence of a forecast of bioclimatic anomalies will allow planning activities for the prevention of diseases and adaptation of people exposed to weather anomalies, as well as reasonably plan the development of year-round tourist activities in the region.

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实施俄罗斯欧洲境内沟壑网络的密度

TO IMPLEMENT THE DENSITY OF THE GULLY NETWORK IN THE EUROPEAN TERRITORY OF RUSSIA

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注解。 在欧洲俄罗斯大部分地区（超过50%），在天然流域不变的情况下，沟壑过程的发展概率几乎为零，仅为该地区的0.8%，为100%。 在欧洲俄罗斯大部分地区（47%），在自然流域不变的情况下，沟壑形成的可能性几乎为零，仅占该地区面积的2%，为100%。 20–40%的概率份额为28%，40–60%–14%，60–80%–9%。

关键词：沟壑侵蚀，沟壑侵蚀概率，沟壑侵蚀潜力，沟壑，沟壑密度。

Annotation. *On the most part (more than 50%) of the territory of European Russia, in conditions of unchanged natural watersheds, the probability of development of the gullying process is practically zero, and only on 0.8% of the area it is 100%. In the majority (47%) of the territory of European Russia, under the conditions of unchanged natural watersheds, the probability of development of a gully-formation is practically zero, and only on 2% of the area it is 100%. The probability share of 20-40% is 28%, 40-60% – 14%, 60-80% – 9%.*

Keywords: *ravine erosion, ravine erosion probability, ravine erosion potential, ravine, density of ravines.*

Introduction

Gullying is one of the most intense modern processes associated with anthropogenic changes in natural landscapes. The spread of ravines is considered to be one of the essential criteria for assessing the environmental tensions of regions.

Objects and methods of research

Analysis of topographic maps and field studies show that in areas of long-standing agricultural development, where the arable land in some areas reaches 70% of the territory, ravines shorter than 150 m prevail and constitute about 70% of the total number of gully [Gully erosion, 1989]. On the territory of European Russia, the main number of gullies (up to 85%) falls on gullies up to 200 m long.

The number of extended ravines is only 15%, but their total length is 114 thousand km, which is 144 thousand km in proportion to the length of short ravines. Taking into account the fact that the lengthy ravines have a significantly larger area, the area of affected economically usable lands also increases. In this respect, the indicator of the density of the gully network is more significant. In the Research Laboratory of soil erosion and channel processes named after N.I. Makkaveeva a map of the modern density of the ravine network on the European territory of the European Russian Federation was compiled on a scale of 1: 2500000. This indicator was determined for each catchment of the 1st order. The obtained values of density varied from 0.01 to 1.3 km/km^2 and more. Analysis of the map allowed us to identify the following types of territories:

1) areas of very weak contamination (thickness less than 0.01 km / km^2), where ravines are extremely rare, these include poorly developed or undeveloped lands with flat and ridge relief — tundra and forest-tundra areas; planted forest and treeless lowlands with very small base depths; poorly divided flat-tope lowlands and flat-mountain regions.

2) weak contagiousness (0.01-0.02 km / km^2), characterized by shallow dismemberment of the relief, occupying large parts of the tundra, forest-tundra and forest zones, these are moraine elevations, separate areas along the Ural Mountains, within the Northern Uvalov, Upper Kamskaya and Bugulmino - Belebevsky hills, etc.

3) moderate ravines (average density 0.06 km / km^2) are noted in the north of the Bolshezemelskaya tundra, in certain areas of the Central Russian, Valdai, Smolensk-Moscow, Verkhne-Kama uplands, the Oka-Don plain, in the basin of the Kuban, Kuma, Malaya and Bolshoi Useni and etc.

4) significant ravine (average density 0.3 km / km^2) – observed in elevated, divided, intensively developed areas of the forest-steppe and steppe zones (morenohilly elevations, parts of the Bolshezemelskaya tundra, certain areas of the Upper Kama, Stavropol and Central Russian elevations.

5) a high degree of contagion (thickness - 9 km / km^2 – 1.3 km / km^2 and more) include long-established and well-developed agricultural areas (vast areas of Smolensk-Moscow, Middle-Russian, Volga, Upper Kama and Stavropol elevations, Don Belogorye, southern part of the Don ridge [Geography of ravine erosion, 2006].

To determine the maximum possibilities for the development of the density of the ravine network, the original computational methodology developed in the

research laboratory for soil erosion and channel processes named after T.I. Maccabeeva. The values of potential density for each 1st order catchment were obtained. Based on these data, a map of the maximum density of the gully network on the same scale was compiled. This indicator largely depends on the natural

characteristics of the territory, since the conditions of anthropogenic intervention are assumed to be the same (vegetation cover has been removed). Indicators of potential, in most cases, exceed those of modern ravine and reach 3 km/km^2 or more. In the distribution of potential characteristics of ravine to a greater extent than in its modern manifestation, zonal and azonal patterns of the possible spread of ravines in the lowland territories of European Russia are identified. Zonality in the distribution of ravines is clearly traced. Low ravine (no more than 0.02 km / km^2) is characteristic of moreno-sandy and alluvial plains and lowlands with minor depths of the basis of erosion, straight or concave slopes. A moderate ravine (not more than 0.1 km / km^2) is confined to the hilly-ridge and hilly-kama hills of the north. Considerable gully is predicted in areas with a large amplitude of the dismemberment of the relief, on the convex slopes of the valley-beam network, in areas with easily eroded rocks (Smolensk-Moscow Upland, Klinsko-Dmitrovskaya Ridge, Oksko-Don Plain, north of the Central Russian Upland, Stavropol Plateau). High ravine (3 km / km^2 and more) can be developed mainly in the central part of the European territory of Russia, where hilly-sprawling relief with large absolute heights and depths of the erosion basis, with convex slopes intensively dissected valley-beam network, is widespread.

The difference between the potential and modern indicators of the density of the ravine network determines its possible growth. Comparison of the estimated potential thickness and its modern dimensions allows us to establish the share of the implementation of changes in the density of the gully network to the size of the limit, that is, the probability of gullying. It is presented as a quotient of dividing the current density of ravines by the marginal (potential), given as a percentage.

Discussion of the results

The analysis of the obtained map of the probability of reaching the maximum density of the ravine network was made by geomorphological regions, allocated by A.I. Spiridonov [Geomorphological zoning of the USSR ..., 1978].

Kola-Karelian Province of the European Russia is characterized by relief, formed in the conditions of a long period of continental development and the continuous distribution of crystalline rocks. Intensive denudation processes proceeded together with tectonic ones. Depending on the geological structure of the rocks, there are wavy plains or strongly intersected structurally ridge relief, which was affected by land ice during the Quaternary. Subsequently, the surface was subjected to the activity of erosion processes. nivations and rosaceous weathering [Karandeeva, 1957]. Modern gully erosion is practically absent in the region (less than 0.02 km / km^2), there are separate areas with a gully density of up to 0.1 km / km^2. Forecast indicators give the same characteristics. The probability of formation of ravines is 0%.

Northern part of the Russian Plains, occupying a territory from the Baltic Sea to the Urals and from the Barents Sea to the Moscow Region, covers vast areas of tundra, forest-tundra and forest zone. This is the region of distribution of the forms created by the processes of glacial and water-glacial accumulation on more ancient relief, formed mainly by erosion processes. Its territory is characterized by hilly, hilly-ridge and flat relief in places with a large number of lakes and marshes. By age of relief, there are two areas: in the west - with younger glacial forms left by Valdai glaciation, in the east - the territory covered by the glacier of the Moscow stage of the Dnieper glaciation. The boundary between them coincides with the boundary of the Valdai glaciation [4]. The territory covered by the glacier of the Valdai era is characterized by fresh glacial forms of finite moraine ridges, hilly-ridge plateaus, Kams, lakes, and lake basins. The largest elevation is Valdai with an absolute height of 300 m.

To the northeast of it are extensive moraine-zander and lacquericon glacial depressions, in which the lakes Beloye, Rezhzh, Kubinskoye, etc. are located. At higher elevations, the average density of the modern ravine network is mostly moderate and significant (from 0.06 to 0.3 km / km^2), the potential varies in the range of 0.06-0.8 km / km^2. The share of amounts is mainly 5-10%, in some places 20-50%. The probability of formation of ravines varies from 50 to 10%. On the plains, the current and potential density of the ravines is weak, does not exceed 0.02 km / km^2 and the share of amounts is 100% (probability 0%).

The surface of the territory, the relief of which was formed mainly by the glacier of the Moscow stage of the Dnieper glaciation, after the retreat of the glacier was exposed to intensive influence of erosion processes. There are widespread flat interfluves, sandy zander and alluvial plains. The modern density basically reaches 0.02 km / km^2, in some parts of the plateau and along the banks of large rivers - 0.1 km / km^2. Potential density of the ravine network ranges from 0,02 to 0,5 km/ km ^{2}. The probability of gullying in most of the territory is 0, but there are areas with a probability of 20-40%.

To the south there is a strip of moreno-erosion elevations - Smolensk-Moscow, Klin-Dmitrov, Galich, stretching from west to north-east. On the Smolensk-Moscow Upland, the most ancient and dissected ravine network, the modern density of ravines generally does not exceed 1.1 km / km^2 (moderate and strong), but in some areas it may exceed 1.3 km / km^2. On other elevations, the average modern density of ravines varies from 0.06 to 0.8 km / km^2. The potential of the density of the ravines in these territories significantly exceeds the current figures, varying from 0.3 to 3 km / km^2. The share of potential realization basically does not exceed 20% (the probability of gullying is 80%), however, in some areas it reaches 60 and 100% - the probability from 40% to 0.

Center of the Russian Plain is characterized by a combination of erosion-denaduational elevations and accumulative lowlands. The alluvial and glacial plains are confined to lowlands located at the front of the glaciers of the Dnieper and Moscow glaciations. Covered with easily breakable sandy sediments, they create a belt of woodlands stretching along the Desna and Oka rivers on the left bank of the Volga and descending to the south along the valley of the Don and its tributaries. Between the Klyazma and Oka rivers lies the Meshcherskaya lowland, where the ravines practically lacking, the likelihood of ravine formation is 0. In the area between the Klyazma and the Oka, the Volga and the Klyazma, the current density of the ravines does not exceed 0.02 km / km^2, the potential varies from 0.02 to 0.5 km / km^2. The share of realization ranges from 10 to 40% (probability 90-60%), on the Meshcherskaya lowland - 100% (probability 0)

In the valley of the Don and its tributaries are the Oka-Don Plain, formed by sediments of the Dnieper glaciation. The relief is characterized by extensive flat plains, dissected wide terraced by the valleys of major rivers, the Don, Voronezh, Bityuga, Khopra, and others. The strongest contagiousness is noted in the northern part of the plain, where the modern density of the gully network reaches 0.5-1.1 km / km^2. In the rest of the territory, only steep and high sections of the slopes of the valleys of large rivers were cut by ravines The potential of the density of the ravines in the northern part of the plain reaches 3 km / km^2, in the south it varies from 0.5 to 1.0 km / km^2. The share of realization has a large range of values: from 5-10, 20-40% to 60 and 100%, the probability is from 0 to 90%.

Erosion-denaduational elevations are represented by the Central Russian, Kalachsk, and Volga elevations.

The Central Russian Upland is a wavy plain, dissected by deep valleys of rivers, gullies and ravines. The depth of the incision reaches 100-150 m. During the period of the Dnieper glaciation, the northern part and partly the western and eastern slopes of the hill were covered with glacier. The geomorphological peculiarity of the relief consists in a very young and sharp erosion dissection imposed on ancient erosion forms. The hill has all the necessary conditions for the intensive development of modern and potential erosion processes: a tendency to uplift, large basement depths of erosion, unevenness of the initial relief, readily eroded composition of surface rocks, snow melting rate and summer rain, long-standing agricultural development. The territory is characterized mainly by moderate and dangerous ravines. The modern density of the gully network varies from 0.02-0.1 to 0.3 km / km^2 in the northern part of the upland and to 0.5-1.3 km / km^2 in the southern and western parts. The highest modern density of ravines is noted on the right bank of the Don, the lower reaches of the Oka, on the right bank of the Psel, Donskoy Belogorie. Potential density of the ravine network is predominantly high and very high - from 1.1 to 3 km / km^2 and more. The share of density realization is

mainly 5-10% noted between the rivers Oka and Vitebet, Neruchi and Trudy, Upa and Don, Svali and Seim, etc. In significant areas (right bank of the upper Don, Don Belogorie) the share of sales reaches 20-40%, between the Oskol and the Don rivers - 40-60%, in the lower reaches of the Oka - 60-80%. The probability of gullying can vary in a wide range from 40 to 95%.

On the Kalachsky highland, the modern density of ravines varies from 0.5 to 1.3 km / km^2, potential - from 1.1 to 3.0 km / km^2 and higher. The share of realization - in the central part reaches 50-100%, in the western part 5-10%, and the probability of gullying is from 0-50% to 90-95%.

On the Volga Upland, the steepest eastern slope is the most dangerous of ravines, where the current density of the ravines is more than 1 km / km^2, and the maximum possible density reaches 3 km / km^2. The share of achieving the density of the ravine network of 20–40% prevails (probability of 60–80%). The areas of full implementation are noted - 100% share in the area of Saratov and the interfluve of the Sviyagi and Barysh rivers (probability 0), as well as ranges with a realization share of up to 5% - along the Volga river from Cheboksary to Ulyanovsk (probability 95 %). The western slope of the Volga Upland is longer and gently sloping. The modern dismemberment density of 0.5-1.1 km \ km^2 prevails. Potentially possible ranges from 0.5 to 3 km / km^2. There is a large variability in the probability of achieving the density of the ravine network in this area. Quite large areas (the right bank of the Sura river) are noted with a share of 20–40% (probability 60–80%), between the rivers Tesha and Seryozh, on the left bank of the r. Anadyr the probability value is less than 5%, there are areas with fully realized density (probability 0).

On the territory of Yergeni - the average modern density of the gully network varies from 0.06 to 0.8 km / km^2, potential - from 0.3 to 0.8 km / km^2. In most of the territory, the proportion of the probability of reaching the density of ravines is 20-40%, the probability is 60-80%.

The vast territory in the east of the Russian Plain is occupied by the region called the High Trans-Volga region. In the west it is in contact with the Low Zavolzhye, in the east with the foothills of the Urals, in the north it adjoins the northern Uvalov area, in the south it ends off on a steep slope of the Common Syrt to the Caspian lowland. The modern relief is represented by flat or hollow wavy surfaces crossed by ancient and modern rivers, beams and ravines. In the High Trans-Volga region, there is a sharp difference between lowland rivers and deep embedded valleys with steep slopes dissected by ravines. The modern gullness of ravines varies from 0.1 to 1.1 km / km^2, the maximum possible varies from 1 to 3 km / km^2 and more. The largest areas are occupied by areas with a share of realization of achievement up to 5 or 10% (probability of 90-95%). Areas with 20–40% (probability 60–80%) and 100% (probability 0) are encountered.

On the territory of the General Syrt, the current density of the ravines varies within an average of 0.06-0.3 km / km^2, potential - 0.3-0.8 km \ km ^{2}. In the greater territory, the complete realization of the density of the ravines is noted. However, there are insignificant ranges with a share of realization of up to 10% and 20-40%, the probability is 90% and 60-80%, respectively.

There are practically no ravines in the Caspian lowland and in the Kuma-Manych depression. At Prikubanskaya, modern and potential density does not exceed 0.02 km / km^2 and the growth possibilities are fully realized.

In the Stavropol Upland, both modern and potential density vary from 0.1 to 0.5 km / km^2. In the western part, the potential is fully realized, and in the eastern part it is 10–20% (the probability is 90–80%).

Conclusion

On the most part (more than 50%) of the territory of European Russia, under the conditions of unchanged natural watersheds, the probability of development of the gullying process is practically zero, and only 0.8% of the area is 100%.

The large variability of values within the selected orographic units is mainly due to their size, the variety of depths of the erosion bases, the complex geological structure.

In the majority (47%) of the territory of European Russia, under the conditions of unchanged natural watersheds, the probability of development of the gullying process is practically zero, and only 2% of the area is 100%. The probability share of 20-40% is 28%, 40-60% - 14%, 60-80% - 9%.

Currently, the territory of the European part of Russia is characterized by a change in the seasonal structure of surface runoff in a small catchment area (a decrease in melt runoff and an increase in the frequency of flow-generating showers of the warm period). With the uncertainty of predictions of climate change trends, forecasting the gullying process becomes problematic.

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Notes

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