



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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**“Scientific research of the SCO countries: synergy
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这些会议文结合了会议的材料 – 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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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 48 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。

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

国家高等教育和职业教育机构在渔业培训人员中的分析
**ANALYSIS OF THE STATE HIGHER EDUCATION AND
VOCATIONAL EDUCATIONAL INSTITUTIONS
IN TRAINING PERSONNEL FOR FISHERY INDUSTRY**

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注解。 本文重点介绍了渔业学员和渔业专家的培训和认证质量。 发展渔业教育以及粮食安全和确保该行业竞争力的问题正在变得特别重要。

关键词：人才潜力，教育综合体，创新发展，渔业，渔业，教育组织体系。

Annotation. *This article focuses on the quality of training and certification of cadets and specialists of the fishing industry. The issues of developing the education of the fishing industry, as well as issues of food security and ensuring the competitiveness of the industry, are gaining particular relevance.*

Keywords: *personnel potential, educational complex, innovative development, fish industry, fishing industry, the system of educational organizations.*

Higher vocational education institutions of the fish industry occupy one of the key places in the Russian system of personnel training for the fisheries industry and other socio-economic areas of the fishing regions of Russia. Changes in the structure of production, raw materials base, areas of fishing and the introduction of modern technologies require timely retraining, advanced training and high competence of industry workers, education of highly qualified specialists [3].

It is no secret that the main resource for the development of the economy of the fishing industry is the personnel potential of education, science and high-tech production. In this regard, issues of improving the competitiveness of the Russian economy, ensuring economic security, and attractiveness of the country for investment acquire a special role.

Russia has a sad experience when, under unfavorable economic conditions in the mid-1990s, the loss of highly qualified scientists led to negative dynamics of innovative development, the Russian industry was 4-6 times behind the leading industrial countries. It takes about 2-3 generations of scientists to create a full-fledged highly qualified scientific personnel. At present, national priorities dictate the need to reduce these periods in order to acquire appearance, the basis of which will be composed of technically equipped at the world level, staffed by qualified specialists of the fishing industry of our country.

The fish industry is the most important sector of the Russian economy, whose task is not only to ensure the food security of the Russian Federation, but also the realization of state interests in the development of spaces and resources of the oceans, the harmonious development of coastal regions, since fishing contributes to their population and socio-economic development [4].

The fish industry and the maritime industry places special demands on the organization of training, the most important elements of which are, besides professional knowledge, and high general erudition, the presence of compulsory practice on ships, and a high level of knowledge. The most important direction of the implementation of national policy in the maritime activities of the Russian Federation is the staffing of enterprises of the fishing industry, as well as other industries. In this situation, the training of specialists capable of ensuring the rational use of the raw material base of the Russian fishery, the trouble-free operation of fishing fleet vessels, and the operation of enterprises of the fishery complex is a strategic task of the educational complex of the Federal Fishery Agency. Until 2014, fisheries research in marine waters, both in the economic zone of Russia and abroad, as well as the study of freshwater and marine objects were carried out by 13 research organizations of the Federal Agency for Fishery with branches throughout almost all of our country. By the order of the Government of the Russian Federation No. 2341-r dated November 24, 2014, their network was expanded - the Southern Research Institute of Fisheries and Oceanography in the city of Kerch (Republic of Crimea) was created and assigned to the responsibility of the Federal Agency for Fishery. [5]

At present, the potential of fisheries science is sufficient to solve the most complex industry problems. It has more than 5 thousand employees, of which about 800 people have scientific degrees of candidates and doctors of science. The most numerous team works within the walls of the Pacific Research and Fisheries Center "TINTRO-Center" in Vladivostok - 1120 people, of whom 321 are research workers, and -180 are highly qualified specialists.

At the same time, one of the current tasks of the industry is to raise the prestige of work in fisheries science and update its staff. And this task is solved by departmental educational institutions, including by building a system of training highly qualified scientific personnel through postgraduate and doctoral studies.

The branch educational complex is a system of educational organizations located in the main fishing regions and providing training in accordance with the needs of the industry. Consider the details in the table below as follows:

Table 1. Rating of educational institutions in the system of training for the fish industry

Educational institution	Branches	Institutes and faculties	Rating
1. Astrakhan State Technical University Date of establishment of the educational organization: 1929	1. Volga-Caspian Marine Fishery College 2. Dmitrovsky Fisheries Technological Institute 3. Yeysk Marine Fishery Technical School 4. Temryuk College	1. Institute of Fisheries, Biology and Nature Management 2. Institute of Economics Institute of Marine Technology, Energy and Transport 3. Institute of Information Technology and Communications	49th place in the ranking of technical and technological universities in Russia. ASTU - laureate of the contest "100 best educational institutions of the Russian Federation-2017"
2. Kaliningrad State Technical University Date of establishment of the educational organization: 1958	1. St. Petersburg Marine Fishery College. 2. "Baltic State Academy of the Fishing Fleet" separate structural unit. 3. "Kaliningrad Marine Fishery College" structural unit.	1. Faculty of Biological Resources and Nature Management 2. Faculty of industrial fishing 3. Faculty of Mechanics and Technology 4. Faculty of Shipbuilding and Energy 5. Faculty of production automation	115th place in the ranking of technical and technological universities of Russia.a
3. Far Eastern State Technical Fisheries University Date of establishment of the educational organization: 1930	1. Slavic Technical Fisheries College FSBEI HE "Dalrybvtuz" 2. Sakhalin Maritime College of FSBEI HE "Dalrybvtuz" 3. Far Eastern Nautical School FSBEI HE "Dalrybvtuz" 4. Tobolsk fishing technical school of Federal State-Funded Educational Institution of Higher Education "Dalrybvtuz" 5. Vladivostok Marine Fishery College of the Federal State-Funded Educational Institution of Higher Education "Dalrybvtuz" 6. Lyceum FSBEI HE "Dalrybvtuz"	1. Institute of Fisheries and Aquaculture 2. Maritime Institute 3. Institute of Food Production 4. International Institute 5. Institute of correspondence education	212nd place in the ranking of technical and technological universities of Russia. 17th place in the ranking of universities of light and food industry in Russia.

Educational institution	Branches	Institutes and faculties	Rating
4. Kamchatka State Technical University Date of establishment of the educational organization: 1942	1. The educational organization has no branches	1. Nautical faculty 2. Faculty of Technology 3. Faculty of Economics and Management 4. Faculty of Information Technology	184th place in the ranking of technical and technological universities of Russia. 26th place in the ranking of transport universities
5. Kerch State Marine Technological University Date of establishment of the educational organization: 2014.	1. FSBEI of HE "KSMTU" in the city of Feodosia 2. Sudomechanical technical school of FSBEI of HE "KSMTU"	1. Maritime Faculty 2. Faculty of Technology	No rating information available

Next, we consider the ranking of universities in the system of training for the fish industry in 2018.

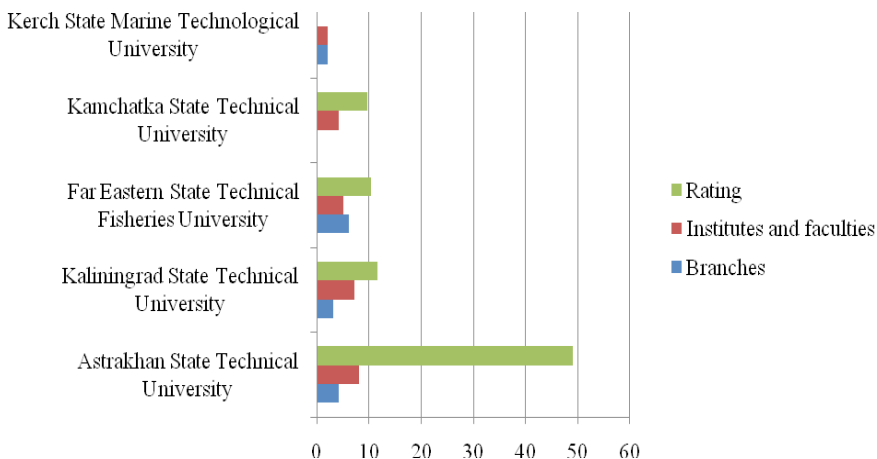


Figure 1. Rating of educational institutions in the system of training for the fish industry, 2018, points

The educational complex of the Federal Fishery Agency includes 5 educational institutions of higher education: Astrakhan State Technical University, Kaliningrad State Technical University, Far Eastern State Technical Fisheries University, Kamchatka State Technical University, Kerch State Marine Technological University.

The total contingent of students in educational institutions of the Federal Agency for Fishery is 40.3 thousand people. Out of the total contingent, 19.2 thousand study at the expense of the federal budget, of which more than 4.6 thousand are cadets enrolled in training programs for seafarers in accordance with international conventions.

In 2017, 9.2 thousand people were accepted for training, of which 5.6 thousand were for training at the expense of the federal budget. Out of the total admission to training in the programs of secondary vocational education, in 2017, 2.1 thousand people were accepted, and to the training in higher education programs - 3.5 thousand people. 2.3 thousand specialists with secondary vocational education and 4.9 thousand specialists with higher education were released [6].

On the basis of educational organizations, there are also institutes of advanced training and retraining of personnel, in which specialists from the fleet of fishing vessels and coastal enterprises of the industry undergo retraining. In addition, the training of highly qualified scientific and pedagogical personnel is carried out. There are dissertation councils working at universities of the industry.

In order to improve interaction with employers in higher education institutions of the industry, long-term contracts have been concluded, within the framework of which training is being sent, to production practices for fishing enterprises. Another area of cooperation with employers is cooperation in issues of targeted training.

The transition of the sectoral education system to the federal state educational standards of the new generation has intensified cooperation of universities with large fishing companies in the development of educational programs, taking into account the demands of employers on the content and quality of training.

Employers are also actively involved in the work of the State Examination Commissions, where they participate in the selection of the best graduates with the subsequent recruitment to work in their companies. A number of final qualifying papers are carried out upon the request of employers and, after graduation, are introduced into the process.

Higher education institutions of the Federal Agency for Fishery actively cooperate with branch research institutes in various areas most relevant to the development of the fisheries complex. As part of this work, great attention is paid to attracting talented young people to research projects together with industry research institutes.

In Petropavlovsk-Kamchatsky, on the basis of three educational institutions, a unified training complex for the stepwise training of seafarers was created. It included two secondary special ones - Kamchatka Polytechnic College, Kamchatka Industrial College and one higher educational institution Kamchatka State Technical University. This will make it possible in one educational institution to train specialists of higher and secondary qualifications, to jointly use the existing teaching and material base and teaching staff, to improve the quality selection of students for the highest degree and ultimately to improve the quality of training.

The new reform in education, which lasts not the first year, is an attempt to solve a number of urgent problems. But for the full development of the nation, it is necessary to take some more measures in the field of education. The state should not only strive to ensure that education meets international standards, but also fully meets the country's needs for qualified specialists and highly educated citizens in fishing enterprises.

In conclusion, we can note such a problem as the decline in the prestige of vocational schools and technical schools. This leads to a shortage of workers at enterprises in the fishing industry, in the service sector, this will subsequently lead to a large drop in production in our country. Vocational schools currently are capable of producing qualified specialists for the fishing industry every 2-3 years, but unfortunately there are very few people who want to enroll in a technical school or a vocational school for training in popular specialties. In each educational organization, the majority of students receive paid educational services and the cost of educational services of higher educational institutions, not much more expensive than the cost of paid educational services of vocational schools. After conducting a comparative analysis on the provision of paid educational services for training programs for mid-level specialists, as well as on the provision of paid educational services for higher educational institutions, the following table shows the following picture.

Table 2. Price list of the average cost of training in educational programs for the preparation of full-time and part-time tuition in the 2017-2018 academic year in higher and secondary educational institutions

Educational institutions		The cost of educational services
1.	College (full-time education)	107 900 rubles
2.	College (extramural studies)	54 000 rubles
3.	University (full-time education)	140 800 rubles
4.	University (correspondence course)	70 200 rubles

It is much easier for a future graduate of an educational institution to receive a paid higher education by correspondence, rather than paying the same amount for specialized secondary education, of course, this is not the main problem of a decline in the prestige of secondary special and vocational schools in the fishing industry, but one of the main ones. It is natural that it will not be advisable to reduce the cost of education for educational institutions especially with a shortage of student recruitment in the required specialties, but the state can take a number of specific measures aimed at solving this problem, for example, all budget places need to be planned and distributed only amongst the most demanded specialties. It is also necessary to take to practice educational institutions together with fishing

enterprises with applicants and citizens registered at the employment center, to hold conversations about entering specialty areas, to try future specialists of the fishing industry to give an opportunity to study at the expense of the enterprise and the state, but with the condition of conclusion contract that a student at the end of their studies must work for at least three years on a sought-after specialty in an enterprise.

Based on the above, we can conclude that the educational complex on fisheries of higher, secondary special and vocational educational institutions practically meets the needs of our enterprises and organizations for engineering, economic and working personnel, in general, also provides the industry with qualified personnel and basically allows to solve the problems of industrial and social development in the new economic conditions, intensification and economic independence.

References

1. *Problems of development of the port infrastructure of the Kamchatka Territory Rogaleva N.L., Volchkova N.V. In the collection: Development of the Theory and Practice of Social and Economic Systems Management Materials of the Seventh International Scientific and Practical Conference. Responsible for the release of N.G. Klochkova. 2018.*
2. *Fishery complex of the Kamchatka Territory as a basis for the development of the regional economy Rogaleva N.L., Werezhak A.V. In the collection: Development of the Theory and Practice of Social and Economic Systems Management Materials of the Seventh International Scientific and Practical Conference. Responsible for the release of N.G. Klochkova. 2018.*
3. *Federal Agency for Fisheries: Report on the main scientific fisheries research in 2010 [Electronic resource]:URL: [http://libed.ru/knigi-nauka/360229-12\(application 24.03.2019\)](http://libed.ru/knigi-nauka/360229-12(application 24.03.2019)).*
4. *Modernization of the marine industry: Actual problems of training specialists of the fishing complex V.A. Volkogon, N.A. Kostrikova, A.Ya. Yafasov. [Electronic resource]:URL: <http://skachate.ru/geografiya/53994/index.html>. (application 22.03.2019).*
5. *Order of the Government of the Russian Federation No. 2341-r dated November 24, 2014 "On the establishment of the Southern Research Institute of Fisheries and Oceanography"*
6. *An extended meeting of the Board of the Federal Agency for Fishery, dedicated to the results of the Agency's activities in 2018 and tasks for 2019. [Electronic resource]:URL: <http://fish.gov.ru/ob-agentstve/kollegiya-rosrybolovstva> (application 26.03.2019).*

机器学习技术在人工智能开发中的问题与展望
**PROBLEMS AND PROSPECTS FOR THE USE
OF MACHINE LEARNING TECHNOLOGIES
IN THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE**

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注解。 本文确定了机器学习技术在各经济部门企业生产高科技产品的实际应用中存在的问题和前景。 阐述了利用机器学习作为人工智能在高科技企业生产活动管理中的关键技术之一的本质和优势。 考虑到用户的要求和要求, 将关键和其他人工智能技术嵌入现有软件以更灵活地管理高科技生产系统的必要性得到了证实。

关键词: 人工智能, 机器学习技术, 大量信息, 神经网络, 控制, 生产系统, 高科技产品。

Annotation. *The article identifies problems and prospects for the practical application of machine learning technologies for the production of high-tech products in enterprises of various sectors of the economy. The essence and advantages of using machine learning as one of the key technologies of artificial intelligence in the management of the production activities of high-tech enterprises are shown. The necessity of embedding key and other artificial intelligence technologies into existing software for more flexible management of high-tech production systems, taking into account user requirements and requests, is substantiated.*

Keywords: *artificial intelligence, machine learning technologies, large amounts of information, neural networks, control, production systems, high-tech products.*

Introduction.

In the early 1980s experts in the field of computing theory A. Barr and E.A. Feigenbaum [4] gave the artificial intelligence (AI) the definition according to which it should be understood as that part of computer science that specializes in the development of intelligent systems for computers that have functionality that

is quite close to the functions of the human mind. These opportunities primarily include: understanding the language, obtaining new knowledge, logical thinking, problem determination, analytics analysis and others.

After a certain period of time, term AI began to define the development of algorithms and software, the distinctive feature of which was the ability to solve individual tasks in ways that are as close as possible to the human mind when solving similar problems [1].

The areas of practical application of AI technologies are very wide and include both fairly well-known technologies and constantly emerging new technologies that are still far from large-scale use. AI technologies are actively developing and gradually cover an ever wider range of solutions in various areas of production. At the same time, AI technologies do not form a single subject area of research. In particular, individual AI technologies represent new directions or subsectors of the economy, which, on the one hand, exist rather separately, and on the other hand, at the same time maintain a large array of sectors of the economy.

Purpose of the study.

The purpose of this study is to identify problems and determine the prospects for the practical application of machine learning technologies in the development of artificial intelligence for the production of high-tech products in enterprises of various sectors of the economy, as well as in the service sector and other areas of society.

Materials and methods.

In the modern sense, artificial intelligence technologies (AI) are used to combine the development technologies of intelligent computing systems that operate on the basis of intelligent software. AI technologies are often associated with the use of computers to understand human intelligence, but they are not limited to using methods that adequately reflect the activity of biologically active systems to create them.

All variety of AI technologies can be divided according to the criterion of key development points. The main properties of AI technologies are in understanding the language, obtaining new knowledge, logical thinking, analyzing analytics, identifying problems and the ability to solve them. The technology of AI includes a complex of essentially innovative technological processes that are developing at a high quality level and fairly quickly. Currently, the most frequently used ones are: word processing with the help of natural language, machine learning, expert systems, virtual agents, recommendation systems [3].

According to most analysts, machine learning (ML), is one of the progressive trends in the development of AI technology [2]. ML technologies form a rather narrow field of expertise in specialization, which is part of the main AI methods and technologies used in the processing of large volumes of information. ML technolo-

gies are used to develop algorithms for automating the search and selection of new knowledge from large amounts of information, training software systems using new knowledge, recommendations for identifying various objects, generating various kinds of forecasts, and solving other classes of problems. ML technologies combine a whole range of AI methods, the distinctive properties of which include not a direct solution of various kinds of problems, but learning through the process of finding their solution based on the choice of feasible solutions from a certain number of similar problems. As such methods, the most commonly used methods are mathematical statistics, various computational methods, optimization methods, probability theory and graph theory, various digital data processing methods and others.

Experts in the field of AI technologies include ML technologies to learning systems, which include elements of the so-called weak AI, which have no abilities for rational thinking, like humans. They are designed to solve the simplest applied problems. Accordingly, the technologies of the so-called strong AI include ML technologies with a predominance of elements that already have some kind of artificial intelligence, which in theory can be combined with a separate software system in order to show abilities of rational thinking comparable to human mental abilities. Technologies of strong AI have such properties as: the ability to sense various external factors, the ability to reason and draw conclusions, the ability to analyze independently, and the ability to think independently.

Being an integral part of the so-called weak AI, ML technology, still have many properties similar to the training of people, which were revealed by psychologists at the turn of the XX-XXI centuries. In particular, they include a number of new ways of learning based on knowledge transfer processes. At the same time, one of such methods, cognitive learning, is directly used in ML technologies. It should be noted here that the theory of cognitive learning is based on the position that a reasonable person initially has the ability to learn, structure, accumulate and preserve new knowledge. The same abilities are laid in the ML technology, which from this angle can be considered a practical example of the application of the theory of cognitive learning, but intended for the use of computer educational technologies.

Therefore, the practical significance of ML technologies for many sectors of the economy is quite high. The total number of existing methods of their application can not be accurately counted. These include the formation of forecasts, and improvement of services, and optimization of all logistics, and the identification of fraudulent operations in financial institutions, and the provision of personal services in the health sector, and rational planning of traffic on the roads, and the dispatching of flights and arrivals at airports and many others.

ML technologies are used for the intellectual analysis of large amounts of information in public institutions in order to ensure the growth of their efficiency and save financial resources. In banking structures, ML technologies are used to

search for new investment opportunities, identify unreliable clients and signs of cyber attacks. In the field of healthcare, the use of ML technologies ensures the timely processing of data from patient-weighted devices and sensors for rapid assessment of their health status.

Currently, ML technologies unite, it would seem, such an independent areas as: neural networks, training on precedents, genetic algorithms, conclusions of rules and analytical training. As a rule, ML technologies use large arrays of information in their work in order to ensure the required accuracy of computational operations across the entire neural network. However, practice shows that in many sectors of the economy there are no databases that use large amounts of information.

You can visualize the operation of ML technology in this way. Suppose that there are descriptions of several computational operations that are combined into one training sample. Then, the presence of a set of separate data fragments that have common properties in the form of dependencies, patterns, and interrelations belonging to not only the training set, but also to other computational operations is revealed. Using the ML technology tuning algorithms by a training sample of computational operations, one can optimize all the parameters of the learning process, and then use the customized ML technology to solve similar applied problems.

On this basis, the operation of ML technology can be represented through the expression:

Machine Learning = Description + Evaluation + Optimization

If: Description - a functional description of the studied element in a natural language that technology can interpret. ML;

Evaluation – functional selection of the most appropriate ML technology;

Optimization - finding the best options and ways to learn.

At the same time, the main purpose of applying the ML technology can be the creation of the ability to detect some other computational operations that are not part of the used training sample in the neural network, but have the same properties.

Thus, ML technologies in practice are used to identify the elements under study, conduct regression analysis of data and predict their new values based on the results of the analysis. Most often, for this purpose, a model of the restorable data dependence is created in the form of a parametric family of customized algorithms. Then, numerical optimization of model parameters is carried out, which allows minimizing the number of errors in the selected training sample of computational operations.

Today the most common ML algorithms are: linear and logistic regression; SVM (support vector method); decision trees; random forest (many decisive trees); AdaBoost (revealing weak functions); gradient boosting; neural networks; K-means (k-means clustering method); EM-algorithm (finding the maximum likelihood estimates of the parameters of probabilistic models); autoregression; Self-organizing maps (neural network with training without a teacher) [4].

The current success of development and the universal recognition of the high efficiency of the practical use of ML technology is due to three circumstances, namely:

1) the need for timely processing of exponentially increasing amounts of data;

It raises the need for analyzing large masses of heterogeneous information and is a prerequisite for the introduction of ML technologies. Processing large arrays of heterogeneous information opens up the possibility for the development of ML technologies, since it creates a large number of computational operations for the formation of training samples, which is a sufficient condition for the introduction of ML technologies.

2) the presence of a sufficiently developed processor base for the production of computational operations on large arrays of heterogeneous information;

As is known, the introduction of ML technology is divided into two stages. The first is learning artificial neural network, its algorithmic tuning. At the second stage, there is a parallel processing of large arrays of heterogeneous information. High-performance CPU processors are usually used to do this.

3) fairly wide distribution of software libraries used in technologies of ML.

At the moment, their number has exceeded 50, the most famous of which are: TensorFlow, Theano, Keras, Lasagne, Caffe, DSSTNE, Wolfram Mathematica. Virtually all software supports the OpenMP application interface, the Python, Java and C++ languages, and the CUDA platform [3].

Results and discussion

The areas of practical use of ML technologies in the future are very difficult to clearly identify. Today, the project of the so-called Industry 4.0 has the greatest development prospects in the world format [5]. The basis for the development of Industry 4.0 is a new level of organization of the production of high-tech products based on the management of the formation chains of its value throughout its life cycle. It involves the transfer of control of most industries from manual to fully automated mode using modern digital intelligent technologies and systems. In the future, their integration into industry-specific industrial networks and organization of interaction on the scale of a global worldwide network is envisaged. The most significant role in achieving this goal belongs to the technologies of ML.

The development of modern information and communication technologies (ICT), the emergence of high-speed communication channels, the creation of new digital platforms and cloud technologies for processing large volumes of information have contributed to the development of modern open information systems and global industrial networks. The above and a number of other technologies and information resources are intended for practical use both within the individual enterprise and beyond its borders, thus opening up new prospects for more efficient interaction of the enterprise with its counterparties. The introduction of new tech-

nologies of artificial intelligence, such as machine learning, as well as the use of network information resources contribute to the transfer of high-tech production to a new level of automation.

Conclusion.

The results obtained in the course of the research allowed us to formulate the following conclusions.

1. Artificial intelligence is commonly understood as the technology of developing intelligent computing systems that operate on the basis of intelligent software.
2. The key technologies of artificial intelligence include machine learning technologies, which in practice are used to identify the elements under study, conduct regression analysis of data and predict their new values based on the results of the analysis.
3. Expansion of the field of application of AI technologies actively contributes to their adaptation in many sectors of the economy across all value chains in the production of high-tech products through the algorithmization of almost all functional operations of enterprise management.

Thanks

This work was partly supported by the Russian Foundation for Basic Research, project №. 19-010-00043a “Theoretical foundations, innovative methods and organizational and economic mechanisms for creating and market-selling domestic high-tech products in a globalized economy and under expanding anti-Russian sanctions.”

References

1. Jones M.T. *Programming artificial intelligence in applications.* - SPb.: DMK Press, 2018. - 312 p.
2. Mosunov E. (2017). *Machine learning / Hi-News.ru. February 14, 2017.* - Access: <https://hi-news.ru/technology/trendy-mashinnoe-obuchenie.html>.
3. Chardin B., Massaron L., Boschetti A. *Large-scale machine learning with Python.* - SPb.: DMK Press, 2017. - 358 p.
4. Aghion P., Bergeaud A., Lequien M. and Melitz M. (2017) “*The Impact of Exports on Innovation: Theory and Evidence*”. Working Paper, Harvard University, March 2017.
5. Barr A., Feigenbaum E.A. (eds.) (1981). “*The Handbook of Artificial Intelligence*”. Heuristech Press / William Kaufmann. – 1518 p.

利用认知计算系统开发人工智能技术, 用于生产高科技产品
**THE USE OF COGNITIVE COMPUTING SYSTEMS
IN THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE
TECHNOLOGIES FOR THE PRODUCTION
OF HIGH-TECH PRODUCTS**

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注解。机器学习, 认知计算系统等技术的迅速发展, 同时在现代社会生活的各个领域扩展其实际应用领域, 正在成为人工智能时代开始的决定性因素。这种情况预先确定了本文主题的相关性。其主要目标是确定认知计算系统的实际应用领域, 以便在各经济部门以及社会其他领域的企业中生产高科技产品。作为该研究的方法论基础, 使用了分析和功能分析的主要规定, 计算操作的自动化, 算法和软件的开发。作为研究的结果, 揭示了认知计算系统的实际应用的功能特征与控制缩放功能的新组件的存在之间的基本差异。CC系统应用领域的扩展通过算法处理从事高科技产品的管理企业的几乎所有功能操作, 积极地促进了它们在所有高科技产品链中适应经济的许多部门。

关键词: 人工智能, 技术开发, 认知计算系统, 高科技产品。

***Annotation.** The rapid development of such technologies as machine learning, cognitive computing systems and others, while simultaneously expanding the spheres of their practical application in various areas of the life of modern society, are becoming a determining factor in the onset of the artificial intelligence era. This circumstance predetermines the relevance of the topic of this article. Its main goal is to identify promising areas of practical use of cognitive computing systems for the production of high-tech products in enterprises of various sectors of the economy, as well as in other areas of society. As a methodological basis of the study, the main provisions of analytical and functional analysis, automation of computational operations, development of algorithmic and software were used. As a result of the research, fundamental differences between the functional features of the practical application of cognitive computing systems and the presence of a new component of the control scaling function were revealed. Expansion of the areas of application of CC systems actively contributes to their adaptation in*

many sectors of the economy across all chains of high-tech products through algorithmic processing of almost all functional operations of managing enterprises engaged in high-tech products.

Keywords: *artificial intelligence, technology development, cognitive computing systems, high-tech production.*

Introduction

The world community is rapidly entering an era of artificial intelligence (AI) [1, 4] and cognitive computing (CC) [3], the distinctive feature of which is not only the improvement of computing functions and their automation, but also the development of the functionality of computers as machines, capable of rational thinking. If earlier CC systems were mainly understood as systems that automatically perform various kinds of computational operations, then under the influence of expanding the informatization of all spheres of production, their functional content becomes fundamentally different. In addition to the wide variation in various computational operations using computers, CC systems today also combine algorithmic support for performing these operations, software for managing these processes, conceptual support in the form of modern concepts of computerization development in all areas of public life. Thus, at present, CC systems are being transformed into a functionally integral component of the development of AI technologies and the production of high-tech products. This article will show some features of the practical use of CC systems in modern conditions.

Purpose of the study

The purpose of this study is to identify promising areas of practical use of CC systems in the development of artificial intelligence technologies for the production of high-tech products in enterprises of various sectors of the economy, as well as in other areas of society.

Materials and methods

The creation of CC systems is currently recognized by many specialists as a real alternative to the development of well-known application software packages (ASPs), the functional content of which in the overwhelming number of them was quite narrow. At the same time, despite the growing interest in the development of machine learning technologies (ML) [2], it would be completely wrong to reduce the essence of the concept CC to ML technologies. Indeed, in its essence CC is one of the components of AI technologies, and with good reason it can be considered as its subsystem, which, in turn, are ML technologies (see Fig. [6]).

In addition, in the modern sense, the concept of CC combines, along with ML technologies, the automation of management decision making and data identification in various formats and volumes, video analytics algorithms, the use of natural languages for processing large data arrays in real time and a large number of other areas of practical application.

As can be seen from the above listing, many of the practical applications of CC intersect each other. For this reason, they are quite difficult to clearly separate from each other on the functional and essential levels. Moreover, at the moment such a division has not been made by any team of specialists possessing the highest professional competences in the field of AI. However, there is every reason to believe with a large degree of certainty that many CC systems specifically represent ML technologies in which cognitive learning processes are supported using mathematical methods and algorithms.

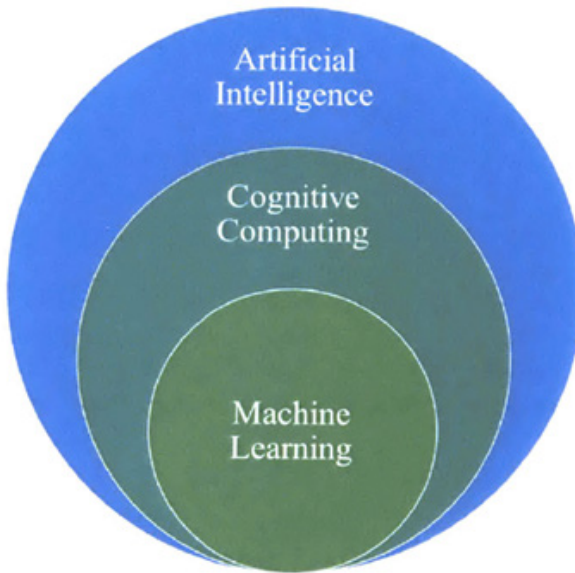


Fig. Interconnection of AI, CC and ML technologies

The main purpose of the development of CC systems is not a complete replacement of the thinking abilities of the human brain or learning a computer system to think in ways similar to the human brain. On the contrary, the high efficiency of CC systems is achieved due to the fact that computer systems are better in carrying out calculations with large amounts of information and process large data arrays, and the mental abilities of the human brain will be aimed at developing intuition, obtaining sound solutions, creative approach to managing modern high-tech industries .

CC systems differ from conventional computers that have already become familiar and still existing today with fundamentally different functional features. If processes and processors are the basis of the functioning of computers, then

the basis of functioning of CC systems is large data arrays, presented in different formats and in fact not limited in size. The consequence of this will be a gradual replacement of obtaining a certain result of calculations according to algorithms originally introduced into the program for a variety of results obtained using various analytical methods. Accordingly, if today the so-called manual control prevails in most high-tech productions, then in the near future it will be replaced by automated CC systems.

Another fundamental difference between CC systems is the scaling of control functions. Using conventional computers allows two types of scaling control functions - vertical (up) and horizontal (wide). With the advent of CC systems, it becomes possible to scale the control functions in depth (inward), which is based on combining such components as processors, RAM, storage systems of large data arrays, as well as their interaction with each other into one control system.

Comparative features of conventional computer programs and CC systems are shown in the table.

Table
Comparative features of conventional computer programs and CC systems

Conventional computer programs	Cognitive computing systems
Usage of training programs	The training is based on specific examples.
Usage of only structured information	Usage of unstructured information
Usage of deterministic applications	Usage of applications containing uncertainty and aimed at finding something new
Usage of machine languages to process information	Usage of natural languages to process information
Processing information on the established algorithms	Selection of algorithms for information processing
Obtaining of the result of calculation on a none-alternative basis	Hypothesis formation and assessment of possible alternatives to the calculation results
Obtaining of only one result	Selection of a valid result from among the most closely matching the specified calculation conditions
Working with information of limited volume	Work with large amounts of information, the volume of which is not limited

Nowadays, CC systems include everything that somehow affects the processes of modeling high-tech productions based on the use of computer-aided thinking abilities, by analogy with the abilities of the human brain. The CC systems include various training systems, data mining systems, information and image identifica-

tion systems, natural language text processing systems and many other systems whose main purpose is to find solutions to various kinds of tasks without involving a person.

Already today, large-scale implementation of such CC systems as speech recognition systems, sentiment analysis systems, face recognition systems, and a number of others is in demand in many areas of society's life. If using conventional computers, users interact with them on the basis of various programs, while using CC systems, interaction with them will be carried out through ML technologies [5]. The algorithms of the ML technologies are able to extract the data needed by the user from large amounts of information, process them and gain new knowledge by searching for alternative solutions to different tasks.

CC systems can be used in the management of high-tech enterprises to identify the preferences and characteristics of consumers of their products. According to the heads of marketing departments, the identification of "consumer insights" is considered one of the promising ways to use CC systems in order to improve customer service. At the same time, it would be wrong to consider the practical application of CC systems only in independent areas of enterprise activity. Enterprise management should develop an approach to CC systems as part of an overall strategy for introducing digital production management. At the same time, CC systems will be focused on performing the most time-consuming work, therefore, the need for specialists with analytical skills, a comprehensive vision of the strategic development of the enterprise and knowledge of its key activities is increasing. Such specialists can quickly identify promising areas of business based on cognitive "consumer insights". In addition, they must have the skills to develop and make sound management decisions.

Professional use of CC systems is possible in various areas of production management of high-tech enterprises, starting directly from production, its marketing and sales, optimizing the supply of components and materials, solving various operating and financial tasks, personnel management and ending with customer service. Such opportunities contribute to the integration of data exchange processes and their implementation in the activities of individual departments of enterprises in order to improve the production of high-tech products. In addition, CC systems as tools for managing high-tech enterprises can be easily implemented into functioning cloud platforms and management systems for these enterprises. Practice shows that even a small use of CC systems contributes to obtaining additional competitive advantages by enterprises and identifying promising directions for the development of their production activities.

Results and discussion

The development of modern information and communication technologies (ICT), the emergence of high-speed communication channels, the creation of new

digital platforms and cloud technologies for processing large volumes of information have contributed to the development of modern open information systems and global industrial networks. The above and a number of other technologies and information resources are intended for practical use both within the individual enterprise and beyond its borders, thus opening up new prospects for more efficient interaction of the enterprise with its counterparties. The introduction of new technologies AI, ML and CC systems, as well as the use of network information resources contribute to the transfer of production of high-tech products to a new level of automation.

Conclusions

Based on the results obtained in the course of the research, the following conclusions were formulated.

1. The structure of artificial intelligence technologies includes MO technologies, CC systems and a whole range of other technologies, the main purpose of which is to develop thinking abilities of machines with the aim of their subsequent use in the production of high-tech products in various sectors of the economy. At the same time, in many CC systems, MO technologies are definitely represented, in which cognitive learning processes are supported using mathematical methods and algorithms.

2. A distinctive feature of CC systems is not only the improvement of computational functions, but also the development of the functionality of computers as machines capable of rational thinking. Therefore, in modern conditions, CC systems are transformed into a functionally integral component of the development of AI technologies aimed at improving the efficiency of high-tech products.

3. Expansion of the areas of application of CC systems actively contributes to their adaptation in many sectors of the economy across all chains of high-tech products through algorithmic processing of almost all functional operations of managing enterprises engaged in high-tech products.

4. The introduction of new technologies AI, ML and CC systems, as well as the use of network information resources contribute to the transfer of production of high-tech products to a new level of automation.

Thanks

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References

1. Jones M.T. *Programming of artificial intelligence in applications*. - SPb.: DMK Press, 2018. - 312 p.
2. Mosunov E. (2017). *Machine learning / Hi-News.ru. February 14, 2017*. - Access: <https://hi-news.ru/technology/trendy-mashinnoe-obuchenie.html>.
3. *Overview of the most popular machine learning algorithms*. – Access: <https://tproger.ru/translations/top-machine-learning-algorithms/>.
4. Barr A., Feigenbaum E.A. (eds.) (1981). *The Handbook of Artificial Intelligence*. Heuritech Press / William Kaufmann. – 1518 p.
5. Parloff R. (2016). *Why Deep Learning Is Suddenly Changing Your Life / Fortune*. 28.09.2016. – Access: <http://fortune.com/ai-artificial-intelligence-deep-machine-learning>.
6. Roberts J. (2016). *Thinking Machines: The Search for Artificial Intelligence Distillations / Chemical Heritage Foundation*. 17.02.2017. – Access: <https://www.chemheritage.org/distillations/magazine/thinking-machines-the-search-for-artificial-intelligence>.

俄罗斯经济中集群投资结构创新的现状
**CURRENT STATE OF INNOVATIZATION OF CLUSTER
INVESTMENT STRUCTURES IN RUSSIAN ECONOMY**

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学科。现在，在外交政策和危机不稳定的情况下，集群形成代表了与外国投资者进行有效沟通的主要环节。集群方法是通过这种方式吸引投资以增加投资潜力，创造有利的商业环境，改善确保社会和经济领域的稳定发展的方法之一。采用集群方法的高质量区域投资战略可以对外国投资的流入产生积极影响。在这方面，热门话题是集群投资结构的可持续发展。

目的。评估俄罗斯经济中集群投资结构创新过程的现状效率和确保其可持续发展的措施的发展。

方法。研究的方法论基础是经验和逻辑结构，比较分析，系统方法，综合，概括，归纳和演绎。

结果。分配了对国家和区域聚类政策产生负面影响的关键障碍。评估了俄罗斯创新领土集群发展的关键财政和经济指标的动态。对我国创新领土集群基础设施发展投资的主要需求进行了分析，其中揭示了我国绝大多数创新领土集群的基本障碍是基础设施发展水平不足。考虑了创新领土集群“软基础设施”发展的方向。

结论。通过引入所列措施，可以观察到集群投资结构创新的可持续发展和活动效率的提高。

关键词：集群，创新，投资，创新。

Subject. *Now in a situation of an unstable foreign policy and crisis cluster formations represent the main link of effective communication with investors of the foreign states. Cluster approach represents one of ways by means of which attraction of investments is carried out to increase investment potential, to create the favorable business environment, to improve ensuring stable development in*

the social and economic sphere. High-quality regional investment strategy with use of approach of a clustering can exert positive impact on inflow of foreign investments. In this regard the topical issue is sustainable development of clustering investment structures.

Purposes. *Assessment of efficiency of the current state of processes of an innovatization of cluster investment structures in economy of Russia and development of measures of ensuring its sustainable development.*

Methodology. *The methodological basis of a research was made by empirical and logical constructions, comparative analysis, system approach, synthesis, generalization, induction and deduction.*

Results. *Key barriers exerting negative impact on the state and regional policy of clustering are allocated. Assessment of dynamics of key financial and economic indicators of development of innovative territorial clusters of Russia is carried out. The analysis of prime needs for investments on development of infrastructure of innovative territorial clusters of our country within which it has been revealed that for absolute majority of innovative territorial clusters of our country an essential barrier is insufficiently considerable level of infrastructure development is carried out. The directions on development of "soft infrastructure" of innovative territorial clusters are considered.*

Conclusions. *As a result of introduction of the listed measures sustainable development of an innovatization of cluster investment structures and increase in efficiency of their activity is observed.*

Keywords: *clustering, innovatization, investments, innovations.*

Innovatization represents process due to which there is an accumulation, preservation, use and development of innovative opportunities of economic entities of economic systems. Innovatization is carried out in various organizational and administrative forms [1]. In modern conditions the most productive organizational and administrative form of innovatization is the clustering.

Effective form of the self-organization necessary for successful development in the conditions of globalization when regional borders not always manage to act as the economic controller, is the cluster acting as the environment of functioning of business processes [2]. According to the theory of the founder of cluster approach Michael Porter "the cluster is a group of geographically adjoining interconnected companies and the related organizations operating in a certain sphere, which are characterized by community of activity and complementary each other"[3]. The cluster represents the interconnected firms which are concentrated in a certain territory: infrastructure, higher educational institutions and research institutes; the suppliers of the equipment, accessories and special services complementing each other and increasing competitive advantages of the separate participating organi-

zations of a cluster and in general a cluster. In other words, the cluster is a concentration of business, scientific and educational institutions, enterprises of the industry.

The most effective existence of a cluster is considered as the "symbiosis of cooperation and the competition" considering positive synergetic effects of territorial agglomeration [4]. The innovative interaction between real and financial sectors of economy arising in cluster formation is symbiosis industrial, innovative, investment, technological, monetary and credit policy and the policy of regional development. As a rule, the potential of the cluster formation representing sustainable partnership of the interconnected organizations exceeds the simple sum of potentials of separate elements. Such increment arises at the expense of a combination of cooperation, the competition, cooperation and productive use of opportunities of partners. First of all, the cluster represents an innovative form of a society organization which allows to survive in circumstances of the fierce international competition. National borders in the conditions of globalization of economy not always work as economic regulators, therefore new forms of the organization of business and its interaction with authorities and societies are required.

Cluster formation, in comparison with the majority of mechanisms of public-private partnership, acts as a construction in which not the state but business is an initiator, showing need of participation of public authorities and the further organization of development of cluster formation. At the same time the regional governments which interact with the private sector should carry out rather expansion and strengthening of the functioning clusters, than try to create new. On the example of cluster formation s it is possible to disclose practical technology of network innovative interaction of economic entities of real and financial sectors of economy.

In modern conditions the perspective direction of development of the industry is formation of clusters as effective form of interaction of the producers of finished goods with suppliers of raw materials completing and also specialized production services. Formation of competitive clusters contributes to the development of those territories in which they are located; acts as a crucial condition of deepening of interregional economic integration; is the catalyst of placement of those productions and infrastructure facilities which promote development of a cluster.

Modern clusters represent inter-industry, multi-sphere formations with the institutional form allowing to connect diverse material and intellectual resources in the most effective way. The important feature of a cluster is that a certain participant, pursuing own aim, increases efficiency of own activity and also activity which is carried out by partners or competitors (fig. 1). Increase in efficiency of functioning of a cluster the science and technology park acting, on the one hand, as the integration mechanism of innovative processes in a cluster, and on another – representing a wide-profile form of infrastructure of innovative development can play significant assistance.

Cluster approach is adequate to process of economy formation of innovative type. The innovative policy with orientation to clusters stimulates emergence of "new combinations" and supports them, especially in education and research works and also through the implementation intermediary centers. In the Government of the Russian Federation of the politician in the field of clusters treats one of eleven key investment initiatives and is considered as the instrument of diversification of domestic economy. The provision on a clustering is reflected in the concept strategists of long-term social and economic development of Russia till 2020.

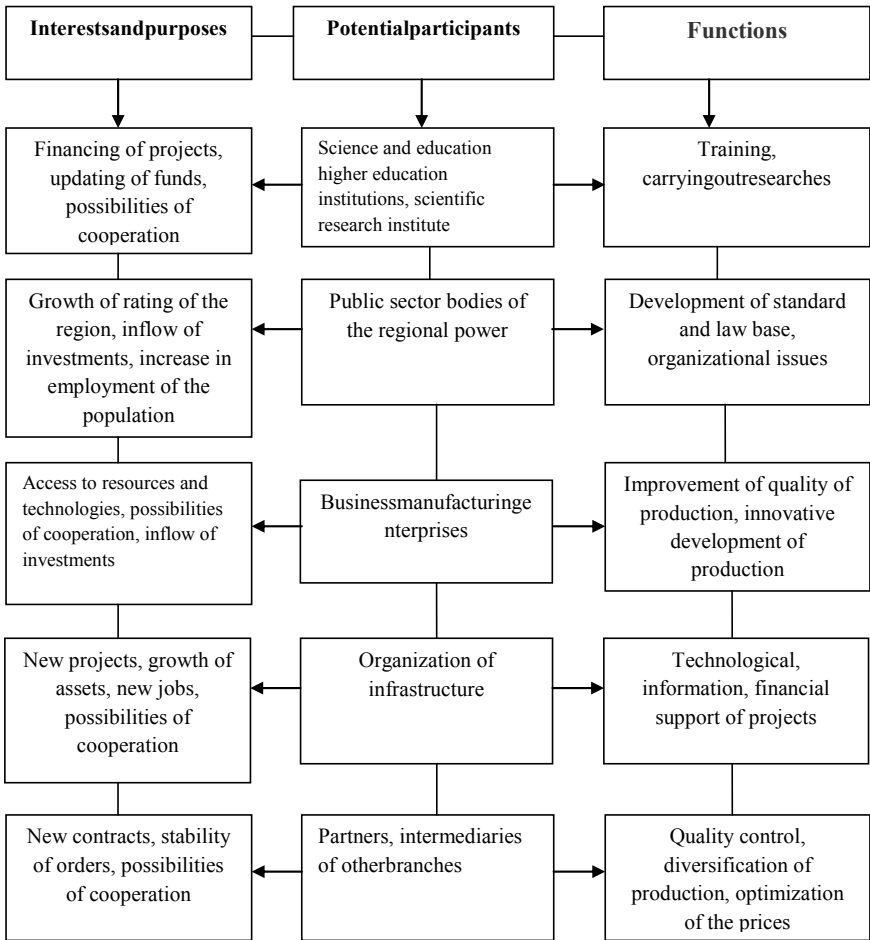


Figure 1. Relationship of potential participants of cluster formation

The most important tendency of development of the modern economy caused by its globalization, informatization and post-industrial innovative development is the clustering. The cluster policy realizing functions of innovative interaction of economic entities in cluster formations leads to increase in competitiveness of regional economy. The clustering represents process of formation and development of clusters with the purpose to increase the level of competitiveness of regions, and most often subjects of economic activity concentrate within geographical boundaries of the territory which has in the greatest measure a favorable situation.

However today the proximity to each other of suppliers, partners in researches and consumers isn't defining due to progress of information technologies and new principles of interaction of economic subjects. The great popularity was gained by "virtual" clusters which in the geographical plan aren't attached to the concrete region and are created as a result of emergence of innovative networks.

Regional cluster formation represents the center of attraction of internal investments of owners and firms, money of the population, financial instruments of investors, the credits, budgetary funds and means of state non-budgetary funds. Clusters provide the greatest stability of regional economy and realization of its competitive advantages on the basis of synergism in the sphere: product sales; operational management; financial investment activities; management. As scientific, information, financial and other resources are limited, the role of public authorities becomes complicated. Therefore there is a need to create the mechanism of self-organization of financial and economic structures. This mechanism functions due to coordination of interests of all participants and limited use of the resources attracted from external sources.

Today regions of the Russian Federation compete among themselves concerning attraction to the region of investments. Cluster approach represents one of ways by means of which attraction of domestic and foreign investments is carried out to increase investment potential, to create the favorable business environment, to improve ensuring stable development in the social and economic sphere, etc. Cluster approach is the perspective tool having innovative orientation, influencing innovative development of economy, increase in competitiveness of business, stimulation of innovations, increase in quality of life, development of new activities, etc. Clusters represent the innovative systems having the high level of the competition at the expense of which mechanisms the considerable potential of sustainable development of spatial economic systems can be created

The distinctive feature of a cluster is that in it there is a formation of special innovative environment which promotes growth of competitiveness of the organizations of participants of a cluster and development of the region. Due to formation of a cluster development of the branches of economy which are in continuous interaction that leads to increase the level of investment, innovative, educational, production, scientific, technical, technological capacities of the region is carried out. The effective

mechanism of policy in the field of clusters exerts positive impact on increase in steady growth of economy of spatial economic systems due to influence of positive factors:

- all-round development at the expense of clusters of adjacent territories;
- growth of tax base;
- improvement of opportunities for attraction of domestic and foreign investments;
- increase the level of competitiveness of the country and its regions;
- effective development of innovative and investment infrastructures;
- due to creation of the enterprises of large business there is a development of small enterprises.

The strategy of innovative development of Russia until 2020 provides formation and development of innovative territorial clusters for the purpose of support of steady growth of national economy and improvement of innovative and investment infrastructures. It is necessary to understand a certain territorial education where there is favorable innovative infrastructure possessing interaction of the participants entering its with third-party educational institutions, science and technology parks, technopolises, financial credit institutions, investment structures, etc. as an innovative territorial cluster and the powerful share of production is innovative. The innovative territorial cluster represents set of the firms and institutions which are participants of a cluster with the following characteristics:

- a research and production chain which unites participants of a cluster and works in the branches which are key for national economy;
- the mechanism by means of which coordination and cooperation of the enterprises' activity of a cluster is carried out;
- the synergetic effect expressed in increase in economic result and efficiency of activity of each participant of a cluster in connection with the considerable level of their cooperation and concentration.

Important effect of development of innovative territorial clusters –is stimulation of innovative activity (the cluster is innovatively focused) that is the strategic direction of modern economy, and it, in turn, provides economic formations with additional competitive benefits.

The experience of regions of Russia based on achievements in cluster policy indicates that the cluster gives the chance to improve a material economic situation of economic formations and the region in general. Today a large number of regions of Russia seek to develop economy in the innovative course due to use of clustering. It is necessary to notice that there is an emergence and further growth of disproportions in development of territories that can negatively influence economy of the Russian Federation in general. Therefore there is a development of measures which are directed to overcoming barriers of development of the firms which are participants of a cluster. Allocate the following key barriers exerting negative impact on the state and regional policy of clustering:

- undeveloped or completely old infrastructure;
- low sensitivity of a number of the organizations to introduction of innovations;
- serious load of many productions of ecology;
- a lack of the shots having high qualification;
- lack of coherence between various government institutions;
- low level of competitiveness of many territorial subjects of the Russian Federation, etc.

In total during 2012-2017 investment expenses of the organizations and institutions which are participants of a cluster will make 3,6trln. rub. amount of works and projects in the field of scientific developments and researches which are executed by participants of a cluster – 648 billion rubles; investments on development of a cluster, including budget funds and means of non-budgetary sources – 3,3trln. rub. [5].

At the same time there are plans for significant increase in quantity of high-performance jobs which are created anew or due to process of modernization of already available jobs. By 2017 it is planned that this indicator in comparison with 2012 will increase approximately twice and will make 55143. In total during the period from 2012 to 2017 in innovative territorial clusters of the Russian Federation about 255000 high-performance jobs will be created.

Due to data of executive authorities of Russian regions where 13 innovative territorial clusters which have received target interbudgetary subsidies for development function, requirement of development of infrastructure of the territory of these clusters makes 27 billion rubles, including development of innovative infrastructure – 13 billion rubles (about a half), transport – 8,3mlrd. rub (30%), education – 2,5mlrd. rub (9%), power – 1,8mlrd. rub (7%), social – 0,8mlrd. rub (3%), engineering – 0,4mlrd. rub (1%).

However together with investment support of capital investments it is necessary to support the directions on development of "soft infrastructure": implementation of consultation of participants of cluster formations in questions of development of effective innovative and investment projects; professional development, carrying out professional retraining and training of workers of cluster participants; purchase of the equipment and cars for development of educational and innovative infrastructure; holding such actions as exhibitions, fairs; participation by representatives of the firms which are participants of clusters in the exhibitions, fairs and actions having communicative focus, both within the country, and abroad. As it is noted in works of many authors, activity of the non-profit or government organizations which provide firms with the most important infrastructure of mutual aid, condition for cooperation and also opportunity for carrying out joint researches, developments and innovations is very important for functioning of a cluster.

Clusters represent a form of self-organization of innovative leaders who are localized in a certain territory. They represent the components of an economic and innovative landscape playing a significant role on the innovative world map now. In cluster formations there was a support of a number of considerable innovative and investment projects due to which implementation the country can come to the leading positions in technological development, first of all it is about cluster initiatives in branch of petrochemistry, laser and radiation technologies, biotechnologies, IT.

Russian regions for ensuring sustainable development of a clustering of investment structures in the conditions of an innovatization of reproduction processes and development of efficiency of process of implementation of innovative and investment strategy have to pay attention to questions of any overcoming the barriers and barriers constraining development of cluster formations. Therefore we recommend to focus attention to the following questions:

- elimination of disproportions of territorial development of territorial subjects of the Russian Federation;
- to the coordinated work connected with preparation of innovative and investment platforms and their full equipment by due infrastructure;
- outflow of the population, first of all workers of high qualification;
- complex attraction of investments from various investment structures;
- creation of the effective legislative base for support of the enterprises which are participants of a cluster;
- carrying out regular monitoring of activity of cluster formations in certain regions to reveal successful experience of creation and functioning of clusters;
- formation of the effective mechanism of support by public authorities of the activity having innovative focus in the territory of cluster formation.

Also today it is especially important that the control system of cluster formations to be developed, competences of cluster teams to be formed and increased, the best practitioners in the field of system management, at the expense of the following mechanisms were selected and extended:

- active involvement in clusters of innovative firms, first of all small and medium business for transfer of competences of management and practice in projects for development of cluster formations;
- development of management systems in cluster formations as a result of feedback from the enterprises which are participants of clusters with transition in the future to certification of quality of cluster management on the basis of the principles displayed by the European Cluster Excellence Initiative program;
- the organization of process of training of cluster managers, involvement of cluster formations in strategic development of regions where they are located;
- creation of the organizational mechanism and formation of culture of relationship of subjects of the clusters functioning in different branches of economy with the emphasis on the modern approaches based on an effective combination of different types of economic activity of firms.

References

1. Postalyuk M.P., Gusarova V.Yu. [Investment maintenance of innovatization structures of economic development in Russia]. *Vestnik "TISBI" = "TISBI" Bulletin*, 2014, no. 1, p.p. 118-129.
2. Zhalbe S.V. [Innovatization economic structures of the Russian society in modern conditions]. *Vestnik "TISBI" = "TISBI" Bulletin*, 2015, no. 3.
3. Porter M. *Konkurentsiya [The Competitive Advantage of Nations]*. Moscow, Vil'yams, 2010, 592p.
4. Markushina E.V. [Clusters and cluster strategies in the development of economy of the region]. *Problemy sovremennoy ekonomiki = Problems of modern economy*, 2010, no. 2, pp. 321-323.
5. Vagizova V.I. [Clustering as an innovative form of diversification of economic systems and a factor to increase the competitiveness of the economy of Tatarstan]. *Problemy sovremennoy ekonomiki = Problems of modern economy*, 2009, no. 4, pp. 336-339.

在确定人员居住的地点和时间时,使用法医孢粉学检查的识别可能性

**USE OF IDENTIFICATION POSSIBILITIES OF FORENSIC
PALYNOLOGICAL EXAMINATION AT ESTABLISHMENT
OF THE PLACE AND TIME OF STAY OF THE PERSON**

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抽象。在检测和调查各种类型的犯罪时,需要确定该人的位置和时间。这项任务通过使用从证人,受害者,使用技术手段获得的数据来解决。本文讨论了为这些目的使用孢粉学研究的可能性。建立地理区域的过程是一个连续的,多步骤的过程。它包括显微镜产品和分类测定是花粉粒和孢子,使用面积求和的方法,多项式组成的植物区系和生态地理评价,通过气团可能转移花粉,植物引入的评估。

关键词:法医学,鉴定,孢粉学研究,多项式,研究。

Abstract. *In the detection and investigation of various types of crimes there is a need to establish the location and time of the person. This task is solved with the use of data obtained from witnesses, victims, the use of technical means. The article discusses the possibility of using for these purposes the possibilities of palynological research. The process of establishing a geographical area is a sequential, multi-step process. It includes microscopy products and the taxonomic determination was pollen grains and spores, using the method of summation of areas, floristic and ecological-geographical evaluation of the components of polynomial, assessment of possible transfer of pollen by air masses, of plant introduction.*

Keywords: *forensic science, identification, palynological research, polynomial, investigation.*

One of the tasks of modern criminology is the creative adaptation of scientific and technological progress to the needs of practice [7, P. 13]. At the same time, the range of science and technology achievements is quite wide and may include not only the exact and technical, but also the natural Sciences. One of these promising areas is the use of spore-pollen analysis to solve identification and diagnostic problems in the production of forensic biological examinations and studies.

The first attempts to use the spore-pollen analysis of soil layers on clothes and shoes suspected of committing a crime were made in the 40s of the last century [1]. The method involves a comparative study (microscopic detection of spores and pollen grains, their accounting, statistical processing of the results, and the formation of a specific spore-pollen spectrum of soil samples removed from the scene, and soil layers of the body, clothing, shoes, wearable items of the offender.

The effectiveness of this method is quite high, but it requires the presence of significant mineral (clay, soil, vegetable substrate) layers on the carrier object.

In expert practice, there are often cases when even with a thorough microscopic examination of the object-carrier to identify on its surface any significant contamination of the mineral substrate is not possible.

However, this does not exclude the presence on the surface of the object of spore-pollen material carrying a significant amount of forensic information about the location and time of the person[6, P. 78].

During vegetative flowering plants in the air emitted a huge amount of pollen, which settles near the place of growth of the "parent" plants[2]. For example, one flower European Beech (*Fágussylvática*) produces up to 12 000 pollen grains, Linden heart-shaped (*Tíliacordáta*) – 43 500, Oak rock (*Quércuspétraea*) – 550 000, Downy Birch (*Bétulapubéscens*) – 600 000, Hazel ordinary (*Córylusavellána*) – 550 000. Each flowering spike Cocklebur perennial (*Loliumperenne*), Jerzy team (*Dáctylisglomeráta*), Bucharica soft (*Hólcusmóllis*), trostnikovaya Canary (*Phalarisarundinacea*) is from 2 to 5 million pollen grains [3].

When spore-pollen material enters the air, it becomes one of its components, the behavior of which is described by the laws of interaction of particles in a dispersed medium and aerosol. The movement of pollen grains is passive and is carried out under the action of air masses according to the laws of aerodynamics.

It should be noted that there is a rather strict binding of individual plants and phytocenoses to certain physical and geographical conditions, respectively, each geographical area is characterized by a certain composition of vegetation. As a result of this rather rigid zoning and individual characteristics of the producing plants, a set of pollen grains is emitted into the air, which, with a certain approximation, can be considered as an individualizing identification feature of a certain phytocenosis[2].

In this regard, the problem of identification of the area becomes solvable. The algorithm of such a solution does not contradict the basic provisions of the theory of forensic identification and is reduced to a comparative morphological analysis of pollen material found on the object carrier (skin, clothes of the suspect, the victim), and pollen samples taken from the identified area.

In the event of a tie polinomov possible to talk not only about finding the person in individualizarea area of space, but about the time of his stay (spring, summer, autumn), as well as to establish a single source of origin of the spore-pollen material.

Spore-pollen material should be removed in stationary laboratories. Taking into account the properties, size and specificity of the transfer, the different degree of their retention on the surface of the carrier objects, it is most preferable to remove micro-objects in laboratories specially equipped with “clean rooms” or laminar flow cabinets. Isolation of spores and pollen grains from dust samples, their preparation for analysis, subsequent microscopy of drugs, the study of pollen and spores using an optical microscope (increase from 300X to 900x) — the processes are very time-consuming. Significantly facilitate the study and, most importantly, improve the accuracy of the determination can be using a scanning electron microscope (SEM), as at high magnifications, lying outside the possibility of optical microscopes, it is possible to identify additional morphological features of the structure of the shell, even in pollen grains, which in the study with the help of an optical microscope seem to us the same type.

As noted above, plants and vegetation cover are generally confined to certain physical and geographical conditions. Human economic activity leads to changes in natural landscapes. Many plant species are introduced into their unusual natural phytocenoses. This is especially true of urbonavicienes, where, along with indigenous species of introduced plants are found, i.e., uncharacteristic for this area. This contributes to the formation of unique artificial plant communities, which makes it possible to more accurately diagnose the desired region, provided that the specialist has information about the introduction of plants in a particular area. Regardless of the issues to be solved, the specialist should have an idea about the possible ways of forming those sets of pollen and spores that are removed from the surface of objects, about endemic and relict plants of a Botanical and geographical zone, about plants — edicators of environmental conditions, soils, etc.

To verify the correctness of the identified area on the composition of polinoma withdrawn from the surface of the object carrier, it is necessary to compare the floristic composition of polynome with a list of the flora of a specific area of diagnosed. Such a study is aimed at obtaining information on whether and if so, in which phytocenoses plants, pollen of which has been detected, can grow together.

The study of ecological and geographical characteristics of the components of polinoma useful from the point of view that it is sometimes possible to clarify certain areas inside the diagnosed area. Each phytocenosis is characterized by a certain floristic composition and a peculiar structure, resulting from a long mutual adaptation of different plants to a joint existence in specific environmental conditions, so the plants are the best indicators of climatic, hydrological, soil and other conditions of their habitat. Depending on ecological requirements it is accepted to divide plants into certain ecological groups. Adaptation to the joint existence in one phytocenosis of plants of different species is manifested in the relative time difference of their development during the growing season, in particular in the

time difference of flowering [8]. Taking into account the closeness of different plants to certain environmental conditions, it is possible to obtain valuable additional information about the characteristics of plant communities in the diagnosed area.

Since the identified area is often quite extensive, it is quite natural that within it there are areas with different microclimatic conditions.

With certain difficulties occurs specialist, if present in the palinoma pollen grains or spores of plants, characteristic of different altitude zones. It is particularly important in species determination of the components of parinama that can along with the floral and eco-geographical assessment of these components to specify judgments about the object-carrier in a more or less limited area. Thus, the environ eco-geographical assessment of the components of polynome allows in the identified area, a more detailed differentiation of areas depending on climatic factors.

The basis of the method for determining the region of origin of objects is the existence of a relationship between the main plant species dominant in a particular area and the composition of spores and pollen of plants settling from the air in the area. Pollen is a more or less adequate reflection of the composition of the “pollen rain”, settling out of the air on all objects of the material world, and the specific features of the “pollen rain” depend, in particular, on the characteristics of the floristic composition of a particular phytocenosis, which is the source of this rain. Therefore, after analyzing the components of polynome, you can determine which area can simultaneously grow plants, the pollen of which was discovered. This can be done by conducting areological studies, causing the map of the areas of all plants identified by pollen [5].

To solve the forensic problem of diagnosing the geographical region in which the object-carrier was found, which was received for the study, it is possible, knowing: the areas of plants whose pollen was found on the object; the possible range of distribution of the detected pollen grains and spores; the possibility of the existence of artificial plantings of plants characteristic of other Botanical and geographical zones. To do this, it is necessary to identify the territory of the joint growth of most plant species identified by disputes and pollen, put on one map the areas of all these plant species, resulting in the discovery of the territory in which these species grow together or the majority of them. The above-mentioned territory will be the geographical area in which the corresponding pollen grains and disputes could get to the carrier object. The boundaries of such an area are determined by the crossing of the boundaries of the plant habitats whose pollen was found in the sample.

Therefore, the area and contours of the identified area, even for two objects, obviously located in one place, may be different, as the ingress of a particular pollen and the dispute on the object — a random process, depending on many factors [4].

The easiest case is when the method of car-tografichesky summation of the areas it is possible to identify a single geographic region. Plant habitats are superimposed on one another, and one region is identified, where plants grow simultaneously, the pollen of which was found on the carrier object. However, two or more regions are more likely to be identified. In these cases, the interpretation of the research results should be slightly different than in the diagnosis of one area, taking into account both the possibility of pollen transport through the air and the introduction of any of the species. If the introduction of a particular species is completely excluded, and the transfer of pollen by air is unlikely, then the joint presence in one palinoma of pollen of different two species, the ranges of which are spaced from one another at a considerable distance, leads to the conclusion that the object was for some time within the ranges of both one and another species. If the introduction is not excluded and there is published information about it, then the interpretation of the research results should be taken into account.

The possibility of solving specific criminal problems, the degree of localization of the identified geographical region depends on the following conditions: a sufficient variety of pollen grains and spores on the object-carrier; the presence of reliably determined pollen grains and spores that are not carried by air currents outside the areas of the plants that produced them; the presence of reliably determined pollen grains and spores of plants with narrow habitats or confined to environmental conditions.

In addition to issues related to the establishment of a geographical area, the results of the study of spores and pollen of plants can be used in solving issues, to some extent related to the determination of the time of the studied object in a particular geographical area. It is known that plants even in one phytocenosis bloom at different times, therefore, analyzing the timing of the beginning and end of flowering of certain plants, it is possible to determine the season within a year (spring, summer, autumn), during which on the surface of the object under study have accumulated spores and pollen grains fallen out of the air [8].

At the decision of questions of time of stay of object in this or that area now it is possible but to draw reliable conclusions only if it is known that the object was in the area no more than one year. This is determined by the fact that the conclusions are based on a comparison of the timing of flowering plants, pollen which was found, partly on the safety of the components of palinoma. Therefore, if the object was in the area for more than one year, on its surface can remain pollen grains of plants that bloom in different seasons of one year, or hit the subject in past years, which excludes the possibility of determining the season of the year, as the composition of the palinoma is averaged.

When deciding on the time of the object in a certain geographical area, the specialist should use information about the flora of the area, the ecology of individual

plants and of course the data of phenology. Only a comprehensive use of the above information allows obtain information about the time of stay of the host object at a particular time in a particular geographical area.

Using the method of map overlay of areas of plants, pollen, which was identified polynome, floristic, ecological and geographical assessment of the components of parinama, given the possibility of pollen transfer of air masses and the introduction of certain plants can be used to solve the forensic task of diagnosis, geographical area in which there was an object, and about the time of his stay.

Thus, the range of issues to be solved with the help of the method of spore-pollen analysis is diverse, and the information obtained provides unquestionable assistance in the disclosure of many criminal cases, and also makes it possible to answer questions to which other methods of forensic science do not give reliable answers.

References

1. *Dvorkin A.I. Osmotr, predvaritelnoye issledovaniye i ekspertiza veshchestvennykh dokazatelstv – mikrochastits. M.: EKTs MVD SSSR. 1980. 127 s.*
2. *Fedorova R.V. Kolichestvennyye zakonomernosti rasprostraneniya pyltsy drevesnykh porod vozdushnym putem // Nauchnyye trudy In-ta geografii AN SSSR. 1952. Vyp. 52. № 7. S. 91–103.*
3. *Golovko V.V. Ekologicheskiye aspekty aeropalinologii : analit. obzor. Novosibirsk. 2004. 107 s.*
4. *Grichuk V.P. Metodika interpretatsii paleobotanicheskikh materialov dlya resheniya zadach stratigrafii i korrelyatsii pozdnego kaynozoya // Palinologicheskiye issledovaniya na Severo-Vostoke SSSR. Vladivostok. 1978. S. 5–22.*
5. *Kabaylene M.V. O rasseivanii pyltsy vetrom i metodakh ego izucheniya // Palinologiya v kontinentalnykh i morskikh geologicheskikh issledovaniyakh. Riga. 1976. S. 121 – 128.*
6. *Koziner E.P., Mitrichev V.S., Tyurikova V.V. Kompleksnoye kriminalisticheskoye issledovaniye pochv. M. : EKTs MVD SSSR. 1978. 153 s.*
7. *Kriminalistika : Uchebnik / T.V. Averianova. E.R. Rossinskaya. R.S. Belkin. Yu.G. Korukhov. - 4-e izd.. pererab. i dop. - M.: Norma: NITs Infra-M. 2017. - 928 s.*
8. *Malchina E.A. Opyt sopostavleniya rasprostraneniya pyltsy nekotorykh drevesnykh porod s ikh arealami v predelakh evropeyskoy chasti SSSR // Nauchnyye trudy In-ta geografii AN SSSR. 1950. Vyp. 46. № . S. 256–270.*

因疏忽导致身体伤害的资格问题
**QUALIFICATION PROBLEM CAUSING BODILY INJURY
THROUGH NEGLIGENCE**

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注解。在这篇文章中，作者提出了一些问题，这些问题在分析Art的罪行的主观方面存在最大困难。“刑法”第118条，用司法实践的例子说明其调查结果。

关键词：有罪，犯罪，公共危险，刑事责任，资格，过失，法院。

Annotation. *In this article, the authors raise questions that present the greatest difficulty in analyzing the subjective side of the offenses under Art. 118 of the Criminal Code, illustrating its findings with examples from judicial practice.*

Keywords: *guilt, crime, public danger, criminal liability, qualification, negligence, court.*

The questions of guilt throughout the entire period of the formation and development of both criminal law and the relevant branch of legal science have always been among the most sought-after ones. However, at the present stage of development of criminal law science, the general issues of systematization of crimes against life and health remain insufficiently studied. Problems of criminal liability for harm caused to life and health through negligence continue to require careful examination and scientific reflection.

Criminal responsibility for the careless infliction of grievous bodily harm occurs on the basis of Art. 118 of the Criminal Code. The greatest difficulty in this case is the establishment of elements characterizing the careless form of guilt in the form of levity and negligence. The main feature that determines the content of the subjective side of the offenses under Art. 118 of the Criminal Code, is the lack of awareness of the person of the socially dangerous nature of his actions. Tak-

ing into account the fact that the legislator is limited to listing the signs of a rash crime, without specifying the volitional and intellectual elements of the types of negligence, there is a pronounced tendency in the special literature to define them by referring to psychological theories. In particular, it is indicated that if a person were aware of the socially dangerous nature of his act, he would not have decided to commit it, given the possibility of serious consequences [9,123]. Such crimes are characterized by a lack of preparatory stage, which indicates a lack of intent. A person feels negative emotions regarding the outcome of his actions, which is verbally expressed in phrases: “I didn’t want this to happen,” “I didn’t think that ...”, “I don’t understand why ...”, etc. . [7, 110]. For example, D. was convicted under Part 1 of Art. 118 of the Criminal Code of the Russian Federation, since at the court hearing it was proved that, striking the victim in the left and right temporal areas, from which the latter had lost consciousness, the defendant acted in defense of the seller of the shop in which he worked as a security guard. He had no intent to cause serious harm to the health of the victim. At the court hearing, the defendant showed that when he saw how the victim, with his fist swung, went towards the shopkeeper, wanting to protect it, ran up and first pushed the injured man away, and when he went to him, he struck the right side of the victim’s face with a fist, from which he fell to the floor, losing consciousness. He did not think that serious consequences could come from his actions, he tried by his actions to stop illegal actions.

The testimony of the defendant, given at the hearing, coincide with the protocol of surrender. In accordance with the expert opinion, the victim had injuries in the form of a closed head injury, including haemorrhage into the soft tissues of the left parietal and occipital region of the head, centers of severe cerebral contusion, and acute epidural hematoma of the left parietal-temporal region. The commission of experts pointed to the mechanism of formation and localization of injuries received in the back of the head from one or several blows, which, according to the court, confirms D.’s testimony about the absence of intent to cause grievous bodily harm, the injured person receive these injuries when they fall from a height of their own height and stress the tiled floor surface [10].

The problem of the subjective side is particularly actualized in the context of the separation of frivolity from indirect intent, since their intellectual content is almost identical. This is most clearly manifested in the analysis of the crime, provided for by Part 2 of Art. 118 of the Criminal Code of the Russian Federation, when serious harm to the health of the victim is caused due to improper performance by the guilty of their professional duties. The reckless form of guilt is characteristic of crimes of the category in question that are committed in the process of rendering medical assistance, when criminal consequences are in a causal relationship with a violation of the rules of diagnosis and treatment of various diseases. The

overwhelming majority of specialists sufficiently substantiate the thesis that medical crimes, including the infliction of grievous bodily harm, are always committed through negligence, since otherwise it directly contradicts the essence of medical activity [4]. For example, the court assessed the actions of the operating nurse, who carelessly, did not want the onset of socially dangerous consequences capable of causing harm to the injured F.'s health, and did not foresee the possibility of their occurrence, although with the necessary attentiveness and forethought they should have foreseen them, failed to produce a quantitative account of gauze napkins used in the course of the operation, which resulted in leaving a gauze napkin in the patient's abdominal cavity, which in turn caused the spilled purulent peritonitis (inflammation of the peritoneum with accumulation of inflammatory fluid in the abdominal cavity) resulting from the integrity of the small intestine wall (sore) created by compression of the intestine by a foreign body (large gauze tissue) left in the abdominal cavity during surgery [11].

Counting on the prevention of socially dangerous consequences, manifested in the ability to carry out resuscitation measures, introduce the necessary drugs, interrupt the procedure, as well as confidence in their high qualifications, special knowledge and experience in conducting medical interventions, without sufficient reason, confidently counting on preventing these consequences, were ascertained by the court in the actions of surgeon B., who decided to conduct an appendectomy without an assistant, independently. During medical intervention upon immobilization (discharge) of the apex (dome) of the cecum B., anticipating the socially dangerous consequences of their actions, but without sufficient reason arrogantly counted on their prevention, made a defect in providing medical care to the patient in the form of iatrogenic intraoperative full transverse intersection surgical scissors with a curved end of the right external iliac artery and a through marginal damage to the right external iliac vein, which led to the development of acute a mixed (arterial-venous) bleeding, acute massive hemorrhage, hemorrhagic shock of 3rd degree, causing injury to health, life-threatening, cause the development of life-threatening conditions, and having a qualifying sign of serious harm to human health. [12]

The question of the motives and purpose of committing crimes under Art. 118 of the Criminal Code deserves its own consideration. Opinions of experts on this issue are the opposite. Thus, a number of authors consider it possible to ascertain the existence of motives in unwary crimes, as well as a goal that should not cover the consequences of the act, in our case, the occurrence of serious bodily harm [6, 4-6]. I.I. Nagornoia indicates, in relation to iatrogenic encroachments on life and health, that the motives and goals of criminal activities of medical workers can be either negative (for example, hostility to the patient, the intention to leave work early) or neutral or even carry a false positive attitude (for example, the conviction that one should not use potent drugs, or that it will be more comfortable for the patient at home than in the hospital) [3].

Proponents of the opposite position argue the lack of motive and purpose, which are optional signs of the subjective side of intentional crimes, the fact that criminal iatrogenic occur in the normal operation of the medical institution, where all professional actions of its employees are aimed at the only socially useful goal - to cure the patient or alleviate it suffering [2].

The reason for the commission of the crime, under Part 2 of Art. 118 of the Criminal Code of the Russian Federation can also become a psychological and physical condition of a medical worker, which is determined as a burnout syndrome (BO), i.e. psychological defense mechanism in the form of complete or partial exclusion of emotions in response to certain psycho-traumatic effects. All possible symptoms of BO are grouped as follows:

- physical (fatigue, physical tiredness, exhaustion; weight change; inadequate sleep, insomnia; poor overall health);

- emotional (emotional deficiency, emotional detachment, lack of emotions; pessimism, cynicism and callousness in work and personal life; indifference, fatigue; feeling helpless and hopeless; aggressiveness, irritability; anxiety, increased irrational anxiety, inability to concentrate, depression, guilt, hysteria, mental suffering; loss of ideals, hopes or professional perspectives; increase in the depersonalization of one's own or others — people become faceless, like mannequins, the loneliness prevails). A feeling comes to the doctor that emotionally he can no longer help his patients - he cannot enter into their position, sympathize, empathize, react. And some time ago there were no such sensations, and the doctor is experiencing their appearance. Over time, these manifestations intensify and become more stable - positive emotions appear less and less, and negative ones more often. Rudeness, irritability, resentment, harshness and moods become integral to the emotional sphere [5];

- behavioral (working time more than 45 hours per week; during work there is fatigue and a desire to rest; indifference to food; low physical exertion; justification for using tobacco, alcohol, drugs; accidents - falls, injuries, car accidents, etc.; impulsive emotional behavior) [eight];

- intellectual (falling interest in new theories and ideas in work, alternative approaches to solving problems; boredom, longing, apathy, falling taste and interest in life; greater preference for standard patterns, routines, rather than creativity; cynicism or indifference to innovations; little participation or refusal to participate in developmental experiments - training, education; formal performance of work);

- social (low social activity; falling interest in leisure, hobbies; social contacts are limited to work; poor relationships at work and at home; feeling of isolation, lack of understanding of others and by others; feeling of lack of support from family, friends, colleagues) [1].

The presence of the above symptoms, confirmed by the evidence available in the criminal case, with a certain degree of confidence allows us to state the reckless form of guilt in the commission as a crime under Part 2 of Art. 118 of the Criminal Code, and other compositions attributable to the number of criminal iatrogenic.

It should be noted that the above description of the subjective side of crimes that encroach on the life and health of a person is quite fair in relation to other categories of persons who have committed a criminal assault in the performance of their professional duties. So, for example, S., being a tractor driver, in violation of clause 1.8. Instructions No. 10 "On labor protection of forklift truck drivers", according to which forklift drivers are required to perform only the work that is entrusted by the administration and is part of their duties, driving the forklift without proper instruction from the management of the enterprise, independently, on its own initiative, carried out snow removal in the adjacent territory to P.'s house. The defendant cleared snow in the loader bucket moved and, at its own discretion, stored the carriageway on the side of the road, as a result of which a snow mound was formed, which later during subsequent unloading of snow onto it, excluded the view of S. from the loader cab because of its height. snow mound - snow unloading zone. C., reliably knowing that he is doing work on the loader, which is a source of increased danger, in the residential sector, directly near the playground - in a place where people may appear, acting carelessly, without foreseeing as a result of their careless actions, causing someone serious bodily injuries, although with the necessary care and forethought should and could have foreseen it, without looking and making sure that there are no people in the immediate vicinity of the loader and under the loader bucket, and also not convinced of the safety of their actions, when approaching the next snow unloading to the embankment formed by him, being in the loader cabin during seeing the whereabouts of a minor A., without being convinced of the safety of the work performed, and that he can begin unloading snow from the bucket without creating a threat to the life and health of A., showing criminal negligence, pressed the lever of the hydra the distributor, and thus dumped the snow from the bucket of the loader he operated on A., which was at that moment on the other side of the above snow mound in the immediate vicinity of the loader, as a result of which A. covered the snow dumped from the loader bucket. As a result of careless criminal actions of S., A., bodily injuries were caused in the form of hemorrhages in the region of the sternum arm, multiple merging small focal hemorrhages on the skin of the face, punctate hemorrhages in the connective membranes of the eyelids, and acute emphysema of the lungs with complete filling of the pleural cavities, closing of the heart shirt small and large-focal hemorrhages under the pleura, detection of bronchial epithelial cells in the blood from the left half of the heart, congestion of the internal organs, the liquid state of the blood and, which caused a condition in the form of mechanical asphyxia from compression of the chest and abdomen with a snow mass, spilling out as a serious injury to health [13]. Thus, it can be stated that to establish the reckless guilt of a person who has caused serious harm to the health of the victim, due to improper performance of their professional duties, it is necessary to determine the amount of his professional knowledge, as well as decide on compliance with the standards for the implementation of a particular activity

References

1. N.E. Vodopyanova *Mental burnout syndrome in communicative occupations* / Ed. GS Nikiforov. SPb.: Publishing House of St. Petersburg State University, 2000. P.443-463; Boyko V.V. *Burnout syndrome in professional communication*. - SPb.: Peter, 1999. 105p.
2. M.I. Galyukova. *Features of criminal liability of health care workers for causing harm to human health: Textbook*. - Omsk: Omsk Academy of the Ministry of Internal Affairs of Russia, 2008. 55 p; Bagmet A.M., Cherkasova L.I. *Composition of crimes committed by medical workers* // *Legal world*. 2014. No. 12. P. 56-58; Erokhin V.G. *Epistemological aspects of the problem of causality in medicine*. M.: Medicine, 1981. 88 p.
3. Nagornaya I.I. *The negligence of a medical professional in causing injury or death to a patient* // *Russian legal journal*. 2017. No. 4. P. 2071-2073.
4. N.A. Ognerubov. *Burnout syndrome as a determinant of crime in the field of medical activity* // *Socio-economic phenomena and processes*. 2013. No. 1. P. 245-247; Novoselov, V.P. *Responsibility of health professionals for professional offenses*. Novosibirsk: Science, 1998. 231p.
5. N.A. Ognerubov *Criminological aspects of professional burnout of medical workers* // *Science education and business: problems of prospects, integration: materials of the International Correspondence Scientific Practical Conference*. M., 2013. P. 122-123.
6. N.A. Ognerubov *Criminological aspects of professional burnout of medical workers* // *Science education and business: problems of prospects, integration: materials of the International Correspondence Scientific Practical Conference*. M., 2013. P. 122-123.
7. A.Yu. Safonov, E.V. Batysheva *Qualification of crimes related to injury to health (part 1 of article 111 and part 1 of article 118 of the Criminal Code of the Russian Federation)* // *Contemporary Law*. 2018. No. 11. P. 109-113.
8. E. Chervonnykh *Criminological characteristics of the personality of the offender - a medical worker* // *Society and Law*. 2008. № 3. P. 204-207.
9. Sharapov R.D. *Actual issues of qualifying violent crimes* // *Criminal Law*. 2015. No. 1. P. 112-124.
10. *Verdict of the Volgograd Regional Court on the criminal case № 22-3409/2018* // <http://sudact.ru/regular/doc/92c17SAFgTWa/?regular> (application: 28.02.2019г.).
11. *Verdict of the Upper Iset district court of the city of Yekaterinburg* // <http://sudact.ru/regular/doc/6WfmqMPxwdq/?regular-> (application: 01.03.2019 г.).
12. *Verdict of Kalininsky District Court of Novosibirsk* // <http://sudact.ru/regular/doc/aOaERYdnjAUg/?regular-> (application: 01.03.2019 г.).
13. *Verdict of the Ordzhonikidze district court of the city of Ufa of the Republic of Bashkortostan in a criminal case №1-153/2017* // <http://sudact.ru/regular/doc/87Pieaz3m5gP/?regular-txt> (application: 01.03.2019 г.).

专业医疗风险: 合法条件

PROFESSIONAL MEDICAL RISK: CONDITIONS OF LAWFULNESS

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注解。 本研究的主题是制定一般合理风险和医疗风险 – 作为其品种,旨在为涉及人类受试者的创新医疗风险的合法性制定条件,排除了将医务工作者绳之以法的可能性。

职业医疗风险是一种合理的风险,是在Art的规定范围内进行的。“刑法”第41条。 在本文中,作者强调了一些条件,这些条件允许根据法律规定的医疗活动要求确定专业医疗风险的有效性标准。

研究方法包括分析,正式的法律和系统方法。

该研究的结果具有一定程度的创新,可用于进一步研究所考虑的问题。

关键词: 医务人员, 犯罪, 紧急情况, 医疗活动, 合法性, 医疗风险, 伤害, 责任。

Annotation. *The subject of this study is the institution of reasonable risk in general and medical risk - as its varieties, with the aim of formulating the conditions for the legality of innovative medical risk involving human subjects, which excludes the possibility of bringing medical workers to criminal responsibility.*

Occupational medical risk, being a reasonable risk, is carried out within the limits provided for in Art. 41 of the Criminal Code. In this article, the author highlights a number of conditions that allow to determine the criteria for the validity of professional medical risk in terms of legally established requirements for medical activities.

The research methodology consisted of analytical, formal legal and systemic methods.

The findings of the study have a certain degree of innovation and can be used in further research on the issues under consideration.

Keywords: *medical worker, criminality, emergency, medical activity, legality, medical risk, harm, responsibility.*

The institute of reasonable risk in general and medical risk - as its varieties cannot be considered among the most demanded either in legal or medical science.

We believe that this is due to its low practical relevance, mixing with the adjacent circumstance, which excludes the criminality of the act, is an absolute necessity. In addition, the current doctrinal provisions of the science of criminal law are extremely meager and contradictory, sometimes limited only by commenting on the existing provision of criminal law. The historical retrospective of the formation and development of criminal legislation in Russia also does not give rise to reflections on the legal traditions of regulation of the institution in question, since it is relatively young and was not thoroughly legalized until the adoption of the Criminal Code of the Russian Federation in 1996.

The provisions concerning reasonable risk are applicable in medical practice due to the fact that any intervention in the functioning of the body entails the risk of harm to it, i.e. is risky in nature. Regardless of whether the intervention is carried out in the human body for the sake of medical science, or in the course of medical activities carried out by traditional methods, the medical professional must be aware of the potential for side effects and complications, especially when it comes to intractable diseases, emergency medical care, etc.

From the general legal point of view, actions of a medical worker who do not fall into the category of professional medical risk, i.e. the use of approved, but not effective in the particular case of treatment methods, does not raise questions, i.e. are the most reliable position in relation to the possible legal liability of a medical worker. However, from the point of view of the final result and the general goal of medical activity - the restoration of human health, such a position, which is essentially an inaction, is unacceptable. The absolute exclusion of risks from medical activity ultimately predetermines the refusal to treat the vast majority of patients. This leads us to the logical conclusion that medical risk is an unavoidable reality; harm to the life and health of a patient is possible as a result of the proper discharge of medical duties by a medical professional. The main condition for avoiding criminal responsibility in such a situation is compliance with the legally established requirements for the justification of risky actions.

Note that the principle of the validity of medical risk is recognized internationally. So, in addition to the Helsinki Declaration of the World Medical Association, stating the presence of predictable innovative risks when conducting medical research with human participation (paragraph 18), similar rules are provided for research, treatment or diagnosis related to the human genome [1], assistance in sports medicine [2] etc.

Occupational health risk is a reasonable risk, i.e. carried out within the limits provided by art. 41 of the Criminal Code of the Russian Federation [5]. However, due to the specifics of medical activity, it is possible to single out the conditions that characterize the legitimacy of the type of risk under consideration. In the literature there are various positions regarding the totality of such conditions. So, for

example, V.A. Oygenzikht, using the term "medical risk", believed that its validity depends on the inability to achieve the desired therapeutic effect by other means [10, p.51], i.e. essentially adapted to medical practice a sign of compelled reasonable risk, which, as already noted, seems to us to be indisputable. A more detailed set of the studied conditions was proposed by V.A. Glushkov: 1) the scientific validity of using non-traditional methods of diagnosis and treatment of a particular disease; 2) the comparability of the ultimate goal of risky actions danger, threatening the life and health of the patient; 3) the patient's consent to the use of risky methods of diagnosis and treatment; 4) the likely nature of the onset of harmful effects [11, p.86]. Note that the presence of voluntary informed consent is not a condition for the legitimacy of reasonable risk, in accordance with the provisions of Art. 41 of the Criminal Code of the Russian Federation, however, should be recognized as a condition of the legitimacy of both medical and innovative medical risks. At the same time, some of the specialists, in particular, Dagele P.S., Aleksandrova O. Yu. And others rightly believe that the patient and his close relatives should be aware of not only the use of risky methods of diagnosis and treatment, but also the degree of potential danger to life and health [7; 6]. However, let us note that the allocated by V.A. The Glushkov criterion for the scientific validity of non-traditional methods of diagnosis and treatment is not always applicable, for example, in the extraordinary conditions of medical care.

The most detailed set of conditions for the validity of medical risk was proposed, in our opinion, by O.M. Sariev, who singles out not only diagnostics and treatment, but also the development of medical science as a socially useful goal of risky actions, points to the need to comply with international law, principles of medical ethics and bioethics, and to obtain the patient's voluntary informed consent, except when committed in the presence of an immediate threat to his life, the lack of personal material interest of the medical worker in the outcome of risky actions, requiring merits on the level of qualification and practical experience of health worker compliance of medical experiment modern achievements of medical science and practice in the absence of the threat of the death of two or more subjects, environmental catastrophe or public disaster [12, p. 248]. It seems that compliance with the norms of international and national law, as well as ethical and bioethical norms is not an essential sign of justified medical risk, since it characterizes the legitimacy of any medical intervention. In addition, the presentation of special requirements for the qualifications of a medical worker and the availability of relevant practical experience raises certain questions. There is no doubt that a more experienced doctor sees a much wider range of risks than a beginner doctor, but a significant part of them is related to the presence of uncertainty in the behavior of the patient's body, i.e. It is created independently from the will of the medical worker. In this case, the qualification criterion is admission to medical

intervention of a certain level of complexity. On the one hand, having received a document on qualifications of a certain level, a medical professional must understand that the actual discrepancy of his skills to the declared level of education does not relieve him of responsibility for the consequences, on the other hand there are external circumstances determining the possibility of foreseeing a negative result of medical manipulations under certain conditions. In this regard, we believe that the qualification of a health worker objectively determines the boundaries of his responsibility, since the criterion specified in the norms of law, as well as rules and standards that have technical and legal content should be the basis for distinguishing between guilty and innocent harm. Accordingly, the subjective criterion of justified risk, i.e. the ability to anticipate adverse consequences for the life and health of the patient is not determined by experience and knowledge, but by the requirements for the qualification characteristic of a medical worker, in accordance with which he is entrusted with medical intervention of a certain complexity, taking into account the specific situation in which risky actions are taken.

Taking into account the risky nature of medical activity when designing an institute of grounded medical risk, another approach is proposed - by contradiction, i.e. simulates a set of conditions for the unlawfulness of risky actions of a medical worker. In particular, as such an overwhelming majority of specialists recognize: the contradiction of the actions of a medical worker to the generally accepted rules of medicine; his duties and ability to foresee the onset of consequences harmful to the patient's life and health, i.e. a volitional element of the careless form of guilt, characteristic of criminal iatrogeny; the presence of a causal relationship between the adverse consequences for the patient and the actions of a health worker [8, p. 161-168]. By virtue of the logical postulate on the comparison of opposites, the named criteria of wrongfulness must, of course, be taken into account when modeling the conditions of legality of reasonable medical risk.

The conditions of legitimacy of reasonable risk, under Art. 41 of the Criminal Code of the Russian Federation, have certain specifics in relation to medical practice, which in general terms is as follows.

First, the public benefit goal is presumptive for any type of medical activity, since it is to maintain and restore human health. When performing risky medical manipulations, there must be a real threat to the life or health of the patient, due to the presence of a certain disease or other pathology. In this case, as a socially useful goal of medical intervention, a full restoration of health may not be put, it is about saving lives, improving its quality, reducing suffering, etc.

Secondly, the goal cannot be achieved by conventional, traditional methods of diagnosis and treatment, and the degree of risk must correspond to the state of health of the patient. Here it is necessary to focus on the provisions of Art. 10 of the Federal Law "On the Principles of the Protection of Citizens' Health in

the Russian Federation", in accordance with which the quality of medical care is stipulated by the observance of standards and procedures for its provision, which are not applicable only in the framework of clinical testing, medical experiment [4]. These procedures and standards describe in detail the actions of a doctor in profile at various stages and in various forms of medical care, which makes the criterion of risk justification dependent on doctors compliance with it.

Thirdly, the possibility of adverse effects is probable, and not deliberate. At the same time medical science and practice to achieve a positive result of medical intervention is objectively confirmed, as well as the possibility of adverse effects.

Fourthly, the risky actions of a health worker must comply with the modern achievements of medical science and practice, if it is an innovative risk.

Fifth, all measures should be taken to prevent or minimize harm to the life and health of the patient. The permissible degree of risk of adverse consequences for the patient, as well as taking sufficient measures to prevent them, are the most difficult issues in medical practice, both in determining the appropriate criterion of the validity of a professional medical risk and in determining the medical worker's guilt in the form of negligence. The legislator presumes that adherence to the rules and standards of medical care makes the risk of adverse consequences minimal. In accordance with the Methodological Recommendations No. 2004/46 [8], this represents the maximum possible correspondence of the clinical outcome to the expectations of the doctor and the patient, but at the legal level there is no definition of the minimum risk. In the most general form, it can be stated that the task of a medical professional is to minimize the risk in relation to a specific situation, which provides for the likelihood of damage to the patient's health, not exceeding that typical of standard medical procedures. However, in any particular case, there remains a field for the discretion of the doctor and his decision, including containing elements of risk, since medical practice is not subject to clear algorithmization.

Sixth, a specific condition for the legitimacy of a reasonable medical risk is the presence of voluntary informed consent of the patient to conduct medical manipulations. Analysis of the provisions of Art. 20 of the Federal Law "On the basis of the protection of public health in the Russian Federation" [4] allows to state the presence of two main elements of the process of obtaining such consent:

1) providing the patient with complete information about the goals, methods of providing medical care, the risk associated with them, possible medical interventions, its consequences, as well as the expected results of providing medical care;

2) procedural execution of consent either by the patient himself or his legal representative, if the patient is a minor or is declared legally incapable in the manner prescribed by law and is unable to consent to medical intervention. The named document has a written or electronic form and is contained in the medical documentation of the citizen.

In situations of reasonable risk, obtaining consent for medical intervention is not always possible, which is covered by the situation stipulated in paragraph 1 of Part 9 of Art. 20 of the Federal Law "On the Basics of the Protection of Citizens' Health in the Russian Federation", namely, its conduct according to emergency indications to eliminate the threat to human life when his condition does not allow to express his will [4]. We believe that such situations can not spread to innovative medical risk due to the specifics of conducting medical experiments, which was discussed in the previous paragraph of our study. However, in an emergency situation, when the patient's consent cannot be obtained, the decision on medical intervention is taken by a consultation of doctors, and if it is impossible to collect a consultation, it is directly followed by the attending (duty) doctor with the introduction of such a decision into the patient's medical documentation and subsequent notification to officials of the medical organization, citizen in respect of which medical intervention was carried out, or his legal representative.

We believe that the conditions for the legitimacy of an innovative medical risk involving a person can be defined as follows.:

- research character, focus on achieving a socially useful result, which is the development of medical science and practice;
- availability of voluntary informed consent of the patient to participate in a medical experiment;
- the absence of other possibilities to cure the patient, when all necessary and sufficient medical measures did not lead to the achievement of the desired result.

References

1. *Universal Declaration on the Human Genome and Human Rights, adopted 11.11.1997 by the General Conference of the United Nations Educational, Scientific and Cultural Organization* // Access: www.un.org/ru/documents/decl_conv/declarations/human_genome (application: 29.11.2018).
2. *Declaration on Basic Principles of Assistance in Sports Medicine, adopted by the 34th World Medical Assembly in Lisbon in September / October 1981, amended by the 39th World Medical Assembly in Madrid in October 1987* // Access: www.med-pravo.ru/International/Sport_Decl.htm (application: 29.11.2018).
3. *Ethical principles of medical research involving human subjects as the object of study: the Helsinki Declaration of the World Medical Association. Adopted in June 1964 by the 18th General Assembly of the Military Medical Academy (as amended in 2008)* // Access: http://www.morphology.dp.ua/_pub/MORPHO-2010-04-02 (application: 23.10.2018).
4. *On the basis of the protection of public health in the Russian Federation: Federal Law of 21.11.2011 No. 323-FZ (as amended on 08/03/2018)* // ATP ConsultantPlus (application: 22.11.2018).
5. *Criminal Code of the Russian Federation dated 13.06.1996 No. 63-FZ* // Official Internet portal of legal information <http://www.pravo.gov.ru>.
6. Aleksandrova O.Yu., Lebedinets O.N., Ryabinina O.V. *Civil-law consequences of harm in the implementation of medical risks* // Materials of the All-Russian scientific-practical conference "Legal and deontological provision of the rights of Russian citizens to health care" (National Association of Medical Law, Moscow - Novosibirsk, 2006). - P 9-10.
7. Dageļ P.S. *On the criminal liability of doctors* // Soviet Justice. - 1984. - No. 19. - P.12-14
8. Egorov K.V. *Legitimate and unlawful infliction of harm in the field of medical activity: civil law aspect: dissertation.* - Kazan, 2006. - 190 P.
9. *Continuous improvement of the treatment and diagnostic process and ensuring patient safety in the industrial model of quality management of medical care in the hospital. Methodical recommendations No. 2004/46 (approved by the Ministry of Health of the Russian Federation on March 19, 2004).* - Moscow: Research Institute of Public Health and Health Management of the Sechenov Moscow Medical Academy Ministry of Health, 2004.
10. Oygenezikht V.A. *Medical error and medical risk.* // Strengthening the rule of law and order in the period of developed socialism. Dushanbe, 1976. -P.50-64
11. *Problems of criminal responsibility for socially dangerous acts in the field of health care. Dissertation / Glushkov V.A.* - Kiev, 1990. - 432 P.
12. Sariev OM *Reasonable risk in medical activities and the conditions of its legality* // Bulletin of Tambov State University. 2015. № 5. - P. 246-251

学生的独立工作是教学科学和实践的重要问题

INDEPENDENT WORK OF STUDENTS AS AN IMPORTANT PROBLEM OF PEDAGOGICAL SCIENCE AND PRACTICE

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注解。 本文对未来专家的专业培训过程中对内容的改进，学生的独立工作的组织以及对其的准备形成问题的研究进行了分析。 作者阐明了“为独立工作做好准备”的概念，并在实施人格化原则的基础上提出了形成的方法。

关键词：学生独立工作，个人准备，自我发展，学生活动。

Annotation. *The article presents an analysis of research devoted to the problem of improving the content, the organization of independent work of students, as well as the formation of readiness for it in the process of professional training of future specialists. The authors clarify the concept of “readiness for independent work” and suggest ways of its formation based on the implementation of the principle of personification.*

Keywords: *independent work of students, personal readiness, self-development, activity of students.*

Modern social challenges determine the importance of personality characteristics that determine the competitiveness of the future employee and the possibility of self-realization of the individual. The most significant of them are the developed intellect, cognitive independence, information culture, non-standard thinking and activity, ability to self-development, constructive dialogue and teamwork. All these qualities listed above must be purposefully developed under the conditions of various forms of education and throughout the entire period of study at the university.

Modern requirements of the state educational standard are characterized by a decrease in the share of the classroom work, i.e. direct communication of students with each other and the teacher and an increase in the time allocated for independent work, which makes up from 50 to 70% of the total academic work, and this is full-time tuition, in absentia this figure reaches 80-90 % In this regard, independent work is of particular importance in the system of professional training.

In recent years, the problem of independent work has been considered from different angles: individualization (E. V. Kuznetsova, K. M. Tsarkova), organizations taking into account the character of cognitive activity (M. A. Tsyvareva and V. V. Rudin), increasing the effectiveness of leadership (A.A. Avuz), realization of personal-developmental potential (R.M. Garanin), as a factor of personal-professional development (S.V. Mamporia, I.A. Korovina, G.V. Petruk , Z.M. Alisultanova). The staff of the Department of Pedagogics of the Herzen State Pedagogical University is working on this problem.

The analysis of the above mentioned studies suggests that the independent work and the formation of readiness for it are considered by the authors through the process of “teaching”, i.e. organization, conditioning, development of various forms, use of various teaching aids. Thus, the organization of independent work in the conditions of information-learning environment (N.V. Muravyova) is considered, based on the use of methodological complexes and ICT (MA Ivanova), the use of interactive learning technologies (social networks of the Internet) as a means of organizing independent work of students (M.A. Odinokaya), on the basis of distance learning technologies (N.A. Aleksandrova, V.I. Butuzova), as a form of management of educational activities (Sh.R. Rabadanov), didactic conditions of management of self study second activity were revealed (N.A.Eroshina).

The problem of readiness for independent work over the past decades has been considered in many dissertations. Researchers offer various solutions to this problem. They suggest ways of forming readiness for independent work of university students (S.A. Karavaeva), college students and lyceum students (M.A. Ivanova, I.V. Afanasyev), cadets of military schools (A.A. Poroshin).

At the same time, the concept of “readiness” is considered in the psychological-pedagogical literature in the context of various approaches (M.I. Dyachenko, I.A. Zimnyaya, L.A. Kandybovich, V.A. Slastenin, etc.).

In the psychological dictionary “readiness” is interpreted as “setting aimed at performing a particular action. This setting assumes the existence of certain knowledge and skills; readiness to counter obstacles arising in the process of performing an action; attributing any personal sense to the action being performed, "... the state of mobilization of all psycho-physiological systems of a person that ensure the effective implementation of certain actions" [1], that is, as a fundamental condition for the successful implementation of any activity.

Thus, in the early stages of the study of readiness, A. A. Ukhtomsky considers readiness as a state of operational tuning for the upcoming activity, and V. N. Pushkin and L. S. Nersesyan interpret readiness as a special emotional-volitional state, vigilance, highlighting following three components in its structure:

1. the image of the structure of the action that must be carried out in response to an emergency signal;

2. general psycho-physiological condition that ensures the speed of actualization of the necessary experience of activity;

3. proper psychological orientation of the individual to perform the necessary actions, involving a certain volitional effort.

Such an understanding of readiness is of a temporary nature, and therefore cannot be considered as fundamental in the formation of readiness for independent work.

S.A. Karavaeva, K.K. Platonovaregivensimilardefinitions of psychologicalreadiness, consideringthisconceptas a mentalphenomenon, whichexplainssthesustainability of humanactivity. Theauthorsemphasizethatthisisnot a feature of thewillorcharacter, abilitiesorthinking, but a morecomplex, integrativepersonalityformation - a property, a persistentmentalphenomenonthatreflectsthemostcommon, essentialpsychologicalfeature of a personasanindividual. [3]

At the same time, V. M. Galuzinsky, L. M. Kuviko define readiness as a trait or a stable personality characteristic repeating in various situational settings.

M. I. Didora, A. G. Kovalev, 3. F. Ponamareva speak about psychological readiness as a quality or a generalized property of a person, determining its individuality.

In some works (S.A. Karavaeva, A.A. Poroshin), the composition of readiness include reflection, but it is being considered only at the stage of control and analysis of results.

The main performance indicators of students' independent work areits awareness, purposefulness, planned character, fullness of implementation, i.e. achievement of the result (A.E. Mantulin, E.V. Kuznetsova, K.M.Tsarkova and others).

A different version of the understanding of psychological readiness that is closest to our study is suggested by V. A. Yadov, regarding readiness as a definite level of value orientations.

Thus, depending on the angle of consideration, as a trait, quality, or quality of a person, the general direction of the study of the notion of “readiness”, the breadth of the factors and phenomena covered by it, changes. At the same time, the personal component of this readiness is considered mainly as the motivation of students for independent work.

Despite a large number of pedagogical studies, both in recent years and for earlier periods, independent work remains one of the most important problems of modern educational practice. A special attention to this pedagogical phenomenon, in recent years, allows us to speak of the unresolved nature of this question to this day.

Numerous methodical instructions, recommendations, manuals on the organization of independent work, unfortunately, do not eliminate the difficulties that students experience in selecting materials, in analyzing various sources and highlighting a problem, in interpreting from the perspective of the problem being studied and independently identifying solutions tasks even with the methodically correct and competent organization of all stages of independent work by the teacher.

Proceeding from the above, the formation of personal readiness for independent work remains an important problem that requires a search for approaches to its solution.

Our experimental work allows us to say that this contradiction can be solved once, provided that the students' independent work will be considered not only and not so much from the point of view of the teaching process, but, first of all, from the point of view of the *learning process*. This will help to understand the features of the formation and development of the internal mechanisms of self-regulation of cognitive-educational activities of students, which are the driving forces and the necessary conditions for the effectiveness of their independent work.

Thus, the study of the mechanisms of the learning process with the aim of developing ways to stimulate it is of particular importance. The active involvement of the person himself in the learning process, taking into account the peculiarities of his self-regulation processes, requires various learning methods (principles), one of which is personification.

The principle of personification implies a gradual transition of the learner to the position of the self-learning on the basis of the need to develop self-knowledge in the processes of learning new things developed in the training. It is the students themselves who consciously (in accordance with the depth of self-knowledge) adapt the content of the training to themselves.

Personification is the way of learning that leads to the purposeful formation of the mechanism of conscious independent decision making and independent monitoring of its results. This is a way to implement self-study in life and in self-education. Therefore, the basis for understanding the essence of the process of personification as a method of pedagogical activity becomes the identification in it as the main feature - conscious self-regulation of student behavior in educational processes, constantly stimulated (using various technologies) by teachers.

Personalized training is possible only with the initial installation of teachers on the formation in the educational process of reflexive personality traits. Indicator of the formation of such qualities are self-determination, self-esteem, etc. [4]

In turn, reflection is the basis of interpretation as a way for each person to master the knowledge created by other people and generations, was and remains the highest stage of information processing for its perception and transmission, and the main channel of its active life. Interpretation as a productive individualized and creative process is of particular importance in higher education, because in the process of building such an ability, the learner becomes a specialist, independently creating and evaluating his achievements, their quality, novelty and significance, based on the criteria of experience created by other people.

The ability to interpret is always associated with the process of methodological self-determination.

Methodological self-determination involves self-determination in the field of the most important scientific foundations and approaches with which the student begins to independently guide himself as the main guideline regulating his independent activity.

Thus, the personification of education reveals the mechanism for the implementation of the principle of "consciousness and activity" in cognitive activity, which is the basis of independent work.

References

1. *Psychological dictionary / Under. ed. V.P. Zinchenko, B.G. Meshcheryakova. - Moscow: Pedagogy-Press, 2001. - 440 p.*
2. *Ivanova, M.A. Formation of readiness for independent work of college students in correspondence courses in the conditions of informatization of education (on the example of "Engineering Graphics" and special disciplines): Dis ... cand. of ped. sci-ences: 13.00.08. Moscow, 2007.*
3. *Karavaeva, S. A. Formation of the readiness of high school students for independent work in the process of studying psychological and pedagogical disciplines: Dis. ... cand. of ped. sciences: 13.00.08. -Chelyabinsk, 2004.*
4. *Personification of higher vocational education: on the way to self-managed learning: monograph / ed. M. B. Esaulova. - SPb.: SPGUTD, 2010. 160 p.*

已经停止从事业务的企业家的个人心理特征
**INDIVIDUAL PSYCHOLOGICAL CHARACTERISTICS
OF ENTREPRENEURS WHO HAVE CEASED TO ENGAGE
IN THEIR BUSINESS**

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注解。 文章讨论了企业家精神的方法, 现代青年企业家的形象, 研究企业家个人心理特征的基础知识, 介绍了对停止营业的人的个人心理特征进行试点研究的结果。

关键词: 创业, 企业, 个体心理特征

Annotation. *The article discusses approaches to entrepreneurship, the image of an entrepreneur in modern youth, the basics of studying the individual psychological characteristics of entrepreneurs, presents the results of a pilot study of the individual psychological characteristics of people who have stopped doing business.*

Keywords: *entrepreneurship, enterprise, individual psychological features*

Entrepreneur - a person who has his own business in order to make a profit in the form of providing services, trade or production. Entrepreneur - a person engaged in entrepreneurial activities. Every entrepreneur may have his own business or may help create businesses to other entrepreneurs. In English-speaking countries, the word “businessman” is used (Zhiltsova E.N., Egorova E.V. 2015)

Recently, more and more people in Russia want to be entrepreneurs.

Our survey among students of the Perm region and the Novgorod region of different specialties (the sample was 126 young men and women aged 19 to 26 years) showed the following results:

- 92% of respondents are positive to entrepreneurship, 5% - neutral, 3% - negative.
- 69% of respondents would like to associate their further professional activities with entrepreneurship.

Thus, in everyday consciousness, the phenomenon of entrepreneurship is surrounded by an aura of fame and wealth, while such features of business as responsibility for everything that happens in business, for its employees, for their

finances, which can be completely lost in case of failure, as a rule are not taken into account by ordinary people. The same applies to the huge moral and emotional costs of entrepreneurship.

Perhaps it is because of these rose-colored glasses that many people, working in an office, dream of becoming entrepreneurs. Some of them decide to completely change their lives drastically, slam the door of the office and become "their own master." However, this usually happens because of dissatisfaction with current work, low wages, uncomfortable heads, and a team with whom it was not possible to build good relationships. It often seems to office workers that in an independent voyage everything will surely be wonderful.

At the same time, as a rule, bonuses that work in the office provides are not taken into account at all: this is a fairly clear schedule when evenings and weekends are at the complete disposal of the employee, this is an opportunity not to bear personal responsibility for the complete collapse of the whole business, but to be responsible only for a specific area work, as well as the ability to carry out their personal affairs during the work day (it's not a secret that most employees check their personal email or sit on social networks including during work hours), while entrepreneurs, on the contrary, work all the time time (the concept of "free time" simply does not exist). And in order to become so developed an entrepreneur and to build such a large own business that can work independently and generate income while the owner relaxes and sunbathes at sea, it takes time, time and great effort and expense.

Unfortunately, not everyone makes the choice to change the office chair to their own business consciously. This is connected with the fact that 99 out of 100 startups close after one or two years of existence, because faced with unexpected difficulties, people cannot overcome themselves, develop further, and succumb to failures, returning back to work in the office.

Traditionally, when predicting the success of a future entrepreneur, psychological diagnostics (start-up support funds) is used, because it is assumed that in addition to financial ideas (some of which are actually included in the proposed start-ups - for example, franchising), a person needs to have a certain set of individual features that will allow him to become an effective entrepreneur.

In economic psychology, the personal and individual characteristics of representatives of various specialties are widely studied, but the leaders among them are certainly entrepreneurs (A.I. Ageyev, 1991; E.K. Zavyalova, S.T. Posokhova, 2004; R.Hizrich, M. Peters, 1991; et al.) And managers (I.G. Velkov, 1993; A.L. Zhuravlev, 2004, etc.). The overwhelming majority of authors focus their attention on the study of the specific individual characteristics of managers and entrepreneurs, and proceed from the assumption that effective economic and managerial activities are associated with the presence of a number of specified characteristics

of its subjects. Such qualities as courage, openness to the new, leadership abilities, etc., are most often involved. As one of the specific parameters, “entrepreneurial activity” is explored - the full embodiment of the entrepreneur's mental, material, financial, organizational capabilities, the quantitative result of which is the degree of fruitfulness of labor achieved by the production of goods and the provision of services, reflected in the amount of profit obtained as a result of product sales. Thus, a very detailed and working system of indicators was developed, allowing to evaluate entrepreneurial activity in the system of indicators of entrepreneurial activity. (Orlova E.O., 2017). One of the main questions in the study of entrepreneurship, which is increasingly of interest to psychologists, is the understanding of entrepreneurial activity as a favorite or public access, i.e. understanding of entrepreneurs as a special category of people endowed with certain psychological qualities, or the understanding that absolutely all people have entrepreneurial activity, but in varying degrees of severity (Meneghetti, A., 2004). We are closer to the approach, claiming that “entrepreneurs are not born, they are becoming” (Ageev A.I., 1991), we believe that it is not possible to single out any particular human trait responsible for becoming a good entrepreneur, “the differences between people lie in how many entrepreneurial actions they commit” (Ageev, A.I., 1991).

However, if we assume that anyone can become an entrepreneur, why are startups being closed? Probably, the causes of this phenomenon are some component of luck, and the characteristics of a given economic situation (for example, the economic crisis), and yet some of the undervalued individual characteristics of the business people themselves. To understand the last paragraph, we conducted a pilot study, including a comparison of the personal characteristics of entrepreneurs who successfully continued their activities for three years after it began, and entrepreneurs who had ceased entrepreneurial activity during that time. The sample consisted of 30 respondents, respectively. A rather wide range of methods was used as a diagnostic tool - to study the multi-level properties of the integral individuality, well-known methods used in the laboratory of V.S. Merlin - B.A. Vyatkin (B.A. Vyatkin, L.Ya.Dorfman, M.R.Shchukin, 2011). The LDK MBK Kalininsky L. P. technique was used for the study of entrepreneurship.

Analysis of the results was carried out in several directions: 1). a study of the general level of development of the structural components of entrepreneurship in samples of successful entrepreneurs and people who have abandoned their business activities. 2). study of the role and place of enterprise in the structure of the integral individuality of successful entrepreneurs and people who have abandoned their business activities.

In absolute terms, the intensity of enterprise showed a relatively high level of all its components in both samples, which indicates a high potential for the success of these people in entrepreneurial activities.

Let us give as an example the statistically significant differences between the multilevel properties of the integral individuality in groups of successful entrepreneurs and people who have abandoned entrepreneurial activity (Table 1).

Table 1
*Statistically significant differences between the multi-level properties of the integral individuality in groups of successful entrepreneurs and people who abandoned entrepreneurial activity **

Variable name	Av. gr. 2	Av. gr. 1	Student's t-test	Significance level
Internality in the field of achievements	8,06	2,73	2,58	0,005
Internality in the field of failures	9,06	3,73	2,87	0,002
Intellectual emotionality	32,94	26,50	1,78	0,050
Psychoticism	5,06	6,47	-2,47	0,016
Neuroticism	13,24	11,71	2,31	0,024
Prostancia, suspicion (L)	12,53	10,24	1,99	0,051
Self control behavior (Q3)	10,64	12,27	-2,79	0,007
Productivity	11,12	6,21	7,27	0,000
Dominance	8,12	4,76	4,94	0,000
Self-confidence	5,47	9,54	-3,93	0,000

*(Hereinafter, only significant differences are presented. $p \leq 0,05$).

In general, there were not so many significant differences. In general, people who have ceased entrepreneurial activity within 3 years after it began are characterized by a large compared with continuing entrepreneurial activity internality in the field of achievements and failures, intellectual emotionality, neuroticism, suspicion, dominance and lower self-confidence. It is probably these qualities that played an important role in overcoming or not the difficulties that any entrepreneur inevitably faces.

In addition, in personal free interviews, most of the people who stopped their business, noted that they initially underestimated the difficulties that they would have to face, were not ready to invest all their time and energy in their work, and also, in our opinion, it is very important that they began to engage in entrepreneurship not because of the “call of the heart,” but because of necessity — lack of financial satisfaction, problems at their former place of work, and so on. At the same time, successful entrepreneurs noted that they had come to entrepreneurship because of the idea that caught fire. They wanted to realize a dream, and not just make money quickly and easily. Most of them, by the way, were quite successful in their previous work.

Thus, it can be assumed that the presence of certain “entrepreneurial” personality traits does not guarantee success in entrepreneurial activity, purposefulness, goal coverage, as well as an adequate assessment of the upcoming difficulties and their capabilities are also needed.

References

1. Ageev A.I. *Entrepreneurship: problems of property and culture*. - Moscow, 1991
2. Velkov I.G. *The identity of the head and management style*. - Moscow: MPSI, Voronezh: MODEK, 2001
3. Zhuravlev A.L. *Psychology of managerial interaction (theoretical and applied problems)*. - Moscow: IP RAS, 2004 - 476 p.
4. Zavyalova E.K., Posokhova S.T. *Psychology of entrepreneurship*. - SPb.: Publishing House of SPb. un-ty, 2004 - 296 p.
5. Khizrich R., Peters M. *Entrepreneurship or how to start a personal business and achieve success*. - Moscow, 1991
6. Meneghetti, A. *The personality of an entrepreneur*. - Moscow: FOIL LLC, 2004
7. Orlova E.O., Akhmadbekova N.M. *Entrepreneurial activity and the impact on it by the state (on the materials of the Republic of Tajikistan) // Russian Entrepreneurship*. - 2017. - Vol. 18. - p. 3507-3526.
8. *Psychology of integral individuality: Perm school / comp. B.A. Vyatkin, L.Ya. Dorfman, M.R.Shchukin* - Moscow: Smysl, 2011 - 636 p.
9. *Economics and social management: A textbook for bachelors / E.N. Zhiltsova, E.V. Egorova*. —Moscow: Dashkov and Co. Publishing and Trading Corporation, 2015.

健康心理健康女性的健康状况调整
**CORRECTION OF PSYCHOSOMATIC HEALTH WOMEN
IN FITNESS**

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注解。 本文介绍了他们自己的长期观察结果，这些作者研究了参加健身俱乐部的女性的心理状态及其变化。 事实证明，对女性采取综合方法，将健康心理治疗方法纳入其中，导致精神压力水平稳步下降，从而导致更多的工作状态，无论是在训练期间还是在完成培训。

关键词：负荷，健身，身体适应，训练，精神压力。

Annotation. *The article presents the results of their own, long-term observations of the authors who studied the psychological status and its changes in women who attended fitness clubs. It is established that an integrated approach to women, with the inclusion in the process of psychotherapeutic methods in fitness, lead to a steady decrease in the level of mental stress, which in turn leads to a more working state, both during training and after the completion of training.*

Keywords: *load, fitness, adaptation of the body, training, mental stress.*

It is known that training is a multifaceted process that includes mental functions, such as, for example, memory, attention, and will. The attention of the trainee, his perception of the proposed skills and abilities is, in essence, training; This means that a person most often cannot learn anything until he completely perceives information and does not comprehend it. Along with this, training is often an unconscious and not understood by us activity; practitioners do not know and do not understand how this happens. As a result, a “psychological dissonance” is created. At the same time, long-term training loads often cause psychological fatigue, which leads the student to a state of apathy and even contributes to the development of chronic fatigue syndrome [8, 9, 10]. Psychological fatigue is caused not only by the volume or intensity of the load; No less significant factor

in the nervous system overload is the systematic monotony of the training process [1,2,6,7]. In the structure of fitness clubs, in group classes - this is a common phenomenon, indicating the urgency of the problem of correcting the mental and psychosomatic status of the trainees.

With a high degree of mental stress, often associated symptoms such as: insomnia, increased irritation in communication, loss of motivation in the training process, poor concentration in exercise and the perception of material in class, mood swings, general body fatigue, apathy, etc. . This determined this goal of the present study - to develop a method for correcting the health status of women in fitness conditions, in the aerobic mode.

To achieve this goal, we conducted a pedagogical experiment in the conditions of the fitness club “Svelte” in Moscow, in which practically healthy women aged 25–40 years took voluntary part. Those engaged were divided into 2 groups (control and main) of 17 people each. Fitness workouts in the aerobic mode were carried out 3 times a week. The technique of circuit training for 60 minutes each was applied, including warm-up, the main part of the lesson and hitch, for 7 months [3,4]. With the main group, in addition to physical training before fitness classes, psychological training was conducted twice a week. At the same time, psychomuscle training (PMT) was used, as well as ideomotor training (IT) [5]. The control group trained as usual. At the beginning and at the end of the experiment, with each involved, the Hamilton test was conducted [11]. As a result of the research it was found that fitness workouts have a positive effect on the psycho-emotional status of the students (table 1).

Table 1. Changes in the psychosomatic state of women control group (n = 17)

Indicator (points)	To experimen	after experiment
Disturbing affect	2,1 ± 0,2	0,9 ± 0,01*
Stress	2,6 ± 0,1	1,9 ± 0,1*
Fears	0,9 ± 0,1	0,4 ± 0,01*
Insomnia	2,3 ± 0,4	1,3 ± 0,1*
Cognitive disorders	1,9 ± 0,2	1,5 ± 0,09
Depression	3,2 ± 0,3	1,8 ± 0,2*
Somatic signs	1,8 ± 0,2	1,4 ± 0,15
Sensory disturbances	2,4 ± 0,3	2,1 ± 0,2
Respiratory symptoms	1,9 ± 0,2	1,2 ± 0,2
Gastrointestinal disorders	1,6 ± 0,2	1,4 ± 0,1
Cardiovascular disorders	0,4 ± 0,05	0,2 ± 0,01*
Urogenital disorders	0,6 ± 0,09	0,5 ± 0,1
Vegetative signs	1,4 ± 0,1	1,1 ± 0,2
Behavior when viewed	0,6 ± 0,1	0,4 ± 0,1

Note * - significantly at p <0.05

However, in the main group of persons with whom psychogenic training was conducted, i.e. impact was complex, positive changes in psychoemotional status, were expressed much clearer, as evidenced by data in (table 2).

Table 2. Changes in the psychosomatic state of women main (experimental) group (n = 17)

Indicator (points)	To experimen	after experiment
<i>Disturbing affect</i>	2,1 ± 0,2	0,5 ± 0,04*
<i>Stress</i>	2,6 ± 0,1	1,1 ± 0,09*
<i>Fears</i>	0,9 ± 0,1	0,2 ± 0,02*
<i>Insomnia</i>	2,3 ± 0,4	0,8 ± 0,07*
<i>Cognitive disorders</i>	1,9 ± 0,2	1,2 ± 0,08*
<i>Depression</i>	3,2 ± 0,3	0,8 ± 0,04*
<i>Somatic signs</i>	1,8 ± 0,2	1,1 ± 0,1*
<i>Sensory disturbances</i>	2,4 ± 0,3	1,8 ± 0,15
<i>Respiratory symptoms</i>	1,9 ± 0,2	1,0 ± 0,2*
<i>Gastrointestinal disorders</i>	1,6 ± 0,2	1,2 ± 0,15*
<i>Cardiovascular disorders</i>	0,4 ± 0,05	0,1 ± 0,01*
<i>Urogenital disorders</i>	0,6 ± 0,09	0,4 ± 0,1
<i>Vegetative signs</i>	1,4 ± 0,1	1,0 ± 0,2
<i>Behavior when viewed</i>	0,6 ± 0,1	0,3 ± 0,1*

Note * - significantly at p < 0.05

It can be assumed that a complex effect on the body, a properly selected training load, the correct nutritional system, and recovery procedures can shorten the time interval for passing to the set goal by several times. And the increase in training loads, provides the result, only at the initial stage of the training path, which in the future will necessarily lead to physical stagnation and the accumulation of psychological tension. At the same time, there are two main cases of manifestation of mental stress: a) before any important process, for example, training or competition. b) during training or during competitions. In the first case, the assistance of a professional specialist is permissible, in the second, the practitioners will have to rely only on their own strength, i.e. control the state of the psyche with the help of self-regulating workouts.

Psychological preparation of the student for the competition or for other specific goals, this is an integrated approach and cannot be considered separately from the process, but it is often considered by experts as one of the types of training. She is assigned a specific role, with her goals, forms and methods. In fitness, sports psychologists use exactly the same methods and means, adapting them to the capabilities of a particular student. They help not only to find weaknesses in the state of the student, but also teach him how to self-motivate, adjust, and psychologi-

cally recover. Comprehensive effects on the body, properly selected training load, proper nutritional system, recovery procedures, can significantly reduce the time to achieve the goal. At the same time, mental stress for the organism is often a positive factor in its existence.

Thus, the data presented indicate the need for an integrated approach in working with women exercising in fitness clubs. It does not matter in which sport or physical education training is conducted. This model is suitable everywhere, helping to determine the quality of the training process.

References

1. APOEL V. Ya., Tsygan V. N. *Stress and stress resistance of the person.* - SPb.: Peter, 1999. 365 PP.
2. Weiner I. *Basics of psychotherapy.* – SPb.: Peter, 2002. -288 p.
3. Golovanov S. A. *Complex correction of men's health in conditions of aerobic exercise. Diss. abstract.* - Moscow, 2016. 28 p.
4. Golovanov S. A., Storozhenko P. A., Rasulov M. M. *Correction of condition of patients with obesity and hypertension in men. Palmarium Academic Publishing, International Book Market Service Ltd. Beau Bassin. 2018, 233 p.*
5. Gorbunov D. *Psychopedagogy sports.* - Moscow, 2007, 256 p.
6. Korolenko C. P. *psychophysiology of the person in extreme conditions.* - L.: Medicine, 1999, 255 p.
7. Krovyakov V. M. *Psychotraumatology.* - Moscow: Medicine, 2005, 345 p.
8. Lazarus R. *theory of stress and psychophysiological studies // Emotional stress. [Red. Levi L.] - L., 1970, Pp. 27-84.*
9. Leontiev A. N. *Psychology of 2000 // Leontiev A. N. Philosophy of psychology.* - Moscow: Moscow State University Publ., 1994. p. 277-278.
10. Eysenk M. W "A Handbook of Cognitive Psychology" 1984. 256 p.
11. Hamilton M. *Development of a rating scale for primary depressive illness // Br. J. Soc. Clin. Psychol., 1967; 6: 278-296.*

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下诺夫哥罗德设计低水头水电站的大型项目开发中遇到的一些社会心理问题
**SOME SOCIO-PSYCHOLOGICAL PROBLEMS ENCOUNTERED IN
THE DEVELOPMENT OF LARGE-SCALE PROJECTS
ON THE EXAMPLE OF THE NIZHNY NOVGOROD DESIGN
OF LOW-HEAD HYDROELECTRIC**

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注解。本文回顾和分析了大型项目发展过程中出现的一些社会心理问题。考虑下诺夫哥罗德低压水力发电项目的例子该项目是必要的，以恢复从Gorodets到下诺夫哥罗德有问题的四十公里长的航行。这解决了主要问题。同时，应该指出的是，下诺夫哥罗德地区的居民很难意识到下诺夫哥罗德低压液压系统的建造并没有引入任何根本性的新生活，因为它没有预测洪水区或次洪水区将超过洪水期的典型平均值。众所周知，例如，今天Balakhna地区的水文情况复杂，不稳定，需要不断监测。自苏联时代以来，巴拉赫纳市一半以上的领土处于淹没状态。在项目进程中，工程保护措施，包括拦截和射线排水系统的建设，小河道的清理和现有改善网络的重建，在一定程度上甚至可以改善这种情况。与公众合作，解释当前情况是介绍计划中的技术创新的最重要部分之一，包括下诺夫哥罗德低压液压系统的创建。

关键词：下诺夫哥罗德低压液压系统，船闸，液压执行器，现代化效率，社会和心理问题，经济补偿

Annotation. *The paper presents a review and analysis of some socio-psychological problems arising during the development of large-scale projects. Consideration is carried out on the example of the development project of the Nizhny Novgorod low-pressure hydroelectric The project is necessary in order to restore navigation on the problematic forty-kilometer stretch from Gorodets to Nizhny Novgorod. And this solves the main problem. At the same time, it should be noted that it is difficult for residents of the Nizhny Novgorod region to realize that the construction of the Nizhny Novgorod low-pressure hydraulic system does not introduce anything fundamentally new to their daily lives, since it is not forecasted*

that flooding zones or sub-flooding zones will exceed average values typical of the flood period. It is known that already today the hydrological situation, for example, in the Balakhna region is complex, unstable and requires constant monitoring. Since Soviet times, more than half of the territory of the city of Balakhna was in a submerged state. Scheduled in the course of the project, engineering protection measures, including the construction of intercepting and ray drainage systems, the clearing of small rivers and the reconstruction of the existing ameliorative network, to a certain extent, can even improve the situation. Working with the public, explaining the current situation is one of the most important parts of the work to introduce the planned technical innovations, including the creation of the Nizhny Novgorod low-pressure hydraulic system.

Keywords: *Nizhny Novgorod low-pressure hydraulic system, shipping lock, hydraulic actuator, modernization efficiency, social and psychological problems, financial compensations*

Introduction

At present, an innovative development of a number of large-scale projects is underway in the Russian Federation, during the implementation of which significant territories and the population living there are affected. In the world economic literature, innovations are interpreted as the transformation of potential scientific and technological progress into a new product or technology. One of these projects is the “Construction of the Nizhny Novgorod Low-Pressure Hydraulic System” (NLPHS). Its main goal is to preserve the through navigation on the Volga River as an international-class waterway, reduce transport costs in the economy by eliminating loss of carrying capacity on draft and time, improvement of the efficiency and competitiveness of cargo traffic by inland waterway transport, and further development of cruise shipping [1, c. 555-559].

At the same time, the implementation of this project involves not only technical and economic issues directly related to the construction of the NLPHS, but also the interests of a large number of people living directly in the area of the planned construction, as well as a large part of the population of the Middle Volga region (for example, due to possible changes in general epidemiological situation in the region [2, c. 15]). The population is aware of the changes that are occurring in their lives, but they do not quite clearly understand what to do and how they should react to future changes. [3].

The purpose and materials of the study.

The design of NLPHS is carried out within the framework of the implementation of the state contract № 38 dated July 01, 2014. The state customer of the project is the Federal Agency for Maritime and River Transport (Rosmorrechflot), represented by the head of the Federal Budget Institution “Administration of the Volga Basin of Inland Waterways” (FBI “Administration of the Volga Basin”). The general designer of NLPHS is «Tekhtransstroy» Limited Liability Company (TTS LTD).

During the preparation of project documentation for the construction of the main NLPHS facilities, engineering surveys were carried out. Based on their results, a positive opinion was received from the FAU Glavgosexpertiza of Russia №171-16/GGE-10436/07 [4].

The purpose of the engineering survey was:

- obtaining the full amount of necessary information for the development of the environmental part of the construction project;
- assessment of the current ecological state of individual components of the natural environment (atmospheric air, levels of physical factors, aquatic environment, soil, vegetation and wildlife) and ecosystems in general, their resistance to anthropogenic influences and ability to recover;
- study of the social conditions of the region;
- identification of possible sources of exposure to environmental components based on the results of the analysis of the current situation, etc.

As a result of engineering and environmental surveys conducted within the territory of the intended impact, information was obtained on the existing state of all the examined components of the environment, a qualitative assessment and mapping of the current state and development of the most common processes and phenomena were carried out, both for individual components of the environment and ecosystems in general.

In analyzing the impact of the planned economic activity on the components of the environment and the socio-economic conditions of the region, the most priority areas were identified. From the point of view of changes in the level of comfort for residents, the main factor will be the flooding of the territory and the associated impact on surface and groundwater, soil and land. In connection with this circumstance, the project is developing a whole range of organizational and technical environmental measures, the purpose of which is to minimize and prevent possible negative impacts on environmental components.

The materials of the conducted research in the project documentation were highlighted in a separate volume “Environmental Impact Assessment” (EIA) and a non-technical summary. (These materials are presented on the website of the TTSLTD. [4]).

One of the important stages of work with the population, also carried out in the course of the development of the project “Construction of the Nizhny Novgorod Low-Pressure Hydraulic System. Stage 2 ”is the holding of public hearings devoted to the discussion of the results of the works implemented. In the first quarter of 2019, these hearings were held in four municipal districts of the Nizhny Novgorod region, including the Sormovsky, Balakhna, Borsky and Gorodetsky districts.

The main objectives of these public hearings were:

- inform the public and all interested parties about the planned economic activity carried out during the implementation of the project “Construction of the Nizhny Novgorod low-pressure hydraulic system. 2nd stage ”;

- provide public access to preliminary environmental impact assessment (EIA) materials of the above mentioned project;
- to register and convey to the management and specialists of the Administration of the affected areas of the project, as well as representatives of project organizations, suggestions and comments from the public expressed during public hearings and media discussions.

Following the results of the hearings, a single register of comments and suggestions was drawn up. The Ministry of Ecology of the region sent it to the designer in order to take into account the formulated comments when adjusting the project documentation and drawing up the final version of the materials for assessing the environmental impact of the project. [5].

Past hearings are reflected on the Internet. It was noted that “one of the results of the hearings, which were voiced by the administration of Gorodetsky district, was that due to the lack of information necessary to achieve the goal of environmental impact assessment and uncertainties regarding impacts, the EIA provider must organize additional research aimed at eliminating the uncertainties necessary to make a decision. Finalize the draft Environmental Impact Assessment to reflect the written and voiced comments, questions, suggestions and opinions.” [6].

On April 10, 2019, the Scientific Council of the Russian Academy of Sciences (RAS) met in Moscow, and the theme of the meeting was “The expediency of building the Nizhny Novgorod low-pressure hydraulic system”. According to the results of a comprehensive discussion, the opinions of the participants were divided, and the scientific council refused to give a final assessment to the project due to a lack of elaboration of a number of environmental issues [7]. For example, an issue that is not fully clarified, both for the population and for specialists-the time factor remained. Spring flood usually lasts from two weeks to a month and falls on the relatively cool season of the year - spring. At the same time, the planned level of the reservoir should be maintained at a level close to the flood level for much more than six months, and falls on the hottest part of the year - summer. And it is not entirely clear how the processes accompanying hydrological changes, for example, the process of karst development, changing the chemical composition of groundwater, biological processes, including reproduction of blue-green algae, will manifest themselves.

Research results

An analysis of the questions that have been received, as well as the protocols formed during public discussions, show that the multitude of problems of citizens concerns fall into three disbalance groups.

The first group is the individual or personal problems of citizens (for example, is there a flood expected from a general rise in the groundwater of personal cellars, basements, the death of vegetable crops, fruit trees in garden plots, etc.).

The second group is collective problems (for example, concerns related to flooding of household landfills, storage sites for industrial waste, cattle cemeteries, cemeteries, sewage treatment plants, etc.)

The third group is the fear of the possibility of the formation of regional problems, for example, a sharp deterioration in the sanitary-epidemiological situation (in particular, in malaria); unpredictable development of karst processes (affecting potentially hazardous enterprises, including those located in relatively remote areas) [8, p. 62-67; 9, p. 62-65]; a sharp deterioration in the quality of drinking water (in the water intakes, wells and boreholes); a general decrease in the river bioresource, as well as the destruction of the habitats of animals and plants listed in the Red Book, the loss of valuable oak forests, (including the monument of regional significance Dubrava near the city of Gorodets).

It should be noted that the problem of changing the level of groundwater for the local population is in one of the first places.

People fear that at present the level of standing of groundwater in the territory under consideration is 1.5-2 m [10, p. 140-145], after the construction of the facility is completed, the situation may deteriorate (the groundwater level will rise significantly). Moreover, where it is planned to raise the level of groundwater, there are four existing cemeteries, industrial enterprises, a sludge reservoir, storage sites for manure and household waste.

Impact assessment was performed using modeling data reflecting projected levels of flooding of the territory. During the period of the spring flood, the costs through the hydropower station are passed without pressure conditions, and the annual filling is carried out on the decline of the spring flood, drawdown - after closing the navigation. The increase in flooded areas after the creation of the reservoir, amounting to from 44 to 117% for different water content periods, is mostly due not to an increase in the level of groundwater, but to the flooding of low-lying areas when the reservoir is filled.

As a result, it is predicted that in the residential development area on the right bank of the Volga River, the rise of the groundwater level is only 0.1-0.3 m, which is insignificant. The final assessment of groundwater will not exceed regulatory requirements, namely 2 m - for rural areas and 3 m - for urban areas.

Another lead problem - the possible change in the quality of the water taken.

At the same time, as studies have shown, water quality is already characterized by a high proportion of non-standard samples for microbiological indicators. After the construction of the reservoir, in the case of a slowdown in the flow rate of the Volga, the water quality is expected to worsen [11, p. 110-121], and due to the connection of underground sources with the river, there may be a deterioration in the quality of water in the central water supply systems, as well as in wells, which provide water for about 22 thousand people.

As the NLPHS project was developed, there is an increase in the public campaign against the construction of a low-pressure hydraulic system. In particular, the public movement “Committee for the Protection of the Volga Floodplain” collects signatures under an open message to Vladimir Putin, Dmitry Medvedev, Minister of Transport of the Russian Federation Yevgeny Dietrich and Nizhny Novgorod Governor Gleb Nikitin, insisting that the hydro system “will cause an irreversible blow to the well-being of the population, the environment and on the budget of the country. ” As an alternative to the hydropower plant, it is proposed to create a third gateway in the Gorodets area, leaving the Volga River well below the two existing ones. The authors recalled that this alternative was approved by scientists of the Russian Academy of Sciences in 2015, and the planned hydropower plant will lead to flooding of territories, including natural monuments, deterioration of the sanitary and epidemiological situation due to flooding of landfills, cemeteries and cattle burial grounds [12].

For example, it is known that only in 2014, in the Sechenovsky district, 16 ownerless cattle cemeteries were identified that pose a potential danger to the population. And in the Borsky district today more than 70 unofficial cattle cemeteries have been identified, the exact location of which has not been described and mapped [13].

In this regard, it should be recalled that the NLPHS was designed to solve the water transport problem and is designed to provide seasonal regulation of the level regime in its upstream, maintaining the project support level at 68.0 m at the alignment site during the entire low water period.

As a result of the forecast calculations, it was determined that the quality of water in the low-pressure reservoir section after the project implementation will remain at the current level and the formation of the high-flow Sormovsky reservoir will not cause noticeable changes in hydrological processes.

A separate theme voiced during the hearings was the intensification of interest in alternative projects that can solve the problem of the Volga shipping.

In the course of many years of work, various options for the restoration of shipping have been considered. This includes filling the Cheboksary reservoir to the originally planned level (68 m), and dredging the site, and a comprehensive project for the construction of the third line in Gorodets [14]. But as the analysis showed, the implementation of these projects leads to a progressive deterioration of the situation.

Conclusion

The implementation of a large-scale construction project for the Nizhny Novgorod low-pressure hydraulic system is necessary in order to restore navigation on the problematic forty-kilometer stretch from Gorodets to Nizhny Novgorod. And it solves this problem quickly and in a relatively short time.

At the same time, it should be noted that it is psychologically difficult for the residents of the Nizhny Novgorod region to realize that the construction of the Nizhny Novgorod low-pressure hydraulic system does not introduce anything fundamentally new to their daily life, since it is not forecasted that the flood zones and sub-flooding zones will exceed existing flood period.

It is known that already today the hydrological situation, for example, in the Balakhna region is complex, unstable and requires constant monitoring. Since Soviet times, more than half of the territory of the city of Balakhna was in a submerged state.

Scheduled in the course of the project, engineering protection measures, including the construction of intercepting and ray drainage systems, the clearing of small rivers and the reconstruction of the existing ameliorative network, to a certain extent, can even improve the situation.

Working with the public, explaining the current situation is one of the most important parts of the work to introduce the planned technical innovations, including the creation of the Nizhny Novgorod low-pressure hydraulic system.

References

1. Syropyatov, V.V. *Modernization of a unified deep-water system in the European part of Russia / Current state, problems and prospects for the development of sectoral science Materials of the All-Russian Conference with international participation.* - 2017. - P. 555-559.
2. Orekhov, V.F. *On the environmental problems of the Volga basin and ways to solve them / The problems of ecology of the Volga basin works of the 3rd All-Russian Scientific Conference. Volga State University of Water Transport (VSUVT).* - 2018. - P. 15.
- 3 *Water hammer on the region Free Press Nizhny Novgorod* <http://sypressa-nn.ru/2019/05-124/gidroudar-po-regionu.html> (application 24.04.2019)
4. *Website TTC Ltd. Nizhny Novgorod hydroelectric* <https://tts63.ru/gidrouzel> (application 24.04.2019)
5. *Open Nizhny Novgorod City interactive portal. The Nizhny Novgorod Ministry of Ecology has formed a preliminary register of comments and suggestions on the construction of a low-pressure hydroelectric complex.* / <https://opennov.ru/news/society/2019-03-18/14232> (application 11.04.2019)

6. In Gorodtsa, public hearings were held on the project EIA for construction of NLPHS / <https://dront.ru/news/2019/02/22/v-gorodtse-proshli-obshestvennyye-slushaniya-proekta-ovos-pri-stroitelstve-nizkonapornogo-gidrouzla/> (application 11.04.2019)

7. Reporter-NN Scientific Council of RAS refused to evaluate the project of the Nizhny Novgorod hydroelectric complex http://reporter-nn.ru/%D0%BD%D0%BE%D0%B2%D0%BE%D1%81%D1%82%D0%B8/ns-ran_1359/ (application 14.04.2019)

8. Gordeeva, Z.I., Yermakova, Yu.I. Geoecological characteristics of the Balakhna karst region / *Journal of Social-Ecological Technologies* - 2016, P. 62-67.

9. Yashnova, T.V. Manifestations of karst on the territory of the Nizhny Novgorod region // *Young Scientist*. - 2014. - № 21. - P. 62–65.

10. Solovyov, A.V., Seliverstov, V.A. Assessment of the influence of the Nizhny Novgorod low-pressure hydraulic system on changes in the groundwater level / *Traditions and innovations in construction and architecture. Construction Samara State University of Architecture and Civil Engineering. Samara*, - 2016. - P. 140-145

11. Kamensky, S.B., Churazov, A.G. The preservation of the Volga flow area in the Nizhny Novgorod Volga region is an important step towards the revival of the Volga / *Astrakhan Journal of Environmental Education* № 1 (39) - 2017, - P.110-121

12. Information Agency REGNUM Experts will assess the environmental impact of the construction of a hydroelectric complex on the Volga / <https://regnum.ru/news/2601651.html> (application 11.04.2019)

13. Site Nizhny Novgorod. 16 ownerless cattle cemeteries found in the Sechenovskiy district of the Nizhny Novgorod region / <https://www.vgoroden.ru/novosti/16-beshoznyh-skotomogilnikov-vyyavleno-v-sechenovskom-rayone-nizhegorodskoy-oblasti-id236926> (application 23.04.2019)

14. RAS will consider alternative options for providing shipping from Gorodets to Nizhny Novgorod / *Government of Nizhny Novgorod Region* / <https://government-nnov.ru/?id=231873> (application 11.04.2019)

蛋白质sVCAM - 1及其在围产期的意义
PROTEIN SVCAM - 1 AND ITS SIGNIFICANCE IN PERINATOLOGY

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摘要。 先兆子痫是围产期病理学的一个危险因素，因为它的特征是母亲适应系统的不足，不足以充分满足发育中胎儿的需要。在先兆子痫的孕妇中，血管的内皮是各种各样的目标。病理影响。大量研究证实，当先兆子痫加入慢性高血压时，母体血清中的sVCAM - 1蛋白会增加。

蛋白质sVCAM - 1是内皮功能障碍的早期标志物，也是围产期病理学的预测因子。

关键词：先兆子痫，sVCAM - 1，内皮功能障碍，围产期病理学。

Summary. Preeclampsia is a risk factor for perinatal pathology, as it is characterized by a mismatch between the capacity of the mother's adaptation systems to adequately meet the needs of the developing fetus. In pregnant women with preeclampsia, the endothelium of the vessels is the target of various pathological effects. Numerous studies confirm that when preeclampsia is added to chronic hypertension, there will be an increase in the sVCAM - 1 protein in the maternal serum.

Protein sVCAM - 1 is an early marker of endothelial dysfunction, as well as a predictor of perinatal pathology.

Keywords: preeclampsia, sVCAM - 1, endothelial dysfunction, perinatal pathology.

Study of the activity characteristics of active molecules involved in the development of preeclampsia (a pathological condition arising in the second half of pregnancy (after the 20th week) characterized by arterial hypertension (AH \geq 140/90 mm Hg) in combination with proteinuria (\geq 0,3 g/day) and often with edema and multiple organ failure) [1] in pregnant women is a very important area for obstetricians and gynecologists. Placental growth factor, (sVCAM - 1) plays a pathogenetic role in the development of preeclampsia; its definition makes it possible to predict the severity and extent of pathological changes in this state [2, 3]. Today, the first commercial kits for determining the content of placental growth factor, (sVCAM - 1-vascular cell adhesion molecule) are being developed based on enzyme immunoassay [4].

Adhesion molecules are proteins that ensure the mechanical interaction of cells with each other, being on the plasma membrane. For the first time, their role in the pathogenesis of preeclampsia was mentioned in 1994 by Lyall F. and co-authors, who were able to detect a significant increase in the level of VCAM - 1 in the serum of pregnant women with preeclampsia compared with pregnant women without it and non-pregnant. The authors interpreted these results as a reflection of the process of leukocyte activation during preeclampsia [5].

sVCAM-1 is a protein that belongs to the family of immunoglobulins, is involved in the adhesion of leukocytes and endothelial cells, mediation of signals [6]. This adhesion molecule also affects the development of a number of pathological conditions associated with inflammation [7]. sVCAM-1 is involved in the hyperaggregation of blood cells, leads to the formation of parietal thrombus and impaired microcirculation [8, 9].

VCAM - 1 contains 6 or 7 immunoglobulin domains of the H - type and is expressed only after stimulation of cells with IL - 1, TNF - α or endotoxin [10]. VCAM - 1 is a ligand of integrin VLA - 4, found on lymphocytes, monocytes and eosinophils [11]. VCAM - 1 is directly involved in the adhesion of leukocytes outside blood vessels, mediating the interaction of lymphocyte precursors with stromal cells of the bone marrow and B cells with dendritic cells of the lymph node follicles [12].

VCAM - 1 also has a relatively selective leukocyte adhesion [13], provides for the accumulation of mononuclear cells in the process of changing the acute phase of chronic inflammation [14].

In pregnant women with hypertensive disorders, as well as with pre-eclampsia, the endothelium of vessels is the target of various pathological effects, in turn the clinical manifestations of these conditions develop due to endothelial dysfunction as a result of vasospasm, oxidative stress and hypoxic - ischemic changes of target organs [15]. According to the FGBU "Ivanovo Research Institute of Maternity and Childhood after V.N. Gorodkova ", Ivanovo, as a result of the research, it was found that in groups of women with preeclampsia who joined chronic hypertension, there was a significant increase in serum sVCAM - 1 [15].

Recent studies have shown that endothelial dysfunction, which is the pathogenetic basis of preeclampsia, has a common origin with a generalized intravascular inflammatory response. Inflammation-activated endothelium enhances the expression of adhesion molecules, such as VCAM-1 [16]. In many scientific works today, a certain dependence is revealed that the level of sVCAM - 1 correlates with the severity of preeclampsia, the severity of edema, increased blood pressure [17] and the risk of perinatal pathology.

Damage to the vascular wall and activation of the endothelium stimulate the expression of VCAM - 1 [18]. The definition of this adhesion molecule allows the assessment of the severity of endothelial damage and endothelial dysfunction [19]. It was also found that the level of sVCAM - 1 allows to differentially diagnose preexisting hypertension and preeclampsia [20].

Conclusion

Thus, the literature data show that the adhesion molecule sVCAM - 1 is a reliable marker of endothelial dysfunction, the use of these tests is shown in preeclampsia to assess risk factors for perinatal pathology.

References

1. Critchley H., Poston A., Walker J., *Pre-eclampsia*, RCOG Press, London: 2003. - P. 189-207
2. Sidorova I.S., Nikitina N.A., Unanyan A.L., Rzayeva A.A., Kinyakin V.V. *Pathogenetic rationale for a differentiated approach to the management of pregnant women with arterial hypertension and preeclampsia. Obstetrics and gynecology.* 2013; (2): 35-40.
3. Aylamazyan EK, Sokolov D.I., Selkov S.A. *Gestosis and atherosclerosis: common pathogenetic mechanisms // Journal of Obstetrics and Female Diseases.* - 2009. - T. LVIII, No. 1. - P. 4-15.
4. Vandenberghe G.. *Prenatal Diagnosis; first trimester screening for intra-uterine growth restriction and early-onset pre-eclampsia; 2011 Oct; 31(10):955-61*
5. Lyall F., I.A. Greer, F. Boswell. *The cell adhesion molecule, VCAM-1, is selectively elevated in serum in pre-eclampsia: does this indicate the mechanism of leucocyte activation? Br. J. Obstet. Gynaecol.* -1994. 101: 485-487
6. Farzandnia M., Ayatollahi H., Hasan-Zade M, Rahimi HR. *A comparative study of serum level of Vascular Cell Adhesion Molecule -1 (sVCAM-1), Intercellular adhesion Molecule-1 (ICAM-1) and High Sensitive C-REACTIVE protein (hs-CRP) in normal and pre-eclamptic pregnancies. Iranian Journal of Basic Medical Sciences.* 2013; 16(5):689-693
7. Krauss T, Kuhn W, Lakoma C, Augustin HG. *Circulating endothelial cell adhesion molecules as diagnostic markers for the early identification of pregnant women at risk for development of preeclampsia. American Journal of Obstetrics and Gynecology.* 1997; 177(2):443-449.
8. *Group of Companies BioHimMak [electronic resource]: adhesion molecules, selectin family P.42541 URL: <https://biochemmack.ru/upload/uf/afa/afa00f4e-b5603eb8d2f34186f031faab.pdf> (application 08.05.2019)*
9. Anacker J., Feix S., Kapp M. et al. *Expression pattern of matrix metalloproteinases (MMPs) in human deciduas during pregnancy // J. Reprod. Immunol.* - 2010. - Vol. 86. - P. 79-111.

10. Heyl W, Heintz B, Reister F, et al. Increased soluble VCAM-1 serum levels in preeclampsia are not correlated to urinary excretion or circadian blood pressure rhythm. *Journal of Perinatal Medicine*. 2005;33(2):144–148.

11. Tziotis J, Malamitsi-Puchner A, Vlachos G., Creatsas G., Michalas S. Adhesion molecules expression in the placental bed of pregnancies with pre-eclampsia. *An International Journal of Obstetrics and Gynaecology*. 2002;109(2):197–201.

12. Group of Companies BioHimMak[Electronic resource]: adhesion molecules, selectin family P.42541 URL: <https://biochemmack.ru/upload/uf/afa/afa00f4e-b5603eb8d2f34186f031faab.pdf> (application08.05.2019)

13. Ziganshina M.M. Detection of antibodies to endothelial cells in patients with preeclampsia / Ziganshina M.M, Nikolaeva M.A, Kan N.E, StepanovaYe.O., Kretchetova L.V, Sukhikh G.T. // *Mother and Child: Materials of the 15th All-Russian Scientific Forum.*– Moscow.-2014.-P.64-65.

14. Averkieva V.S., Lisyanskaya M.V. Innovative biomarkers for the diagnosis and prognosis of preeclampsia. // *Polyclinic*. - 2016. - N 1 (3). - P. 20-23.

15. Steegers EA, von Dadelszen P, Duvekot JJ, Pijnenborg R. Preeclampsia. *Lancet* 2010; 376 (9741):631–644

16. Panova I.A., Rokotyanskaya E.A., Kuzmenko G.N., Kudryashova A.V., Popova I.G., Sytovova L.A., Nazarov S.B. The nature of the inflammatory reaction and endothelial dysfunction in pregnant women with hypertensive disorders of various origins. *Clinical laboratory diagnosis*. 2016;61(10):692-696. DOI: 10.18821/0869-2084-2016-10-692-696

17. Panfilova L.S. Diagnostic and prognostic value of determining the partial pressure of oxygen in venous blood in pregnant women with preeclampsia: autoref. dis. ... Cand. medicalsci. Samara. 2014 –24 P.

18. Petrishchev N.N., Vasina L.V. Violation of adhesion activity as a form of endothelial dysfunction. *Translational medicine*. 2014; (6): 5–15.

19. Panova I.A. Expression of cell adhesion molecules by phagocytes as a criterion for the differential diagnosis of hypertensive disorders in pregnant women. *Obstetrics and gynecology*. 2015; (7):33–7.

20. Komilova M.S., Pakhomova Z.E. The value of the endothelium in the development of complications of the gestational period. *Russian Bulletin of the obstetrician-gynecologist*. 2015; 15(1): 18-23.

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血清标志物WFA + -M2BP用于评估HCV诱导肝细胞肝纤维化和肝硬化的影响
**THE USE OF SERUM MARKER WFA+-M2BP FOR EVALUATION
OF FIBROSIS AND CIRRHOTIC AFFECTION OF LIVER
AT HCV INDUCED HEPATITISES**

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抽象。慢性病毒性丙型肝炎与乌兹别克斯坦特别相关，因为它具有广泛的分布和肝硬化的高风险，而早期发现和治疗反过来又可以逆转。在这方面，开发新的非侵入性诊断方法具有高度相关性。

目的：确定标志物M2BP对肝硬化肝损伤的诊断效果。

基于慢性HCV患者与不同程度的纤维性和肝硬化性肝损伤的相关性分析，进行了M2BP标记物敏感性的临床试验。

结果。在M2BPGi指标的增加和依赖性对纤维化程度的动态观察到明显趋势，组间具有统计学显著性指标。

结论已确定的统计学显著指标，明显的趋势表明其信息量，并且所提出的95%限值可用作肝损伤组的分类标准。

关键词：慢性病毒性丙型肝炎，纤维化，肝硬化，诊断，血清标志物，M2BP

Abstract. *Chronic viral hepatitis C has particular relevance for Uzbekistan due to its wide distribution and high risk of developing cirrhosis of the liver, which in turn can be reversible with early detection and treatment. In this regard, the development of new methods of non-invasive diagnosis is highly relevant.*

Objective: *to determine the diagnostic efficacy of the marker M2BP for the detection of cirrhotic liver damage.*

A clinical trial of the sensitivity of the M2BP marker was conducted on the basis of a correlation analysis among patients with chronic HCV with varying degrees of fibrous and cirrhotic liver damage.

Results. *A pronounced trend was observed in the dynamics of the increase and dependence of the M2BPGi indicator on the degree of fibrosis with statistically significant indicators between groups.*

Conclusion. *The identified statistically significant indicators, a pronounced tendency indicate its informativeness, and the presented 95% limits can be used as criteria for classifying the liver damage groups.*

Key words: *chronic viral hepatitis C, fibrosis, cirrhosis, diagnostics, serum marker, M2BP*

Introduction. Today, there are about 170 million people affected by hepatitis C virus, which is the leading cause of hepatocellular carcinoma and liver transplantation [1]. The prognosis of HCV cirrhosis is determined by the stage of its development. With compensated cirrhosis within 5 years, the transformation into decompensated is registered in 18% of patients, malignancy - in 7%, 91% surviving in total. With decompensated cirrhosis, 50% of patients survive by 5 years.

Diagnosis of cirrhosis in the debut of the disease is very difficult, since clinical manifestations, as well as laboratory data (clinical and biochemical indicators) and instrumental (ultra-sound, isotope scanning, computerized or nuclear magnetic resonance imaging) methods of research are very difficult. They are tedious and in most cases do not allow to distinguish between cirrhosis, chronic hepatitis and steatohepatitis (dystrophic liver disease) [2].

Despite the fact that liver biopsy provides comprehensive information on the inflammatory necrotizing degree of liver damage, its use is often limited by invasiveness and soreness. In this regard, the use of non-invasive methods for the diagnosis of liver fibrosis becomes relevant. Among recent methods of non-invasive examination of the liver, we distinguish two methods: the determination of serum markers of liver fibrosis and the instrumental method of determining the density of the liver based on transient elastometry.

Recently, it was announced that liver agglutinin positive human protein *Wisteria floribunda* Mac-2 (WFA \pm M2BP) can be used as a marker of liver fibrosis (WFA \pm M2BP), which can be determined using immunological methods of diagnostics [3]. We have conducted studies to determine the practical use of this marker among the population of a highly endemic area for the early diagnosis of liver cirrhosis.

Purpose of the study: to determine the diagnostic efficiency of WFA \pm M2BP serum marker of fibrosis in relation to non-invasive diagnosis of early liver cirrhosis in chronic viral hepatitis C.

Materials and methods. The study included 120 patients of the clinical and outpatient department of the Scientific Research Institute of Virology of the Ministry of Health of the Republic of Uzbekistan who were treated in 2017. Patients confirmed by PCR with a diagnosis of chronic hepatitis C were examined using clinical methods and research. The degree of liver damage was assessed using ultrasound, as well as studies using the transient elastography method (fibroscan). In 10% of all patients, liver damage was verified using a liver biopsy.

The quantitative determination of the serum marker WFA + -M2BP was carried out on the basis of an antiselectin drive ELISA using a fully automated immuno-analyzer HISCL-2000i (Sysmex, Hyogo, Japan) [4].

Statistical analysis and data visualization was performed using the IBM-SPSSStatisticiansversion 22.0 program (IBM, Chicago, IL, USA).

Results. All patients (n = 120) with chronic hepatitis C and varying degrees of liver fibrosis were examined to determine the level of serum M2BPGi. Thus, the average level of the marker was 6.88 ± 0.33 COI, while the minimum level was 0.7, and the maximum 13.94 COI.

When studying the distribution by age, M2BPGi did not have pronounced features (Fig. 1). Thus, there is a slight increase in the average in the older age groups of 8.11 ± 0.84 COI in the age group 45–49 years, 7.91 ± 0.77 in the group 60–64 years, 7.38 ± 0.75 C.O.I. in the age group of 50–54 years. But also relatively young groups have a high level of the indicator, for example, in the group of 30–34 years, the M2BPGi indicator was 7.29 ± 2.09 C.O.I. The given distribution of the indicator among age groups is not statistically significant ($p = 0.054$). This indicates that the age factor in the distribution of the indicator does not play a significant role and may not be taken into account in further analysis.

When studying the effect of the gender of the patients on the M2BPGi index, it was found that the average sex index is approximately equal and amounts to 6.62 ± 0.44 C.O.I. in women and 7.29 ± 0.52 C.O.I. in men. The difference between the indicators has no statistical significance ($p = 0.34$).

In order to assess the diagnostic effectiveness of the use of a marker based on linear regression, comparative trials were conducted among patients with various degrees of fibrosis. The group of severe fibrosis (f3) was $30.0 \pm 4.1\%$, the group of pre-cirrhosis (f3-4) - $20.8 \pm 3.6\%$, the group of early cirrhosis (f4) was $49.2 \pm 4.5\%$.

To determine the correlation relationship between indicators of the level of serological markers of fibrosis and the degree of fibrosis, a statistical comparison of the indicators of fibrosis in the pre-cirrhosis group in comparison with other groups was made, taking into account the role of mixing factors in the logistic regression model.

Different levels of M2BPGi were observed in different groups of cirrhosis (Table 1). So, in the group of severe (developed) fibrosis, the M2BPGi indicator was 3.48 ± 0.30 COI, in the pre-cirrhosis group, this indicator was set at 5.68 ± 0.39 , and in the group of early cirrhosis, this indicator was already 9.46 ± 0.40 . ANOVA test shows statistically significant differences ($p < 0.001$).

A pronounced trend emerges in the dynamics of increase and the dependence of M2BPGi on the degree of fibrosis (Fig. 2). Statistically significant indicators differed between the groups of severe fibrosis and pre-cirrhosis at the level of $p = 0.004$, and between the groups of severe fibrosis and pre-cirrhosis and early cirrhosis $p < 0.001$.

Thus, in the group of heavy fibrosis f3, the 95% variation of the M2BPGi indicator varied from 2.86 to 4.1 C.O.I. In the f3-4 group, M2BPGi varied within 4.87–6.49 and in the group of early cirrhosis within 8.6–10.2 C.O.I. The median in the f3 group was 3.03, in the f3-4 group, 5.7, and in the f4 group, 9.8 COI.

Discussion. Mac-2-bound protein (M2BP) is a glycoprotein produced mainly by hepato-cytes, as well as by many other cells [5, 6]. As liver fibrosis progresses, total M2BP in serum in-creases. The overall serum M2BP level increased with the severity of liver damage from chronic hepatitis C. [7]. In addition, serum M2BP levels do not specifically reflect liver damage or fibro-sis [8]. Recently, a WFA + -M2BP quantification system has been established, and it has been reported that WFA + -M2BP is a unique glycerol-alteration marker associated with liver fibrosis. In our study, the level of WFA + -M2BP in serum was significantly correlated with the stage of fibrosis in patients with chronic hepatitis C. The advantages of assessing liver fibrosis using WFA + -M2BP are its liver specificity, high diagnostic accuracy and good reproducibility. Also, no correlation was found between serum level of WFA + -M2BP and age and sex. Our research will be useful both in clinical practice and for further study of the potential of this marker in the future.

Conclusion. Thus, the identified statistically significant indicators, a pronounced tendency indicate that the indicator is informative, and the identified 95% limits can be used as criteria for the classification of groups of liver damage.

In relation to the clinical manifestation of liver fibrosis and the M2BPGi indicator, the factors of the patient's sex and age do not have any effect. The M2BPGi indicator directly correlates with the degree of liver damage and is especially pronounced in the detection of the pre-cirrhotic state, with a level indicator of 2.86 COI.

References

1. Mohd Hanafiah K., Groeger J., Flaxman A. D., Wiersma S. T. *Global epidemiology of hepatitis C virus infection: new estimates of age-specific antibody to HCV seroprevalence // Hepatology. – Place Published,2013. – V. 57, № 4. – P. 1333-42.*
2. *Challenges in HCV Elimination // JAMA. – Place Published,2017. – T. 318, № 10.– C. 899.*
3. Inoue T, Tsuzuki Y, Iio E., Shinkai N., Matsunami K., Fujiwara K., Matsuura K., Nojiri S., Tanaka Y. *Clinical Evaluation of Hepatocarcinogenesis and Outcome Using a Novel Glycobi-omarker Wisteria floribunda Agglutinin-Positive Mac-2 Binding Protein (WFA(+)-M2BP) in Chronic Hepatitis C with Advanced Fibrosis // Jpn J Infect Dis. – Place Published,2018. – V. 71, № 3. – P. 177-183.*
4. Kuno A., Ikehara Y, Tanaka Y, Ito K., Matsuda A., Sekiya S., Hige S., Sakamoto M., Kage M., Mizokami M., Narimatsu H. *A serum "sweet-doughnut" protein facilitates fibrosis evaluation and therapy assessment in patients with viral hepatitis // Sci Rep. – Place Published,2013. – V. 3.– P. 1065.*
5. Kuno A, Ikehara Y, Tanaka Y,etal. *Aserum "sweet-doughnut"protein facilitates fibrosis evalua-tion andtherapy assessment in patients withviralhepatitis.Sci Rep2013;3: 1065*
6. Artini M, Natoli C, TinariN,etal. *Elevated serum levels of 90K/MAC-2BP predict unrespon-siveness to alpha-interferon therapy in chronic HCVhepatitispatients.J Hepatol1996;25:212–7.*
7. Kuno A, Sato T, ShimazakiH,etal. *Reconstruction of a robust glyco diagnostic agent supported bymultiple lectin-assisted glycan profiling.ProteomicsClin Appl2013;7: 642–7*
8. Kuno A, Ikehara Y, Tanaka Y,etal. *Aserum "sweet-doughnut"protein facilitates fibrosis evalua-tion andtherapy assessment in patients with viral hepatitis. Sci Rep2013;3: 1065*

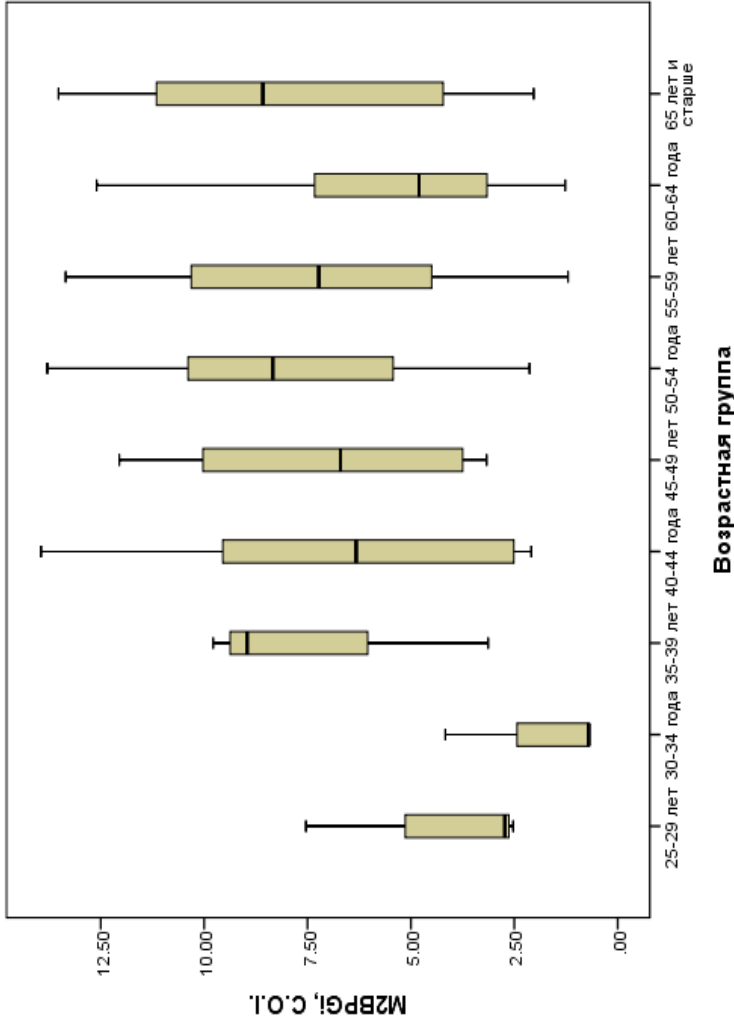


Fig. 1. The age distribution of the M2BPGi indicator with an indication of 25% and 75% quartiles and a 95% confidence interval

Table 1
M2BPGi (C.O.I.) by fibrosis groups

Fibrosis groups	Qty	COI (M)	Standard error (m)	95% Confidence interval		Minimum	Maximum
				Lower-border	Top border		
Severefibrosis(f3) *	36	3.48	0.30	2.86	4.10	1.27	8.59
Pre-cirrhosis(f3-4) *	25	5.68	0.39	4.87	6.49	1.20	9.73
Earlycirrhosis(f4) **	58	9.46	0.40	8.65	10.27	0.70	13.94
Total	119	6.88	0.33	6.21	7.54	0.70	13.94

Note: * reliability of differences between the f3 and f3-4 p = 0.004 groups, ** reliability of the differences between the f3 and f4 groups, f3-4 and f4 p <0.001

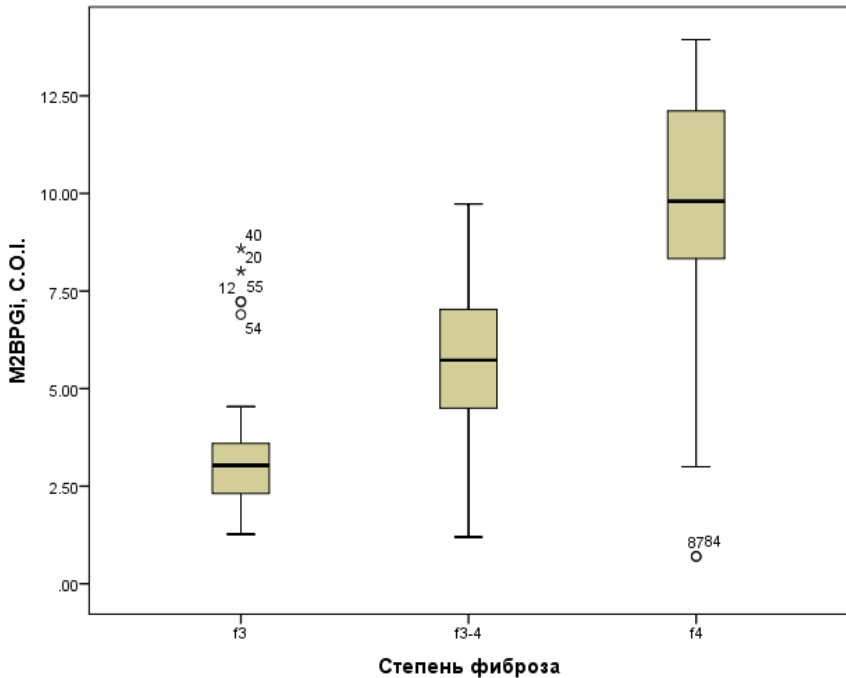


Fig. 2. The distribution of M2BPGi (C.O.I.) by fibrosis groups indicating 25% and 75% quartiles and a 95% confidence interval

Note: * significance of differences between the f3 and f3-4 groups p = 0.004

** significance of differences between the f3 and f4 groups, f3-4 and f4 p <0.001

关于地理信息学的说明
NOTES ON GEOINFORMATICS

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抽象。地理信息学的概念和地理信息技术在各种活动领域的应用实例被认为：*预测自然条件，地质研究，流行病学，生态灾难的地方。*

关键词：*地球科学，地理信息系统，航空摄影，空间测量，地质，监测。*

Abstract. *The concept of Geoinformatics and examples of application of geoinformation technologies in various fields of activity are considered: in prediction of natural conditions, in geological researches, in epidemiology, in places of ecological catastrophes.*

Key words: *Earth Sciences, geoinformation systems, aerial photography, space survey, Geology, monitoring.*

Earth science appeared long ago, at the dawn of the emergence of mankind in General and science in particular. The concept of a map of the area arose to describe the path from one object to another, including various landmarks, as well as to differentiate the possessions.

Then there were more detailed maps suitable for long journeys. Scientists created and thematic maps, which indicated minerals, habitats of animals, air and sea currents, etc. With the advent of Aeronautics began to emerge the first aerial images of the area.

When there were electronic computers, a huge amount of paper cards began to translate into electronic form. At present, this task can be considered mainly fulfilled. At the same time, new data obtained with the help of aerial photography, space photography, which is constantly being improved, are added to the images from low-flying aircraft and ground test data and sensors [2].

In computer data processing there are details that are not visible to the researcher studying conventional or digital maps without the use of computer tools. For example, the task of predicting weather conditions was previously considered unsolvable due to the large amount of data processed. Currently, the weather forecast is made with a fairly high accuracy, since mathematical models of these processes are built, and large amounts of data are collected (in the form of databases tied to electronic maps of the area) [3].

In geological studies, it is no longer necessary to have a human presence in hard-to-reach areas for the discovery of new mineral deposits. On the surface of the earth can be on the terrain, the nature of vegetation, other signs to determine the presence of certain minerals. This can be seen from images taken by space satellites in different radiation ranges.

Here is an example from epidemiology. Let's say we found a hotbed of infection. It is immediately necessary to isolate the area. That is, all flights are controlled, passengers are checked on arrival. You need to close the borders of infected areas. In parallel, it is necessary to monitor the spread of the disease: on the map the color shows the percentage of infection, in real time, new foci and numbers are indicated – the number of patients, the percentage of the population in this locality, etc. This will help to provide timely assistance to the sick, to deliver the necessary amount of drugs to the area of the epidemic.

In places of environmental disasters (for example, Chernobyl) also need geographic information systems. Very useful would be information in which areas of the area what level of radiation, and in detail, for each locality, pond, forest. This information is often unknown even to the local population. If there is a detailed map, you can avoid such places. Residents should have a detailed map of the area with the levels of danger marked in color. In addition, it is necessary to know where and how many people actually live, taking into account the age composition, for the timely provision of medical and other assistance. Also need a map of these areas to carry out actions for reduction of radiation hazard.

Next, consider the environmental safety in industrial areas. In areas of hazardous industries should be created maps of the area indicating the excess MPC of various harmful substances, as well as the wind rose and the movement of these substances within settlements. This is especially important in emergency situations where a very short period of time is needed to prevent the spread of the threat. The consequences of a possible accident or forest fire in the General case should be calculated in advance. Then it will be known what forces and where to send more effectively to minimize losses. Here, for clarity, it is better not just to show the numbers that a person needs to further process, and to simulate a visual picture of the event. To do this, a lot of preliminary work should be done, but there will be no surprises in the event of a real emergency.

Geographic information systems can be used in various fields [5]. Here are just a few examples of using GIS [4]:

administrative and territorial administration

- urban planning and design of facilities;
- maintenance of cadastres of engineering communications, land, urban planning, green spaces;
- forecast of emergency situations of technogenic-ecological character;

- management of traffic flows and urban transport routes;
- construction of environmental monitoring networks;
- engineering-geological zoning of the city.

telecommunications

- trunking and cellular services, traditional networks;
- strategic planning of telecommunication networks;
- selection of the optimal location of antennas, repeaters, etc.;
- determination of cable routing;
- network health monitoring;
- operational dispatch control.

engineer communication

- assessment of water and sanitation needs;
- modeling the impact of natural disasters on utility systems;
- engineering network design;
- monitoring of the state of engineering networks and prevention of emergency

situations.

transport

- road, rail, water, pipeline, air transport;
- transport infrastructure management and development;
- fleet management and logistics;
- traffic management, route optimization and cargo flow analysis.

gas complex

- exploration and field exploration;
- monitoring of technological modes of oil and gas pipelines;
- design of trunk pipelines;
- modeling and analysis of the consequences of emergency situations.

power department

- rapid response services, armed forces, police, fire services;
- planning of rescue operations and protection measures;
- simulation of emergency situations;
- strategic and tactical planning of military operations;
- navigation of rapid response services and other law enforcement agencies.

ecology

- assessment and monitoring of the state of the natural environment;
- modeling of environmental disasters and analysis of their consequences;
- planning of environmental protection measures.

forestry

- strategic forest management;
- the management of harvesting, planning approaches to forest and road engineering;
- maintenance of forest inventories.

agriculture

- planning of agricultural land cultivation;
- registration of landowners and arable land;
- optimization of transportation of agricultural products and mineral fertilizers.

An outline of the use of GIS in various areas of human activity was provided. Almost any kind of activity will benefit from the use of geoinformation technologies([1], [6], [7]).

References

1. *All-Russian scientific and practical conference "Geoinformation systems in the modern world»* URL: <http://www.econf.rae.ru/conference/880>
2. Kapralov E.G. *Geoinformatika: v 2 kn. Kn. 1: uchebnikdlya stud. vyssh. ucheb. zavedeniy.* / [E.G. Kapralov, A.V. Koshkarev, V.S. Tikunovi dr.]; pod red. V.S. Tikunova. – 3-e izd., pererab. idop. – M.: :Izdatel'skiytsentr «Akademiya», 2010. – 400 s. - 2500 ekz. -ISBN 978-5-7695-6468-0.
3. Kapralov E.G. *Geoinformatika: v 2 kn. Kn. 2: uchebnikdlya stud. vyssh. ucheb. zavedeniy.* / [E.G. Kapralov, A.V. Koshkarev, V.S. Tikunovi dr.]; pod red. V.S. Tikunova. – 3-e izd., pererab. idop. – M.: Izdatel'skiytsentr «Akademiya», 2010. – 432 s. – 2500 ekz. - ISBN 978-5-7695-6820-6.
4. Mironova Yu.N. *Geoinformacionnyesistemy // Aktual'nyeproblemygumanitarn yhiestestvennyhnauk №03 (62) 2014 Ch.I., Moskva, s. 63-65.*
5. Mironova Yu.N. *Geographic information systems and their classification // International Journal Of Applied And Fundamental Research. – 2016. – № 1 – URL: www.science-sd.com/463-24961 (26.04.2016).*
6. Mironova Yu.N. *Geo-information systems applied in competitive orienteering // Theory and Practice of Physical Culture № 3 2018. – URL: http://www.teoriya.ru/ru/node/8139*
7. Mironova Yu.N. *Use of fuzzy sets in modeling of GIS objects // International Conference Information Technologies in Business and Industry 2018 / Journal of Physics: Conference Series. 1015 (2018) 032094. - URL: http://iop-science.iop.org/article/10.1088/1742-6596/1015/3/032094doi :10.1088/1742-6596/1015/3/032094*

理论力学在机械系统计算中的应用方法

**APPLICATION METHODS OF THEORETICAL MECHANICS
TO THE CALCULATION OF MECHANICAL SYSTEMS**

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注解。文章介绍了使用力学变分原理计算用于生产硅砖的压力机的动态特性的实例。

关键词：硅酸盐砖生产压制机理，运动方案，硅酸盐混合物上的活塞压力，动力学特性，机构动能，发生力，可能位移原理，D'alambert原理，第二类拉格朗日方程，均衡方程。

Annotation. *Article presents an example of calculating the dynamic characteristics of the pressing mechanism of a press for the production of silica brick using variational principles of mechanics.*

Keywords: *pressing mechanism for silicate brick production, kinematic scheme, force of piston pressure on silicate mixture, dynamic characteristics, kinetic energy of the mechanism, generalized force, principle of possible displacements, D'alambert principle, Lagrange equation of the second kind, equilibrium equation.*

Theoretical mechanics is a basic discipline for the study of other sciences: the resistance of materials, machine parts, etc. The methods of theoretical mechanics are the basis of the known methods of forces and displacements of the resistance of materials. However, the methods and principles of theoretical mechanics not only serve as the basis for the methods of applied mechanics, but in some cases they significantly simplify the solution of mechanical problems. It is especially convenient to use the variational principles of mechanics for the analysis of the motion of mechanical systems.

In this article we will not dwell on the description of the variational principles of mechanics. They are in the special literature [1; 2]. We will show their application to the calculation of the actual mechanism of pressing the press for the production of silica brick. To calculate any real mechanism means to be able to find the speeds and angular velocities of its links, the dynamic reactions arising in the links imposed on the links of the mechanism.

The basis for the calculation of any mechanism is its kinematic scheme. It is a mechanical model of a real mechanism. Consider the kinematic scheme of the pressing mechanism, presented in Fig. 1.

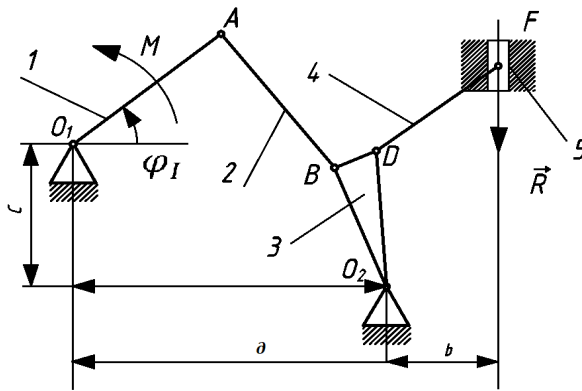


Fig. 1. Kinematic scheme of the pressing mechanism

The mechanism consists of the following links: O_1A and O_2BD – cranks, AB and DF – rods, F – piston. Cranks O_1A and O_2BD perform rotational movement, the connecting rods AB and DF - plane-parallel movement, the piston F – translational movement.

The driving link is the crank O_1A , to which torque M is applied from the electric motor. The position of the mechanism is determined by the angle φ_1 , that is counted from the horizontal axis counterclockwise

As an example, consider the position of the mechanism when $\varphi_1 = 45^\circ$.

The initial data for the calculation are as follows: $M = 30PH\cdot m$, $O_1A = l_1 = 4\text{ cm}$, $AB = l_2 = 7,5\text{ cm}$, $O_2B = l_3 = 7,5\text{ cm}$, $DF = l_4 = 8\text{ cm}$, $a = 10,5\text{ cm}$, $b = 2,3\text{ cm}$, $c = 2,8\text{ cm}$,

$P_1 = 2PH$, $P_2 = 3PH$, $P_3 = 8PH$, $P_4 = 2,5PH$, $P_5 = 0,5PH$, if P -coefficient of proportionality, which determines the weight of each of the rods of the mechanical system.

The tasks for calculating the mechanism were:

- 1) finding the force applied to the slider F, corresponding to the equilibrium position of the whole mechanism;
- 2) determination of piston acceleration F with an increased value of torque M;
- 3) determination of dynamic reactions in the hinged joints of the mechanism.

This mechanical system is a system with one degree of freedom..

To solve the first problem, we use the principle of possible displacements.:

$$\sum_{k=1}^n \delta A_k = \sum \bar{F}_k \cdot \delta \bar{r}_k = 0. \quad (1)$$

The mechanism under consideration is under the action of a system of balancing forces: the forces of gravity of the links P_1, P_2, P_3, P_4, P_5 , torque M, reactions of the supports and force R applied to the piston.

It should be said about the mechanical sense of the force R. This is a force equal to the force of the pressure of the piston on the silicate mixture in the form for pressing a brick.

We give the system the possible displacements $\delta\varphi_1$ and express the possible displacements of the links: crank O_2BD as the quantity $\delta\varphi_3$, connecting rods $A-B$ and $D-F$ respectively - $\delta\varphi_2$ and $\delta\varphi_4$ and translational displacement of the piston F, determined by the value δS_F , through $\delta\varphi_1$. To do this, use the position of the instantaneous turning centers of the links of the mechanism.

According to equality (1) we make up the equation of work for a given mechanism:

$$M\delta\varphi_1 - \frac{1}{2}P_1 \cos \varphi_1 \delta S_A - P_2 \cos \varphi_2 \delta S_{C_2} - P_3 \cos \varphi_3 \delta S_{C_3} - P_4 \cos \varphi_4 \delta S_{C_4} - P_5 \delta S_F - R\delta S_F = 0 \quad (2)$$

Based on the constructed instantaneous turning centers, we calculate and express the possible movements of all points of the mechanism through the movement of point A, from where we get:

$$\begin{aligned} \delta\varphi_1 &= \frac{\delta S_A}{l_1} = 0,25\delta S_A; \delta S_{C_2} = \frac{\delta S_A}{AP_2} \cdot l_2 P_2 = 0,915\delta S_A; \\ \delta S_B &= \frac{\delta S_A}{AP_2} \cdot BP_2 = 0,816 \delta S_A; \delta S_{C_3} = \frac{\delta S_B}{BO_2} \cdot l_3 O_2 = 0,416 \delta S_A; \\ \delta S_D &= \frac{\delta S_B}{BO_2} \cdot DO_2 = 0,471 \delta S_A; \delta S_{C_4} = \frac{\delta S_B}{DP_4} \cdot P_4 l_4 = 0,53\delta S_A; \\ \delta S_F &= \frac{\delta S_D}{DP_4} \cdot P_4 F = 0,597\delta S_A. \end{aligned} \quad (3)$$

Substituting the original data and expressions (3), equation (2) after reduction by the common factor $\delta S_A \neq 0$ the equality takes the form:

$$7,5P - 0,707P - 2,328P - 0,412P - 1,315P - 0,249P - 0,59R = 0 \quad (4)$$

From where we find the force $R = 4.085 H$.

To drive the pressing mechanism, we increase the amount of torque applied to the crank O_1A by 10%, i.e. accept $M = 33PH \cdot m$.

To determine the acceleration of the piston F, we use the Lagrange equations of the second kind.

Since the considered pressing mechanism is a system with one degree of freedom, the equation takes the form:

$$\frac{d}{dt} \left(\frac{\partial T}{\partial q_I} \right) - \frac{\partial T}{\partial q_I} = Q_{q_I} \quad (5)$$

Taking for the generalized coordinate the displacement of the point F, we get:

$$\frac{d}{dt} \left(\frac{\partial T}{\partial S} \right) - \frac{\partial T}{\partial S} = Q_S \quad (6)$$

where T is the kinetic energy of the mechanism, Q_S - is the generalized force corresponding to the displacement of S.

Let's calculate the value of the kinetic energy of the mechanism as a function of the generalized velocity S. The kinetic energy of the system under consideration will be equal to:

$$T = T_1 + T_2 + T_3 + T_4 + T_5 \quad (7)$$

The kinetic energies of the links of the mechanism will be equal

crank O_1A : $T_1 = \frac{1}{2} J_{O1} \omega_1^2$; crank O_2B : $T_3 = \frac{1}{2} J_{O2} \omega_3^2$;

connecting rod AB: $T_2 = \frac{1}{2} J_{C_2} \omega_2^2 + \frac{1}{2} m_2 V_{C_2}^2$; connecting rod DF: $T_4 = \frac{1}{2} J_{C_4} \omega_4^2 + \frac{1}{2} m_4 V_{C_4}^2$;

slider F: $T_5 = \frac{1}{2} m_5 V_F^2$.

Taking into account the kinetic scheme of the mechanism, we calculate the values of kinetic energies as a function of the generalized velocity $V_F = \dot{S}$

$$T_1 = \frac{1}{2} \cdot \frac{1}{3} \cdot m_1 l_1^2 \cdot \frac{V_A^2}{l_1^2} = 0,333 m V_F^2; T_3 = 0,207 m V_F^2;$$

$$T_2 = \frac{3m}{24} \left(J_2 + \left(\frac{7,5}{12,9} \right)^2 \right) V_{C_2}^2 = 1,891 m V_F^2; T_4 = \frac{2,5m}{24} \left(12 + \left(\frac{8}{24,4} \right)^2 \right) V_{C_4}^2 = 1,354 m V_F^2;$$

$$T_5 = \frac{1}{2} \cdot 0,5 m V_F^2.$$

Then the kinetic energy of the system will be equal to: $T = 2,274 mV_F^2$.

To determine the generalized force, we find the sum of the work of all forces on the possible displacement δS_A . Will have:

$$\sum \delta A_{SF} = M \frac{\delta S_A}{l} - P_1 \frac{l_2}{2} \cos \varphi_1 \frac{\delta S_A}{l_1} - P_2 \cos \varphi_2 \delta S_3 - P_3 \cos \varphi_3 \delta S_3 - P_4 \cos \varphi_4 \delta S_4 - P_5 \delta S_F - R \delta S_F. \quad 8$$

Given the expression (3), $\sum \delta A_{SF} = 0,751 P \delta S_A$, from where we define

$$Q_S = \frac{\sum \delta A_{SF}}{\delta S_A} = 0,751 P, \text{ and then we find:}$$

$$\frac{\partial T}{\partial S_A} = 2,274 mV_A = 4,548 mV_A; \quad \frac{\partial T}{\partial S} = 0.$$

Substituting the values found in equation (6), we obtain:

$$4,548 \frac{P}{g} a_F = 0,751 P, \text{ from here: } a_F = 0,165 g = 1,62 \text{ m/s}^2.$$

To determine the dynamic reactions in the hinged joints of the mechanism, we use the D'Alambert principle. To this end, in accordance with the principle, we apply to all links of the mechanism of inertia force:

$$\begin{aligned} F_1 &= m_1 \omega_1^2 \frac{l_1}{2}; \quad F_1 = \frac{1}{12} m_1 l_1^2 \varepsilon_1; \\ F_2 &= m_2 a_{C_2}; \quad M_2 = J_{C_2} \varepsilon_4 = \frac{1}{12} m_2 l_2^2 \varepsilon_2; \\ F_3 &= m_3 a_{C_3}; \quad M_3 = J_{C_3} \varepsilon_3 = \frac{1}{18} \left(3 \left(\frac{O_2 B}{2} \right)^2 + \frac{B}{C^2} \right) m_3 \varepsilon_3; \\ F_4 &= m_4 a_{C_4}; \quad M_4 = J_{C_4} \varepsilon_4 = \frac{1}{12} m_4 l_4^2 \varepsilon_4; \\ F_5 &= m_5 a_{C_5} = m_5 a_F. \end{aligned}$$

Express the angular velocities of the links of the mechanism through the angular velocity ω of the crank O_1A . The angular accelerations and accelerations of the centers of mass are found by constructing a plan for the accelerations of the mechanism.

Using the principle of exemption from bonds, we apply the reaction of bonds in the O_1 and O_2 points

$$\bar{R}_{01} = \bar{X}_{01} + \bar{Y}_{01}; \quad \bar{R}_{02} = \bar{X}_{02} + \bar{Y}_{02}; \quad \bar{R}_F = \bar{X}_F + \bar{Y}_F.$$

Similarly, the reactions of internal bonds at points A, B, D are decomposed into two components: vertical and horizontal.

$$\bar{R}_A = \bar{R}_{Ax} + \bar{R}_{Ay}; \quad \bar{R}_B = \bar{R}_{Bx} + \bar{R}_{By}; \quad \bar{R}_D = \bar{R}_{Dx} + \bar{R}_{Dy}.$$

Making equations of equilibrium for each link and solving the resulting system, we find all the reactions. Equilibrium equations for links have the form:

$$\text{link } AB: \begin{cases} \sum F_{kxx} = 0 \\ \sum m_A(\overline{F_k}) = 0 \\ \sum m_B(\overline{F_k}) = 0 \end{cases}; \text{ link } O_1A: \begin{cases} \sum F_{kxx} = 0 \\ \sum F_{ky} = 0 \\ \sum m_{O_1}(\overline{F_k}) = 0 \end{cases};$$

$$\text{link } DF: \begin{cases} \sum F_{kxx} = 0 \\ \sum m_D(\overline{F_k}) = 0 \\ \sum m_F(\overline{F_k}) = 0 \end{cases}; \text{ link } O_2BD: \begin{cases} \sum F_{kxx} = 0 \\ \sum F_{ky} = 0 \\ \sum m_{O_1}(\overline{F_k}) = 0 \end{cases};$$

$$\text{piston } F: \begin{cases} \sum F_{kxx} = 0 \\ \sum F_{ky} = 0. \end{cases}$$

This article provides an example of applying the methods of analytical mechanics to calculate the real mechanism. The results of this work were used to train students in the course “Variational principles of mechanics” of Belgorod State Technological University [3].

References

1. Polak, L.S. *Variational principles of mechanics: Their development and applications in physics.* - 2nd ed. - Moscow: Book house "LIBROCOM", 2010. - 600 p.
2. Berezkin, E.N. *The course of theoretical mechanics.* – 2nd ed. - Moscow: MSU, 1974. – 645 p.
3. Akhtyamov, A.V. *Variational principles of mechanics: study guide* / A.V. Akhtyamov, L.N. Spiridonova, E.N. Novikov. - Belgorod: BGTU publishing house, 2012. - 56 p.

用MPI研究频率控制EMVE非线性元件的相互影响

INVESTIGATION OF MUTUAL INFLUENCE OF NONLINEAR ELEMENTS OF FREQUENCY-CONTROLLED EMVE WITH MPI

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注解。 在本文中,我们考虑了研究元素的非线性特征的相互影响的问题以及消除或减少它们对具有单相并行库存(MPI)的电磁振动激励器(EMVE)的操作模式的负面影响的方法。 这使您可以进入EMVE MPIE的节能模式,这是一种与非线性元件形成许多相互关联的谐振电路的电抗元件。

关键词: 电磁弧按摩器,单相并联逆变器,非线性电路,电路振荡。

Annotation. *In this paper, we consider the issue of studying the mutual influence of nonlinear characteristics of elements and ways to eliminate or reduce their negative effects on the modes of operation of Electromagnetic vibration exciter (EMVE) with a monophasic parallel inventory (MPI). This allows you to energy saving mode of EMVE MPIE, reactive elements which form many mutually related resonant circuits with nonlinear elements.*

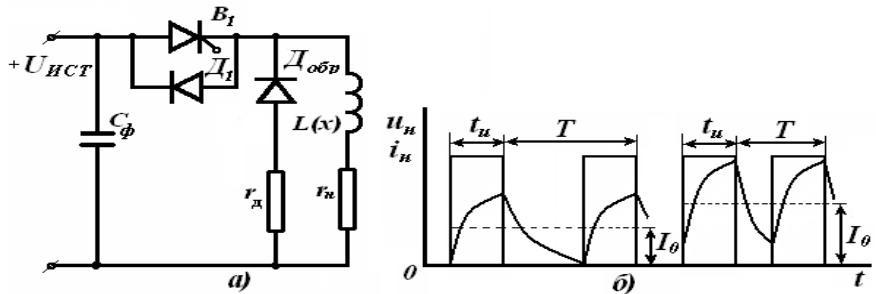
Key words: *Electromagnetic vibrio-massager, monophasic parallel inverter, however, nonlinear circuit, the circuit oscillation.*

The intensive development of the economy of the independent Republic of Uzbekistan provides for the modernization of production processes, the widespread introduction into production of modern technologies that ensure the production of high-quality and competitive products with minimal expenditure of energy resources. In vibration machines (VM) with an electromagnetic vibration exciter (EME), in the resonant zone the amplitude of vibration repeatedly increases - displacement, speed and acceleration of operating organ, useful mechanical power and performance; significantly reduced specific power loss. Ensuring the harmonic form of currents and voltages in the elements of the system, allows you to get energy-saving mode of

EMVE with MPI, the reactive elements of which form a set of interconnected oscillatory circuits with nonlinear elements. The question of studying the mutual influence of the nonlinear characteristics of elements and ways to eliminate or reduce their negative effects on the performance of EMVE with an MPI are relevant.

The research teams dedicated to the study of the properties of controlled EMEs were led by professors N.Kh. Bazarov, A.V. Bauman, I.I.Bleykhman, I.I.Bykhovsky, M.Ibodullaev.

However, studies of the mutual influence of nonlinear elements of frequency-controlled EMVE with the MPI, as a single oscillatory multi-loop system and the development on the basis of them of the MPI using the latest controlled valves have not been conducted. Unlike pulse-width interrupters, where non-lockable thyristors are used, in order to improve them, we propose using them with lockable gates and proposing new circuit solutions. Proceeding from the production and technological needs, for the power supply of the electromagnetic energy source with bias, the developed irreversible SHIP allows the following:



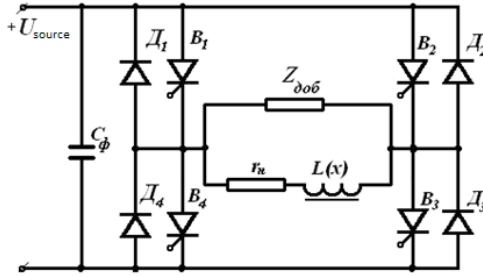
a) Interrupter with lockable thyristor b) voltage change graph

- change the value of the period T of the repetition of rectangular pulses or control the magnitude of the frequency, thereby controlling the tuning process in the resonant mode of the electromagnetic wave, leaving the pulse duration unchanged. At the same time, in contrast to the use of the circuit in DC machines, where the DC component of the current is dominant, in EMVE, the DC component of the current is proposed to be suppressed using an additional resistor r_{D} ;

- it is proposed to change the frequency value - to control the setting in the resonant mode, while simultaneously changing the duty cycle of the voltage pulse
- to control the bias current I_{θ} , thereby controlling the maximum amplitude of oscillations of the working body in the resonant mode.

For reactive EMVE, it is proposed in the work to use a reverse direct current SHIP with lockable thyristor (Fig. 2a).

In them, alternately unlocking and locking two pairs of thyristors B1-B3 and B2-B4 allows to obtain an alternating rectangular voltage (Fig. 2, b and c). Frequency control of the EMVE winding voltage allows you to adjust the EMVE in the resonant mode, by shifting the phase of the control signals to change the duty cycle of the voltage being generated, thereby controlling the value of the constant current component in the EMVE winding, therefore, controlling the amplitude of oscillations of the vibrator machine.



a) Scheme of the pulse-width dc converter with lockable thyristor

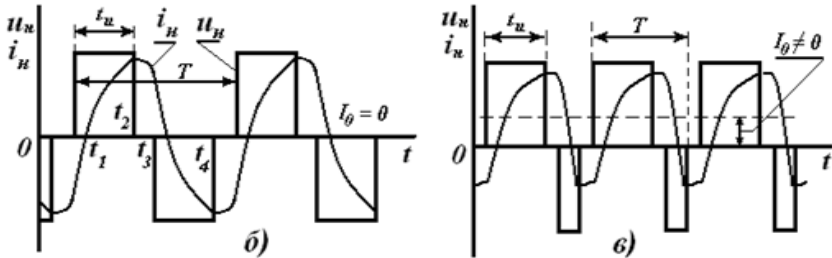


Fig.2. b), c) Graphs of voltage currents

If at time t_1 (fig.2, b) a pair of thyristors B1-B3 is turned on (fig.2, a), then a load current i flows through the main winding $r_H - L(x)$ EMVE. At the moment of time t_2 (fig.2, b) the locking signal closes the pair of thyristors B1-B3 and the winding EMVE opens. If in the circuit there is no resistance Z_{dob} necessary for damping the stored magnetic energy in the load, then at the terminals of the inductance and the pair of thyristors B1-B3 appears emf. much larger magnitude, which can lead to the breakdown of thyristors and winding insulation.

At time t_3 , another pair of thyristors B2-B4 is opened (Fig. 2a), and a load current in the opposite direction begins to flow through the winding $r_H - L(x)$ of the EMVE. So the process of unlocking and locking the thyristors is periodically repeated (Fig. 2, b and c).

Due to the occurrence of overvoltage, additional requirements are imposed on the installation: it is necessary to choose controlled valves and insulation of the high-voltage EMVE winding.

To eliminate the overvoltage on the thyristors and in the winding of the EMVE, it is necessary to have an additional resistance Z_{dob} , which leads to additional losses and unreasonable overestimation of the installed capacity of the unit. Another way to eliminate over-voltage is to simultaneously lock the previous pair and unlock the next pair of thyristors. The third way to eliminate overvoltage is the presence of reverse diodes connected in anti-parallel with controlled valves. In this case, the energy stored in the inductance is returned to the source or to the smoothing capacitance of the SF.

When a single thyristor pair is unlocked, electrical energy from a DC voltage source with a CF filter capacitor enters parallel reactive elements $Ck-L(x)$ with an active resistance r_{Hr} . Part of the energy is converted into useful mechanical power and transmitted to the working body of the VM. Another part of the energy is consumed in the form of heat in the core of the electromagnet (loss in steel), in the active resistance of the winding r_H and the switching active resistance of r_k . The rest of the energy is returned (energy recovery) to the filter capacitor through reverse diodes. When unlocking another pair of thyristors, the processes of consumption and exchange of energy will be similar.

The use of such a scheme for powering an EMVE with bias makes it possible to simultaneously adjust an EMER to a resonant mode and control the maximum amplitude of the vibration of the working member. This leads to the improvement of technical and economic indicators of the vibratory machine, the establishment of effective modes of operation, reduction of energy losses, a significant improvement in weight and dimensional parameters of EMVE by combining the flow of alternating and direct currents in one winding leads to a reduction in the number of bias windings. However, the presence of non-sinusoidal current in the winding EMVE leads to additional losses. To create an energy-saving system "MPI-EMVE", it is necessary to provide a sinusoidal current and voltage EMVE - reducing energy losses in the elements of this system from higher harmonic currents. Attempts to improve the shape of the current in the winding by applying output filters led to deterioration in the stability of the circuit, switching failures. This is due to the complex processes associated with the mutual influence of the reactive elements of the frequency converter with the nonlinear inductance EMVE, forming electromagnetic resonant circuits and mechanical oscillatory (resonant) system. The basis of the power scheme of the MPI was taken the same scheme in Figure 2, *a*. In the proposed scheme, the MPI periodic current, under certain conditions, can take a strictly harmonic form with the required frequency and amplitude. To determine these conditions, the operation of a mono-phase parallel inverter with EMVE is considered as several interconnected oscillatory circuits with nonlinear elements. These include both the essentially non-linear and periodically changing elements of the load itself - the electromagnetic vibration exciter, and the main, auxiliary, switching and filtering elements of the MPI itself.

These conditions include:

1. The need to meet the basic requirements of the process load - maintaining the mechanical resonance mode and the required magnitude of the vibration amplitude, while simultaneously controlling the frequency and voltage amplitude of the MPI under various load conditions.

2. The need to maintain the electromagnetic resonant mode in a parallel oscillating circuit MPI " $L(x) - C_k$ " with changes in the switching frequency of the controlled keys MPI necessary to maintain the resonant frequency of the load voltage.

The fulfillment of this condition ensures the harmonic form of the voltage and the load current — the mode of resonant energy exchange between the load inductance and the switching capacitor capacitance is set.

3. The need to maintain the electromagnetic resonant mode in a series oscillatory circuit " $L(x) - C_k$ " to ensure the power pulse through controlled MPI keys — the current of the required duty cycle, when the switching frequency of the controlled MPI keys changes, by adjusting certain parameters of the electrical circuit.

Studies of electromagnetic processes in the MPI, with an arbitrary form of the load current, taking into account the nonlinearity of the characteristics of the elements, allowed separately to write the nonlinear differential equations of mechanical (1) and electrical oscillatory circuits:

$$L_H(x)C_k \cdot du^2 / dt^2 + r_H C_k \cdot du / dt + u = 0, \quad (1)$$

with frequency of free oscillations $\omega^2 = \omega_0^2 = \frac{1}{C_k L_H(x)}$ and

$$L_H(x)C_k \cdot du^2 / dt^2 + r_H C_k \cdot du / dt + u = U_{HCT}, \quad (2)$$

with frequency of free oscillations

$$\omega_{\phi 0}^2 = \frac{1}{C_{\phi} [L_k + L_H(x)]}. \quad (3)$$

Solving the system differential equation (1) - (2) relative to the current flow-

ing through the valves $n_k \left[\frac{df(t)}{dt} \right] = jk\omega \hat{F}_k$, taking into account (where is the

complex image), taking the starting point of the valve unlocking as the origin, it is possible to determine the effective value of the current of the k-harmonic

$$i_k = \frac{4U_{source} \left(\frac{j\omega}{L_H(x)L_k C_{\phi}} - \frac{jk^2 \omega^3}{L_k} - \frac{r_H k \omega^2}{L_H(x)L_k} \right)}{F}, \text{ Where}$$

$$F = \pi \left\{ j \left[\left(\frac{r_H}{L_H(x)L_k C_k} + \frac{r_H}{L_H(x)L_k C_{\phi}} \right) k\omega - \frac{r_H}{L_H(x)} k^2 \omega^3 \right] + \right\}$$

$$+ k^4 \omega^4 \left(\frac{1}{L_H(x)C_k} + \frac{1}{L_\phi C_k} + \frac{1}{L_\phi C_\phi} \right) k^2 \omega^2 + \frac{1}{L_H(x)C_k L_\phi C_\phi} \}. \quad (4)$$

The dependence (4) allows determining the harmonic components of the load current and their initial phases for any values of the parameters. It involves all the parameters of the MPI and the orders of all higher harmonic load currents.

Solving the problem of minimization for each particular component of the current (4) we find the specific numerical values of each of the L_k, C_k and C_k of the parameters of the circuit of the PGI for certain values, $LH(x)$ of the load $\omega = \omega_0 = 2\pi f$ and voltage frequency.

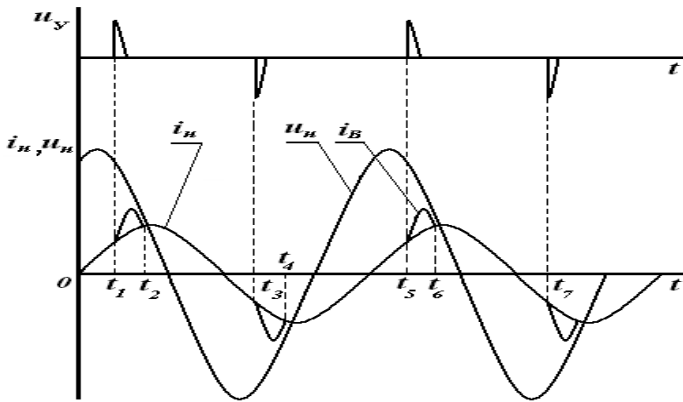


Fig.4. Voltage and current output forms

On the basis of the NL differential equations of oscillatory circuits (1) - (2) and EMVE (1), a mathematical model of an MPI with frequency-controlled EMVE was developed. The calculation algorithm was compiled using the Runge-Kutta method and the mathematical model program in Basic language was solved on a computer using the RUNGE-KUTTA method. In this case, the parameters of the MPI scheme were selected from conditions (4). According to the calculation on the computer, graphs of the output values were built - currents and voltages at the terminals of the EMVE winding (Fig. 4).

An indispensable condition for the stable operation of such a circuit with the listed oscillatory circuits is the sufficiency of the electric power supplied by the half-cycle of the current into the oscillating circuit to convert this power into the useful mechanical work of an electromagnetic wave.

To ensure that this condition is met, the frequency and parameters in expressions (2) and (3) should be chosen in such a way that the electric power of the B1-B3 and B2-B4 gates was no less than the effective mechanical power at the output of the EMVE, plus the total power loss emitted in the windings, the magnetic core, for the mechanical losses of the EMVE and the so-called additional losses.

Studies of the mathematical model to determine the degree of influence of individual nonlinearities of parameters of an electromagnetic-wave on the operating modes of a mono-phase parallel inverter were carried out in the following sequence.

At the beginning, the nonlinearities of only one EMVE element were set, leaving the others linear. The shapes of the current, voltage and magnetic flux curves in various elements of the magnetic circuit, the degree of their separate influence on the operating modes of the MPI were determined. So the degree of nonlinearity was considered due to:

- Saturation of the magnetic circuit;
- Changes in the magnetic conductivity of the working air gap;
- Periodic change of load inductance $L(x)$.

Then, the nonlinearities of all the above parameters were set simultaneously, and their degree of influence on the stable locking of the MPI controlled gates was determined.

The proposed method of taking into account the nonlinear characteristics of the elements and the developed scheme of a pulse-width converter for powering a frequency-controlled reactive single-ended EMVE makes it possible to significantly reduce the current value of the controlled chopper valve, thereby reducing the installed power of the converter at other constant load values.

Conclusion

The results of studies of the modes and nature of the nonlinear characteristics of the elements of a reverse pulse-width dc interrupter supplying frequency-controlled EMVE make it possible to obtain a mathematical model of the installation, which is used to determine the rational values of currents in various elements and during the EMVE operation modes. The developed mathematical model of a frequency-controlled electromagnetic vibration exciter with a mono-phase parallel inverter allows taking into account the substantially nonlinear characteristics of the elements of the MPI-EMVE system - the saturation of the magnetic system.

References

1. Alimhodjaev K.T. *Frequency-controlled vibration motors AC, Diss. on the competition edu. step. Dr. tech. Science, Tashkent: 2004, pp.392-394.*
2. Tatur T.A. and Tatur V.E. *Steady and transient processes in electrical circuits, Tutorial, M.: Higher, 2001, pp.407-410.*
3. Oreshnikov V.G. *The method of successive approximations for the study of periodic modes of nonlinear circuits, Electro mechanics, 2001, No. 3. pp. 42-46.*

超大货物运输问题

**PROBLEMS OF TRANSPORTATION OF OVERSIZED AND
HEAVY CARGO**

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注解。 考虑“超大货物”的概念。 确定了超大型和重型货物的运输问题。 如超大货物运输对交通事故的影响，交通安全，速度，车辆的不一致性与现代技术要求有关。 还经常改变立法，在联邦公路上引入柏拉图，建立和更换行车记录仪，获得特殊的运输许可证。 解决超大货物运输问题的途径。

关键词：超大货物，重型货物，车辆，立法，超大货物运输，安全，解决方案。

Annotation. *The concepts of "oversized and heavy cargo" are considered. The problems of transportation of oversized and heavy goods are identified. Such as the impact of the transport of oversized and heavy cargo on traffic accidents, traffic safety, speed, inconsistency of the vehicle fleet with modern technical requirements. Also often changing legislation, the introduction of Plato on federal highways, the establishment and change of tachographs, obtaining a special permit for transportation. Ways to solve the problems of transportation of oversized and heavy cargo.*

Keywords: *oversized cargo, heavy cargo, vehicles, legislation, transportation of oversized and heavy cargo, safety, solutions.*

In modern conditions in the Russian Federation, road freight transport is a powerful complex of technical means and road infrastructure, which is a part of the country's unified transport system. Its carrying capacity is growing every year. Carrying out more than half of the transportation of all goods of the country, freight transport in the main sectors of the economy has no alternative not only in road, but also in multimodal traffic.

One of the most problematic tasks in the field of road haulage is currently the transport of oversized and heavy cargo.

On each type of transport, taking into account the conditions of traffic safety, the weight and size standard values are established, contributing to the normal functioning of vehicles, ways specifically adapted for them, the entire infrastructure of this type of transport [1]. This is due to the areas of application and regulated rules for the transport of various goods on each type of transport, as well as their technical features. The minimum and maximum limitations of the weight and size parameters of the road make it possible to classify a vehicle with or without a load, as well as a load itself, into a special category called oversized and (or) heavy.

For domestic transport by road, the concept of “oversized heavy cargo” is defined by several domestic documents, namely the Traffic Regulations of the Russian Federation, which is the main document, and the Rules for the transport of goods by road (Resolution of the Government of the Russian Federation of April 15, 2011).

According to the rules of the road, loading capacity and carrying capacity of 2.55 m (2.6 m for refrigerators and isothermal bodies), height 4 m from the surface of the carriageway, the length (including one trailer), 20 m, or movement throughout, and also, the movement of cargo vehicles by more than 2 meters, as well as the movement of road trains with two or more trailers, is carried out in accordance with special rules.” The term “heavy” in the wording of the Rules of the road is not defined.

Currently, the Ministry of Transport of the Russian Federation has developed Rules for the transport of goods, including oversized and heavy cargo [1]. So, in the Regulation of the Government of the Russian Federation №. 12 dated January 9, 2014, from January 1, 2015, in the Rules for the carriage of goods by road dated April 15, 2011 No. 272, the following notions of “oversized heavy cargo” are given:

- heavy cargo - a cargo whose weight, taking into account the vehicle mass, exceeds the maximum permissible vehicle masses or permissible axle loads of vehicles;
- oversized cargo - a cargo that, taking into account the dimensions of the vehicle, exceeds the maximum permissible dimensions of the vehicles.

The term “heavy cargo” is defined by the axial and total mass of the vehicle, taking into account the distances between the axles. This is determined by the need to protect the roads and its artificial structures. Maximum weight is 40 tons [1].

In general terms, it is possible to define “oversized heavy cargo” as an indivisible cargo, or cargo in the transport position, or the vehicle itself, the weight and dimensions of which exceed at least one of the indicators established by the conditions of traffic safety on each type of transport of the country's transport system.

Based on all of the above, heavy and oversized cargoes are those, the weight and dimensions of which, together with the vehicle, exceed the following parameters:

- height - more than 4 m;
- length - more than 20 m (a cargo overhang of 2 m is allowed, if the total length does not exceed 20 m);
- width - more than 2.55 m;
- weight of the cargo with the vehicle - more than 40 tons.

There are a lot of problems when transporting oversized and heavy goods. One of them is traffic accidents involving large and heavy vehicles, which are always marked by severe consequences, injuries and death, damage to vehicles and infrastructure [1].

An important factor affecting traffic safety and reducing the number of accidents during transportation of oversized and heavy cargoes, is the speed of movement of motor vehicles. In accordance with the Rules of the road of the Russian Federation, the speed of movement on bridges should not exceed 15 km/h, and on roads 60 km/h. But the allowed mode of movement may be variable in different parts of the route.

Therefore, in order to improve road safety, one of the most important decisions is to limit the maximum speed to 50 km/h on roads, to 20 km/h on the enterprise's territory and when turning to 15 km/h, in order to avoid a coup and a departure of the cargo being transported from the platform trailer. But road accidents often occur through the fault of the road users themselves. In this case, it is necessary to introduce stricter rules and high penalties for violations, which would entail a speed limit on the roads, following the rules of the road.

Also, the problems of oversized and heavy transport should include the mismatch of the vehicle fleet with modern requirements and operating conditions [3]. The average age of trucks exceeds 11 years, half of the fleet is not in demand, a significant part of them falls into the category of depreciated funds and must be written off. The structure of the vehicle fleet by body type, capacity, quality and type of fuel consumed is characterized as imperfect. Quite a lot of trucks on the technical characteristics, namely capacity, is considered low, which entails a rise in the cost of travel heavy equipment for damage to the road. If we analyze the growth of the freight vehicle fleet and the volume of work performed by it, then we can conclude that there is a sharp decrease in output per vehicle or per tonne of its carrying capacity. This is due to the fact that almost 60% of the truck fleet is in the personal use of individuals. This situation has led to an aging fleet of motor vehicles due to inadequate write-off of depreciated cars, deterioration of its technical condition due to the destruction of the system of maintenance and repair. The motor transport strategy until 2030 provides for a reduction in the average age of the truck fleet for the period 2016–2030 from 11.2 to 8.5 years, which will increase the output by one ton of vehicle carrying capacity by 8-10%.

The level of compliance with environmental standards is also very low.

In the structure of the fleet of freight vehicles, more than 27% are vehicles with a gross weight of more than 12 tons. After the introduction of the Platon system, the owners of such trucks are mostly obliged, according to Russian legislation, to pay the fixed fee for 1 km of federal highway traffic as compensation for damage. To implement this system of charging, all these vehicles must be equipped with GLONASS / GPS onboard devices that provide electronic control over the movement of vehicles on federal roads. This entails additional costs, which falls on the shoulders of vehicle owners.

The cargo carriers did not have time to adapt to the new conditions of the game, as from July 1, 2016, the Order of the Ministry of Transport of the Russian Federation No. 348 “On Amending the Procedure for Equipping Vehicles with Tachographs” enters. Replacing analog tachographs with digital controllers on one road train costs, on average, about 40-50 thousand rubles. It is not entirely clear why it is necessary to change the tachographs on all vehicles, because you can also leave them on those vehicles where they already exist, and install new tachographs on the release of new trucks.

A big problem for truck owners is obtaining a special permit for transporting oversized and heavy cargo. Special permission is important from the point of view of the owner of the road. Oversized and heavy loads can damage bridges, viaducts, power lines, forest roads, etc. The carrier must take into account the buildings on the side of the road and on the road itself and, if necessary, with the permission of the owner, for example, lift the wires.

And for the owner of the vehicle, obtaining permission becomes a real problem. First of all, applying for a permit for transporting oversized and overweight cargo must be started in advance when a particular cargo and transportation route is known, since the time period for producing this permit will take about a month. In accordance with the orders for the issuance of permits, the legal period is 15 working days, but in fact, in these terms, the specialists in issuing permits do not fit. It depends on obtaining approvals of each section of the road along the entire route, and sometimes it is necessary to completely change the route where the passage of large and heavy equipment is not possible due to the reconstruction of the road, repairs, detours, about which the permitting officer may not know. All this increases the time of issuance of permits and delays the goods on the way, imposing certain difficulties on the carrier and material costs. When changing the route, the permit should be reissued, having paid for it again the state duty.

It is also necessary to choose the best route for traffic. The choice of optimal transportation routes depends on the specifics of the cargo, its size and destination. The choice of the route of transportation of goods has a main goal - to ensure the safety of transportation of goods and the proper conditions of its transportation.

Also, the optimal choice of the route of transportation of goods allows you to ensure the safety of other road users. This factor is of particular importance for oversized cargo. The route for transporting a uniquely heavy cargo must be designed to prevent damage to other vehicles or the road surface.

Thus, when composing a route from point A to point B, it is necessary to have a clear idea of all AB roads that can be transported. If there are several solutions, it is necessary to weigh the pros and cons before arriving to a final conclusion.

The development of the route usually takes into account one important rule - the travel time should be minimal and the delivery time of the cargo as short as possible. However, the transportation of oversized cargo requires consideration of a number of additional parameters - for example, how many bridges and railway tracks there are on the laid path, how far the routes are from the settlements. Factors such as weather conditions, time of year and time of day are also taken into account. If you do not succeed in traveling around the settlements, then special traffic rules for vehicles transporting oversized heavy cargo are in effect in the city limits. For example, the movement should be carried out at the time when the roads are maximally unloaded, that is, at night. In addition, when transporting heavy oversized cargo by road (for example, road construction equipment), escorts may be required, which must be separately agreed with the traffic police.

Also, the problem is obtaining a special permit for a particular cargo and for transportation in one direction only. The carrier has to spend time processing another permit in the reverse.

One of the important problems is often changing legislation, which does not allow carriers to calculate transport logistics costs in long-term contracts and leads to higher costs for projects and delays in completion. Often, the cost of transporting oversized and heavy goods is disproportionately higher than the cost of the product itself. Many new laws and regulations have led to a significant increase in the cost of such transportation (especially in terms of paying for damage to roads), increasing the likelihood of giving and receiving bribes [2].

Another stumbling block in the industry was Resolution № 12 of January 9, 2014, which recorded changes in tariffs in the field of transportation of heavy cargo on federal roads, where the average amount increased by 30-50 times. As a result, the majority of cargo owners are simply not able to pay such taxes, which leads to widespread evasion of such fees.

The segment of transportation of heavy and oversized cargoes is currently experiencing a long-term stagnation, aggravated by the general economic crisis. Accordingly, the freight sector as a whole suffers a loss, and Russia's prestige, as a country that is convenient for transit, has practically already been lost.

Considering all the above, the total volume of freight traffic in the country is reduced, as a result of which hundreds of millions of rubles are lost, which affects the transport infrastructure as a whole and the construction of new roads.

The issues involved require urgent action by the controlling authorities and the legislature. It is necessary to introduce the personal responsibility of officials of the Ministry of Transport. Lawmaking in this area should be given the most productive and economically feasible character, contributing to the development of the industry with the replenishment of the budget with funds that will be controlled to improve roads and road structures.

Otherwise, a deep crisis observed in this industry may take a long-term character.

References

1. *Troitskaya N.A. Organization of transportation of specific types of cargo: study guide / N.A. Troitskaya, M.V. Shilimov. - 2nd ed. – Moscow: KNORUS, 2016. - 240 p.*
2. *The transportation sector of heavy, oversized and dangerous goods continues to be the “stepchild” of the authorities [Electronic resource] <http://www.rotransport.com/article/14539/>*
3. *The market for road freight in Russia: the main problems and suggestions [Electronic resource] <http://www.rotransport.com/article/19321/>*

高浓度疏水乳液 - 酸油偏转器, 用于油藏化学增产技术
**HIGHLY CONCENTRATED HYDROPHOBIC EMULSIONS -
ACID DEFLECTORS IN TECHNOLOGIES OF CHEMICAL
STIMULATION OF OIL RESERVOIRS**

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注解。该研究的目的是用于刺激井生产力的非油工艺流体。当在裂缝性海绵状储层中钻孔应用疏水性乳液时, 出现了问题, 油水乳液的物理化学和工艺性质的调节范围不足以可靠地阻断裂缝区间和灾难性吸收区。与此相关的复杂性在很大程度上决定了降低酸处理, 防止杀菌和防水工作的有效性和成功率。

这项工作的目的是开发一种非油乳液 (NOE), 它具有排斥酸的低粘度水溶液所需的物理化学, 流变学, 结构 - 机械和工艺参数和性质的所有必要复合物。近井区 (TWZ) 多孔裂缝 - 海绵状碳酸盐岩储层选择性处理技术。

由于可以在疏水性NOE的新组合物中调节结构 - 机械和粘性 - 流变学参数的最大范围, 因此实现了提高酸性TWZ的效力, 杀死井并限制特别复杂的地质条件下的水流入。在这种情况下, 第一次实现了显著的结果 - 从疏水性乳液制剂的组合物中排除了可销售的油 (目标产物)。计划通过优化TWZ期间的再操作和堵塞复杂的井来减少材料, 劳动力和经济成本。

关键词: 无油乳液, 井产能, 酸处理, 渗透性

Annotation. *The object of the study is non-oil process fluid for stimulateion of productivity of wells. When borehole application of hydrophobic emulsions in fractured cavernous reservoirs, problematic aspects arise, the range of regulation of the physicochemical and technological properties of oil-water emulsions is insufficient to reliably block fractured intervals and catastrophic absorption zones. The complications associated with this largely determine the decrease in the effectiveness and success of acid treatments, well killing and waterproofing works.*

The aim of the work is to develop a non-oil emulsion (NOE), which has all the necessary complex of physicochemical, rheological, structural-mechanical and technological parameters and properties necessary for the rejection of low-viscosity aqueous solutions of acids in the technology of selective treatments of the near-well zone (TWZ) porous-fractured-cavernous carbonate reservoirs.

Improving the effectiveness of acid TWZ, killing wells and limiting water inflows in particularly complicated geological conditions is achieved due to the possibility of regulating the maximum ranges of structural-mechanical and viscous-rheological parameters in new compositions of hydrophobic NOE. In this case, for the first time, a significant result is achieved - the exclusion of marketable oil (target product) from the composition of the hydrophobic emulsion formulation. It is planned to reduce material, labor and economic costs by optimizing re-operations during TWZ and plugging of complicated wells.

Keywords: *oil-free emulsion, well productivity, acid treatments, permeability*

The increase and maintenance of high levels of oil production is largely determined by the filtration characteristics of the bottomhole formation zone (BFZ). Experience in the development of oil fields suggests that in the processes of primary and secondary opening of productive strata, plugging and repair work in wells, as well as during their operation, the collection properties of BFZ are gradually deteriorated. An alternative system in this regard are technological hydrocarbon-based fluids, a large segment of which is occupied by inverse emulsions (IE), in the development and application of which certain progress has been made at PJSC TATNEFT, the range of their practical use in many oil production processes is expanding [1].

The success of using IE is due to their ability to preserve, restore and enhance the natural properties of the reservoir, a wide range of density, structural-rheological, filtration and other technological properties. The main components of IE, as a rule, are oil (or petroleum products), saline stratum water (or aqueous solutions of inorganic salts) and surfactant emulsifiers [2].

At the same time, as the internal phase of such emulsions, it is possible to use not only various compositions of water, but also solutions of acids, glycols, polymers, cement, and as the external environment - oil and oil products, gas condensate, their mixtures among themselves, natural and synthetic oils, acetals and other components. This allows obtaining IE compounds with different functions in relation to the reservoir, and the development of special IE compounds contributed to the emergence of new technological processes in oil production, as well as the increase in success and effectiveness of traditional technologies [3].

One of the ways to increase the effectiveness of standard deviation by increasing the coverage of oil-saturated reservoirs by chemical treatment with acid is the deviation of the acid solution from fracture zones and intervals due to their preliminary chemical blocking with highly viscous colloidal liquids, for example, high viscosity hydrophobic emulsions (VHE).

High viscosity hydrophobic emulsions with high water content are highly concentrated structured dispersed systems. Their distinctive features are, firstly, the presence of a pronounced thixotropic hardening of the structure in statics (emulsions acquire an almost gel-like state) and the possibility of a reversible transition

from gel to sol (flowing liquid solution). Secondly, the possibility of hardening the structure and increasing the viscosity during dynamic contact with the aqueous phase and vice versa, liquefying and reducing viscosity during contact and mixing with oil and hydrocarbons. Thirdly, at low shear rates, VHEs have a maximum viscosity and structure, at high shear rates, VHE reduces the viscosity by a factor of several [4].

The theory and practice of using different formulations of hydrophobic emulsions in PJSC TATNEFT allowed us to substantiate the development and start research of a new generation of emulsions with abnormally high water content (more than 73% by vol.) and two-component oil-free systems (with water content of 90% by volume and more) [5].

At the first stage of research, the possibility of creating a non-oil emulsion was estimated; reservoir mineralized waters with a density of 1170-1185 kg/m³ and a number of surfactant emulsifiers on a cationic and non-ionic basis have become basic components. Most of the emulsions on different emulsifiers were either aggregatively unstable (the emulsion was not formed), or had extremely high viscosity (they were not fluid). Sedimentation instability of emulsions was observed with the release of the hydrocarbon phase (syneresis) and the rapid "aging" of the emulsion. Some emulsions lost their texture and viscosity upon contact with hydrochloric acid, the components were salted out; therefore, such NOEs could not perform technological functionality — to be highly viscous deflecting material with respect to hydrochloric acid.

At the second stage of research, optimization of physicochemical and technological parameters and properties of NOE was carried out. According to the standard methods, a series of rheological studies and an assessment of the structural and mechanical properties were carried out and the basic compositions of the multi-purpose NOE were determined.

By selecting certain component-formula ratios based on the E1 emulsifier, a stable oil-free emulsion was obtained (Fig. 1). Visually, all three formulations were characterized as aggregatively and sedimentation-stable systems. During the day, the appearance of NOE did not change.

The next stage of NOE research was the optimization of the emulsifier concentration taking into account the viscosity-rheological and structural-mechanical parameters.

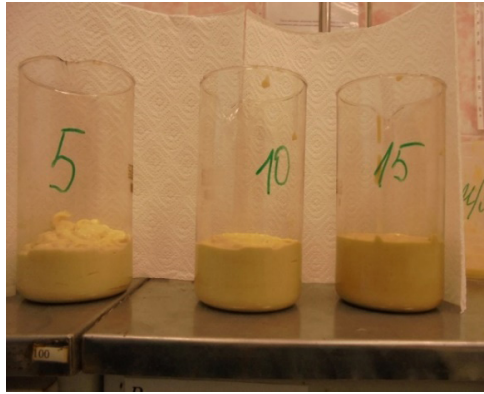
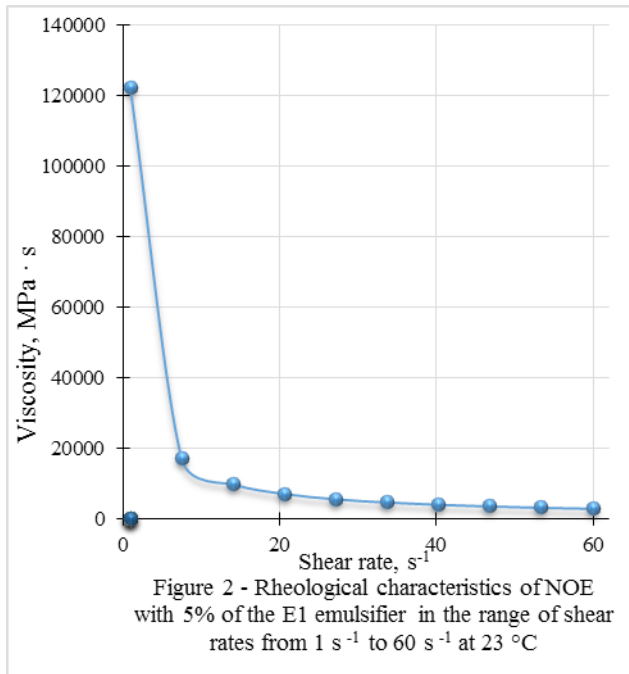
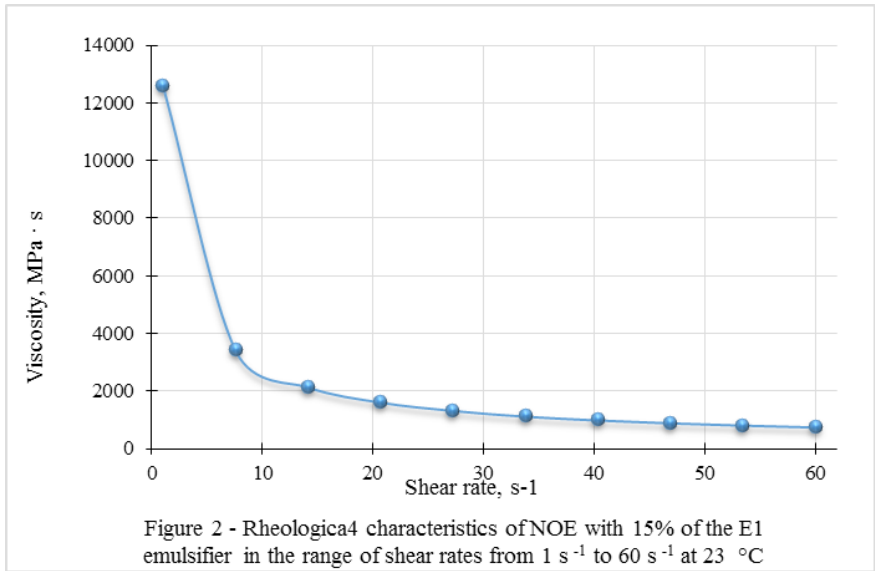
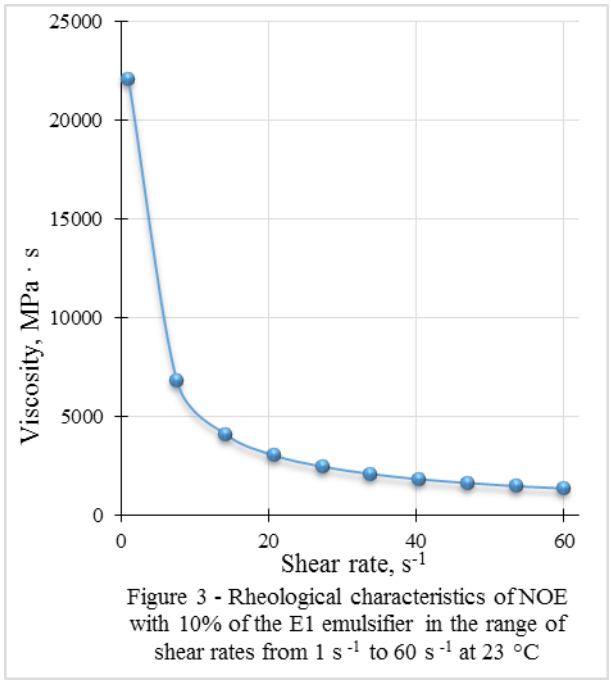


Figure 1 - NOE at various concentrations E1: 5.10.15% (by volume)

To quantify the dynamic range of NOE viscosity, rheological studies were performed on a rotary viscometer RHEOTEST RN 4.1 (Figure 2-4).





The viscosity of NOE with 5% (by volume) of the E1 emulsifier in the studied intervals of shear rates is characterized by ultrahigh values (122000–3000 mPa · s). The emulsion is not technological, the consistency is not fluid.

NOE with 10% emulsifier has acceptable viscosity in the range of 2900–1360 mPa · s at shear rates of 20–60 s⁻¹, characteristic of emulsion movement in the near-wellbore zone of the formation.

NOE with 15% emulsifier has an insufficient, relatively low viscosity (less than 1500 mPa · s) and insufficient consistency, so it cannot fulfill the technological functionality - to be highly viscous deflecting material to hydrochloric acid.

A graphical interpretation of the dependence of NOE viscosity on shear rate clearly shows that NOE refers to pronounced non-Newtonian fluids and, according to rheology, to pseudoplastic type of behavior, when the viscosity depends on the velocity / shear gradient and decreases exponentially.

Thus, according to the results of rheological studies (“dynamic viscosity - shear rate”) and consistency (fluidity), NOE based on emulsifier with a concentration of 10% and brine saline water with a density of 1170-1185 kg/m³ showed satisfactory results.

The next stage of the NOE research on saline waters was the optimization of the concentration of the emulsifier E1. It has been established that a rational concentration of emulsifier (in terms of physicochemical and technological parameters) in NOE compounds is a range of 8–9%, and on all samples of the saline stratal waters studied. NOE dynamic viscosity is in the optimum range of 2500–1650 mPa · s with real reservoir shear deformations in the range of 30-60 s⁻¹.

Table 1 shows the results of studies of the structural-mechanical properties of NOE at various component-prescription ratios.

Table 1 - Characteristics of the structural and mechanical properties of NOE on the emulsifier E1

NOE recipes - the ratio of the components "saline water * / E1	SMP _{1/10} , dPa
95*/5	560/670
90*/10	407/417
85*/15	211/220
93/7	608/647
92/8	503/584
91/9	455/527
90/10	287/297

Structural and mechanical properties (SMP_1 – static shear stress for 1 min, SMP_{10} – static shear stress for 10 min) NOE increase with decreasing volume fraction of emulsifier. With 5-7% (by volume) emulsifier, emulsions are practically non-flowing (600-700 dPa). With an increase in the concentration of the emulsifier to 10-15% (by volume) $SMP_{1/10}$ decreases to relatively low values - 200-400 dPa. The optimal area is the emulsifier concentration range of 8–9% (by volume), with $SMP_{1/10}$ having an intermediate value of 500–600 dPa. The established dynamics of SMP_{10} in relation to SMP_1 shows an increase in the thixotropic hardening of the NOE structure.

The difference between SMP_{10} and SMP_1 characterizes the thixotropy (hardening / structure set) of NOE. The thixotropic strengthening of the NOE structure over time plays a positive role in enhancing the deflecting effect of a highly viscous emulsion to a low viscosity acid or its compositions with chemical additives.

It was further established that the aggregative state of the developed NOE and the «NOE – hydrochloric acid» contact boundary, as well as with water and oil, is stable, the menisci are not blurred in statics (Fig. 5 (a)). This means that the NOE of this recipe can function as acid diverter in selective TWZ technologies, and also has water repellency. With the continuation of experiments by a small portioning of NOE with formation water, a further increase in the emulsion viscosity is observed at a water concentration in the system of 94-96% by volume. (NOE water blocking properties). If the experiments were continued by mixing NOE with oil, the emulsion was diluted with hydrocarbons, but the aqueous phase was not separated from NOE (Fig. 5 (b)). Therefore, when the technological need to reduce the viscosity of NOE can be added to the emulsion oil or hydrocarbons. If the experiments were continued for 24 hours, the aggregative stability, appearance, color, contact boundary with the studied fluids and the consistency of NOE did not change.

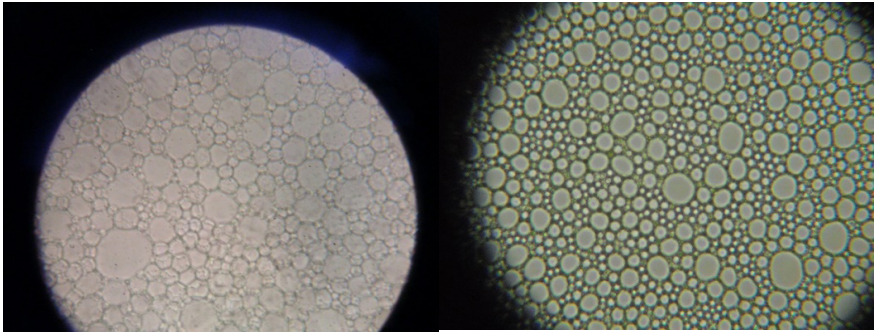


Figure 5 - The state of NOE contact on the emulsifier E1 8-9% with formation water (B), hydrochloric acid (24%) (K) and oil (H) for a period of time from 1 h to 24 h (a); dilution of NOE with oil (b)

Therefore, the developed NOE formulations can be recommended as a flow diverting material to acidic compositions and water.

An important scientific and practical aspect in the study of VHE compositions for selective TWZ is the study of the colloidal-dispersed properties of emulsions. The dispersion of hydrophobic emulsions (the proportion of globules with the geometry of pores and reservoir cracks) is important as one of the criteria for the applicability of these fluids in technological processes of influence on the near-wellbore zone of the reservoir.

Fig. 6 shows micrographs of hydrophobic emulsions containing 75% of the aqueous dispersed phase and a non-oil emulsion with a water content of 92% by volume.



a)

b)

Figure 6 - Micrograph of a hydrophobic emulsion with a water content of 75% by volume. (850+) (a); 92% by volume (1000+) (b)

Fragments of a modified internal polyhedral structure of the emulsion are seen with the closest packaging of aqueous dispersions. When the globules of the dispersed phase are as dense as possible, a pronounced polydispersity is observed and a narrower range of the particle sizes of the dispersed phase is practically 75% of the globules have a diameter of 10-23 μm and the rest are 2 to 8 μm , which is a valid geometric ratio with the characteristic dimension of microcracks and cracked natural carbonate reservoir.

Thus, as a result of laboratory research, the following conclusions and recommendations can be made:

- the following two-component NOE formulation is characterized by the optimal complex of physicochemical and technological properties:

a) reservoir saline water - 91-92% vol.

b) E1 surfactant emulsifier - 8-9%vol;

- relatively high NOE density of this recipe (1130-1150 kg/m³), high viscosity at rest (from 3000 mPa·s to 10,000 mPa·s) and structural-mechanical properties (SMP1 / 10 - 400-500 dPa), stability under static contact with reservoir water allows recommending NOE developed as a process fluid for killing wells in the complicated conditions of “swallowing” reservoir formations, as well as water-proofing and buffer working fluids;

- the recipe found and the identified complex of physicochemical and rheological properties and parameters of developed NOE’s have a novelty and distinctive characteristics that make it possible to claim the criteria of the invention “Multi-purpose hydrophobic emulsion” (application to Rospatent has been filed);

- potential areas of NOE implementation: improving the efficiency of acid TWZ, killing wells, limiting water inflows in particularly complicated geological conditions. Due to the enhancement of the properties of NOE, an additional increase in the well rate for oil is planned (relative to the baseline variants of selective hydrochloric acid treatments using standard oil hydrophobic diverters).

References

1. *Increase in permeability of carbonate reservoirs of oil fields / R.S. Khisamov, M.Kh.Musabirov, A.F. Yartiev.-Kazan: publishing house “Ikhlas” .- 2015.-192 p.*
2. *Glushchenko V.N. Inverse emulsions and suspensions in the oil and gas industry.-M.: Intercontact Science.-2008.-725 p.*
3. *Glushchenko V.N., Orlov G.A., Silin M.A. Technological processes of reservoir opening and oil production using inverse emulsions.-M.: Intercontact Nauka.-2008.-360 p.*
4. *Musabirov M.Kh. Preservation and increase of oil reservoir productivity. -Kazan: publishing house “FEN” of the Academy of Sciences of the Republic of Tajikistan.-2007.-424 p.*
5. *The complex of technologies to stimulate the operation of wells and enhance oil recovery of carbonate reservoirs / R.Kh.Muslimov, G.A. Orlov, M.Kh.Musabirov // Problems of development of oil industry of Tatarstan at the late stage of development of reserves: rep. sci. tech. conf.-Almetyevsk: 1994.*

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