SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

Materials of the International Conference

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参与者的英文报告

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Part 1: Participants’ reports in English

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

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

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

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

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

前言

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

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

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

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”

近代俄罗斯和中国经济发展的制度工具和方法

INSTITUTIONAL TOOLS AND METHODS OF ECONOMIC DEVELOPMENT OF RUSSIA AND CHINA IN THE MODERN PERIOD

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抽象。本文介绍了在现代条件下发展俄中经济关系的方法和工具。结果表明，中国经济的增长与政府模式的高效率相关，该模式将战略性和指示性计划，市场竞争和对政府项目的有针对性的贷款相结合。通过分析，可以确定俄中在经济伙伴关系中的近期前景。这是消费的增长，旨在降低风险的投资平台的发展，建立社会企业家制度，增加道德和道德考虑的重要性，扩大基础设施项目。根据已查明的俄罗斯和中国经济发展问题，制定了最有希望的措施来解决这些问题。

关键词：州政府，俄罗斯，中国，上海合作组织特别经济区，投资，基础设施，机构工具。

Abstract. *The article presents a study of methods and tools for the development of economic relations between Russia and China in modern conditions. It is shown that the growth of the Chinese economy is associated with a high level of efficiency of the government model, which combines strategic and indicative planning, market competition and targeted lending significant for government projects. The analysis made it possible to determine the immediate prospects for Russian-Chinese relations in the field of economic partnership. This is the growth of consumption, the development of investment platforms aimed at reducing risks, creating institutions of social entrepreneurship, increasing the importance of ethical and moral considerations, expanding infrastructure projects. Based on the identified problems of economic development in Russia and China, the most promising measures are formulated to address them.*

Keywords: *state government, Russia, China, SCO special economic zones, investments, infrastructure, institutional instruments.*

Introduction

During the transition of the world economy to a new technological structure, fundamental changes are taking place in the entire world order. China has already begun to master the position of the first economy of the planet. At the same time,

the USA elites are trying to prevent their country from losing the status of the only superpower, for which they launched hybrid wars on several "fronts" at once (China, Russia, etc.) [5]. One can expect that the new world order will be the result of the struggle of these oppositely directed forces. Apparently, the transition of the role of the world economic leader from the USA to the PRC seems inevitable. Unlike other countries, the PRC economy continued to grow both during and after the global financial crisis. This is due to the effectiveness of the model of state management of the development of the national economy adopted in the PRC, which harmoniously combines strategic and indicative planning, state-controlled market competition, and targeted lending to important projects for the country. All this happens in an open economic environment. At the same time, there are various limitations in the Chinese economy that do not allow full use of the existing potential of institutions, which determines the relevance of studying the existing methods and tools of economic development to develop measures aimed at solving existing problems.

Economic interaction of the PRC and the Russia

The economic interaction between China and Russia is characterized primarily by the fact that in the near future, Chinese industry will diligently promote its products on the Russian market. This is due to the overfilling of the domestic market of China and the continuation of the tariff war with the United States. The interaction between the Russian Federation and the PRC will be largely built up through the mechanisms of free trade zones (FTZ), two of which are created in the PRC in the immediate vicinity of the border with our country.

At present, quite a lot of different forms of the free economic zone (FEZ) are already operating in the PRC, mainly aimed at attracting investment and stimulating the growth of labor productivity in the respective regions. At the same time, each region has its own specialization, for example, in Heilongjiang and Xinjiang, and will be agricultural in nature. With regard to Xinjiang, it can be said that the creation of the FTZ there should contribute to a decrease in the level of interethnic tension and the conclusion of a region that has been subsidized from the state budget for many years. It is assumed that this will help to increase the average value of GDP per inhabitant, which in this region is only $ 3690 per year, while on average in the country it reaches $ 4628. The first organization decision with Xinjiang FEZ was made back in 2011 and was implemented in 2015. New FTZs are likely to specialize in the automotive industry and agricultural processing [9].

As for Heilongjiang, there are also economic problems there, the severity of which is planned to be reduced through organization of FTZ. Back in 2017, local GDP showed an increase of 6.4%, but in 2017, it fell to 4.7%, which is below the level average for China. The growth of production also decreased (to 3.7%, against the previous 5.4%), and the domestic market shrank from 8.3 to 6.3%. The volume of investment in fixed assets began to decline (-4.7%, against the previous

6.2%). This means that investors began to leave the region [2]. With the growth of imports, exports decreased. All this suggests that Russia is bordering on a gradually poorer Chinese province, significantly lagging behind in other countries of the PRC, and the organization of a new FTZ should help both correct the situation in this region of the PRC and further strengthen economic cooperation with the Russian Federation.

The organization of FTZ is supposed to stabilize the situation and attract additional investments to the region, but the main problem is a general slowdown in development. From a formal point of view, such regions are becoming open to any companies, including Russian ones, since FEZ has significantly simplified the procedure for creating foreign enterprises. We must not forget that starting work in a shrinking market is always very difficult. For their part, Chinese companies in FTZ will look for ways to promote their products on the Russian market, which is not very desirable for our country, since the intervention of goods from China will create difficulties in rebuilding domestic industry, but at the same time various options for organizing mutually beneficial cooperation are opening up like creating Xinjiang production of organic food for the Chinese market, the organization of small-scale engineering enterprises, the repackaging of Russian goods for sale and in the Chinese market, the creation of a furniture cluster, etc.

In 2019 alone, China will create 6 new FTZs, two of which will be located in regions bordering with Russia. Xinjiang borders with Altai Mountains[1], and Heilongjiang province - with the Jewish AO and Khabarovsk Krai.

Interstate relations between the Russian Federation and the PRC have reached the best state today, perhaps, in the entire history of their presence. We mention strategic partnerships, many cooperation programs in various fields, and coordination of actions in the international arena. The countries jointly oppose the USA attempts to maintain hegemony, take the same positions regarding the multipolarity of the modern world, ensuring its security and stability. The leaders of our states openly declare full mutual trust, and the countries actively cooperate at all levels, building and strengthening strategic cooperation, both in a bilateral format and within the framework of such international institutions as the SCO, APEC, etc. The basis of bilateral relations is the observance of the principles of mutual respect. Heads of state often meet with each other, intergovernmental and interparliamentary ties are strengthened. Contacts are actively being established between the regional and local authorities of both countries with various organizations and business entities and other institutional entities. The task of pairing the EAEU with the “One Belt - One Way” initiative (OBOW) is being successfully implemented in various fields, including those where the level of interaction had previously been insufficient [7].

[1]AIIB - Asian Infrastructure Investment Bank

Achievements and problem areas of interaction between the PRC and the Russian Federation in the investment and trade-economic sphere.

In recent years, the volume of bilateral trade between the Russian Federation and the PRC has been growing particularly rapidly. Along with it, the magnitude of financial flows between the two countries. The interaction of government bodies in the financial sector is becoming increasingly close, but its level cannot be considered sufficient, since it still does not meet the needs of growing trade and other types of economic cooperation, as well as the potential for cooperation in the scientific, technical, military-technical and technological spheres. Lagging in the fiscal sphere hinders the growth of the level of relations in almost all other areas. Financial issues are also a problem in conjunction with the EAEU global project OBOW, the implementation of which requires large-scale interaction and large joint investments [4].

However, related work is underway. A number of mechanisms have already been created for managing and coordinating the processes mentioned together. For example, a joint sub-commission of the Central Banks for financial cooperation has begun work, the work of which contributes to the transfer of mutual settlements into national currencies, the mutual creation of specialized credit and financial organizations, listing of commercial operations, and ensuring proper control. The governments of the PRC and the Russian Federation are strengthening interstate cooperation, including through supporting the creation of a joint private equity fund and institutions such as the Silk Road Fund (SRF), AIIB[2], the Interbank Association within the framework of the SCO, etc.

However, the interaction between the PRC and the Russian Federation in the financial sector has yet to be seriously deepened and expanded. The same applies to related industries such as insurance, securities markets, etc. It is necessary to accelerate the transfer of mutual settlements in bilateral trade to the national currencies of the PRC and the Russian Federation. This will not only contribute to further deepening of interstate cooperation in various fields, but will also help to significantly reduce the damage from the USA sanctions and the PRC trade war with the United States.

Mutual and fairly rapid growth in mutual investment between the PRC and the Russian Federation is currently observed. Nevertheless, the total volume of these investments remains insufficient and this impedes the development of bilateral cooperation in the economic sphere. In investment processes, there is an uneven distribution of investment funds by region, underinvestment of promising areas, failures in already established undertakings [3]. All this cannot but cause a certain worry.

[2]AIIB - Asian Infrastructure Investment Bank

Although the volumes of mutual trade between the Russian Federation and the PRC are growing quite rapidly, they are still relatively small. For example, the total trade turnover between the Russian Federation and the PRC in 2017 was only 13% of the corresponding indicator between the PRC and the USA [1]. In the structure of Russian exports to China, as before, the main place is occupied by the supply of hydrocarbon and other raw materials, as well as other goods with low added value. Frequent and significant fluctuations in world commodity prices adversely affect both trade volumes and the development of interstate economic cooperation as a whole.

The real problems of interaction in the financial sector

Strengthening and intensifying the interaction of the PRC and the Russian Federation in the financial sector is hindered by a number of factors that create difficult to overcome artificial barriers in this area. First of all, it is necessary to name the lack of harmonization in trade and economic interaction. The imperfection of existing institutions should also be noted. The tools, as well as systems to prevent or neutralize financial risks, the current state of affairs cannot be called either effective or sufficient.

Even in conditions of sanction pressure and a trade war by the USA, the Russian Federation and the PRC have not yet created bilateral effective and reliable settlement channels and payment systems. This creates the basis for vulnerability in national financial systems and increases risks, which negatively affects the level of cooperation in the economy in general, and in the financial sector in particular. Many Chinese institutions are ready to cooperate with the Russian Federation, due to the lack of safe channels for directing financial flows from the PRC to the Russian Federation and vice versa, refrain from interaction, for fear of falling under USA sanctions.

Another factor hindering the expansion of cooperation between the PRC and the Russian Federation is the fact that many large corporations of both countries, both state and private, do not seek to convert mutual settlements into national currencies. The reasons for this reluctance in each case are different. In Russia, this is often due to the habit of some company executives to convert part of the proceeds into freely convertible currencies (FCC) with subsequent withdrawal to offshore. In the case of the PRC, the situation is even more complicated, since the yuan is still not fully SLE and cross-border operations with it are still significantly limited by legislative and administrative barriers [6].

Disadvantages of the existing interaction model

As for now, the PRC's cooperation with the Russian Federation in the economy is concentrated mainly at the level of the largest state corporations (for example, Gazprom) and intergovernmental cooperation on the implementation of

large-scale joint infrastructure projects, as well as in such areas as defense, energy, space, etc.

Practice has already shown that this model of economic cooperation has certain inherent disadvantages that impede the expansion of economic cooperation between the PRC and the Russian Federation on a market basis. Innovation sectors, etc., suffer the most from this, as production in the broad sense of the word.

The level of interaction between the PRC and the Russian Federation in high-tech areas is unacceptably low. There is no progress in implementing joint projects in aviation and oil and gas engineering, the electrical industry, etc.

Extremely low rates are observed in the implementation of large-scale joint projects. The Russian side is having difficulty attracting sources of financing, and Chinese partners are concerned about the lack of clear mechanisms for the return on investment.

For the further development of Russian-Chinese trade and economic cooperation, it is necessary to switch to market principles, and taking into account the limitations of the growth potential of both production and consumption in the Far Eastern regions of the Russian Federation, it is advisable to make investments, mainly in areas with good export potential.

Additional measures for conjunction of the EAEU and OBOW

Although a good level of mutual coordination has been achieved in the work on pairing the EAEU with OBOW in recent years, its results are still very limited, especially in terms of implementing large-scale Eurasian infrastructure projects. With a very significant total volume of Russian foreign investments, the RF participation in the implementation of OBOW, as well as in investing in the Chinese economy, is small. There is both a necessity and an opportunity for their significant increase.

The implementation of the conjunction should be ensured through the accelerated development and implementation of general and national strategic programs. A preliminary joint analysis of such programs is required, followed by the inclusion of large-scale investment projects in them with the attraction of financing from various development institutions and investment funds. One of the most important and promising areas of cooperation in the investment sphere is the program for the construction of a number of ports along the northern sea route (NSR).

To strengthen cooperation on the implementation of infrastructure projects, it is advisable to create supranational consortia with granting them concessions for the construction of highways in the corresponding transport corridors and the improvement of the surrounding area. To attract investment, it is planned to issue and place special bonds on the EAEU and the PRC financial markets, lending to AIIB, SRF and other similar financial institutions.

Conclusion and recommendations

Based on the analysis of problems and prospects of cooperation between the PRC and the Russian Federation in the trade, economic and investment spheres, the following conclusions can be drawn and some recommendations made:

1. Foreign exchange regulation in the PRC, whose system is currently in place, demonstrates sufficient effectiveness in ensuring control of capital movements, which made it possible to create conditions for financial support for the steady growth of production and investment and at the same time prevent the leakage of capital. This system combines the licensing procedure for withdrawing funds with the free convertibility of the national currency for current operations. It aims to ensure the expansion of international cooperation in the economic sphere based on mutual benefits and meeting the needs of the PRC economy outside the country. Despite the fact that IMF experts consider such large volumes of money emission fraught with rising inflation and inflation of financial bubbles on the stock exchange, as well as on the real estate market, the Chinese regulator reliably controls the state of these financial resources, taking appropriate measures to direct them to develop their economy.

2. The liberalization carried out in the Russian Federation in the field of currency regulation, which affected cross-border operations, created serious risks for the swaying of the macroeconomic situation and the financial system. These risks are exacerbated by the regime of free fluctuations of the ruble exchange rate, which allows currency speculators to negatively affect the state of the financial market, increasing the volatility of the national currency to an alarming level, and also creates serious difficulties in planning foreign economic and investment activities.

3. With the growing likelihood of destabilizing the international situation and the increasing sanctions pressure from the United States, the risks of speculative impacts on the domestic monetary and financial system, as well as the possibility of implementing threatening scenarios from the outside, increase. To neutralize these threats, Chinese experts recommended introducing restrictions on the freedom of ruble convertibility, preserving it only for current operations and at the same time strengthening currency control by applying similar measures to the cross-border movement of funds. Russia has undeniable arguments for carrying out such actions as retaliation against illegal USA sanctions. These measures can lead to a halt in the export of capital and stabilize the ruble, thereby providing conditions for economic growth. Their adoption is also important for attracting large-scale investments from China to the domestic economy. Now it is necessary to use all the methods and tools that have proved themselves in practice to be effective state control and regulation of monetary policy and monetary circulation. This will create conditions stimulating industrial growth and investment activity, while eliminating the risks of inflation of financial bubbles and violation of macroeconomic stability.

4. According to Chinese experts, the unacceptably high volatility of the ruble, combined with the uncontrolled position of the Russian currency market, creates insurmountable obstacles in opening the Chinese credit and financial system of the PRC for borrowers from the Russian Federation. The PRC monetary authorities are primarily concerned with maintaining their own financial system. They successfully discourage dollarization of the domestic market, limiting foreign exchange operations exclusively to the banking segment, while ignoring US-imposed plans to liberalize control of the financial and currency systems. Chinese experts believe that the prerequisites for steps towards liberalizing the regulation of the currency system can be a significant increase in the level of confidence of business and the population in the national currency and confidence in macroeconomic stability.

5. The strengthening of sanctions pressure from the United States requires comprehensive acceleration of the transfer of the settlement system between the PRC and the Russian Federation to national currencies. Now their share in servicing mutual settlements remains at an unacceptably low level, which creates certain vulnerable segments in Russian-Chinese cooperation that are accessible for influence by third states. It is necessary to complete the full de-dollarization of bilateral trade as soon as possible by switching to mutual settlements in national currencies. The central banks of the PRC and the Russian Federation should as quickly as possible provide appropriate opportunities for this.

6. It seems advisable to involve central bank employees in the preparation of measures to interface financial and payment systems of the Russian Federation and China. So far, the regulators of both countries have paid insufficient attention to resolving these issues, and the orders of the heads of both states to transfer mutual payments to national currencies remain unfulfilled, which negatively affects the state of bilateral economic cooperation, specific participants of which are forced to overcome many difficulties.

7. It is required to develop a set of measures to ensure the security of cooperation between the Russian Federation and the PRC in the credit and financial sphere from the destructive influence of third countries, as well as to coordinate response to the United States and its satellite countries.

8. The next step in improving the global monetary system should be its gradual but irreversible de-dollarization and the transfer of payments in international trade to the multicurrency principle. As an alternative solution, it is possible to create a common currency within the SCO by the name of EACC[3], the exchange rate of which should be determined by the total basket of the SCO, and gold can serve as a reserve asset as the main measurement standard. EACC emission will be provided by gold stored in the SCO joint fund. The issues of the size of contributions from the SCO member countries to this fund have not yet been worked out, but it

[3]Eurasian continental currency

is obvious that it should be established taking into account the gold market rate. A similar procedure is proposed to be introduced to regulate the size of the SCO reserve and EACC emissions [8].

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人工智能技术作为高科技两用产品发展的现代趋势
MODERN TRENDS IN THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES AS HIGH-TECH DUAL-USE PRODUCT

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抽象。当前，人工智能技术实际上已经成为每个人生活中不可或缺的一部分，它通过将越来越多的先进和高速技术及其应用引入到个人使用中，涉及越来越多的先进功能性设备以及个人的专业活动。它。这些情况表明了本文主题的高度相关性。每年扩大人工智能技术的实际应用领域的问题一方面加剧了对其功能能力的信任问题，另一方面加剧了其使用安全性以及获得的结果的问题。　。这项研究的主要目标是，以人工智能技术为例，分析世界高科技产品市场的发展，并确定其在社会各个领域的实际应用前景。为了解决该问题，使用了集成方法和系统化的方法，这些方法将从各种来源获得的信息进行系统化。研究结果表明，人工智能技术世界市场发展的主要趋势是其实际应用范围的扩大和与其功能相对应的新技术的不断发展。满足社会特殊需求的能力。结论是，在21世纪，人工智能技术的发展已成为全球经济新的信息数字化方式发展的决定性趋势。

关键词：高科技产品，人工智能，技术，发展趋势。

Abstract. *Currently, artificial intelligence technologies have actually become an integral part of each person's personal life, involving more and more advanced and functional equipment for personal use, as well as their professional activity by introducing more and more developed and high-speed technologies and their applications into it. These circumstances indicate the high relevance of the subject of this article. The problem of expanding the areas of practical application of artificial intelligence technologies every year exacerbates, on the one hand, issues of trust in their functional capabilities, and on the other hand, issues of the safety of their use, as well as the results obtained. The main goal of this study is to analyze the development of the world market of high-tech products using the example of artificial intelligence technologies and identify promising areas of their practical application in various spheres of society. To solve it, methods of an integrated*

approach and systematization of information obtained from various sources were used. As a result of the research, it was found that the main trends in the development of the world market of artificial intelligence technologies are the expansion of the scope of their practical application and the constant growth of the development of new technologies that correspond in their functional capabilities to the particular needs of society. It is concluded that in the 21st century the development of AI technologies has become a determining trend in the development of a new information-digital way of the global economy.

Keywords: *high-tech products, artificial intelligence, technology, development trends.*

Introduction

Artificial intelligence (AI) is a field of computer science, the main purpose of which is to create intelligent computer systems (ICS), which are quite close in their capabilities to the abilities of the human psyche related to intelligent thinking, namely: understanding the language, the ability to acquire new knowledge and their application for solving various problems. Today, AI also includes a large set of algorithms, applied software (AS) and technologies, the fundamental distinguishing features of which are their ability to practically solve a wide range of tasks at a level that is quite close to the mental psychological abilities of a person.

Currently, ICS with full justification has become an objective component of the life of modern society. The simplest of them are used to identify images, recognize language, and make forecasts. They operate through the use and processing of large amounts of information. At the same time, the tasks they solve are mostly of the same type and do not have a wide variety of functional solutions inherent in the intellectual psychological abilities of a person. Such ICS are not able to understand objective reality at the level of human thinking, cannot be used to form strategic development plans and new models of the functioning of objective reality surrounding a person. On the other hand, both simple and more advanced ICS are based on the use of large amounts of information when training, but this approach is not equivalent to teaching a person a new understanding of the changes that occur in his surrounding reality.

Purpose of the study

The main goal of this study is to analyze the development of the world market of high-tech products using the example of artificial intelligence technologies and identify promising areas of their practical application in various spheres of society.

Materials and methods

By AI technologies, many experts understand the totality of technological processes that improve the quality of processing large amounts of information at the level of understanding natural language, machine learning, expert systems, virtual

agents using AI properties such as the ability to learn and think, as close as possible to human intellectual abilities [1]. However, this definition is quite general and does not reflect all the features of the development and practical application of AI technologies.

Currently, a clear definition of the purpose of AI technologies does not exist due to the fact that they are becoming an integral part of increasingly large areas of society. Just as in philosophy there is no unambiguous understanding of the nature of human intelligence, so in computer science there is no exact definition of the level of computer intelligence, and in relation to AI technologies - the level of mental abilities of ICS. However, even a cursory analysis of information over the past two decades allows us to conclude that AI technologies in the near future will become an important part not only of professional activity, but also of each person's private life. AI technologies are now actively used in all sectors of the economy and, above all, in those enterprises that produce high-tech products [2]. At such enterprises, as well as at many enterprises that are specialized developers of various kinds of AS, operating on the basis of AI technologies, a constant increase in the costs of their creation is observed annually. In addition, we should not forget that AI technologies themselves are nothing more than high-tech products sold through their introduction into the production of specific high-tech products. This approach to improving the production activities of high-tech enterprises allows them to gain additional competitive advantages by moving to a higher level of management of their production activities. The implementation of AI technologies in production makes its information support more stable, improves the organization of all business processes, helps to reduce costs and leads to increased profits of enterprises by optimizing the entire volume of management and computing operations.

Among the many directions of the development of AI technologies, the creation of ICS and the task classes that can be solved with their help, experts identify two fundamental approaches:

– semiotic, within the framework of which expert systems, databases and logical inference systems are created that are as adequate as possible to the mental psychic processes of a person;

– biological, within the framework of which neural networks are developed, evolutionary calculations are carried out on the basis of genetic algorithms and models for the development of biological systems, and progressive neuro- and bio-ICS are created.

It is clear that the directions of development of AI technologies and the creation of ICS are not limited to only these approaches. On the contrary, these approaches are constantly being improved, and new approaches are emerging that take into account the latest achievements of scientific and technical progress. So,

since the beginning of the 1990s, an approach based on modeling the activities of intelligent agents has been actively developing. At the same time, ICS are considered as intelligent agents capable of receiving signals from the surrounding reality through sensors and exerting influence on its objects using various mechanisms. This approach mainly uses methods and algorithms for search and decision making. The development of this approach has become a hybrid approach based on a combination of neural and symbolic models. The synergistic effect of their solution allows you to put into practice the whole range of cognitive and computational capabilities of ICS. As a result, expert rules are generated in neural networks, and forming rules are generated through machine learning. The founders of this approach are convinced that hybrid ICSs will significantly outperform ICSs based on individual concepts.

At the present stage in the development of AI technologies, several promising trends can be distinguished, namely:

1) improving existing AI technologies and developing new ones that will be in demand on the market in a competitive environment;

2) development of the functionality of AI technologies, including adaptive and communicative, interaction with humans, machine learning algorithms, computational speed, perception of human activities, etc.;

3) the search for new solutions to various problems in the conditions of unlimited arrays of information by using self-learning algorithms and algorithms involving a teacher in AI technologies;

4) the creation of flexible and multifunctional AI technologies used to improve robotic systems [3].

The dynamics of the implementation of these and a number of other promising trends in the development of AI technologies will be determined by the totality of the influence of many objective and subjective factors, the identification of which is beyond the scope of this study.

Results and discussion

The above information allows us to conclude that in the XXI century the development of AI technologies has become a determining trend in the formation of a new information-digital way of the global economy. Thus, according to the estimates of Frost & Sullivan specialists, by 2022, the total AI technology market will increase to 52.5 billion US dollars, which is almost 4 times the level of 2017, which amounted to 13.4 billion US dollars (see Fig. 1 [4]). It is expected that in this period the annual growth rate of the AI technology market will remain at the level of 31%. According to the forecasts of specialists from Frost & Sullivan and TAdviser companies [4, 5] dated 01.15.2019, the rapid expansion of the scope of implementation of AI technologies will allow to increase the world market of goods and services by 15.7 trillion US dollars by 2030.

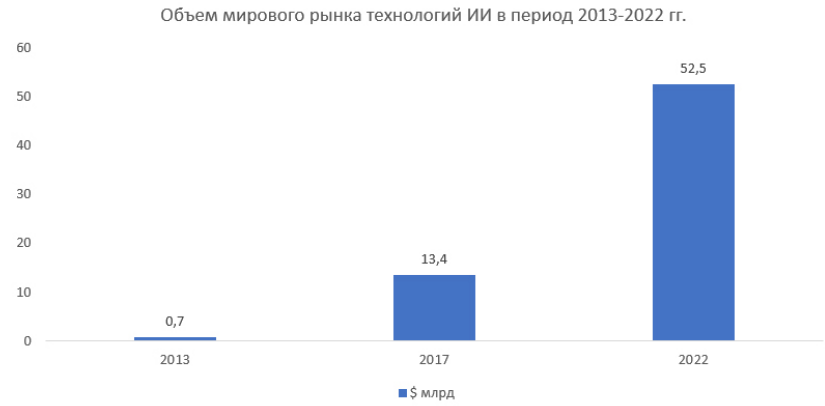

Fig. 1. *The dynamics of the global market for AI technologies, 2013-2022*

According to the data provided in the Tractica analytical report on the development and implementation of AI technologies for 2018, the global AS market volume amounted to 8.1 billion US dollars and has all the prerequisites for further growth. Analysts of this company estimate an increase in its volumes by 2025 to 105.8 billion US dollars [6]. Due to the constant increase in the volume of information, the computing power of ICS and the increase in the performance of algorithms, the demand for AS used in AI technologies is also increasing. Today, AI technology is used in almost all sectors of the economy. They allow the use of ICS for automated management decision making. In addition, the availability of many new options for their application reveals the potential for the development of an existing business, helps to attract additional investment and optimize all business processes in enterprises producing high-tech products.

According to a Tractica report, at the end of 2018, AI technologies were used in 258 areas of the global community: from trade and advertising to transport and various types of communications. Moreover, most of the total income from the use of AI technologies is concentrated in markets with a narrow specialization where processing of significant amounts of information is required. This document discloses in sufficient detail the features of the application of AI technologies in the fields of personal consumption, industrial production and public administration. In addition, the company's specialists substantiated real options for the application of AI technologies and systematized forecasts of the expected income from their use in relation to the sectoral structure of the economy.

In China, there is a very active development of almost all areas of AI technology use. Indicative in this regard can be considered 2017, when the share of Chinese start-ups for the first time exceeded the share of American startups in the

total volume of world investments aimed at the development of AI technologies. It amounted to 48%. At the same time, it is necessary to take into account such an important factor as the total number of start-ups that purposefully develop AI technologies. 54% of such startups operate in the USA, and only 15% in China [4].

The rapid growth in demand for the development and implementation of AI technologies in China is explained by the fact that at all levels of management the task of promoting AI technologies in almost all sectors of the economy is being successfully solved. Chinese companies specializing in the development and implementation of various AI technologies occupy leading positions in attracting foreign investment. In this area of their activity, leading American companies are already losing their primacy (see Table [4]).

Table

Leading companies in attracting investment in AI technology development

Country	**Company**	**Volume of attracted investments million US dollars**
China	SenseTime	1200
China	UBTech Robotics	820
China	Megvii Technology	600
USA	Dataminer	391
China	YITU Technology	300
USA	Pony.ai	214
USA	CrowdStrike	200

The rapid expansion of the field of practical application of AI technologies in the very near future will lead to the fact that in order to increase their effectiveness it will be necessary to accelerate the work of functional applications. It is for this purpose that it is supposed to use chipsets (microcircuits). Practice shows that the potential of AI technologies can be better realized if the chipsets are optimized in order to provide the required computing power with minimum energy consumption as part of their use in specific AI technology applications. This trend in the development of AI technologies contributes not only to the expansion of specialization, but also to the growth of a variety of chips (microcircuits).

The main results of this study include the following.

1. Two fundamentally different approaches to the development of AI technologies and the creation of ICS are defined for solving different classes of problems with their help, consisting of many areas of their practical application - semiotic and biological. The main differences between them are revealed and the functional capabilities of AI technologies developed with their help are determined. These

approaches are constantly being improved, and new approaches are emerging that take into account the latest achievements of scientific and technical progress. So, since the beginning of the 1990s, an approach has been actively developing based on modeling the activities of intelligent agents, focused on the predominant use of search and decision-making methods and algorithms. An alternative to this approach was the development of a hybrid approach, which is based on a combination of neural and symbolic models to obtain a synergistic effect from their solution and the practical implementation of the entire range of cognitive and computational capabilities of ICS.

2. It has been established that AI technologies are nothing more than high-tech products sold through their introduction into the production of specific high-tech products. Therefore, AI technologies are actively used today, primarily at enterprises in those industries that produce high-tech products. This allows high-tech enterprises to gain additional competitive advantages by moving to a higher level of management of their production activities.

3. Such characteristics of the global AI technology market are presented as general market dynamics, expected revenue growth dynamics, chip market dynamics, AI technology markets growth dynamics intended for pattern recognition and speech, as well as using natural languages for processing large amounts of information. In addition, the leaders of the AI technology market for attracting investments by country and individual companies were identified.

Conclusions

As a result of the research, results were obtained on the basis of which the following conclusions can be formulated.

1. The modern understanding of AI as an area of computer science designed to create ICS, which in their functionality is quite close to the abilities of the human psyche related to intelligent thinking, has been clarified.

2. A number of promising trends in the current stage of development of the global AI technology market have been highlighted.

3. An analysis of the main characteristics of the global market for AI tick technologies allows us to state that the AI technology market is developing very dynamically, and the areas of practical application of AI technologies are constantly expanding. In this regard, in the near future we can expect the emergence of new breakthroughs in the development of more efficient and faster AI technologies, not only in the production of high-tech products, but also in various spheres of life of the world community

4. The introduction of AI technologies in production makes its information support more stable, improves the organization of all business processes, helps to reduce costs and leads to increased profits of enterprises by optimizing the entire volume of management and computing operations.

Thanks

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以两用技术为例的高科技产品商业化前景

PROSPECTS FOR THE COMMERCIALIZATION OF HIGH-TECH PRODUCTS ON THE EXAMPLE OF DUAL-USE TECHNOLOGIES

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抽象。在现代情况下，由于国家结构的存在微不足道，并且主要在中小型企业领域中的大量潜在购买者的广泛代表，双重用途技术市场已经非常商业化，主要集中在商业方面为了他们的利益进行买卖交易。在这种情况下，发达国家已经将重点转移到形成一种有效机制上，以在市场上创造和推广高效的双重用途技术。结果，原本用于解决确保国防能力的问题的两用技术向经济民用部门的转移进程大大加快了。市场的主要趋势是开发新技术，以扩大中小企业的整合能力，建立灵活的生产线，以便在同一生产基地部署两用或民用和军用产品的生产。但是，由于客观（制裁限制）和主观（缺乏发达的监管框架）因素，我国尚未在这个市场上占有一席之地。本文将提出一些方法，使俄罗斯成为两用技术市场的领先国家之一。

关键词：高科技产品，两用技术，商业化，监管框架。

Abstract. *In modern conditions, the dual-use technology market is quite well commercialized due to the insignificant presence of state structures and the wide representation of a significant number of potential buyers, primarily in the field of small and medium businesses, focused mainly on the commercial aspects of sale and purchase transactions in their interests. Given this circumstance, developed countries have already shifted their focus to the formation of an effective mechanism for creating and promoting highly effective dual-use technologies on the market. As a result, the process of transferring dual-use technologies, originally used to solve the problems of ensuring defense capability, to the civilian sector of the economy has intensified significantly. The leading market trend was the development of new technologies aimed at expanding the integration capabilities of small and medium-sized enterprises, establishing flexible production lines for deploying the production of dual-use or civilian and military products at the same production base. However, our country has not yet taken its place in this market due to objective (sanctions restrictions) and subjective (lack of a developed regu-*

latory framework) factors. This article will propose approaches that allow Russia to become one of the leading countries in the dual-use technology market.

Keywords: *high-tech products, dual-use technologies, commercialization, regulatory framework.*

Introduction

The market for dual-use technologies is quite large. Currently, the most active positions of the countries of the Asia-Pacific region, which seek to attract certain dual-use technologies to accelerate the development of their own economies, are most active in it. For example, since the 90s, Japan has transferred to China about 90 dual-use technologies, including advanced technologies in computers, semiconductors, telecommunications, fiber optics and other promising manufacturing technologies that do not affect defense issues. The annual export of dual-use technology from Japan to China exceeds 150 million yen. The use of foreign dual-use technologies is the main direction of the development of high-tech production of new industrial and intensively developing countries, such as South Korea, Taiwan, Singapore, Hong Kong, Malaysia, India, China, Indonesia.

The leading importers of technology to these countries are the USA and Japan, which account for almost 80% of the market. Given the above, we can conclude that the dual-use technology market is quite promising for many developing countries, and the volume of transactions made on it makes it one of the promising markets for our country.

Purpose of the study

The main objective of this study is to justify the possibility of effective expansion of dual-use technologies to the market for Russia, as a country with a high scientific and technical potential, individual high-tech sectors of the economy, highly qualified specialists and practically unlimited reserves of resources. These factors determine the favorable prospects for the successful entry of our country into this market and the gradual taking of a leading position in it.

Materials and methods

Specialists of the Ministry of Industry and Science of Russia estimate the proportion of dual-use technologies that are promising for use in the civilian sector of the economy of our country and for exporting that are created within the framework of defense orders and within the scientific and technical reserve programs within 55%, and for the development and supply of weapons and military equipment (WaME) - up to 30%. According to preliminary estimates, the market value of the implementation of such a volume of dual-use technologies can be up to $ 3 billion annually.

However, despite the steady interest in dual-use technologies available in Russia from foreign countries, the active participation of Russian developers and

manufacturers of these technologies in international markets cannot yet be considered as one of the significant sources of replenishing the federal budget and attracting foreign direct investment for further developments. This situation has developed in the presence in our country, along with the backwardness of many industrial sectors, of an exceptionally high level of fundamental and exploratory R&D, the production of science-intensive high-tech products, in a number of sectors of the economy, and above all, at the enterprises of the military-industrial complex (MIC).

As far back as 1992, foreign experts compiled a list of more than 3 thousand dual-use technologies owned by Russia, according to which the United States and developed Western countries either lagged significantly behind or did not have similar technologies at all. At the moment, the number of such technologies has only increased; moreover, many of them are already widely used in industrial production for the release of the latest WaME samples. This fact is now universally recognized by experts in many countries, including the United States and developed countries of the West.

The composition of dual-use products and technologies that attract increased attention of foreign experts include: a nuclear reactor for generating energy in space; small space engine using the energy of magnetic fields; The world's most powerful liquid-propellant rocket engine; high-strength heat-resistant alloys used in the manufacture of rocket engines; composite materials that have no analogues abroad in terms of their quality and technological characteristics; protein crystallization and purification technologies and many others. With such potential, Russia is able to become one of the leading exporters of space rocket, materials science and other technologies, a supplier of high-end dual-purpose goods and services.

One of the main reasons for restraining the commercial realization of this potential is the low competitiveness of Russian enterprises in the international dual-use technology markets. It is connected with their insufficient ability to use the opportunities provided by the legislation on intellectual property to restrict access to advanced technical solutions for all potential competitors. The lack of a clearly focused and coordinated patent and licensing policy often leads either to the disclosure of the main idea of dual-use technology in the early stages of cooperation, or to the low financial and economic efficiency of contracts due to the lack of skills in preparing dual-use technologies for commercialization in industrialized countries standards.

In order for dual-use technology to become popular on the market in the shortest possible time, it is necessary to make clear to all potential buyers what their "significant differences" are from existing world analogues when forming the first commercial offers. In world practice, a patent search procedure is used to provide

a qualified answer to this question. It provides for a comparative analysis of a dual-use product or technology proposed for commercialization with existing analogs in at least five manufacturing countries of products with similar functional characteristics. Without the results of such an analysis, it is impossible to clearly imagine what, in fact, is the "know-how" of the proposed dual-use products or technologies. The consequence of this is the lack of a technology exchange strategy that ensures both their competitiveness, protection against unfair competition, and the financial and economic effectiveness of the project.

This problem has become particularly acute in connection with the emergence in recent years of an increasing number of WaME developers and manufacturers claiming rights to independently participate in military-technical cooperation, as well as the rapid expansion of the dual-use technology market itself. Moreover, as practice shows, these organizations are not able to provide legal protection of exclusive rights to the dual-use products or technologies transferred by them due to the lack of specialists with the necessary qualifications.

Another important reason for the current situation was the lack of a modern regulatory framework, including clear regulations for the actions of legal entities and individuals in the commercialization of dual-use technologies. This creates the prerequisites for the fact that enterprises producing dual-use products and technologies, in practice, fully or partially avoid the enforcement of intellectual property protection regulations created in the process of fulfilling defense orders. A random check conducted by FSUE Rosoboronexport showed that only 10% of dual-use products and technologies offered for export have foreign patents for the entire product or technology, as well as for their individual elements. The same situation has developed with Russian scientific developments, on the subject of which joint R&D with foreign companies is allowed.

A study of the current situation with patent protection of intellectual property in enterprises claiming the right to commercialize dual-use technologies shows that at present they have only security documents from the former USSR and Russia (copyright certificates, patents). Moreover, most of them are closed (secret) and (or) expired. Naturally, such documents do not protect scientific and technological achievements in any country other than Russia, and secret evidence does not even solve this problem.

In addition, the existing practice of filing applications for copyright certificates and patents only in Russia, without timely execution of international or convention applications, makes this impossible after receiving the relevant Russian protection documents. As a result, Russian science not only does not receive significant financial injections, but also loses the right to dispose of the intellectual property created by it. This trend is especially dangerous because it affects the development of dual-use technologies in the field of military security.

Results and discussion

The emphasis on the development of dual-use technologies will allow the Russian economy to not only raise the quality level of production in civilian industries, carry out their technological re-equipment and significantly increase the export, import-substituting potential, but also with the minimum use of budgetary funds, create a scientific and technical groundwork for creating and developing a new generation WaME. Such an approach will allow re-equipping the Russian army and navy with the latest models of military equipment and preparing Russian enterprises to enter the international market with highly competitive dual-use products and technologies.

At the same time, one cannot ignore the fact that any technology as a product is quite specific: on the one hand, it is based on modern scientific and technical achievements and new knowledge, and on the other, the technology must have a certain set of standard functional consumer characteristics. Obviously, scientific and technological achievement must be brought to the level of the product so that it can become a technology. Moreover, as a rule, the second component is financially more voluminous, although the first determines the entire "intelligence" of the technology. The transfer of the intellectual or innovative part of dual-use technologies allows us to determine the ways to bring it to production use when less “skilled” work, but more serious investments are needed. Such specifics of dual-use technology, while promoting it on the market, requires effective management, including state control.

The need for state support and management of the transfer of dual-use technologies is especially important for Russia in modern conditions. The scientific, technical and technological base created in previous years, and, as a rule, in the public sector of the economy, having fallen into the conditions of a developing market, is used extremely inefficiently. Many research organizations, especially academic ones, having the highest scientific and technical potential and receiving world-class developments, are not able to bring them to the level of full-fledged dual-use technology and therefore offer practically "semi-finished products" to the market. Accordingly, the cost of such a product is also low. In addition, Russian scientific institutions, when concluding contracts with foreign customers for R&D, turn out to be insufficiently prepared in the legal field, which allows foreign partners to impose on them their unfavorable conditions, primarily in terms of protecting rights to intellectual property and financial parties to the contracts. Meanwhile, this situation is directly related to the problem of ensuring the technological and military security of our country.

It is urgent to stop the trend of uncontrolled and not bringing noticeable economic benefits to the state leakage of the latest dual-use products and technologies, as well as other know-how abroad. This is especially true of know-how, the

transfer of which in the vast majority of cases is carried out at prices significantly lower than world prices, and often, simply in exchange for missing products or materials of foreign manufacture.

A comparative analysis of the cost of scientific and technical products manufactured in developed Western countries, in the dual-use technology sector, and the prices of contracts concluded by foreign customers with Russian partners shows their "cost reduction" from 5 to 15 times. This is explained, first of all, by the complete lack of accounting for scientific, technical and technological potential, the use of unique equipment and expensive experimental training grounds.

Conclusions

The above facts and circumstances allow us to conclude that it is necessary to single out the problems associated with expanding the scope of export of dual-use technologies and their commercialization in an independent area with a view to transferring it to the framework of a specially created state structure. Such a structure, on the one hand, should not burden the federal budget, and on the other hand, it will promote the promotion of domestic dual-use technologies abroad with the mandatory observance of state interests and the emergence of new sources of extrabudgetary support for the development and creation of the latest dual-use technologies. At the same time, the development of domestic high-tech production, an increase in the tax base and, as a result, additional revenues to the state budget will be ensured.

The proposed state structure should solve such priority tasks as: investment support for the development of the latest dual-use technologies; their promotion to the foreign market; facilitating the integration of defense and civilian industrial sectors through the introduction of dual-use technologies in production; attraction of advanced foreign dual-use technologies in MIC; ensuring the transfer of advanced technologies from the civilian sector of the economy to the military, and vice versa.

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俄罗斯的教育是增强世界经济空间竞争力的一个因素
EDUCATION IN RUSSIA AS A FACTOR OF STRENGTHENING COMPETITIVENESS IN THE WORLD ECONOMIC SPACE

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抽象。 本文讨论了作为增强俄罗斯在全球经济空间中竞争力的一个因素的教育战略发展，以及规范教育战略的文件："对俄罗斯联邦直到30年前的长期社会经济发展的预测 2030年"，"到2025年俄罗斯联邦成人继续教育发展的概念"和2001年国家教育计划"我们的新学校"。它回答了未来学校的样貌问题，并说明了什么标准 现代教育必须遵守。

关键词：教育发展战略，社会经济发展，社会控制，增强竞争力，全球经济空间，发展理念，目标计划，继续教育，规范战略的关键教育目标。

Abstract. The article discusses the strategic development of education as a factor in strengthening the competitiveness of Russia in the global economic space, the documents regulating the education strategy: "Forecast of the long-term socio-economic development of the Russian Federation for the period up to 2030", "Concept for the development of continuing education of adults in the Russian Federation until 2025" and national educational initiative "Our New School" in 2001. It answers the question of what the school of the future will look like and shows what standards modern education must comply to.

Keywords: education development strategy, socio-economic development, social control, strengthening of competitiveness, the global economic space, development concept, target programs, continuing education, key education objectives that regulate strategies.

We live in a modern world that is constantly evolving and rapidly changing. Every minute in our world space scientific and technical discoveries are made, and the incredibly fast pace of life becomes the norm, and every person strives for constant development, growth and self-improvement.

Development is not unique to individuals or groups of people. Any state seeks to improve economic indicators, find new ways to solve internal and external socio-economic issues, as well as methods to improve the lives of citizens and the development of the country.

Competitiveness in the world market is one of the key indicators of the country's development. In this regard, there is a need for constant movement, growth and improvement of its components. The development of the economy, domestic and foreign policy, improving the social standard of living, the development of education and science, and much more.

In our article, we will consider one of the most important areas in Russia - education. The development of education in the Russian Federation is one of the most important tasks today, which strengthens the country's position in the global economic space. Currently, there are many documents regulating the strategies, goals and objectives of the development of Russian education in the country until 2030.

The education development strategy, like any other strategy in one or another sphere, is based on ideas about what life, professions and qualifications will be like for these professions in the future.

Today there is a "Forecast of the long-term socio-economic development of the Russian Federation, for the period up to 2030" [1], which is one of the key documents of the strategic planning system for the development of our state. This document governs

development of Russia, its subjects in the socio-economic sector. Such a forecast provides the basis for the creation and development of strategies and targeted programs in the near future.

The sphere of education as a system exists in order to ensure the preservation and development of the culture of the nation, as well as the formation of an attentive attitude to the historical and cultural heritage of the peoples of Russia, to educate patriotic citizens of a democratic and legal state and, at the same time, to create respect for cultures among the population, languages and traditions of other nations.

One of the key tasks of education is the diverse and timely development of children and young people, their creative abilities, self-education skills, the establishment of their attitude and holistic worldview, as well as the development of an active life and professional position, motivation, and providing students with academic mobility.

Since education is closely related to the sphere of responsibility and interests of the state and its institutions, the state is called upon to provide:

- implementation of constitutional law and equal opportunities for citizens belonging to different sectors of society and population groups on different territorial grounds to receive free education of a high quality level;

- conditions for obtaining education that would suit all children, foreseeing the responsibility of state authorities, local self-government and parents or guardians and, in case of violation of the constitutional rights of children;
- "regulatory funding of educational institutions" [2].

In addition, the education system and educational institutions should be open to general social control and provide universal care for the health and safety of students, not forgetting about their development and physical education.

A modern interpretation of the concept of lifelong education makes it possible to identify its three main functions: professional, social, and personal.

A professional function contributes to the formation of a person's qualities and skills that he will need in a professional industry, and, as a result, the acquisition of new development opportunities.

The social function allows to complement and enrich the process of socialization of a person, his communication and interaction with society, the economy and the state as a whole, practicing familiarization with cultural and social values, language, various activities, modern information (and not only) technologies, as a way social interaction, forming the functional literacy of a citizen in all kinds of areas of his life.

The personal function ensures the satisfaction of individual needs of a person, his interests, hobbies.

In this regard, lifelong education is one of the main components of ensuring sustainable and effective development of human capital and the socio-economic development of our country in general [3].

Consider the concept of the development of continuing education of adults in the Russian Federation until 2025. This document is a system of views on the content, principles and main priorities of state policy aimed at ensuring the possibility of obtaining the right of the adult population of the Russian Federation to lifelong education [3].

The purpose of the Concept is to create the conditions for lifelong education for any person in the state. To achieve this goal, it is necessary to solve a set of basic tasks:

- support and development of a wide range of opportunities for various categories of citizens, to obtain the necessary qualifications throughout their work;
- by increasing the educational and general cultural level of the population, provide assistance in socializing citizens and improving the quality of their lives;
- based on the preferences and abilities of all categories of the population, create and constantly improve conditions that will contribute to their personal growth and self-realization.

The following are the mechanisms that will be used to achieve and implement the goals and objectives:

- improvement of legislation in the field of continuing education and the system of interaction between public authorities;
- introduction and accounting of tasks and measures for the implementation of state policy in the field of education in federal and regional state programs;
- drawing up directions that will be priority for public policy for various types of regions, taking into account the peculiarities of the development of their social and economic spheres;
- formation and promotion of scientific research of citizens in the educational field.

The implementation of the "Concept was foreseen in two stages: the first stage will be in 2016 – 2020", and the second stage will be implemented from 2020 to 2025.

According to the "Forecast of long-term socio-economic development of the Russian Federation for the period until 2030" [1] (prepared by the Ministry of Economic Development of Russia), the establishment and improvement of the education sector, scheduled for the period until 2030, should be aimed at increasing accessibility and raising the level of education, training experienced personnel of all levels of professional education that are able to quickly respond to requests that fall on the labor market, increase their level of education and awareness in the right sphere, throughout life, correctly apply knowledge gained in the learning process.

Among the main ways of developing education in the professional field, in the indicated period modernization and optimization of the network of vocational education organizations are provided.

Network optimization will be accompanied by an increase in requirements for the selection of applicants, the introduction of an independent assessment of the quality of training at all levels of professional education. Due to these measures and against the background of demographic processes in some programs, a reduction in the number of students is possible.

Modernization requires updating the teaching staff and this requires the transition of teachers and institutions to an effective contract [3], which is currently observed in the secondary and higher education system.

The increase in funds allocated to the educational sector allows us to make basic system-wide changes in the industry and ensure the introduction of a modern education model. To improve the quality of educational services, additional investments in human capital and updating the composition of teachers are considered.

It is planned to modernize the material and technical base of education, build new schools, buildings of kindergartens, build modern buildings and campuses in the system of higher professional education, as well as provide them with modern equipment and training facilities.

Digital technologies are actively introduced in all areas of the economy and our lives, and the profession is no longer a standard set of qualification characteristics. The concept of a profession becomes a dynamic set of qualities and competencies that are capable of providing professional mobility. The need for updating knowledge and skills is constantly growing and the answer to this need is the active introduction of modern educational technologies, such as online learning platforms, distance learning forms, electronic teaching aids, and mobile, capable of working remotely technology, is becoming more active.

In the Russian Federation, there is the National Educational Initiative “Our New School”, approved in 2001 [4]. It answers the question of what the school of the future will look like and shows what standards modern education should meet.

This document states that “A new school is an institution that meets the goals of accelerated development” [5]. It is also stated that in modern schools, students will study not only the events of the past, but also new technologies, and the anticipated achievements of the future. Pupils will work on research projects, perform creative tasks in order to learn how to create and make new things, learn how to express their own thoughts, make decisions and help each other, and will be able to develop and implement new opportunities.

"New School" will become a school for everyone. Successful socialization of children with disabilities, children left without parents or in difficult life situations will be carried out in educational institutions. An individual approach will be applied to each student, according to which age and individual characteristics will be taken into account.

“The new school will become a center where parents, local communities, authorities, cultural, healthcare, sports, leisure, and many other organizations of the social sphere will simultaneously and successfully interact” [5]. It will meet the standards of modern infrastructure. Educational institutions will be decorated in a modern style and will have a wide range of functions necessary for successful learning. Schools will also have modern systems for assessing education, and, using modern teaching methods, students will be provided with high-quality and reliable information.

You may notice that in the modern education system, changes are constantly happening. It is in a continuous search for new, innovative solutions and opportunities that contribute to improving the quality of education.

The main principles of the development of education in the Russian Federation are to make the emphasis on education a priority, make it accessible and convenient for every citizen, and instill responsibility in the society for the future of the country. Based on the “Concept of development of modern adult education in the Russian Federation for the period until 2025” [3], the expected effects are as follows:

- increasing the level of satisfaction of the adult population with the quality of life by increasing the opportunities for professional and personal self-realization;

- social stability of society will be strengthened through the development of infrastructure and mechanisms for obtaining and advanced training, mechanisms of socialization and integration;
- form a functional education and literacy of the population and continuous improvement of personal qualities of a person.

The implementation of the Concept should provide the following results:

- at least 50 percent of the population aged 15 to 72 years should take part in continuing education, in its various forms;
- formation of motivation for learning, and providing the adult population with the opportunity to choose individual options for obtaining education, in accordance with personal interests and labor needs;
- create mechanisms for financial support of citizens' rights to participate in continuing education.

We can say that the issues of education and the welfare of the country are interconnected and inseparable. An educated population contributes to the continuous development of society, and the welfare of the country. And subsequently, it will favorably affect the growth and development of the state and the strengthening of Russia's competitiveness in the global economic space.

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基于服务组织中精益创新的质量管理领域的流程记录
DOCUMENTING PROCESSES IN THE FIELD OF QUALITY MANAGEMENT BASED ON LEAN INNOVATIONS IN SERVICE ORGANIZATIONS

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注解。 本文讨论了质量管理领域中流程的文档支持的作用，作为企业实施精益创新的一部分。 确定了精益创新的关键特征和工具，以及在服务行业的企业中实施精益技术的过程中质量领域中的文档编制过程的阶段顺序。 作为工作的一部分，使用Rostelecom PJSC特定组织的示例确定了记录过程在质量管理领域中的作用。 考虑了旨在维护和维护电子文档完整性的方法。 研究了确保电子文档长期存储的问题以及将组织的电子文档传输到档案的问题。

关键字：电子文档档案，精益创新，管理文档，文档，质量管理。

Annotation. *The article discusses the role of documentation support for processes in the field of quality management as part of the implementation of lean innovations at the enterprise. The key features and tools of lean innovations, the sequence of stages of documenting processes in the field of quality during the implementation of lean technologies in the enterprise in the service sector are identified. As part of the work, the role of documenting processes in the field of quality management was determined using the example of a specific organization of Rostelecom PJSC. Methods aimed at maintaining and maintaining the integrity of electronic documents are considered. The problems of ensuring the long-term storage of electronic documents and the problems of transferring the organization's electronic documents to the archive are investigated.*

Keywords: *archive of electronic documents, lean innovations, management documentation, documentation, quality management.*

At the present stage of development of society, the concept of lean innovations has become widespread, which, with other conditions of stability in the market of a particular company, is able to provide large profits to organizations while reducing costs and saving time. The lean innovation model provides the creation of a self-learning organization that tunes the internal communication system and business processes in the company to current trends in the economy and the needs of society. This happens mainly through the regulation of business processes, the improvement of certain aspects of the company's activities aimed at improving the quality of services provided and customer satisfaction. At the same time, it should be noted that quality in the services sector and in the production sector differs in its structure and requires different approaches to documenting processes. Any process in the framework of improving activities needs to be analyzed, the basics of its functioning should be identified. This is the only way to determine the effect of subsequent changes and areas of activity for the modernization of the processes themselves. Documenting processes is the first step in any improvement activity, as it allows you to regulate activities, to draw up projects. Moreover, if the process is considered as an object of analysis, then you can use the method of designing complex systems SADT (Structured Analysis and Design Technique). Modification of the approach towards reduction - analysis of the necessary documentation (IDA). If we consider the presented approaches to the analysis of process documentation, then the description of any system using SADT is a structured model, which is based on both natural and graphic languages. The simplified method of IDA is aimed at extracting and fixing information from documents, which is then necessary for a detailed study of the process. Distinguish between traditional document analysis and content analysis. The characteristics of these methods are presented in Figure 1

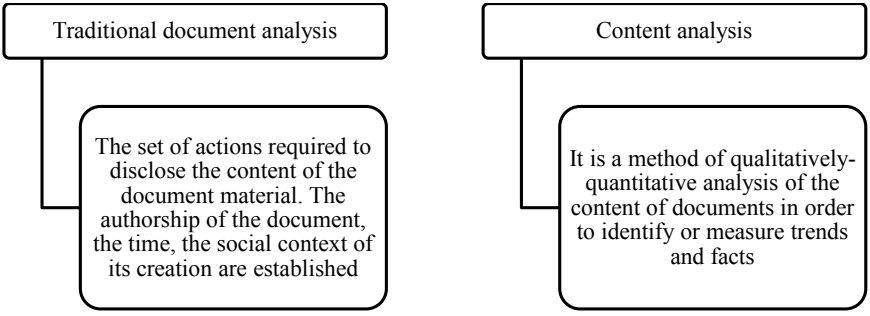

Figure 1 - *Methods of analysis of documents*

As part of the implementation of any projects, it is necessary to document the processes sequentially or to document all developed processes at once. Documentation can help managers to successfully implement almost any project. However, as part of the study of documentation, it is necessary to highlight an important modern trend - the model of lean innovations. The model of lean, evolutionary changes provides complete transparency due to the active involvement of employees, constant adjustment of goals and the use of flexible tools for implementing changes as problems arise [5].

The implementation of lean innovations - unique solutions with low cost and resource efficiency, high quality and competitiveness can positively affect the quality of life [9].

The implementation of the concept of lean innovation in the organization takes place with the help of certain tools. One of them is kaizen (continuous improvement). The most common tools for lean innovation are shown in Figure 2.

According to the philosophy of the kaizen system, it is necessary to constantly improve processes in the organization, including documentation processes. It is important to apply the system to project activities as part of the implementation of lean innovations.

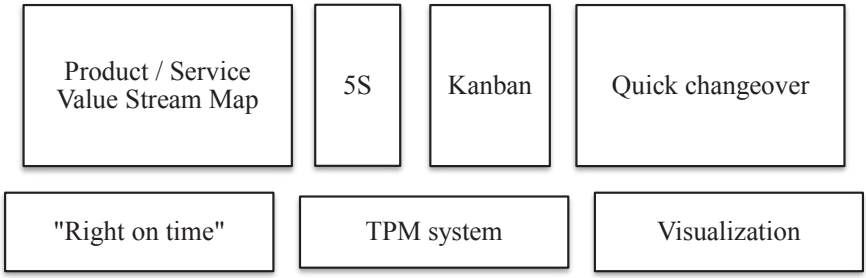

Figure 2 - *Lean Innovation Tools*

In this case, you must initially configure the plan-do-check-act cycle (plan-do-check-act - PDCA). This innovative technology in relation to the documentation of processes will take into account all the elements of project activities. In this particular case, the project activities for the implementation of lean innovations. Any workflow at the initial stage is unstable, it is adjusted, and then improved again after problems arise. So several times, which allows us to talk about cyclicity. To date, the SDCA (standardize-do-check-impact) cycle is known, which allows you to work out in detail, including the process of introducing innovations.

The PDCA and SDCA cycles are shown in Figure 3.

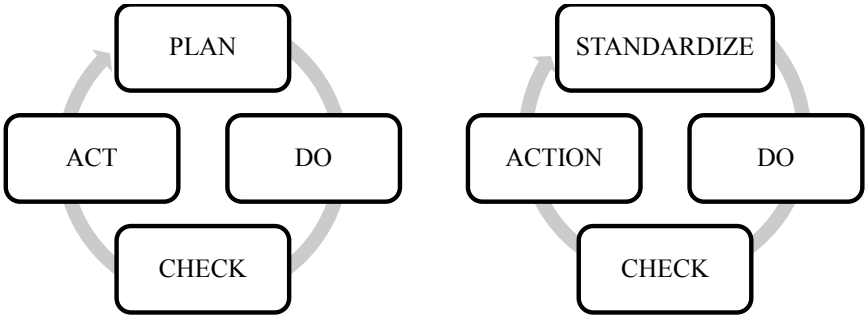

Figure 3 - *PDCA and SDCA loops*

Implementation of lean innovations in accordance with these principles will allow to take into account all kinds of problems and losses, direct all efforts of the organization to continuous improvement and improvement. Lean innovations can also be viewed through the prism of a flexible Agil model, which is based on the methods of Scrum, Kanban [4].

Agile is an approach that assumes a flexible methodology for the implementation of any project, where you do not need to rely only on detailed plans created in advance, but you need to constantly monitor the external environment (reviews of goods and services, the economic situation, the position of competitors, etc.). Thanks to Agile, the organization becomes flexible and adaptive, ready for changes, which is extremely necessary in the current economic situation and the rapid development of society.

Considering the key approaches that are at the core of Agile, it's worth saying that it is applicable to project activities to introduce lean innovations in the organization and, in general, when analyzing documents, it is advisable to use the Scrum approach, which divides the workflow into equal sprints. Before the sprint, tasks for this sprint are formulated, at the end the results are discussed, and the team starts a new sprint. The large-scale task is divided into successive short steps with constant monitoring of all kinds of deviations from the improvement path.

The Kanban project, which contributes to an even distribution of workload among employees, allows the project to be completed "on time". An example of the progressive use of this method is the approach of Toyota, which implements the principle of "just in time" with minimal cost. Kanban itself is convenient in that it provides complete transparency of the process and provides a graphically designed process for working on a project. In the studies of Tyumin D.S. a business model of lean innovations has been developed as tools to increase innovation activity in any company. Three levels can be distinguished in the structure of such a business model: input, processor, and output [9].

At the entrance there are a block of marketing and logistics. In the center is the so-called production unit, and at the output of the system is the sales unit.

There is also a generally accepted algorithm for implementing a lean innovation system, which consists of the following steps:

- assessment of demand and consumer expectations from the product / service;
- the formation of the innovation unit of the lean innovation model;
- the formation of the production unit;
- distribution and marketing.

At the stage of formation of the production unit, activities aimed at improving quality are usually widespread. It is important to prepare the necessary documentation as part of the quality control of goods and services in the implementation of lean innovations.

Thus, before implementing a lean innovation project, it is necessary to analyze the organization itself; for a detailed analysis of the process, many technologies and approaches can be applied. PJSC Rostelecom is an organization that aims to constantly improve performance indicators and introduce innovations that contribute not only to its own development, but also to popularization of modern digital platforms and individual products. Today, most of the company's services are based on cloud technologies, which can significantly improve the position in a competitive environment. Cloud technologists as a whole can achieve savings on the cost of ownership of IT infrastructure by 30-70%, significantly reduce financial investments in projects, quickly configure and put into operation information and communication technologies, etc.

The implementation of standards in the field of quality management system (QMS) based on lean innovations in PJSC Rostelecom should take place at the stage of developing strategic and tactical goals of the enterprise and be reflected in the organization’s policy. The tasks of implementing the requirements of the standards should be spelled out in the job descriptions of employees, regulations on structural divisions and local documents of the company. To control the implementation of the provisions, it is recommended to carry out monitoring, the structure of which should include specially designed control sheets and cards. It would be advisable to create documents to verify the quality of services and projects. At the same time, it is important to involve external auditors in the work.

Today, documentation related in one way or another with quality control checks is presented by the Regulation in the field of internal audit of PJSC Rostelecom. Quality assurance mechanisms are also presented in the structure of social reporting and reporting on sustainable development. From the analysis of the report on sustainable development for 2018, we can conclude that, in the framework of improving the quality, Rostelecom PJSC provides the e-government service functionality, which, as you know, significantly simplifies the provision of public

services through electronic interaction between the state and citizens. Among the innovative priorities of Rostelecom for several years ahead are the development of smart cities, the development of data center services, cybersecurity, digital public administration, big data analysis, artificial intelligence, industrial Internet, and Russia's industrial digitalization.

One of the important modern areas of activity is ensuring the long-term safety of electronic documents. Without the ability to save documents on various digital media for a long time, it is impossible to talk about a full-fledged transition to electronic document management and digitalization in Russia. Today, most Russian companies prefer an electronic document format only in the framework of operational work with documents. However, when transferring documents to the archive, organizations print electronic documents by creating paper copies of them. This practice is ubiquitous and leads to unjustified duplication of documents and inefficient use of employees' working hours, which contradicts the concept of lean innovations and hinders the development of the digital economy.

One of the important advantages of electronic document management is just freeing up the areas where previously printed documents were stored, reducing the cost of paper and cartridges, reducing the time for employees to work on one document [2]. By printing electronic documents, organizations lose all these advantages, and employees spend time working with the same document in paper and electronic form, in fact, I duplicate many operations. What prevents organizations from transferring electronic documents to the archive?

Firstly, electronic documents appeared relatively recently and people do not have clear rules and principles for transferring them to archival institutions. Legislatively, an electronic document signed with an electronic digital signature is equivalent to a paper document with a handwritten signature [3].

However, the legislative framework for the transfer of electronic documents to the archive is still being formed. While the possibility of accepting electronic documents for archival storage has already been registered at the Federal level, at the regional and city levels, not all archival service employees are ready to take such documents for storage.

Secondly, developers of electronic document management systems pay more attention to the convenience of operational work with electronic documents, not caring about the possibility of their long-term storage. In electronic systems, for example, in “1C”, electronic documents themselves are not stored, but only information, which becomes a full-fledged document only after its aggregation and transmission to print on paper [7].

Thirdly, for a full replacement of a handwritten signature, only an enhanced qualified signature (UKP) is suitable, which not all employees and even heads of organizations have. To possess such a signature, it is necessary to annually pay

for an electronic signature certificate, therefore, the full transition to electronic document management does not allow the financial costs of equipping all UKP employees.

Fourth, many people still continue to be wary of digital documents. O.V. Naumov argues that “we know how to save paper: for 900 years we have been doing this in substandard conditions, and 100 years in conditional conditions. Today nobody knows how to store electronic documents forever” [6]. And people tend to be wary of everything new.

If we turn to the world practice of long-term storage of electronic documents, it can be noted that many problems of the long-term preservation of electronic documents already have solution algorithms. Figure 4 shows the main ways to ensure the long-term safety of electronic documents used in the world.

Electronic documents must be stored in at least two copies on two different media and in different formats. In order to protect against viruses, you can use the method of "control amounts", which consists in tracking with the help of cryptographic algorithms the number and order of bits encoding a document. If these parameters remain unchanged, then the document itself can be considered unchanged [1]. And if these parameters have changed in one of the copies of the document, this can signal a virus infection of the electronic document and the need to replace it with an undamaged copy. In addition to the electronic document itself, it is necessary to store its metadata, which may include a mark on the electronic signature, on the relationship of this document with other documents, data on the creation, receipt, transfer of the document, etc. This information should also be transferred to the archive and stored with the document itself.

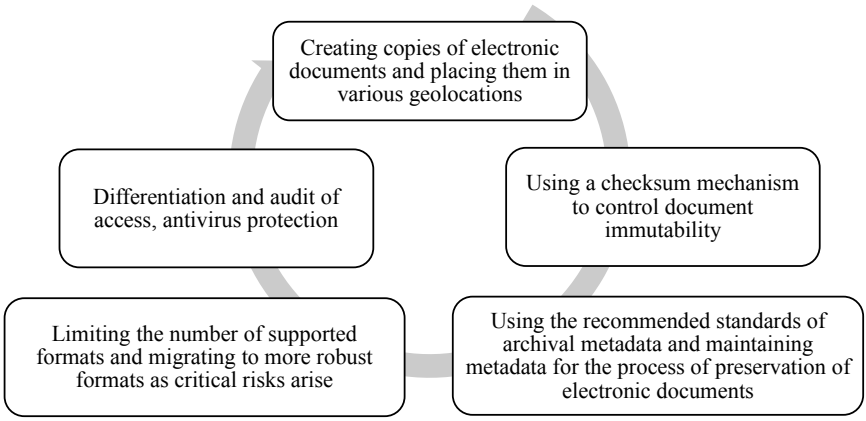

Figure 4 - *Methods aimed at maintaining and maintaining the integrity of electronic documents [2]*

When storing electronic documents for a long time, it is necessary to rewrite (migrate) documents from outdated media to new ones approximately every ten years [1]. For example, from floppy disks, it was necessary to rewrite information on disks in time, because over time, the technical devices necessary for converting electronic information into a form accessible to a person become outdated and stop being produced, and new devices and formats come to replace them.

Thus, today there are no more insurmountable reasons that could hinder the transition to electronic document management. Companies and organizations are actively transitioning to paperless paperwork. PJSC Rostelecom offers its counterparty suppliers to switch to sending accounting documents to their address for the services performed through electronic document management. Also using the capabilities of electronic document management, Rostelecom PJSC corporate clients can generate acts of work / services, TORG-12 invoices and invoices in electronic form and sign them with an electronic signature [8].

Thus, all this confirms the desire to comply with modern trends in the formation and development of the digital economy, lean innovations and improve the quality of internal processes in the organization. Lean innovation is seen as an innovative solution that has high utility and creates great commercial and social value for the company. When implementing a lean innovation project, any enterprise should analyze and work out management documentation that will streamline the process of making important management decisions in the field of improving activities and then ensure quality by monitoring the implementation of the process.

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人文素质对公司知识管理过程的影响

INFLUENCE OF HUMAN QUALITIES ON THE PROCESS OF MANAGING COMPANY KNOWLEDGE

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注解。本文考虑了一个人的内部素质与管理公司知识的过程之间的关系。诸如活动，注重细节，思维灵活，耐压力等素质的发展将有助于形成合适的公司企业文化。了解一个人的内部特征后，您可以选择正确的方法来管理他的知识。有人认为应该通过提高员工的内部素质和不断完善来占据特殊的位置。应该在组织中创建这样的条件，即员工可能会情绪低落。企业文化应旨在为员工的富有成果的工作创造有利条件。由于信息在不断变化，因此会出现新信息，因此员工必须将其吸收。事实证明，有意义，有用和实用的信息会随着时间的流逝而成为知识，然后为了整个社会的利益不断进行知识的形成，分配，交换，分配和使用。

关键词：积累，审计，内部素质，观念，企业文化，知识管理，人力资本。

Annotation. *The article considers the relationship between the internal qualities of a person and the process of managing the company's knowledge. The development of such qualities as activity, attention to details, flexibility of thinking, stress resistance will contribute to the formation of a suitable corporate culture of the company. Knowing the internal characteristics of a person, you can choose the right method of managing his knowledge. It is argued that a special place should be taken by the improvement of the internal qualities of employees and continuous perfection. Such conditions should be created in the organization that the employee has the possibility of emotional unloading. Corporate culture should be aimed at creating favorable conditions for fruitful work of employees. Since information is constantly changing, new information appears, then employees must assimilate it. It has been proven that meaningful, useful and practical information becomes knowledge over time, and then there is a continuous formation, distribution, exchange, distribution and use of knowledge for the benefit of the whole society.*

Keywords: *accumulation, audit, internal qualities, ideas, corporate culture, knowledge management, human capital.*

The foundation of any organization is staff. Their human capital (a combination of skills, abilities, knowledge) allows you to manage internal business processes. The main objective of the company is to obtain a new value, which can be implemented in new management methods, creating a product or service. For these purposes, the knowledge management process is used, which is a set of methods, means of obtaining new (or using existing) knowledge to achieve the goals of the organization [3].

An important criterion in this case is the ability to accumulate (the transition from one species to another) knowledge. Basically, this is a transition from implicit to explicit. That is, emphasis should be placed on the development of the employee's internal knowledge and the creation of conditions under which he can realize them [4]. For this, you can conduct personal conversations between the leader and the employee (problematic model situations will be formed, using which you need to find solutions), trainings (where a person can prove himself), round tables (discussion of issues will reveal who is strong in which field).

Figure 1 presents the main positive qualities of a person that contribute to his development and form the company's knowledge.

For example, an employee has well-developed creative thinking, a creative approach, he can be sent to the marketing department, where he can create vivid advertising for a product or service. Another employee has analytical capabilities, therefore, he can be sent to the analytical department (where the collection and analysis of data on the market will be carried out). That is, there is a distribution of knowledge within the organization, the staff is sent to those areas where it can bring great benefits.

Improving the internal qualities of employees and continuous excellence should occupy a special place. This can be realized both independently by the employees themselves, and thanks to the training programs in the organization [1].

For example, a training program in the direction of teamwork. The bottom line is that a group of people is recruited, a problem is posed to it and it is necessary to find ways to solve it (it checks the speed of thinking, coherence, logic, etc.), while the trainers watch how the participants in the process interact with each other. If someone does not succeed, then he is prompted how best to do it. It is also aimed at overcoming the internal barrier in a person (shyness, fear of communication and more). You can use the brainstorming method. The staff will offer ideas based on their internal knowledge and guesses. Preference will be given to active, proactive, dynamic, purposeful individuals, but at the same time, judicious, calm and balanced, as they better establish causal relationships. In such communication

there will be an exchange of knowledge, experience and skills. Everyone will find something new for themselves and possibly use it in practice.

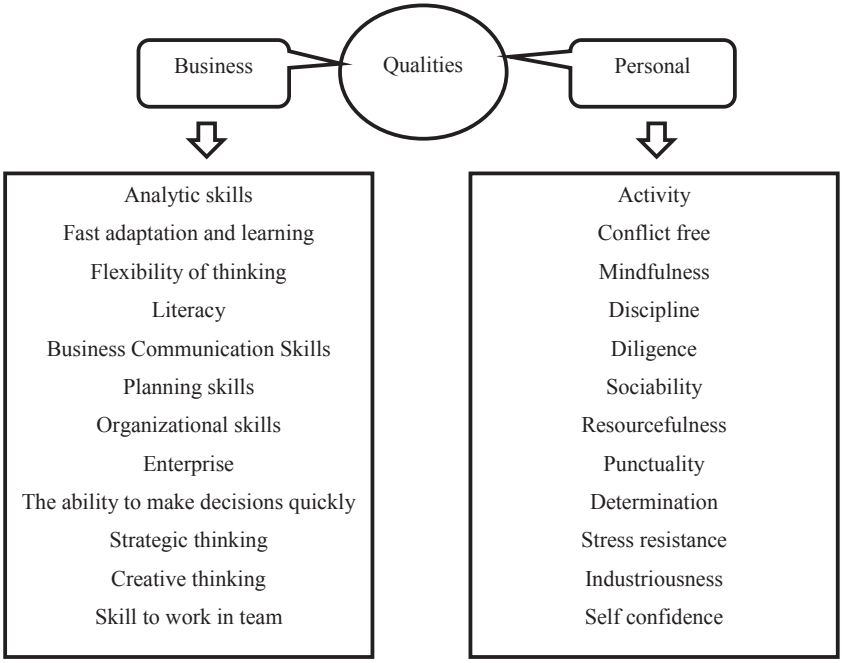

Figure 1 - *Positive qualities of a person contributing to his development*

For the application and use of knowledge, it is necessary to give them an explicit form, which is most often achieved by fixing in something, for example, in documents, possibly in electronic ones. For example, there is a meeting on entering new markets. Speeches are heard, and then the discussion begins. At the end, specific decisions are made on the issues addressed. This is all accompanied by a protocol. Based on his careful study, the stages of further implementation of the solution are developed. This may be the development of a new strategy, the creation of a new internal personnel policy, a new style of sales, etc. That is, there is a use of knowledge in practice.

In the course of fulfilling their professional duties, situations may arise when a person loses interest in his work (professional burnout), dissatisfaction and irritability appear, therefore stress resistance is a necessary quality of each employee. Such conditions should be created in the organization that the employee has the possibility of emotional unloading [5].

This is the task of corporate culture, which is aimed at creating favorable conditions for the fruitful work of employees. For example, the principles of respectful treatment of each other are used, the management should always be open for cooperation, activities for staff are held. Types of corporate culture and their characteristics are presented in table 1 [2].

The organization itself has the right to choose the corporate culture that suits it best. But it is possible to carry out a combination of individual parts. For example, interactions like “family” and “guided missile”. As part of teamwork, creative personalities will realize themselves, propose a non-standard solution to problems. There will be an accumulation of knowledge and application in various fields. As part of the knowledge management process, a “column of ideas” can be created. It will be a separate unit in the corporate system of the organization. The “column of ideas” model is presented in Figure 2.

Table 1 - *Types of corporate culture*

A type	Characteristic
The Eiffel Tower	It has a clear structure and functional responsibilities. There is a pronounced role orientation with detailed responsibilities of employees. Careful control takes place, and deviation from a given course is also not allowed.
A family	Strict hierarchy and orientation to follow directions from above. There is a paternalistic attitude (the initiative and efforts of subordinates must be consistent with the leader’s attitudes). Abilities, decisions, mood of the leader determine the further course of events. An approach policy may apply. Efficiency is determined not only by the degree of respect for the leader to his employees, but also by how much he knows their strengths and weaknesses, that is, an ethical assessment of approval or disapproval takes place.
Incubator	It is aimed at the development of self-realization of a creative person within the framework of non-hierarchical ties. There is a minimal degree of formalization of relations. The main goal is the creation of creative associations.
Guided missile	All decisions of any tasks are made thanks to teamwork. Clear deadlines for a specific result. All tasks are clearly worked out, the maximum degree of delegation of functions down. The main goal is the formation of strategies aimed at achieving goals

The bottom line is that employees will offer their ideas, based on work experience, regarding the company's internal organizational problems. There will be a separate block in the information system where employees will be able to contribute ideas on improving processes, how to change the existing structure in the organization, breakthrough areas in sales, logistics, marketing, document management, etc. Then qualitative selection will be carried out and distributed by activity. In the future, such ideas can be implemented, and they can bring about qualitative changes.

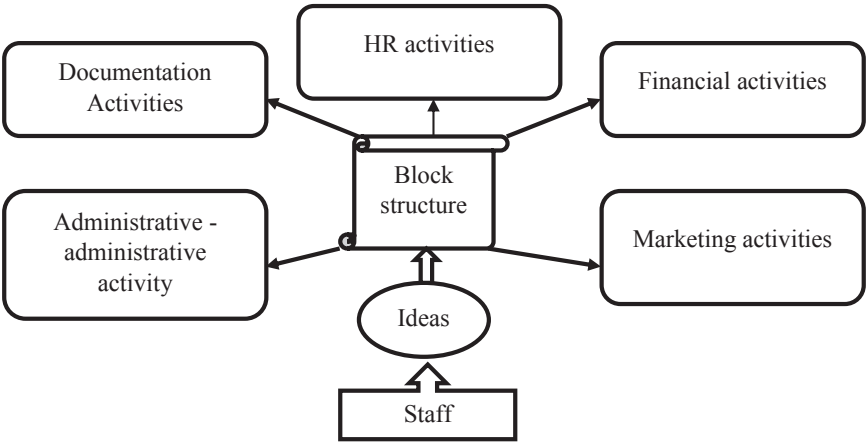

Figure 2 - *Model "column of ideas"*

When hiring people for work, it's worth not only testing (to identify professional suitability), but also creating model situations in several areas of activity in order to see the person's internal qualities, how he manifests them, how high-quality his thoughts are. This will determine the fact whether or not this person can fulfill his duties well and exceed the plan, make a profit for the company.

Thus, human qualities are a powerful tool in company management. Knowing the possibilities and shortcomings of the employee, you can choose the right front for him, and he, in turn, will put his knowledge into the continuous operation of processes within the company. A continuous audit of knowledge should also be undertaken. Since information is constantly changing, new information is appearing, then employees must assimilate it, meaningful, useful and having practical implementation information over time turns into knowledge. Thanks to this, there will be a continuous formation, distribution, exchange, distribution and use of knowledge for the benefit of the whole society.

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在经济低迷的背景下使用导航系统的法律规定

LEGAL REGULATION OF USING OF NAVIGATION SYSTEMS IN THE CONTEXT OF DIGILIZATION OF THE ECONOMY

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注解。 本文介绍了在导航卫星系统领域中俄关系的前瞻性问题。 详细考虑了GLONASS和BDS功能的法律法规。 确定了进一步合作的国家总政策的方向。

关键字：导航系统，数字化，空间发展，中华人民共和国，俄罗斯，联邦，法律，运输系统。

Annotation. *The article describes the problems of the prospective direction of relations between Russia and China in the field of navigation satellite systems. The legal regulation of the functioning of GLONASS and BDS is considered in detail. The directions of the general policy of states for further cooperation are identified.*

Keywords: *navigation systems, digilization, space development, PRC, Russia, commonwealth, law, transportation system.*

The issues of digital transformation of satellite navigation systems are important at the present stage, because the system allows to modernize the process of introducing the digital economy in Russia and China. At a meeting of the Government of the Russian Federation in 2018, the issue of updating this problem was raised. [1] One of the elements of digitalization should be considered the development of the Russian global navigation satellite system GLONASS. Roscosmos together with the Russian Ministry of Defense on October 12, 1982 announced the launch of the first GLONASS launch. [2]

GLONASS was originally used in the military and was launched in conjunction with a missile attack warning system to coordinate the actions of the naval, air and ground armed forces. The system includes 24 satellites moving in three orbital planes. GLONASS has a high advantage over other navigation systems: in their movement, GLONASS satellites do not have synchronism with Earth's rotation, which gives them additional stability. [3]

The GLONASS system is widely used in scientific research to monitor processes that continuously occur on the Earth. Navigation signals from space satellites are used to study seismic processes, satellite systems with higher accuracy record the displacement of tectonic plates than ground-based measuring instruments. The system is able to facilitate the formation of a coordinate system, build a model of the globe, track the water level in reservoirs of various types, etc.

GLONASS Russian navigation satellite system is used in the digital economy in various industries. It is widely used in the activities of the Russian Emergencies Ministry in search and rescue operations. In accordance with the Order of the EMERCOM of Russia, GLONASS is used to coordinate search and rescue teams, track employees during fire extinguishing and other types of hazardous work. [4]

In transport, the system is widespread in order to achieve a reduction in the number of road traffic accidents for the logistics of passenger and cargo transportation. [5] Many modern private cars equipped with the Russian system automatically determine the moment of an accident and call the necessary emergency services at the place of its commission.

GLONASS technologies are used by cadastral engineers in carrying out work, for planning, managing city development and land surveying. Activities using the system are carried out in accordance with the Order of the Ministry of Economic Development of the Russian Federation. [6]

GLONASS is of practical importance in the monitoring of construction equipment, the displacement of the roadway, the deformation of linear stationary objects as well as in the conduct of road construction works in the part of managing road construction equipment.

The GLONASS system is widely used on various types of transport. In automobile transport, the system allows you to track the location of the car, read the readings from the car’s sensors and ensure the safety of cargo transportation. GLONASS is used when maneuvering in difficult conditions, which increases the efficiency and safety of cargo transportation. After its introduction on ships following the Northern Sea Route, their annual freight traffic volume has grown significantly. By order of the Ministry of Transport of Russia, a system was introduced to control the transportation of goods by equipping vehicles with electronic navigation seals compatible with the GLONASS system. [7]

This system is able to track the movement of cargo and, if available the fact of its seizure. In the case of transit traffic, the electronic navigation seal is able to reflect on the map a clear movement of the transported cargo, thereby reducing the load on the control and oversight bodies of the counterparty countries. In aviation, a navigation satellite system is integrated into airborne systems, which, in turn, provide navigation and route planning to ensure safe flight in difficult weather conditions.

With the GLONASS system it is used in almost the entire spectrum of economic activity, has modern legal regulation and reflects the modern demands of the digital economy. The navigation system is able to reduce a large number of costs during virtually any work, thereby increasing the qualitative and quantitative indicators in the digital economy of the Russian Federation.

The People's Republic of China is an important strategic partner of the Russian Federation for international transportation. China's own satellite navigation system creates Bei Dou 北斗导航系统 (the BDS), which is analogue American and Russian. The system was independently built and put into commercial operation in December 2012 , which is used by China taking into account the country's national security needs and its economic and social development. Being a space infrastructure of national importance, BDS provides global users with constant, all-weather and high-precision positioning, navigation and synchronization services.

The development of the BDS is aimed at creating a world-class navigation satellite system to meet the country's national security needs, economic and social development, and provide continuous, stable and reliable service to global users. [8] China has stepped up international cooperation to share development results in satellite navigation, enhancing the comprehensive application benefits of the global navigation satellite system (GNSS). BDS consists of three segments: ground, space and user.

The BDS in the space segment is a hybrid constellation consisting of satellites in three types of orbits. For the first time, BDS integrates navigation and communication capabilities and has five main functions - real-time navigation, quick positioning, accurate time, location reporting and short message communication services.

The ground sector includes ground applications, navigation applications and aviation applications. Terrestrial applications are created and operate for autonomous vehicle navigation, tracking and monitoring of vehicle traffic for logistics and safety purposes, including monitoring of railway operations and more. Navigation applications allow track carriage by sea and inland waterways, their anchor parking and docking of vessels.

BDS was widely used in various spheres of life of the state and society - this is communications, transport, public safety, agriculture and forestry, including

livestock and fishing, hydrological monitoring and weather forecasts, time synchronization, electricity distribution, prevention and reduction of damage from natural Disasters. According to official figures, by September 2019 alone, more than 6.47 million road vehicles and 42,300 vehicles for postal and express transportation were equipped with BDS receivers, due to which the world's largest dynamic traffic control system appeared, increasing road safety, speed of delivery of goods.

And the technical means using the BDS system are successfully used in products intended for a wide market, so the technology of the Chinese navigation system has entered the world market and is used almost everywhere.

The provisions of the People's Liberation on the management of the use of satellite navigation Army (中国人民解放军卫星导航应用管理规定). [9] The military rules were issued by the former Department of the General Staff of the Chinese People's Liberation Army on June 1, 2014 (currently known as the Office of the Joint Headquarters of the Central Military Commission). These rules have a lower status than "law" or "regulation". H and currently this "rule" is the only legally binding, which is directly and specifically concerns BSS applications.

China, as a space power, does not have a basic space law. The White Paper became the official document on China's space activities. The fourth version of the document was published in 2016. A program document specifically for the BDS White Paper on the Chinese navigation satellite system BeiDou. This technical paper outlines the goals and principles associated with the development of BDS, and reiterates the three-stage BDS strategy. [10]

The Chinese government is in international cooperation with all BDS navigation satellite systems in the world. The Chinese government plans to strengthen sharing and use with navigation satellite systems, and to promote the ratification of BDS in accordance with international standards, in particular, the standards of the International Civil Aviation Organization and the Third Generation Mobile Partnership Standardization Project. The BDS has already been recognized by the International Maritime Organization after it has become safe for use on ships.

Supporting the cooperation between Russia and China, on June 8, 2018, an Agreement was signed between the Government of the Russian Federation and the Government of the People's Republic of China on international road traffic [11]. The Agreement abolished significant restrictions on the routes of movement of international goods and their depth. The obligation was introduced to equip all types of transport with the aforementioned Beidou and GLONASS systems, thereby the parties legitimized and agreed to exchange information regarding the movement of international goods across countries. In order to implement these provisions, a unified information portal "SilkWay" (Silk Road) was created. It reflects a system of information and navigation support for cross-border

transport between Russia and China. The introduced system made it possible to obtain the following reserves: access railway lines up to 10 million tons annually, and sea and river transport up to 11.5 million tons. At the moment, a joint study of Russian and Chinese experts suggests the possibility of increasing the volume of cargo transportation in tenfold size.

Decree of the President of the Russian Federation dated 07.05.2018 No. 204 "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024" [12] sets the following tasks for the subjects of the transport complex participating in international trade: reduction of bureaucratic administrative barriers; reduction in the number of procedures required for international trade; minimization of restrictions in the field of logistics in the export of goods; improvement of transport corridors "North-South" and "West-East" for the international transportation of goods.

In the above Presidential Decree, the international transport corridor refers to the effectiveness of the complex interaction of interdependent factors: the direction of the vectors of movement of human and traffic flows; a list of paths suitable for the concepts of land, road, rail, water and air; other infrastructure at the facilities of the transport complex.

A material approach to the formation of a strategy for the development of international transport does not fully reveal their potential. The current situation is aggravated by the paper workflow that has developed over time and has become established in practice and the constant demand for reporting from the state supervisory agencies. Coordination of legal support of foreign economic activity, through the introduction of modern digital services, is not possible. The established methods of legal and logistical support for the international transport of goods are not fully reflected in the current legislation of Russia and China.

According to the authors, for the sustainable development of the use of modern technology in the organization of international transportation, it is necessary to improve the control and supervision activities of state bodies in terms of electronic access procedures (border, customs, etc.), as well as the introduction of electronic document management and the transition to electronic declaration.

A program document issued by the National Administration of China for Geodesy, Cartography and Geoinformation in March 2013 to implement the previous program documents. This policy document was obviously made from the point of view of BDS users. He urges competent regional authorities in the field of geodesy, cartography and geoinformation to accelerate the promotion and industrialization of BDS, as well as protect China's national security and interest within its competence.

Analyzing the above, the authors of the article come to the conclusion that the legal regulation of satellite navigation systems is insufficient. The Chinese

People's Liberation Army and the National Administration for Geodesy, Cartography and Geoinformation have repeatedly stated this. The Russian authorities hold meetings at a constant level and create working groups on digital visions.

The two navigation systems of the two strongest states carry out their functions in each of them, designed to solve, first of all, economic problems by simplifying transport problems, logistics, routing and navigation of vehicles. The Chinese system is more functional for the state, as it performs expanded functions, which include meteorology, agriculture and the social sphere. The interaction of China and Russia on the issue of navigation systems is a promising area of cooperation.

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法律术语中的同义词问题
TO THE PROBLEM OF SYNONYMY IN LEGAL TERMINOLOGY

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注解。 这项工作的目的是研究法律术语中的同义词问题。 本文考虑了为各种法律术语正确使用同义词的问题。 作者得出的结论是，对术语及其相互之间的同义词关系的了解对于确保有效的沟通极为重要。

关键字：同义词，术语，法律术语，沟通。

Annotation. *The aim of the work was to study the problems of synonymy in legal terminology. The article considers the problem of the correct use of synonyms for various legal terms. The author concludes that knowledge of the terms, their synonymic relationships among themselves is extremely important to ensure effective communication.*

Keywords: *synonymy, terminology, legal terms, communication.*

Language changes are directly dependent on the needs and standard of living of speakers of a particular language, closely related to the scientific, technical, economic and social transformations taking place in society and the world. The emergence of new production tools and new products on the market is accompanied, as a rule, by the expansion of the vocabulary of the language due to the emergence of new language units, with the help of which they are designated. In turn, obsolete and unclaimed objects in society disappear, and at the same time, their names disappear or these names get a different rethinking.

Behind this phenomenon, of course, is a person whose result of dynamic activity is the creation of a multitude of language units in accordance with the method and nature of cognition of the world around him. One of the important aspects of human scientific activity is the creation of a conceptual apparatus of science used in professional communication, which in the age of globalization and informatization is gaining enormous scientific and applied significance for humanity.

With the development of scientific and technological progress, modern science as a whole, as well as its specific areas, require constant expansion and enrichment of the terminological apparatus necessary to designate newly emerging objects, phenomena and processes. Terminology is an integral part of any science, not only because it serves to designate scientific concepts, processes and phenomena, but also acts as a universal means of communication among specialists from different countries. The terms are backed with centuries-old experience gained as a result of many scientific discoveries.

In modern terminology, the term refers to a word or phrase correlated with a special concept, phenomenon or subject in the system of any field of knowledge or activity (M. Blokh, Y. Vinokur, G.V. Grinev, S.V., Danilenko V.P., Kobrin R.Yu., Leichik V.M., Tatarinov V.A., Reformatsky A.A.).

The terminology is characterized by the basic methods of nomination typical of a common language (semantic, lexical, morphological, as well as borrowing from other languages). Terminology is also inherent in such systemic-semantic relations as polysemy, antonymy, homonymy, metaphorization and synonymy (A.A. Reformatsky; G.O.Vinokur; A.L. Pumpyansky; N.P. Andreeva).

One of the most important types of semantic relations in terminology is synonymy. Among the huge number of scientific works devoted to the study of various aspects of synonymy, works devoted to the synonymy of terms occupy a special place. Sometimes synonymy in terminology is negatively assessed by linguists, since it is believed that only doublets are found within the terminological systems, for example, S.V. Grinev in his book “Introduction to Terminology” writes: “One term must correspond to one concept and vice versa” (Grinev 1993: 19). The absence of synonyms and antonyms in terminological systems is also indicated by L.A. Kapanadze, comparing terminological units with the words of the general literary language (Kapanadze 1965: 79). In the article of E.N. Tolikina's “Synonyms or Doublets”, it is suggested that only doublets are found within the terminological systems (Tolikina 1971: 58).

But most researchers consider the synonymy of terminological nominations as an objective regularity of the initial stage of the development of the language of science and technology (Yu.D. Apresyan, V.A. Grechko, V.A. Tatarinov and others). The coexistence of a number of competing terminological names is explained by objectively existing conditions when the natural or artificial selection of the most suitable term has not yet occurred. So, for example, V.A. Tatarinov believes that in the transition from academic genres to scientific, the percentage of synonyms increases sharply, since “the higher the level of development of scientific thought, the more progressive thinking, the inexhaustible reality appears to the researcher, the more diverse it finds its expression in linguistic forms” (Tatarinov 1996: 194).

Despite the different points of view of the majority of linguists regarding the definition of synonymy and many approaches to its study, we can conclude that the appearance of new synonyms in the language is not accidental, but is due to a number of patterns and the degree of synonymy of words increases if the number of common positions that can minimize differences in their meanings.

Of particular importance at the present stage of the development of linguistic science is the terminology of one of the most interesting and sought-after sciences - jurisprudence, which is associated, on the one hand, with the intensive development of this scientific discipline, on the other hand, with the desire of society to preserve and maintain legal relations, the desire to live in a legal, democratic society.

Analyzing the legal terminology of the English language, as well as referring to research data in the field of terminology, we will try to prove that the terms reflect a certain part of the lexico-semantic system of the language and possess the characteristics that are specific of each semantically significant element of the language. The term, like any word, subject to the laws of language development, can be unambiguous (*killer*) and ambiguous (*lawyer - a term denoting a wide range of legal professions*), and can also have synonyms containing elements of emotionality and imagery (*residence - resident status - green card*), where the term *residence* is neutral, *resident status* reflects the essence of the process, and the synonymous term *green card* is based on the external attribute of the document.

Trends in opposing terminology to common vocabulary or ignoring the differences between them show that in form and content it is difficult to find a significant difference between the word of commonly used non-specific vocabulary and the word of terminological vocabulary (Golovin 1987: 146).

Despite the fact that in jurisprudence most of the terms are delimited from general literary words, there is a parallelism of everyday and special names, for example:

defendant - figurant - client.

In this work, we proceed from the point of view that the terms reflect a certain part of the lexico-semantic system of the language and possess the characteristics inherent in each semantic meaningful element of the language, including the properties to enter into synonymous relations with each other. It is human nature to remember the meaning of a statement, therefore, when reproducing information, both terms and their so-called “substitutes” or synonyms can be used.

Thus, when studying modern legal terminology of the English language, it was found that terminological synonyms account for about 23% of the total sample size (Shamseeva 2012). An analysis of the literature on the legal terminology of the German language shows that the number of intra-industry terminological synonyms is steadily growing, and the number of terms in the synonymic series can be more than 10.

Modern English legal terminology has so many synonyms that it requires constant systematization and streamlining. The circle of synonymic analysis can include not only simple and complex terms in terms of structure, but also terminological phrases.

Therefore, a synonymic correspondence in a synonymic series can be expressed in the following forms: simple term, complex term, terminological phrase. The components of synonymic series can be summarized as follows: simple term - simple term (*crime - offence*); simple term - complex term (*crime - wrongdoing*); simple term - term combination (*crime - criminal act*); complex term - complex term (*misdemeanor - wrongdoing*); complex term - term combination (*misdemeanor - criminal act*).

Knowledge of the terms, their synonymic relationships among themselves is extremely important in ensuring the effective communication. The most common cause of failures in professional communication is most often not a lack of language skills, but ignorance of a particular term or its synonym. All this suggests the need for research on synonymic relations in the field of terminology.

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十九世纪俄罗斯文学中的“中文”文本，上下文和潜台词
"CHINESE" TEXT, CONTEXT, AND SUBTEXT IN RUSSIAN LITERATURE OF THE XIX CENTURY

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抽象。　在本文中，我们提出了俄罗斯文学的“中文文本”和相关的“中国语境”的形成问题，决定了它在民族文化中的地位。　通过分析“中文文本”，我们可以得出结论，它对俄罗斯文化及其中“中国语境”的出现具有重大影响。

关键词：中文文本，中国语境，潜台词，俄罗斯文学，汉学，十九世纪。

Abstract. *In this article, we pose the problem of the formation of the "Chinese text" and the associated "Chinese context" of Russian literature, determine its place in the national culture. Analysis of the “Chinese text” allows us to conclude that it has a significant influence on Russian culture and the emergence of a “Chinese context” in it.*

Keywords: *Chinese text, Chinese context, subtext, Russian literature, Sinology, XIX century.*

In Russian literary criticism of the 1990–2000s, study of various versions of “thematic texts” became popular - “St. Petersburg” [14], “Pushkin” [4], “Venetian” [11], “London” [3], “Diaghilev” [7] and others.

The concept of "text" in this case is used in the meaning that was used by Yu.M. Lotman [10] and post-structuralists [1]: as *part* of the whole, with its own internal structure and associated with many “texts” and other cultural phenomena that intersect in many ways [8], as a result of which the text becomes the center of intersection of meanings that unite author and reader, literature and other forms of spiritual and material culture.

By “thematic text” we mean the union of works of art (in particular, literature) around a certain “theme”, which is based on descriptions of the “topos” (art space) of countries or cities (Italy, Venice, Moscow, St. Petersburg, etc.), the identities of any outstanding cultural figure (for example, Pushkin or Diaghilev) associated

with certain *cultural contexts*. The context largely determines the thematic "text" corresponding to it, and these differences often determine its specificity. Cultural contexts form figurative associations and mythologies in the consciousness of the "perceiving" (reader, viewer, listener), which are subsequently included in the text.

Among the many and varied "texts" created by Russian culture, a special place was occupied by works in which China was portrayed. We propose to call the totality of such works the "Chinese text."

Unlike the "Moscow", "St. Petersburg", "Venetian", "London" and other "urban" texts, the "Chinese text" cannot be considered as a "local" spatial text, since the subject of this text itself cannot act as a "locus" ", Due to the fact that its object is a special *type of civilization*, created over several millennia by the Chinese people.

The "Chinese text" may include works that reproduce the life of the Chinese people, describing the space and history of the country, its culture and literature. The "Chinese text" of literature reveals the diverse cultural realities of China: religious, philosophical and ethical systems created by Chinese thinkers, plots and images, style and plot-compositional techniques borrowed from works of Chinese literature can be used in it.

The Chinese text exists not only within the framework of Russian literature, but also in the literature of Western Europe and the USA. A typical example of the expanded Chinese text in European literature is the cycle of novels about Judge Dee, created in the 1950s and 1960s by the famous scientist, writer and diplomat Robert van Gulik, or the series of stories about the same judge Dee written by the French writer Frederick Lenorman. The composition of the "western" "Chinese text" can include, for example, works created by Chinese emigrant writers - Lisa See, Jade Lee, Shan Sa, and many others, in the works of which Chinese culture is reproduced.

In Russian culture of XIX – XXI, the "Chinese text" has taken a significant place, and this can be explained by the enormous significance of the life of the country — Russia's close neighbor — for understanding its own history and culture. Russia and China - two states whose historical path and cultural paradigms were fundamentally different, on the one hand, and, on the other hand, with all their originality, had a number of features, a comparison of which helped to understand the essential features of the historical path of Russia and the Russian character. The "Chinese text" helped Russian writers and readers better imagine the prospects of Russia and the laws of its development, contributed to understanding the place of the person and the "voice" of the hero in the public life of a given period.

The existence and functioning within the framework of a particular culture of any thematic text is possible only if there is a diverse cultural and historical *context* corresponding to it. In the "context" in this case, not only the historical

and cultural environment is included, but also the ideas about China (sometimes even very distant from reality, but connected in the minds of perceivers with this country) reflected in the cultural memory of the *subjects* of the text - *readers*, its language, history, nature and culture, including those expressed through other previously created *texts* dedicated to this country (in particular, research by Russian sinologists). We propose to call this context the "Chinese context."

The "Chinese context" of Russian literature may include translations of works of Chinese literature, journalistic and non-fiction books about China. The "Chinese context" of Russian literature includes the diverse "travel literature" that was actively published in the second half of the 19th century in Russia, for example, the works of P. A. Kropotkin, M.V. Pevtsov, G.E. Grumm-Grzhimailo, V.I. Semenov, I.Ya. Korostovets, E.E. Ukhtomsky, V.V. Korsakov, V.M. Alekseev and many other travelers.

For a long time, China remained a "culturally unexplored" country for Russian people and was interpreted as an exotic, "mysterious" country for the reader, and therefore *perception* and *interpretation* problems were especially important for the Chinese text of Russian literature. The most important part of the Chinese context of Russian culture was reflection on the laws and paradoxes of the development of Russia (in comparison with China), especially (from the end of the XIX century until the beginning of the XXI century), in comparison with the history of China.

A focused interest in China and Chinese culture (that is, the formation of the *Chinese context*, which became the basis for the further formation of the *Chinese text*) began to appear in Russia in the XVIII century. In this regard, Russia was included in the pan-European trend associated with a growing interest in the great eastern state: for example, it began to develop the European "court" tradition of turning to the "Chinese style" *chinoiserie*, which influenced architecture, painting, interior design and women's fashion, the use of which has become a sign of refined taste and evidence of material wealth of the owners. However, in the XVIII century, the appeal to Chinese culture was most often superficial, concerning only certain external details and stylistic devices; at the same time, the *essence* of Chinese traditions and the philosophical and ethical system behind it, the life of the Chinese people for a long time remained outside the scope of Russian society and were not accompanied by an in-depth "enlightening" and "intellectual" love for China.

Publications about China and translations of Chinese classical texts that followed throughout the XVIII – early XIX centuries formed an interest in this country in the minds of the Russian public and contributed to the emergence of a certain primary "background", a cultural context. Significant progress in this direction occurred in the XIX century.

The main subject of translations during the first half of the 19th century for Russian Sinologists became *historical* works, which, on the one hand, gave Russian readers an idea of the history of a neighboring country, and, on the other, aroused in their minds parallels with the domestic past (interest in which for XVIII – XIX was constantly growing). Russian magazines (for example, Bulletin of Europe) systematically began to publish on their pages descriptions of travels in Eastern countries, translations of eastern poetry and prose. Traveling notes, in particular, about the countries of the East, replete with exotic, vivid and original images and plots, were of particular interest to Russian readers. Such publications formed in the minds of Russian readers a system of ideas about China, which presented itself as a country with its original historical path, and the problems experienced by Chinese people, their feelings, emotions seemed similar to the same experiences and feelings of many Russian people.

Less frequently appeared texts that described the daily customs and mores of the Chinese. In 1832 in the almanac "Northern Flowers", owned by A.S. Pushkin, published an anonymous translation of a fragment from the XVII century Chinese novel “Hao qiu zhuan” (“Happy marriage”), which tells about the fate of two young people: erudite young man Te Zhunyue and the daughter of an dignitary Shui Binsin [2].

The isolation in Russian literature from the general “theme of the East” of a special “Chinese theme” occurred in the 1830s (the reason for this was largely the formation and development of the “Chinese context” in the minds of society). Among the first works that can be included in the “Chinese text” of Russian literature, for example, V.F. Odoevsky's “4338th year: Petersburg letters” (1835) [12] and ironic “Chinese works” by O.I. Senkovsky [13].

The final work of Russian literature of the first half of the 19th century, in which a detailed image of China appeared, was a “geographical novel” by I.A. Goncharova “Frigate“ Pallas ””, written in 1855–1855 and published as a separate publication in 1858. The writer revealed the peculiarities of the Chinese mentality, especially noting the industriousness, humility, goodwill and zeal of Chinese people, their lack of fanaticism, courtesy and honesty, filial piety. Comparing the Chinese and the British (not in favor of the latter), the author noted: “I don’t know which one of them could civilize the other – shouldn’t Chinese civilize British?” [6: 236].

In the novel by I. Goncharov, for the first time, the most important feature of the “Chinese text” of Russian literature was revealed: for Russian writers and readers, “China” was not interesting in itself, not as an exotic (not familiar to the Russian reader) *scene*, but as a special world that on the one hand, it is constantly opposed to Russia, and on the other, it is in many ways similar to it. Yu.M. Lotman noted: “Frigate“ Pallas ”” by Goncharov, in fact, focuses not on

the cultural space that the traveler crosses, but on the traveler's perception of this space <...>. Goncharov <...> declares that interest in the diversity of cultures, openness to the "foreign" is the real specificity of Russian consciousness "[9: 747]. In this case, Chinese culture has become an example of "foreign", necessary for understanding the "own", that is, part of the *context* of Russian culture.

A qualitatively new stage in the formation of the "Chinese context" of Russian literature is associated with Russian literature of the second half of the XIX century. During this period, a huge role in its development was played by the work of Russian Sinologists about. Palladium [Kafarova], I.A. Gashkevich, A.A. Tatarinova, M.D. Khrapovitsky, V.P. Vasiliev, who in the 1850-1880s published many scientific works on the history and culture of China, Manchuria, Tibet, Mongolia, as well as translations of Chinese classical philosophical texts (including the books of Lao Tzu, Confucius, Menzi) and works of Chinese literature and folklore. Their research was intended not only for orientalists, but also for a wide range of Russian readers.

Articles by Russian orientalists describing the history and current state of China, its religious and philosophical system, nature and culture of the region, the life and customs of the Chinese and peoples living near them often possessed a vibrant artistic and journalistic form and were published in publications that had a wide readership - such as the magazines "Contemporary" and "Publishing of the Russian Geographical Society", the newspapers "Northen bee", "New times", "Stock journal", "Voice" and others. Thus, information about China and Chinese culture entered the minds of the Russian reading public and created a "Chinese context", which, in turn, became widely used by Russian writers during the last third of the XIX – early XX centuries, for example, by L.N. Tolstoy, N.G. Garin-Mikhailovsky, V.M. Doroshevich, A.V. Amphitheatov, K.D. Balmont, N.S. Gumilyov and many others.

Of great importance for the formation of the Chinese context was the activity of L.N. Tolstoy. China attracted him with its spiritual values, high moral principles, the depth of philosophical thought and appeal to the spiritual essence of man. In the 1880s - the period of the most difficult spiritual searches - L. Tolstoy studied in detail the works of ancient Chinese thinkers - primarily Lao Tzu, Confucius and Menzi. In the 1880s, the writer, using European translations, created the exposition of the Chinese doctrine, which briefly described the essence of the treatise "Da Xue" ("大学" - "Great Doctrine") and began work on the treatise "Chinese Wisdom. Books of Confucius. " L. Tolstoy believed that the works of Chinese thinkers represent a spiritual "guidebook" for the Russian person, giving birth to the most important spiritual values in the process of reading it and showing people the true path.

In the works that compiled in the XIX “Chinese text” of Russian literature, the appeal to the image of China was often used as a special way of thinking about Russia itself. China was often seen as a *different*, unrealized by Russia path of development of the country (civilization, culture), the study of which could teach Russia and Russian people a lot, warn it of any potential (possible in the near or distant future) dangers. In this context, many Russian thinkers thought about China - V.G. Belinsky, P.Ya. Chaadaev, F.M. Dostoevsky, V.S. Solovyov, L.N. Tolstoy. Thus, the “Chinese text” formed the “Chinese *subtext*” of literature, which, in turn, influenced the development of *social thought*.

The emergence of the “Chinese context” and related “Chinese text” and “Chinese subtext” in Russian culture XVIII – XIX not only contributed to the growth of interest in China and Chinese culture, the development of Russian readers' understanding of history, nature, life, traditions, religion and Chinese philosophy, but also created the basis for the formation of a complex and polysemantic “Chinese text”, which was actively developed throughout the XX century.

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hokku俄语和英语翻译功能的比较特征
COMPARATIVE CHARACTERISTICS OF FEATURES OF TRANSLATING HOKKU INTO RUSSIAN AND ENGLISH

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抽象。 在这篇文章中，我们谈到了hokku是日本最著名和最广泛的诗歌体裁。并非每个人都能理解hokku的含义，因为它们隐藏了自然与人之间的隐藏联系。将hokku转换为俄语和英语的困难取决于日语的语音和句法特征以及日本诗人的想象力思维。 给出了将hokku翻译成俄语和英语的示例。

关键字：Hokku，翻译，体裁，日本诗歌，俄语，英语。

Abstract. *In the article, we talk about hokku as the most famous and widespread genre of poetry in Japan. Not everyone can understand the meaning of hokku, because they conceal a hidden connection between nature and man. The difficulties of translating hokku into Russian and English languages depend on both the phonetic and syntactic features of the Japanese language and the imaginative thinking of Japanese poets. Examples of translation of hokku into Russian and English are given.*

Keywords: *Hokku, translation, genre, Japanese poetry, Russian, English.*

Hokku is Japan's most famous and widespread poetry genre. The first translations of hokku into Russian and English were verbatim, which condemned them to failure, since the literal transmission of the meaning of individual words in a poetic context was incompetent in all respects. The difficulties of translating hokku into Russian and English depend on both the phonetic and syntactic features of the Japanese language and the imaginative thinking of Japanese poets.

Hokku is a type of poetry that is organized by the number of moras per line according to the principle of 5-7-5. It follows that, according to the sound laws of the Japanese language, a measured alternation of vowels and consonants is characteristic both within words and at their borders. Japanese poetry is characterized by

the absence of stress, as well as equidistance. Musical-tone stress acts as a rhythm factor, becoming the most significant, it is difficult to isolate it.

As for the phonetic laws of the Japanese language, here we can talk about the uniform alternation of consonants and vowels, as well as a limited number of final affixes. All of the above is are contained in the rhythmic structure of hokku and is one of the main factors of the lineup.

The interaction of different parts of speech that take part in a word-section, the formation of new syntactic constructions, the change of syntagmatic boundaries, as well as the shift of pauses, helps to create a special phonetic and syntactic picture in the poem.

As an example, let's analyze by tercet of the great Japanese poet Matsuo Basho, who is also considered one of the founders of hokku poetry:

Original	Interlinear translation
油こほり	Масляная пыль
ともし火細き	Свет пламени
寝覚哉	Ночная слепота[1]

Russian translation	English translation
Тоненький язычок огня.	*The narrow tongue of flame,*
Застыло масло в светильнике.	*the oil in the lamp is frozen;*
Проснёшься - какая грусть!	*it is so sad to wake up!*
(V. Markova)	*(DS)*

The English translation gives a non-standard syllable ratio: 6-7-5, which does not violate the general perception of the aesthetics of the Japanese verse, only increasing the introductory message. As for the Russian translation, it repeats the English version, and therefore, it can be interpreted rather as a tertiary text, because it mixes the original and final message, following not from general to particular, but from a particular fact to the motive of universal sadness, because the original text can be reproduced in Russian, preserving the sequence of phenomena:

С утра какая грусть -
даже масляный фитиль
до костей продрог!

In this sense, the interpretation in Russian and European translations is more of a personal character, while based on the juxtaposition of the general and the individual in relation to the eternal, the general haiku background is a kind of transition from an impersonal statement of natural truth to the concept and acceptance of the universal, eternal, concluded precisely in The final line of the original. That

[1]https://translate.google.ru

is why the observance of the “finality” of the semantic center is also necessary in translation.[2].

Consider a poem by a Japanese poet Kakinomoto no Hitaro, who at one time was considered an unrivaled authority in the field of poetry:

Original	Interlinear translation
あしびきの	Из ашибуки
山鳥の尾の	Из хвоста горной птицы
しだり尾の	О хвосте Дари
ながながし夜を	Накануне вечером
ひとりかも寝む	Он спит один[3].
Russian translation	**English translation**
Утренний иней —	Morning Frost -
Лишь тишина в ушах	Only silence in the ears
Цикадой звенит.	Cicada rings.
(Translation: N. Novich)	(Translation: Reginald Horace Blyth)

In our example, instead of the second syllable ながa kunojiten is used (a repeat symbol for several syllables, used in vertical writing, resembles a large (two-squares) く. The last line in some sources is given as ひとりかも寝ん.

Consider another example:

Original	Interlinear translation
夜の霜	Ночной мороз
しんしん耳は	Голые уши
蝉の声	Голос цикады[4]
Russian translation	**English translation**
Утренний иней —	*Morning Frost -*
Лишь тишина в ушах	*Only silence in the ears*
Цикадой звенит.	*Cicada rings.*
(Translation: N. Novich)	*(Translation: Reginald Horace Blyth)*

The word しんしん poses a certain problem, as it is an onomatopoeic word for silence. At first glance, it may seem that we are talking about mutually exclusive categories. However, dictionaries give the following definition: 生理的耳鳴りの擬音語である — 'Physiological phenomenon of ringing / noise in the ears. " We draw a certain parallel with such epithets of silence in the Russian language as sonant, ringing. In addition, in poetry one can also find definitions such as sonorous, glass, crystal, etc. All these epithets are united by the fact that they cause association with the already mentioned ringing or objects that can produce this sound.

[2]Meshcheryakov A.N. The cultural functions of Japanese place names. - Bulletin of the RSUH, the second book. – Moscow. - 2002. - P. 290-310.

[3]https://translate.google.ru

[4] https://translate.google.ru

When translating a poem, it is appropriate to resort to complex transformations and use “ringing” in the text of the translation as some established equivalent (in this case, the verb rings), and also supplement it with sound recording, preserving the onomatopoietic nature of the translated word. Thus, しんしん is transmitted, inter alia, by the alternation of sounds [ʃ] (similar in sound to hissing Japanese [shi]), [и] and [н]. Also note that the “subtle” [и] and the “ringing” sonorous [н] are present in every line, setting the tone for the whole poem.

The sound design of hokku depends on the theme of the work, the emotional-semantic component and how the author wants to influence the reader[5]. This is not only a structure-forming, but also a meaningfully significant component of the work. In the Japanese language, the sound form of words is no less informative than the word itself, and more often than not the sound content emphasizes the conceptual and qualitatively sign aspects of meaning, due to which there is an increase in the emotional impact on the reader.

In this case, we are talking about the phonosemantic space of a poetic text, combining the text as a physical object in the form of a sequence of sound units and the totality of meanings and associations that arise in the recipient due to the special phonetic organization. For example, a huge number of onomatops can be found in the poetry of Issa Kobayashi:

Original	Interlinear translation
草麦の	Из травы ячменя
ひょろひょろのびる	ветер колышет
日ざし哉	тянуться к солнцу[6]

In the hokku, the lexeme ひょろひょろhas the meaning: ‘staggering, unsteady on its feet’ (足もとが定まらないで、危なっかしいさま) or ‘thin, long, giving the impression of a brittle’ (細長く伸びて弱々しく感 じられるさま).

In the above example, it would be more appropriate to use the verb " колыхаться." In our opinion, the choice of this verb is sufficiently used to the place, because thanks to the alternating deaf and voiced consonants [к], [л], [ʃ] in the word " колышется", as well as vowels of different tones [а] and [ы] there appears an image of “trembling,” or some “vibration.” Translators supplement the image with the help of the second definition of the word, thanks to which the blades of grass receive a new characteristic.

[5]Davydova L.P. PRINCIPLE OF "INTENTIONAL FREEDOM" WITHIN THE FRAMEWORK OF A HERMENEUTIC APPROACH TO AN INTERPRETATIVE TRANSLATION OF JAPANESE POETRY // Modern problems of science and education. – 2015. – No 2-3

[6] https://translate.google.ru

Russian translation	English translation
Хилая травка	*Weakly grass*
Колышется на ветру,	*Sways in the wind*
Тянется к солнцу.	*Reaching for the sun.*

Adding the word " хилый ", we make up for the lost "слабый", "нестабильный" and "шаткий" soft [h'] in the word ひょろひょろ. As for the English translation, it uses the alternation of consonants [s], [w], [k], [l] in the words “Weakly” and “Sway”, showing the softness and trembling of the swaying grass.

Each hokku - is a feeling-sensation, which is captured in a small verbal picture-image. There are two important qualities of images[7]:

1) Some images arise from life experience, which can include any bright life moments; strange coincidences; funny events; landscapes that combine with our inner state and change our mood;

2) images - "pictures" must certainly cause similar sensations in readers: you need to not only describe your experience in words, but do it in such a way as to influence the reader.

For example, the main theme of tercets of Basho - is nature. In three lines, Basho was able to depict the vast expanses of the Sea of Japan, the radiance of stars on a warm autumn night, snow-white breakers on sea waves and the outlines of Sado Island in the sky:

Original	Interlinear Translation
荒海や	Бурное море
佐渡に横たふ	Ты лежишь на острове Садо.
天の河	Млечный путь[8]

Russian translation	English translation
Буря на море —	*The sea is raging!*
До острова Садо	*Away, to the island of Sado, the*
протянулась	*Milky Way is steaming.*
Млечная Река…	*(Translation: Sam Hamill)*
(Translation: A. Belykh)	

The significance of nature in hokku poetry is well known, as the emphasis is on the seasons. Each hokku should be a poem of the season, denoted by one or more seasonal words. The seasonal word may, in fact, refer to human activity, such as a religious ritual that is held only at certain times of the year. But even here, a human event implies a period of time in the natural world with nature. Thus, each poem

[7]Rumak N. The problem of searching for interlanguage equivalents (on the example of the Japanese onomatopoeia) Abstracts of the scientific conference "Lomonosov Readings 2003" M., 2003.

[8]https://translate.google.ru

contains both nature and time. For example, in M. Basho's poem, the seasonal word is the word "лето" in the Russian version of the translation, and the word "summer" in English. As for nature, it is represented by the words "водопад" ("waterfall") and "лесная глушь" ("wilderness").

Original	Interlinear Translation
しばらくは	На время.
瀧に籠るや	Тебе это не сойдет с рук.
夏の始	Начало лета
Russian translation	English translation
Здесь, в лесной глуши, *вижу чистый водопад –* *лето началось.* *(Translation: A. Belykh)*	*Here in the wilderness* *I see a clean waterfall -* *the summer has begun.* *(Translation: Donald Keene)*

There are two opposite answers to the significance of nature in the hokku tradition. Some believe that poetry is an example of "poetry of nature", in particular, a figurative portrait of "things in themselves." Another point of view considers that the hokku tradition does not really concern the true nature, but rather is purely cultural in nature, which was defined by the tradition and, therefore, is artificial.

So, for example, the court adviser Yakamoti writes about the experiences associated with life at court. This is predominantly a "landscape-poet" in the European classification, and it's despite the fact that nature, in principle, is an integral part of almost any uta. But the "landscapeness" of Tyunagon Yakamoti is that he expresses all his feelings through landscape-natural euphemisms.

Original	**Interlinear Translation**
かささぎの	Призрак
渡せる橋に	К мосту, который можно пройти
おく霜の	Мороз
白きをみれば	Если вы посмотрите на белый
夜ぞふけにける	Они прошли сквозь ночь[9]
Russian translation	English translation
Как верный признак *того, что ночь проходит,* *ложится иней* *на лестнице, ведущей* *к покоям государя.* *(Translation: V. Markova)*	*If I see that bridge* *That is spanned by flights of magpies* *Across the arc of heaven* *Made white with a fuke frost,* *Then the night is almost past.* *(Translation: Donald Keene)*

[9]https://translate.google.ru

Thus, an analysis of translation examples demonstrates that in the intertext of almost any original Japanese hokku, the possibilities of at least two self-valuable interpretations based on a general principle coexist, but illuminate the described phenomenon from different angles. If following the rules and symmetry of the Japanese classical verse conveys the classical principles formulated by Basho, with the most adequate translation of its substantive and formal aspects at the lexical and syntactic level, then the interpretation of some translators differs in terms of eliminating rhythm and form in a greater degree of "intentional freedom", inheriting at the same tame the laconicism of the original text[10]. Perhaps it is the intertext of various translations in this case that can be understood as a special interpretative means of immersion in the original text and its linguistic culture.

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罗马军事变革史概述
SUMMARY OF THE HISTORY OF ROMAN MILITARY TRANSFORMATION

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抽象。 这篇文章专门讨论了罗马大国存在期间军事变革的演变。 在古代世界的历史进程中，“古罗马”部分对罗马军事历史，罗马大国的军事组织及其征服给予了极大关注，因此，本文着重介绍了罗马军事历史上最丰富多彩的方面：罗马军队的装备，装备和传统，使罗马国家从一个大都市走向世界古代力量已有四个世纪的历史。

关键字：罗马军队罗马军队的装备罗马军队的装备纪律罗马军队的训练。

Abstract. *The article is devoted to the evolution of military transformations in the Roman power throughout its existence. In the course of the history of the ancient world, in the section “Ancient Rome” much attention is paid to Roman military history, the military organization of the Roman power and its conquests, therefore the article highlights the most colorful aspects of Roman military history: armament, equipment and traditions of the Roman army, which allowed the Roman state to for four centuries to go from a polis to the world power of antiquity.*

Keywords: *Roman army, armament of the Roman army, equipment of the Roman army, discipline, training in the Roman army.*

As is well known, the ancient Roman power conquered the peoples living then in Western Europe, North Africa, Western Asia and Britain.

During the triumphal procession of the Romans across these lands, the warriors of Rome covered themselves with unfading glory, showing the world examples of iron discipline leading them to brilliant victories, and their military leaders who led the armies of Rome from one victory to another, despite the shameful and cruel failures that happened until the inhabitants of the whole Mediterranean were conquered.

753 BC is the classical (“Varronov”) date when the great and only City of the Roman power was founded - Rome (ab Urbae condita). Although, most likely and probably, on these famous seven hills, and before the beginning of the VIII century

BC, there were small tribal and clan villages that came back in the II millennium to the Apennine Peninsula of Indo-European pastoralists: Latins, Umbra, Mars, Volsk, Sabine and Samnites, which gave a new name to the peninsula - Italy - "the country of gobies." In all likelihood, it was at this time on the three most important elevations in the mouth of the Tiber (Palatine, Quirinal, and Capitol) that fortifications were built to control river navigation. And built this "Romula quadrata" was by the Etruscans, then dominant in northern and central Italy.

This Etruscan fortress became an excellent place for safe living for its closest neighbors Latins and Sabinians, due to which the city garrison began to replenish. It was in 753 BC that the legendary founder and first king of the City of Romulus divided the entire population into three tribes (tribal communities) of the Rams (Latins), Luthers (Etruscans) and Titsiyas (Sabinians). He divided each tribe into 10 curiae (phratry), each curia into another 100 genera (gens). 300 tribal elders constituted the supreme ruling body of the Senate (Council of Elders). Only members of the curiae, obliged to Romulus by military service, became full-fledged citizens of the City and began to be called "patricians" (having noble fathers). They called all other inhabitants of Rome plebeians (from lat. Plebs - crowd).

According to legends, Romulus had personal bodyguards (guards) - 30 infantrymen with facets and 30 horsemen, one from each curia.

With a high degree of probability, we can assume that already at the time of Romulus, all the other citizens of Rome, capable of wielding weapons, were brought into a detachment of 3,000 foot soldiers and 300 horsemen. Such a detachment became known as the Legion.

According to Varron, the name legio is based on the verb legere ("collect") and, accordingly, means a bunch of civilian warriors, which in our understanding can be considered a civil militia.

Thus, each curiae militia consisted of one hundred units of infantry and ten cavalrymen. Accordingly, the tributary unit - 1000 foot soldiers and a hundred horsemen.

Therefore, the legion as a whole should have had at least three thousand foot soldiers and three hundred horsemen.

All male citizens of Rome were military liable and had to fight in the army from seventeen to forty-five, at the call of the Senate, and from forty-five to sixty in the city guard squad. Only well-deserved veterans, having gone through 20 military campaigns on foot and 10 in cavalry campaigns, could be released from service at the call of the Senate.

The military organization of the Roman power over the centuries did not remain unchanged. As the territory grew, the number and specialization of military units increased. Near the Roman legions appeared auxiliary troops of the Allies, a fleet consisting of river and sea flotillas. With the development of military strat-

egy, tactical techniques were improved, new types of weapons appeared. All this required fundamental military reforms, changing the very foundations of the defensive and offensive systems of the army, the structure of units and subunits, the principles of recruiting and training recruits.

So at the end of the 6th century VI, the sixth Roman king, Servius Tullius, carried out a military-political reform, which for centuries determined the direction of evolution of the military system of the Roman state. He established service in the Roman army depending on the property condition, dividing all the inhabitants of Rome, and not just the patricians, into property categories. This accordingly began to determine the political rights of the citizens of Rome. Next to the curiae commissarius, he created a centuriate, and forced the plebeians to serve in the Roman army.

As the social wealth of the Roman community grew, it introduced a salary for soldiers on a military campaign.

Starting from the IV century BC, the Romans continuously expanded their subservient territories, conquering more and more tribes and nationalities.

To keep them under their power, the Roman rulers granted the subjugated varying degrees of dependence and political and economic freedoms, sowing envy and hateful relations between them. So one of the basic tenets of Roman foreign policy acted, “divide and conquer!”

After the most severe defeats during the Punic Wars, the Roman military system was again reorganized. The ruling senatorial fathers considered it necessary to increase campaign wages by several times and began to draft proletarians into the army, equipping, arming and training them in military affairs at the expense of the treasury, but with the subsequent deduction of the cost of equipment and weapons from camping wages and military boot payable to them.

In the I century BC, after the military reforms carried out during the Yugurtian wars by Guy Maria, the army practically turned into groups of private military campaigns, since the legions began to be maintained at the expense of the personal funds of their commanders. Thus began the era of civil wars, which buried the old and good republican Rome. The five hundred year period of imperial Rome began, in the political life of which the Roman already professional army took the most important positions.

In the king period of Roman history, the king was the commander in chief. After the establishment of the republican system, the legally elected consuls began to command the legions, taking the place of the commander monthly, if one legion was recruited to the war. But more often began to recruit two legions, one for each consul.

In the event of extreme danger to all Roman sovereignty, the ruling Senate appointed a dictator with unlimited powers, up to resolving issues of life and death

of a Roman citizen without trial. His only assistant was the head of the cavalry.

Both legions and individual army units had their own banners (signum). It was like a spear with a tip at the bottom for sticking into the ground with a transverse beam at the top, where there was a one-color cloth on which the name of the unit was indicated (for example: L‧XI CL‧ Legion XI of Claudius). A gold sculpture depicting the zodiac sign was placed above the crossbar, under which a unit was created (wolf, elephant, horse, bull, wild boar) or a symbol of a military unit, for example, for legions - a golden eagle. Thalers (bronze or silver tablets) were attached to the pole with rewards for the exploits accomplished by the unit's warriors. When the banner was lost, the military unit was decimated (the execution of every tenth) and disbanded. These traditions are preserved in many armies of the world until now. Own signum had manipuls, and then cohorts.

The training of young legionnaires included the ability to understand the orders of the centurion: to quickly move forward, quickly fill in gaps in a linear system when approaching enemies, quickly merge into a continuous mass. The Roman warrior knew that he would never be left alone on the battlefield and his comrades would always support and help him. Even in public schools according to Greek traditions, students were taught the basics of gymnastics, jumping, fisticuffs, swimming, horseback and chariot riding and other Olympic sports. Already as part of the legion, such classes are carried out with full clothing in military marching or combat equipment, and sometimes also with double luggage. “Only when the spirit and body of the young legionnaire is sufficiently hardened by the tests described above, can he begin individual lessons in mastering personal defensive and offensive weapons, devoting all his free time to group exercises,” wrote Flavius Vegezi Renat [2. IX.12.6].

Strict discipline reigned in the army. The concept of discipline was deified, and there was a special patron deity, which was so named and revered under the name Disciplina. Even small disciplinary offenses were equated with blasphemy and were punishable by death, as well as for failure to comply with the order.

So, in 340 BC, the son of the Roman dictator Titus Manlius Torquat during reconnaissance without the order of the commander-in-chief entered into battle with the head of the enemy detachment and defeated him. He spoke about this in the camp with enthusiasm. However, his father condemned him to death. The sentence was carried out immediately, despite the pleas of all the troops for mercy.

The sleep on duty threatened with trial and stoning and sticks to death.

For minor errors, they flogged, lowered the rank, transferred to shameful slave labor, reduced the service fee, transferred to fodder for pack animals, deprived of citizenship, with subsequent sale into slavery abroad, because a citizen could not be a slave in his homeland.

But on the other hand, the commander also generously handed out awards for good service: raised his rank, increased his salary, awarded him with a land plot or a cash prize, exempted him from servicing the camp, and presented silver and gold chains and bracelets as insignia.

The highest award for the legions and the commander himself for the victorious end of the military campaign was a triumph, in our opinion - a victory parade.

The triumph was allowed to ride on a gilded chariot dressed in a purple robe embroidered with palm leaves. A quadriga - four of the snow-white horses was harnessed to the chariot. Ahead the chariots military booty was carried and prisoners were led. The hero was followed by relatives and friends, songwriters who performed triumphal songs in honor of the winners. Soldiers periodically shouted: "Io!" and "Triumph!" ("Io!" - meant "Hurray!"). And only the slave, who stood behind the triumph in the chariot, again and again told him that he was a mere mortal and should not be conceited. The soldiers behaved cheerfully and naturally. So, for example, the warriors of Julius Caesar, who idolized him, following the triumph, let out scanty jokes about his bald head.

The pinnacle of Roman military art was the construction of military camps. Contemporaries wrote that Roman soldiers wore fortresses behind their backs. The legionnaires began the construction of the camp immediately, as soon as a halt was announced, without waiting for special commanders. Everything was thought out and worked out with daily exercises. The camp was also filmed when the trumpeters played a "campaign". If the army remained on a campaign for the winter, they built a winter camp, where instead of tents they built barracks for soldiers and houses for officers. In the imperial era, when the army became professional and was brought to a permanent deployment in the border provinces, they began to build stone camps. Later, entire cities grew up there, existing to this day. For example, Lancaster, Rochester, Cologne (Roman colony of Agrippinn), Vienna (Windobona). The current cities, ending with the names "... chester" or "... castera", grew up on the site of Roman military camps. "Castrum" in Latin - camp.

The Roman army, which became professional at the end of the Republic, was never, even in the IV century, hired.

In Roman legions, only native Roman citizens had the right to serve. And from the beginning of the Republic to the military reform of the emperor of the Antonin dynasty Antoninus Pius the Pious, only natives of the City (Rome). After his reforms, Roman citizens born in Italy. Even after the edict of Caracalla, which granted Roman citizenship rights to all free-born inhabitants of the empire, the tradition remained. The special Council for the Review of Troops, called "probatio", was engaged in elucidating the social origin of the legionnaire candidate. The applicant was sentenced to death for attempting to deceive probation investigators.

In addition to impeccable ethnic and social origin, good physical development was required from a recruit.

First of all, the recruit must be at least 165 cm tall. He must have excellent eyesight and hearing, because the teams were transmitted to the personnel due to shouts, groans and clanging weapons by the position of the standards of cohorts and maniples, as well as special wind musical instruments. Moreover, the 18-year-old candidate for legionnaires had to be trained not only in the spoken Latin language, but also quite briskly reading, writing and counting [1. 1,5].

Military historians have calculated that for the rotation of personnel in twenty-six legions of the Empire (about 96 thousand soldiers), each year only 6-7 thousand new recruits were needed. Therefore, during the Early Empire (I-III centuries), the Romans practically did not use conscription in the army. Only carefully tested volunteers served in the legions.

Even the sons of veterans who served the Fatherland in more than one generation were subjected to a thorough examination. After the recruits informed the Council of their full names (pronomen, nomen, cognomen), the date of conception, since the Romans considered the date of conception, not birth, and any distinctive features of the body to be their birthday, the commission proceeded to clarify their civil state, occupation of their parents. Not only slaves, but also children of freedmen, and even Roman citizens of dirty professions, such as gladiators or owners of the so-called shameful houses of free love, were not allowed to serve in the army [2. X.30.2].

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伊特鲁里亚国王统治时期的罗马军队

THE ARMY OF ROME IN THE ERA OF THE RULE OF THE ETRUSCAN KINGS

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抽象。 本文专门讨论罗马军事组织历史上最早的时期。 在分析叙事历史来源（加图帕纳苏斯的提图斯•利维乌斯和狄奥尼修斯）的信息的基础上，本文重点介绍了罗马军事系统的最重要方面：军队的结构以及士兵的军备和装备 市（罗马）。

关键词：伊特鲁里亚人，罗马早期，罗马军队，罗马军队的装备，罗马军队的结构。

Abstract. *The article is devoted to the state of the Roman military organization in the earliest period of its history. Based on the analysis of information from narrative historical sources (Titus Livius and Dionysius of Gapicarnassus), the article highlights the most important aspects of the Roman military system: the structure of the army, as well as the armament and equipment of the soldiers of the City (Roma).*

Keywords: *Etruscans, early Rome, Roman army, armament of the Roman army, structure of the Roman army.*

Formally, Etruscan civilization that existed in the North of the Apennine Peninsula was a military-religious union. However, joint military enterprises were extremely rare. Joint religious holidays were more frequent. The rest of the time, Etruscan centers were busy figuring out numerous border disputes that gave rise to a permanent state of war of all against all. Therefore, all Etruscan cities had their own armed forces, which by the VII century BC were a kind of Hellenic phalanx, which was built in an “archaic loch” of 12 by 8 hoplites and consisted of soldiers of four, and sometimes five categories, and they were called centuries.

Thus, the Etruscan army consisted of:

in the the first category of 40 centuries of hoplites armed according to Hellenic traditions;

in the second category, out of 10 centuries of spearmen who had Italian-style weapons — a spear and a sword, a helmet, greaves and a scutum (Italian shield);

in the third category of 10 centuries of lightly armed spearmen who were armed with a spear, sword, helmet and scutum;

in the fourth category of 10 centuries of skirmishers, using spears, darts, and hiding behind scutums;

And, finally, in the fifth category of 15 centuries, who owned slings.

The sizes of the centuries were established, depending on how many soldiers were required for a particular military enterprise.

Centuries of veterans, who constituted the inner-city defense front, were likewise lined up.

With high probability, we can assume that the Roman army, commanded by the Etruscan kings-commanders, was something similar, and could basically consist of two components: the Etruscans, who formed the phalanx of the heavily armed hoplites directly, and the Latins, who fought with lightly armed spears, with axes, darts - and covering mainly the phalanx flanks.

Several written sources have come down to us about the military reform of the sixth king of the City, Servius Tullius, of the middle of the VI century BC. The most complete of them is the information of Titus Livius and Dionysius of Halicarnassus. Ab urbae condita Libya is written in Latin, the narrative of Dionysius in ancient Greek, but the information they provide almost completely coincides, since, according to the sources, they had one source - the works of Fabius Pictor, whose writing was based on genuine early documents, the existence of which partially confirmed by Polybius, who saw the original peace agreement between Rome and Carthage from 509 BC, written in archaic Latin, which at the time of Polybius was already perceived with great difficulty.

Servius Tullius, extended the duties of military service not only to the citizens of the City, but to all the inhabitants of Rome, depending on their property status, and not on social origin.

This accordingly began to determine the political rights of the citizens of Rome. Next to the chicken committees, he created a centuriate, and forced the plebeians to serve in the Roman army, not endowing them with political rights, which in the future laid the foundation for the long struggle of the plebeians with the patricians for legal and property rights.

He divided all the liable inhabitants of Rome into six classes.

The richest inhabitants were included in the highest category - this class should have been ready to form 80 centuries, or lochoi. All warriors who fit this category should come to the training camp in a helmet, with a shield, in greaves, armed with a spear and a sword. In all likelihood, for the most part, these were immigrants from the tribe of Lucers (Etruscans). When describing the shield, Titus Livius uses

the term “clipeus”, and Dionysius of Halicarnassus writes of them as Argolian or Argiv shields. However, without a doubt, both belonged to the armor and armament of the hoplites, and therefore, these 80 centuries were nothing more than a phalanx. In addition, the phalanx was attached to two centuries of gunsmiths and builders, who were called fabri, "craftsmen." The latter did not take part in the clashes and most likely belonged to the fifth category.

The second class supplied only 20 centuries, and unlike the first category they did not have shells, and the Argiv shields were replaced by scutum. Both Dionysius and Diodorus described this shield as rectangular or quadrangular, which caused discussion among researchers and led some of them to recognize that the rectangular scutum characteristic of the Roman army of the Principate era was also used in the republican period. Archeology data helped to understand. During the excavation of the Etruscan city of Bologna, a bronze bucket was discovered dating back to 500 BC, the so-called Certosa Situa, which had minted figures of soldiers with protective weapons in the form of Argiv, oval and rectangular shields as decoration. This allowed us to come to the conclusion that in the tsarist period of Roman history, along with the traditional oval shields, rectangular shields were also used, which were some variants of ordinary oval skutums (Fig. 1).

Fig. 1. *Image of warriors from the Certosa Situula, about 500 BC*

Thouse, who fell under the conditions of the third category also exhibited 20 centuries, armed, like the second category, but in the absence of such protective equipment as greaves.

According to Titus Livius, 20 fourth-tier centuria arrived at the training camp with spears and darts, while Dionysius claims that they were required to have a scutum, spear and sword.

And, finally, Livy equips 30 fifth-century centers with slings, and Dionysius writes that they, fighting outside the general order, besides stones also threw darts. The divisions of trumpeters (tubicines) and horns (cornicines) were attributed to the same category.

All the rest, that is, the poorest inhabitants of Rome, were not involved in the Roman army.

In addition, the army was divided into two age categories: up to 45 years - the army, after - the intracity defensive garrison.

Thus, the Etruscan-Roman phalanx was formed by 80 lochoi, equipped with a full set of heavy Hoplite weapons according to the Hellenic model, and she was supported by another 90 centuries, which were traditional for the Italians (Latins, Sabinians, Samnites) in equipping and fighting in clashes wars, and which were armed with permanently lightened weapons and means of defense.

Bearing in mind some difference in the information between Livy and Dionysius, and given that their primary source, the story of Fabius Pictor, is written in Greek, it seems to me that you can still trust Dionysius.

A number of researchers claim that soldiers of the second, third and fourth ranks fought only on the flanks, like Etruscan allies before the reforms of Servius Tullius. Others object, as Titus Livy clearly writes that they were 2-4 ranks in the army. In this case, this order would already be a prototype of building the legion of the republican period. At the same time, the phalanx centurial units were to be divided into four branches of 25 soldiers (enomotia).

Centuria, in fact, was a draft district. As soon as there was a need for the collection of troops, each of them put under arms as many soldiers as needed to assemble an army capable, under the command of the king, in the opinion of the senatorial fathers, to solve the military-political problems that arose. For example, for a 10,000 army, each century supplied only 2 enomoties, that is, 50 military men.

A number of researchers suggest that when the last Etruscan king Tarquinius the Proud was expelled from Rome in 510 BC. The city was supposed to lose most of the heavily armed soldiers of the first category. But this is not so, since a tyrant hated by all, and not Etruscans, was expelled from Rome. Livy indicates that the round shield (and, consequently, the phalanx system) remained in service even in the V century BC.

The division of troops into centuries for this time was of great military, and political importance. Despite the fact that it did not survive in political life, the army began to steadily adapt this division to its own needs.

The post of commander in chief, which belonged to the king, was now divided by two praetors, commanding alternately or simultaneously, but with half the army. So it was until the middle of IV century BC until there was a special army for the defense of the City.

Later, this post was transferred to praetor urbanus - the commander of a veteran militia to protect the city - and, from the end of the IV century BC, they began to perform only the duties of the supreme judge.

From the end of the IV century BC the command of the army of the Roman Republic passed to two new higher magistrates - consuls.

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欧亚融合在美国科学学术话语中
EURASIAN INTEGRATION IN THE AMERICAN SCIENTIFIC-ACADEMIC DISCOURSE

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注解。本文讨论了现代欧亚一体化-后苏联空间的区域统一过程，俄罗斯在其中发挥了指导作用。尽管美国确立了欧亚宏观区域的重要性，并宣布美国在该地区事务中的深入参与，但美国的外交政策言论表明，专家团体对一体化没有兴趣在后苏联时代。本文分析了欧亚一体化进程的美国科学和学术话语中的照明实践，并确定了外交政策话语的主要类别。通过考虑美国整个政治范围的代表的工作，该研究表明，欧亚一体化对美国的外交政策战略不具有独立的价值，只是与周围的军事政治和经济进程一起提到俄罗斯，尽管美国政治阶层和专家分析界对欧亚一体化的看法与他们对世界其他一体化进程的看法不同。

关键词：欧亚经济联盟；大欧亚大陆外交政策专长；欧亚一体化

Annotation*. The article discusses modern Eurasian integration - regional unification processes in the post-Soviet space, in which Russia plays a guiding role. Despite the declaration by the American establishment of the importance of the Eurasian macro-region and the deep involvement of the United States in the affairs of the region, the American foreign policy discourse shows a lack of interest on the part of the expert community in integration in the post-Soviet space. The article analyzes the current practice of lighting in the American scientific and academic discourse of Eurasian integration processes and identifies the main categories of foreign policy discourse. The study, through consideration of the work of representatives of the entire political spectrum of the United States, showed that Eurasian integration is not of independent value for the US foreign policy strategy and is only mentioned in conjunction with the military-political and economic processes around Russia, while the perception of Eurasian integration by the American political class and the expert-analytical community different from their vision of other integration processes in the world.*

Keywords*: Eurasian Economic Union; foreign policy expertise, Greater Eurasia; Eurasian integration*

Introduction

International economic integration is one of the most important trends in modern world development. The participants in the integration blocs seek to use international economic integration as a tool to increase their global competitiveness by creating favorable conditions for interaction in the common economic space. The relevance of studies of Eurasian integration is due to the implementation on the Eurasian continent of many integration projects and various kinds of cooperation programs of the leading actors in world politics - the United States, Russia, China and the European Union, which leads to a clash of their interests in this region.

Experts involved in Eurasian research share the concept of "Eurasia" into "Lesser Eurasia" and "Greater Eurasia". The term "Greater Eurasia" refers to the space of the entire vast Eurasian continent from the Atlantic to the Pacific Ocean, from the Arctic to the Indian Ocean. By "Lesser Eurasia"[1] is meant "post-Soviet, post-imperial space, which conditionally coincides with the territory of the former Russian Empire and the former Soviet Union." In this article, we will consider the process of modern Eurasian integration, meaning by this term primarily regional processes of unification of the territory of the post-Soviet republics. As a geopolitical construct, the term "Greater Eurasia" (synonymous with "Greater Eurasian Partnership")[1] implies the creation of a network of free trade zones and the integration of regional integration processes throughout the continent, which should ultimately lead to the creation of a common economic space "from Lisbon to Shanghai".

The analysis of domestic and foreign publications showed the presence of a small number of fundamental works on the stated problems and the presence of individual case studies, partly related to the declared subject of the study. There is a lack of work to shed light on how US experts evaluate the processes of consolidation of the post-Soviet space and how the realities of the region are consistent with Washington's foreign policy strategy in this part of the world.

In the context of studies of Eurasian integration processes, a rather contradictory picture is observed: while the statements of the representatives of the American establishment declare the importance of the Eurasian macro-region for the global foreign policy strategy of the United States, and in foreign policy activities there is a deep involvement of the United States in the affairs of this region, the absence of American foreign policy discourse attention and interest from the expert community to the promoted Ross s integration in the post-Soviet space on the background of the apparent assistance of the Washington integra-

[1]As a geopolitical construct, the term "Greater Eurasia" (synonymous with "Greater Eurasian Partnership") was coined in 2015 at the Center for Comprehensive International and European Studies of the Higher School of Economics (S. A. Karaganov, T. V. Bordachev). Then, at the highest international level, this concept was put forward in 2016 by the presidents of Russia V.V. Putin and Kazakhstan N.A. Nazarbayev.

tion processes in other parts of the world. There is a reduction in research funding in the Eurasian area, a decrease in the number of specialists willing to study Russian and post-Soviet vector.

The study aims to determine the main content of the vision of American experts on Eurasian integration processes, in the promotion of which Russia plays a leading role. In achieving this goal, the following **tasks** are expected to be solved: based on the opinion of American experts, determine the place of Eurasian integration issues in the American foreign policy discourse; outline the vision and assessments of American experts on Eurasian integration projects; determine the prospects of Eurasian integration with the active participation of Russia in it.

To achieve the set goal and solve problems in the study, general scientific and disciplinary methods were used. The study proceeds from the provisions of the systemic, structural-functional and discursive approaches in political science. Analysis of the subject of research is based on the provisions of the constructivist paradigm of the theory of international relations, revealing the dependence of the political behavior of players on ideological structures that are formed in the process of intersubjective practices of understanding the material characteristics of the international environment. P. Haas's theory of "epistemic communities" is used as the theoretical basis of the work. It states that in the process of social interactions groups of internal and external experts are formed, sharing common normative beliefs, standards of validity and ideas about cause and effect relationships [Haas, 1992].

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An analysis of the publications of American experts suggests that the US research community does not have much interest in Eurasian issues after the end of the Cold War. Russia's attempts to create regional organizations, in particular, a limited number of CIS achievements in the 1990s. allowed Western observers to be skeptical of Russia's potential in promoting regional integration and view its attempts as "symbolic" or "virtual."

American experts agree that the situation around Ukraine has radically changed the position of the international community regarding Moscow. The Ukrainian events marked the "disappearance of two concepts from the Russian foreign policy agenda that have been defining Russian politics since the collapse of the USSR: integration into the big West and reunification of the former Soviet republics with Russia" [Trenin, 2017]. In the works of American authors that appeared after the events in southeastern Ukraine, the entry of Crimea into the Russian Federation and the Russian authorities providing military assistance to Syria, the tone of assessments of Moscow's foreign policy steps towards integrating the post-Soviet space changes towards harsh criticism and consideration of the actions of the Russian leadership through its prism global aspirations.

So, American experts say "the presence of Russia is much more ambitious goals." According to them, “Russia is trying to undermine the elements of the current international order that emerged after the end of the Cold War, especially in Europe, and replace it with - a multipolar world - one in which Russia will have power, influence and military power. This means subjugation of Russia's closest neighbors and their integration into the political and economic system oriented towards Russia” [Schoen and Roth, 2016]. Moreover, they point to “an impressive set of tactical steps and tools used by the Kremlin both in the post-Soviet space and in the West, which at first glance may seem ad hoc, but which form a coherent strategy. This set of tools is partly new (using energy warfare and modern media for propaganda) and partly old (subversive activities of targeted governments by discrediting their leaders and exerting economic pressure). An arsenal of tools is a combination of threats, pressure, temptations, rewards and punishments” [Starr and Cornell, 2014].

Considering the development of Eurasian integration and the actions of Russia in the post-Soviet space, American experts state the “eclectic nature of the ideological design of Russia's foreign policy, which is a mixture of Russian statism, great power chauvinism, pan-Slavism, pan-Orthodox Christianity, multi-ethnic Eurasianism, Russian nationalism, social conservatism, anti-liberalism, anti-Americanism. This cocktail is based on the idea of restoring Russia’s fame and global status, which is said to have been subdued and defeated after the collapse of the Soviet Union as a result of a combination of subversive activities of the West and internal treason” [Bugajski and Assenova, 2016].

American analysts regard Eurasianism as an “alternative globalist philosophy of history, a new pragmatic formulation of “Sovietism”, replacing global explanatory schemes of Marxism-Leninism, a set of expansionist geopolitical principles for Russia, and so on.” The theoretical prerequisites for Eurasianism include: (1) the rejection of Europe, the West and capitalism through criticism of the “Atlantist” domination, which is considered catastrophic for all of humanity; (2) the affirmation of cultural unity and the common historical fate of the Russian and non-Russian peoples of Russia, the former Soviet Union and parts of Asia; (3) the idea that the central geographical position of this Eurasian space naturally and inevitably entails the imperial form of political organization, and that any separation will be doomed to failure, and the new independent states will have no choice but to return to a single political education; (4) belief in the existence of cultural constants that explain the deeper significance of contemporary political events” [Laruelle, 2016].

Meanwhile, analysts point to the “double identity of the Russian World concept: as Russian policies for the near abroad and as Russia's “voice” in the world. As American experts note, an integral characteristic of the Russian World is the

fuzziness of the concept, allowing its various interpretations. It “serves as an excuse for what Russia considers to be its right to oversee the development of its neighbors and, sometimes, to apply interventionist policies.” In addition, it serves as an “argument” for Russia to reunite with its pre-Soviet and Soviet past through reconciliation with Russian diasporas abroad. And finally, it is “the most important tool for Russia to brand it in the international arena and promote its own voice in the world” [Laruelle, 2004].

American analysts call Russia's efforts to integrate the post-Soviet republics “re-imperialization”, driven by both external and internal factors. In their view, in addition to ideological and pragmatic considerations, Russia has other reasons to strive for closer integration in the post-Soviet space: deep interdependence between post-Soviet economies; considering the republics as buffer states against threats in the south of Russia and as possible operational bases for projecting Russian power; the availability of natural resources; passing through the territories of neighboring republics of land and sea routes for export to other markets; the desire to become the largest transit country of goods transported from Asia to Europe. Among internal factors, American analysts call maintaining the personal popularity of the current leadership in Russia and “the desire to restrain popular movements calling for a regime change that has embraced the post-Soviet space and could provoke massive public protests in Moscow” [Cohen, 2013].

According to American experts, promoting the Eurasian integration agenda, Russia, through the EAEU, the CSTO, seeks to create a “counterbalance to the Euro-Atlantic institutions and integration initiatives of the West, as well as to counteract the strengthening of China in the region. The main goal of Moscow’s foreign policy is to restore Russia as the main center or pole of power in a multipolar or polycentric world. In this logic, Russia should be an independent sovereign entity, unlimited by any other political association and exercising unlimited power in its field” [Bugajski and Assenova, 2016].

As follows from the works of American authors, “the neo-imperial geopolitical project of Russia no longer relies on the mechanisms of the Soviet era in relation to neighboring states, such as strict ideological devotion, control over local ruling parties and security services, the deployment of Russian troops on an ongoing basis, and almost complete confusion with the Russian economy. Instead, sufficient pressure instruments are used to ensure the main goal - that Moscow exerts a dominant influence on the foreign and security policies of its closest neighbors, that they either remain neutral or support the international agenda of Russia and do not dispute the legitimacy of the current power system in Russia. The ultimate goal is to create protectorates around the perimeter of the country, which do not establish close and independent ties with each other and do not enter into Western institutions.” [Bugajski and Assenova, 2016].

American experts point out that "Moscow interacts with the post-Soviet countries in different ways." They divide the former Soviet republics into three categories according to their importance for the foreign policy agenda of Moscow: 1) countries of paramount strategic importance for Moscow: Ukraine, Kazakhstan and Belarus. These relationships are in the focus of close attention of politics and significant financial investments. They are vital not only regionally, but also in the broader picture of Russian foreign policy; 2) states that Moscow considers important, but not to the same degree of existentiality as in the first group. The nature of their importance also varies from country to country - this may be due to security issues or determined by economic factors. This somewhat fragmented group includes Georgia, Azerbaijan, Uzbekistan and Turkmenistan; 3) other republics: Moldova, Kyrgyzstan, Tajikistan and Armenia - to a certain extent, are significant for Moscow, but significantly less than countries in the first two categories. Their value is largely instrumental or preventive and varies depending on the degree of external (American, European, Chinese) interest in their affairs [Lo, 2015].

Only a small part of American experts are not inclined to see in Russia's foreign policy integration efforts a "post-imperial hangover" or "neo-imperial aspirations". The overwhelming majority of American experts negatively assess Moscow's foreign policy steps in the post-Soviet space and are rather pessimistic in assessing the prospects for Eurasian integration and, in general, Russia's global aspirations. American experts explain the critical nature of their assessments by the presence of structural problems in integration projects, a lack of trust among the participating countries and the influence of external factors.

Assessing the Russian World concept by Russia's ability to promote an alternative economic and financial order, experts believe that "the concept has not shown tangible results and is based on coercive instruments that are difficult to maintain in the long term. Moreover, in their opinion, demographically, Russian World is doomed to reduction" [Laruelle, 2015].

As American analysts note in their works, "the concept of Eurasianism is based on the opposition of Russia to the West in the context of culture, religion, power, economy, the rule of law and human rights and does not guarantee a single solution to the problems facing post-Soviet states. Russia pays more attention to the creation of new supranational institutions and the use of economic integration as a path to political integration. Moscow, by its foreign policy actions, repels and scares potential participants in Eurasian integration. The Eurasian Union provides Russia's unilateral benefits at the expense of the former Soviet republics" [Guttman, 2013].

American experts explain the pessimism regarding the prospects of the Eurasian Union "by the presence of negative factors in Russia: the imperial past, corruption, low index of business activity and economic freedom, the lack of comparative advantages of the economy in most sectors, with the exception of the energy, armed forces and nuclear industries and, in overall, a decrease in Moscow's ability

to enforce compliance with regional partners" [Cohen, 2013]. Moreover, since "the Eurasian Union is a Russian concept, it will transfer the imperfection of the economic and legal system of modern Russia to the space of the EAEU member countries. By reorienting the economic systems of member countries inside the post-Soviet space, the Eurasian Union can create new barriers between member states and the outside world" [Mankoff, 2012].

According to American experts, within the framework of the EAEU there is: a lack of credibility in the implementation of union rules and directives; the phenomenon of "Euroscepticism" (by analogy with the EU), when Eurasian states are interested in closer economic relations with Russia and the benefits that it offers, but are not ready to give up part of their sovereignty; the desire of the Eurasian countries to interact with the West for both political and economic reasons in order to distance themselves from Moscow and Beijing; the lack within the Eurasian Economic Union of a fully developed financial sector and technological capabilities that could contribute to regional innovation; the absence of transparent and understandable rules of the game in the EAEU space - protection from organized crime and corruption [Stronski and Sokolsky, 2017].

Among the weaknesses of this region, experts call "isolated geography, lack of intellectual property protection, instability along borders and lack of export diversity, as well as experts stress the" dysfunction of the EAEU and poor ability to promote Eurasian integration, fragmented economic and legal systems of the participating countries and the potential ability of the EAEU to violate WTO provision on "non-discrimination in trade" [Sergi, 2018].

The EAEU growth prospects for American experts seem limited, also because "the main sources of investment and innovation for the post-Soviet space are located outside China, Europe and the United States. As noted, "the potential for internal instability in Russia, financial problems will affect its integration project and its ability to continue to support intermediary regimes in the separatist regions in Georgia, Moldova and Ukraine" [Cohen, 2015].

As for the CSTO, experts point to its "weakness, whose member states, which deeply distrust each other, cannot count on Russia as a guarantor of the continuity of their regimes, and the organization's military forces have never been deployed and are a paper command and control organization, and not an active military alliance... Despite the fact that it combines three different regional security complexes - East European, Caucasian and Central Asia - it has not demonstrated the ability to effectively resolve conflicts in any of them." [Starr и Cornell, 2014]

The prospects for promoting the global and regional agenda of Russia to American specialists also seem limited in a number of indicators - the size of the economy, views on the international system, the structure of the modern world order, the rise of China, etc. Experts doubt that "Moscow will be able to maintain an effective foreign policy with the necessary material means and vision to present its leadership as an

alternative to the US-led international order, especially since Russia's previous attempts to demonstrate global or regional leadership through the BRICS, CSTO and EurAsEC - were unsuccessful" [Colton and Charap, 2018]. Guided by these considerations, experts believe that "Russia's efforts to advance the EAEU beyond Eurasia — through free trade agreements (FTAs) or discussions of potential proposals to join Iran, Turkey, and other countries — are also likely to be unsuccessful" [Pannier, 2017].

Obstacle to cooperation between the Chinese project "Silk Road Economic Belt" (SREB) and the Russian Eurasian Economic Union (EAEU) in Central Asia, American analysts see "the lack of a common perspective between the EAEU member states, the lack of a" habit "of working in Asia in multilateral formats in Asia , Moscow's tendency to consider EAEU member states as passive junior partners, the presence of a strong Sinophobic wave in the Central Asian republics, as well as a misunderstanding between Moscow and Pe kicking the conditions of this process, the lack of involvement of the business community on both sides" [Spivak, 2016].

Conclusion

The study made it possible to fill in the gaps in understanding the nature and characteristics of coverage of Eurasian integration processes in the American foreign policy discourse and made it possible to outline in general terms the position of the American expert community regarding integration led by Russia. In support of the hypothesis, the study showed that despite the development of the global trend of integration and regionalization, as well as the noticeable attention of the United States to unifying efforts in other regions of the world, the integration of post-Soviet states is not of independent interest for Washington. The region represented by the former Soviet republics, for the US foreign policy strategy is relevant only in the context of the geopolitical interests of the United States in other areas - the European Union, the Middle East, China, South and Southeast Asia. American experts examine the political and economic processes of the post-Soviet space through the prism of Russia's foreign policy steps regarding the former Soviet republics and the strengthening of China's economic position in this part of the world. Further more detailed research is required by American integration initiatives and various projects in order to strengthen the US geo-economic and geopolitical positions in the Eurasian region.

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在使用肠吸收剂的背景下，年龄方面的犊牛协同程序的动态

DYNAMICS OF THE COPROGRAM IN CALVES IN THE AGE ASPECT AGAINST THE BACKGROUND OF THE USE OF ENTEROSORBENT

The study was carried out at the expense of the federal budget by order of the Ministry of Agriculture of Russia in 2020

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抽象。 本文介绍了使用不同剂量的聚甲基硅氧烷多水合物在年龄方面的犊牛的粪便研究数据。 在新生儿直至5天的年龄段内，以0.3-0.5 g / kg活重的剂量喝肠溶性吸收剂的悬浮液，后来以0.1-0.3 g / kg的剂量饮用，会导致消化功能正常化 。

关键词：肠吸收剂，剂量，共同程序，犊牛，新生儿期，动力学。

Abstract. *The article presents the data of coprological studies in calves in the age aspect with the use of polymethylsiloxane polyhydrate in various doses. Drinking a suspension of enterosorbent in a dose of 0.3-0.5 g/kg of live weight during the neonatal period up to 5 days of age, and in a later – in dose of 0.1-0.3 g/kg, leads to normalization of digestion function.*

Keywords: *enterosorbent, dose, coprogram, calves, neonatal period, dynamics.*

Introduction

Digestive apparatus diseases in newborn calves for many years occupy one of the first places in terms of prevalence, with no tendency to decrease. More than 70-90% of these disorders are of functional origin. The newborn calf, in addition to pain, also experiences other unpleasant symptoms associated with impaired digestion and adequate digestion. Digestive disorders can have negative consequences for the further growth of calves. A wide range of medications prescribed for the treatment of diseases of the digestive tract adversely affects the development of

the calf, the functioning of other organs and systems of the body. In addition, drugs prescribed for newborns and young animals in connection with digestive problems do not always have only a positive effect. Most of them lead to the development of dysbiosis, allergic reactions, violation of the protective, endocrine and excretory functions of the gastrointestinal tract [1, 2]. One of the indicators of the physiological functioning of the digestive system are coprological studies [3]. These methods are simple and available to the veterinarian in agricultural production. Another task: the search for environmentally friendly means and methods for the prevention of digestive disorders, and most importantly, the selection of an effective dose of drugs.

Purpose of the study: determine the effect of suspension of a drug based on polymethylsiloxane polyhydrate on the dynamics of coprograms in calves.

Conditions and research methods

Scientific work was completed in 2020 at the Department of Obstetrics, Surgery and Non-communicable Animal Diseases of the Ivanovo SAA.

The experiment included 48 clinically healthy calves of the Kostroma breed obtained from cows of 3-4 years of age. The animals were kept according to standard technology adopted at the farm. According to the plan of veterinary measures, a serum against pasteurellosis, salmonellosis, escherichiosis, parainfluenza-3 and infectious rhinotracheitis of cattle was introduced to the calves in the first days of life in accordance with the instructions for use.

For the experiment, analog calves were divided into 12 heads in 4 groups: 1 group - control, received the main diet (colostrum and dairy products); Groups 2, 3 and 4, in addition to the main diet (MD), after 2 hours after the last feeding, a suspension based on polymethylsiloxane polyhydrate was evaporated, respectively, at a dose of 0.1 g/kg, 0.3 g/kg and 0.5 g/kg of live weight.

To achieve the goal of the experiment, clinical and laboratory methods were used using microscopy of native preparations, preparations with Lugol and Saathof reagents, as well as microscopy of smears stained according to Romanovsky-Giemsa, in accordance with generally accepted methods using a Micromed 3Var3-20 microscope and video cameras with software Microscope Color Digital Camera LevenhukC 1400 NG, SP40X/0.65 and SP10X/0.25 lens and WF10X/22 eyepiece.

Coprological studies were performed in clinically healthy newborn calves (before the first colostrum), 5- and 15-day-old. Feces were taken directly from the rectum.

Results and their interpretation

In newborn calves, feces (meconium) are brownish-yellow, the smell is not expressed, the consistency is thick, viscous, unformed with a slight admixture of hair, the reaction of the medium is from slightly acidic to acidic.

Microscopy of native preparations leads to mucus in a small amount in 50% of cases. The microflora is represented by coccal and bacilli forms in equal proportions, and varies from single cells to a significant number. There are red blood cells and white blood cells (up to 5-7 cells in the field of view) and single cells of the intestinal epithelium. Under microscopy, in 70% of cases, neutral fats are detected in a single and moderate amount, in 30% in large and very large quantities. In all samples, starch is detected (up to 10-15 grains). Iodophilic microflora in feces is represented by bacilli forms in single copies.

In group 1, in 5-day-old calves, the color of feces is from light yellow to ocher-brown, the smell — from sourish to acidic, the consistency — from lint-like with alkaline pH (30%) to maze-like with acidic pH (70%). In contrast to the indicator in newborn calves, in the stool samples, there are no foreign impurities, however, on the surface of the stool in 100% of samples there is a moderate amount of mucus. Red blood cells (up to 5 cells in the field of view), white blood cells (up to 10 cells) and intestinal epithelial cells in large numbers were found. In 100% of the samples, very large amounts of neutral fats were found, as well as single starch grains. A large number of iodophilic bacilli microflora were established, and coccal in 30% of samples.

In 5-day-old calves of the 2nd group, the stool color is from yellow to light brown. In 70% of cases, a small amount of mucus on the surface and mixed with feces, single cells of the intestinal epithelium, smell and pH are acidic; 30% of mucus in the feces is moderate, the smell is specific, the pH is slightly alkaline. The samples contain red blood cells and white blood cells, respectively, up to 6 and 12 cells in the field of view. The consistency of feces is ointment; single grains of starch are found. Neutral fat (from insignificant to very large quantities) was detected in 100% of samples. In 30% of samples, single struvites were noted. Microflora is represented by cocci and bacilli, with a predominance of coccal microflora in 30% of animals. Iodophilus bacilli microflora was absent in all samples.

Five-day-old calves have 3 groups of brown feces with a greenish, grayish or terracotta hue, a specific odor, slightly acidic pH, soft (30%) or pasty (70%) consistency. No mucus was found on the stool surface; mucous bands were found in a mixture with feces in 70% of samples; starch and a very large amount of fat were detected in 30% of the samples, and a small amount of neutral fat was detected in 70% of the samples. Iodophilic microflora is represented by bacilli in a small amount. Erythrocytes from 0 to 2 cells in the field of view are fast in all samples, white blood cells from 0 to 2 cells in 70% of samples. In 30% of samples, where the leukocyte count was up to 9 cells, a moderate number of intestinal epithelial cells with a predominance of bacilli microflora was also found in the field of view of the microscope.

In 5-day-old calves, 4 groups of feces are yellow-brown, brownish in color, with a greasy consistency, with an acid smell and a slightly acidic pH. In 70% of the samples, a slight or moderate amount of mucus was present on the surface, and in 100% the mucus was found mixed with feces. In 30% of the samples, salts of calcium oxalate dihydrate were detected. The presence of 5 to 8 red blood cells, 5 to 10 white blood cells, a small amount of intestinal epithelium and neutral fat in the field of view of the microscope was detected in 70% of samples. In 30% of cases, intestinal epithelial cells and moderate fat were found in moderation. In all samples, single starch grains were found. Iodophilic microflora is represented by bacilli in a small amount.

Digestible and non-digestible fiber, muscle fibers, fatty acids and soaps were not found in calves of 5 days old in groups 1-4.

In calves of 15 days of age, the 1st group of feces is gray-yellow in color with a putrefactive odor, a greasy consistency, alkaline pH. Mucus on the surface and mixed with feces from moderate to a significant amount in the form of strands. Starch is present in moderation. Neutral fat and intestinal epithelium were detected in a significant amount in 100% of the samples; microscopic crystals represented by struvites were present in 30% of the samples. Microflora is represented by cocci and bacilli in equal proportions in all samples. A significant amount of iodophilic microflora (bacilli forms) was found in 30% of samples, in a moderate amount - in 70%. Significant red blood cell counts (up to 20 in the field of view) were detected in 70% of the samples, the white blood cell count reached 25 cells in the field of view of each sample. In all stool samples, digestible and indigestible fiber, muscle fibers, fatty acids and soaps were absent.

In calves of 15 days of age, group 2, upon macroscopic examination of feces without impurities, had a yellow-gray - gray-brown color, a specific smell, soft consistency, and slightly alkaline pH. The mucus in the form of a slightly noticeable shiny coating on the surface of the feces, is determined in 100% of samples; in a mixture with feces - in 30% of samples. In all samples, starch in the form of dark blue grains was found in small quantities. Digestible plant fiber was absent in all samples; undigested plant fiber was observed in moderation in 30% of the samples in the form of cells with thick bypass membranes and wide intercellular septa. Single drops of neutral fat, and its moderate amount was noted in 60%, a significant amount - in 40% of samples. The soap content is insignificant and salt crystals (struvites) are found in 30% of the samples. Cellular elements in 30% of the samples are represented by a moderate amount of intestinal epithelial cells and red blood cells (up to 2 in the field of view), in 100% of the samples by leukocytes (2-3 in the field of view). In 30% of the samples, the microflora is represented by cocci and bacilli in a ratio of 70:30, while in 70% in a ratio of 50:50. Iodophilic flora in 30% was found in the form of bacilli and coccal forms in a ratio of 1:1, and in 70% it was represented only by a bacilli form.

Fatty acid crystals were absent in all samples.

In 15-day-old calves of group 3, by visual examination, feces were observed to be of brown or ocher color, with a mild, specific smell, soft consistency, slightly acidic pH with impurities in the form of strands of mucus in all samples. Mucus on the surface of feces in moderate and insignificant amounts, respectively, in 30% and 70% of samples. Starch was found singly in the field of view in only 30% of samples. Plant fiber, both digestible and indigestible, was absent in all samples. Drops of neutral fat in 30% of samples were noted singly in the field of view, and in 70% in a small amount. Fatty acid crystals, soaps, muscle fibers, salts were absent. The erythrocyte content in all samples is single in the field of view, leukocyte variations are significantly expressed: from 0 to 2 in the field of view in 80% of the samples, up to 10 in the field of view in 20% of the samples. Microflora is represented by cocci and bacilli in a ratio of 70:30 in all samples. Iodophilic flora in 80% of the samples is represented by the bacilli form, and in 20% of the samples by the coccal form.

In 15-day-old calves, 4 groups of feces are brownish, gray-green, soft consistency, with a mild specific smell, acidic pH, and a slight amount of mucus on the surface. The presence of a significant amount of impurities in the form of mucous strands was detected in 30% of samples. Starch grains were found singly in the field of view in 30% of samples, and in a small amount in 70% of samples. In 30% of the samples, drops of neutral fat were found singly in the field of view, in 70% of the samples - a small amount. Red blood cells were observed in all samples singly in the field of view, while leukocytes and intestinal epithelium were observed in only 30% of the samples. The ratio of coccal and bacilli flora in 20% of the samples was in equal proportions, in 80% of the samples the ratio was 90:10.

In 15-day-old calves in groups 1-4 there were no salts of fatty acids and digestible fiber.

Conclusion

The analysis showed the presence in the feces of newborn calves of hair, mucus, drops of neutral fat, starch, up to 5-7 cells of blood cells, coccal and bacilli microflora, a small amount of bacilli forms of iodophilic microflora. On day 5, calves change color, odor, texture, pH of feces, mucus is moderate on the surface of the feces, leukocyte counts increase, intestinal epithelial cells, neutral fats, iodophilic bacilli microflora and single starch grains are present in large numbers. In 15-day-old calves, in addition to discoloration, consistency, putrefactive odor and a pH shift to the alkaline side are noted. On the surface and mixed with feces, there is mucus in the form of strands to a significant amount. Neutral fat, starch and intestinal epithelium are detected, struvites were found in 30% of samples. The content of red blood cells (up to 20 cells) and white blood cells (up to 25 cells in the field of view of each sample) increases. Coccal and bacilli microflora are

presented in equal proportion, in a significant amount of bacilli forms of iodophilic microflora in 30% of samples.

In 5-day-old calves of the 2nd group who received the preparation at a dose of 0.1 g/kg live weight, fecal pH was slightly alkaline, single starch grains, single struvites. The microflora is represented by cocci and bacilli, with a predominance of coccal microflora in 30% of samples and the absence of iodophilic bacilli microflora. In calves of 15 days of age, the feces pH is slightly alkaline, mucus in the form of a brilliant coating on the surface of the feces, a small amount of starch. In 30% of samples, indigestible fiber, soaps, struvites, and cellular elements are present. Coccal microflora predominates; of the representatives of the iodophilic flora, it is predominantly bacilli.

In 5-day-old calves of the 3rd group who received the drug at a dose of 0.3 g/kg live weight, a specific odor and a slightly acidic pH of feces were noted. The absence of mucus on the surface of the feces and a small amount of formed elements. Iodophilic microflora in a small amount is represented by bacilli. In 15-day-old calves, the feces are slightly acidic with mucus impurities. The content of red blood cells in all samples is single in the field of view, white blood cell variations are expressed. The samples were dominated by coccal microflora, among the iodophilic flora — bacilli.

In 5-day-old calves of the 4 groups receiving the drug at a dose of 0.5 g/kg live weight, feces had a slightly acidic pH, mucus on the surface and mixed with feces. In 30% of the samples, salts of calcium oxalate dihydrate, intestinal epithelial cells and neutral fat in moderation were detected. The presence of blood cells in moderation. Iodophilic microflora is represented by bacilli in a small amount. In 15-day-old calves, the pH of feces is acidic, with a small amount of mucus on the surface. Single red blood cells, white blood cells and intestinal epithelium were noted in only 30% of samples. The feces were dominated by coccal flora.

Based on the analysis, we can draw the following **conclusions**:

- all 5-day-old calves feces lack digestible and undigestible fiber, muscle fibers, fatty acids and soaps;
- in 15-day-old calves in 1-4 groups, salts of fatty acids and digestible fiber are not detected;
- in the feces of 5-day-old calves of the control group, intestinal epithelial cells, neutral fats, iodophilic bacilli microflora are present in large numbers, in 15-day-old calves there is a putrid odor of feces and a pH shift to the alkaline side;
- in 5-day-old calves of group 2, single struvites were revealed, the absence of an iodophilic bacilli microflora; in 15-day-old calves, in 30% of samples, indigestible fiber, soaps, struvites, and cellular elements were found;
- in 5-day-old calves of group 3, there was a lack of mucus on the surface of the feces and a small amount of formed elements, iodophilic bacilli microflora in an

insignificant amount; in 15-day-old calves in the feces there are single red blood cells, coccal microflora predominates, among the iodophilic microflora - bacilli;

- in 5-day-old calves of group 4, 30% of the samples showed salts of calcium oxalate dihydrate, intestinal epithelial cells and neutral fat in moderate amounts, iodophilic microflora is represented by a small amount of bacilli; in 15-day-old calves, 30% of the samples showed single blood elements and intestinal epithelium, the prevailing coccal flora.

Based on the analysis, we recommend that, regardless of the technology of maintenance and the plan of veterinary measures, in order to normalize the digestive function, calves should be fed a suspension of polymethylsiloxane polyhydrate in a dose of 0.3-0.5 g/kg during the neonatal period up to 5 days of age, and in a later suspension the drug in a dose of 0.1-0.3 g/kg of live weight.

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道路耐久性标准
CRITERIA OF ROAD DURABILITY

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抽象。 本文提出了一些修改公路强度标准的建议。 由于道路负载较重，需要考虑道路运行中的新现象（层状剪切，整体层弯曲时的张力等），因此在1960.1972、1983和2001中进行了这些操作。 增加道路结构的厚度及其使用寿命。

所提出的修改考虑了分层道路结构上的运动载荷，从而在其中产生了动态功，同时考虑了分层中弹性波的形成。

关键字：动力学，振动，波动，载荷多重性。

Abstract. *This article makes suggestions for modifying the criteria for the strength of road pavement. They were carried out in 1960.1972, 1983 and 2001 for reasons of heavier loads on the roads, the need to take into account new phenomena in the operation of roads (shear in layers, tension during bending of monolithic layers, etc.) and usually led to an increase in the thickness of road structures and their service life.*

The proposed modification takes into account the moving loads on the layered road structures, causing dynamic work in them, taking into account the formation of elastic waves in the layers.

Keywords: *dynamics, vibrations, waves, loading multiplicity.*

Introduction

Currently, roads in the Russian Federation are designed and built on the basis of a theory that includes three criteria for the strength of pavements:

- by elastic deformations (reversible deflection), stretching of coatings during bending, and by shear in the soil and disconnected layers of the base.

In 2001 a new “updated” document of the Ministry of Transport of the Russian Federation ODN218.046-01 was published, which has novelty only in terms of modernizing the criterion of road strength by reversible deflection. The remaining criteria retain their original value for 36 years. Meanwhile, scientific schools have long been established in Russia that make it possible to modernize the criteria for the strength of road pavement, improve the quality of road projects and their durability (MADI, SibADI, DSTU (Rostov-on-Don schools), etc.

The first analytical modifications of the criterion for the strength of pavements for deformations under the action of moving (short-term) loads on them are shown in [5,4,3]. In this case, the criterion of strength by to elastic deformations (reversible deflection) is replaced by the criterion of "dynamic" deflection, which allows it to be applied to roads along which vehicles move. This article shows the forms of dynamic deflections of road surfaces and methods for obtaining tensile stresses in them, as the basis for the modification of the second strength criterion. The third criterion (in terms of shear) is proposed to be replaced by a coefficient of plastic stability, which makes it possible to determine the track in pavements of a non-rigid type.

Content

When performing calculations, multilayer road structures previously lead to two-layer models. We calculate the total dynamic elastic modulus $E_{дин}$ and layer-by-layer moduli $E''_{дин}$, $E'_{дин}$ etc., having previously adopted D and q for the estimated moving load. For load on the axle AK100 D = 34 cm; q = 0,6 MPa.

Then, in accordance with the distribution of compressive stresses (see Fig. 1), stresses along the z axis are calculated: $\sigma_{z=0}$=*q, σ2, σ3, σj, σm* according to formulas 1 - 7 of the table in fig. 1.

Next, calculate the diameters of the areas of the stress distribution in the layers ***D***:

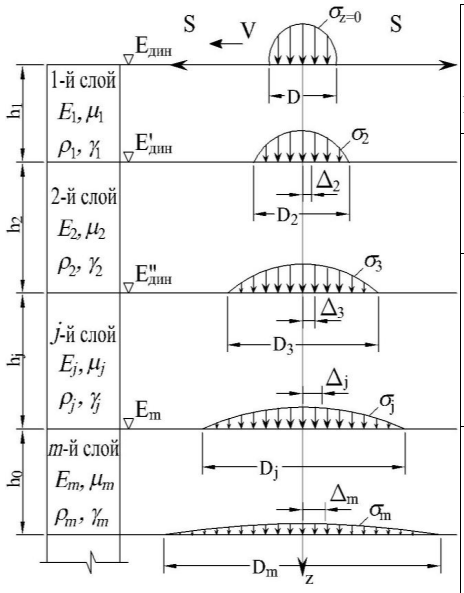
$D_2 = D \cdot \sqrt{\frac{q}{\sigma_2}}$; $D_3 = D_2 \cdot \sqrt{\frac{\sigma_2}{\sigma_3}}$; $D_j = D_3 \cdot \sqrt{\frac{\sigma_3}{\sigma_j}}$ and $D_m = D_j \cdot \sqrt{\frac{\sigma_j}{\sigma_m}}$; stress duration $T_0 = \frac{D}{V}$; $t_j = \frac{D_j}{V}$ and $t_m = \frac{D_m}{V}$ and deviations of the point of maximum stresses from the axis z: Δ_2, Δ_3, Δ_j and Δ_m.

If when designing pavement according to technological or economic conditions, it will contain a layer with density and elasticity values greater than the density and elasticity of the overlying layer, then the stresses in the overlying layer increase by reflection coefficient $K_{отр}$, and under the layer with increased density and elasticity they decrease by the value of the refractive index $K_{пр}$. Their values are given in table. 1 and depend on the stiffness of the layer of increased density ($E_j \cdot h_j^3$).

In this case, the thickness of the lower soil layer h_o is prescribed for reasons that the compressive stresses will be no more than 5% of the stresses on the surface of this layer:

$h_0 = 150 - \sum_1^m h_{j-1}$. Then calculate the average stress in the layer as

$\sigma_j^{cp} = \frac{\sigma_j + \sigma_{j-1}}{2}$, used in formulas 2÷7.



№ of layer	Stresses on the faces of the layers	
1	$\sigma_{z=0} = q$;	(1)
	$\sigma_2 = q\left(1+\sqrt{\frac{E_1}{E'_{дин}}}\cdot\left(\frac{h_1}{D}\right)^2\right)^{-1}$	(2)
2	$\sigma_2 = q\left(1+\sqrt{\frac{E_1}{E'_{дин}}}\cdot\left(\frac{h_1}{D}\right)^2\right)^{-1}$;	(3)
	$\sigma_3 = q\left(1+\sqrt{\frac{E_2}{E''_{дин}}}\cdot\left(\frac{h_1+h_2}{D}\right)^2\right)^{-1}$	(4)
j	$\sigma_3 = q\left(1+\sqrt{\frac{E_2}{E''_{дин}}}\cdot\left(\frac{h_1+h_2}{D}\right)^2\right)^{-1}$;	(5)
	$\sigma_j = q\left(1+\sqrt{\frac{E_j}{E_m}}\cdot\left(\frac{h_1+h_2+h_j}{D}\right)^2\right)^{-1}$	(6)
m	$\sigma_j = q\left(1+\sqrt{\frac{E_j}{E_m}}\cdot\left(\frac{h_1+h_2+h_j}{D}\right)^2\right)^{-1}$;	(7)
	$\sigma_m = \sigma_j \cdot e^{-\gamma_m \cdot h_a}$	(8)

Figure 1 - *Distribution of compression stresses and calculation formulas*

Table 1

Reflection and refraction coefficients

Coefficients	**Layer hardness $E_j \cdot h^3_j$, MPa·cm^3 · 10^8**							
	0,1	**0,2**	**0,3**	**0,4**	**0,6**	**0,8**	**1,0**	**1,2**
Refraction K_{np}	5,5-9,5	7,5-11,5	8,2	9,0-12,1	13,0	13,2	13,6	14,0
Reflection $K_{отр}$	1-3,1	3-3,5	3,5	3,7	3,8	3,9	3,9	3,9
Note. Smaller values of the coefficients at $E_j/E_{j+1} = 2 \div 8$, greater at $E_j/E_{j+1} = 100 \div 400$.								

The first criterion for the strength of non-rigid pavement may be the condition and coefficient:

$$U_{дин} \le [U],\ К_{пр}^{дин} \le \frac{U_{дин}}{[U]} \le 1, \quad (9)$$

where $U_{дин}$ – dynamic deflection of the road structure;

$[U]$ – permissible dynamic deflection.

The dynamic deflection of the layer is calculated by the formula

$$u_j = \frac{\sigma_j^{cp} \cdot h_j \left(1-\mu_j^2\right)}{E_j}\left(1-\frac{t}{5T_{0j}}\right)\cdot \sin\left(\pi \frac{t}{T_{0j}}\right), \quad (10)$$

where μ_j – Poisson's ratio: $T_{0j} = \frac{D_{j-1}}{V}$; $D_{j-1} = D \cdot \sqrt{\frac{q}{\sigma_{j-1}}}$.

The total dynamic deflection of the layered structure is calculated

$$u_{дин} = \sum_1^m u_j \ . \quad (11)$$

The lag (delay) of the dynamic deflections of the layers from the center of load application is calculated

$$\Delta_j = \frac{h_j}{c_j} \cdot V + \sum_1^{j-1} \Delta_{j-1} \ , \quad (12)$$

where $c_j = \sqrt{\frac{E_j}{\rho_j\left(1-\mu_j^2\right)}}$ – propagation velocity of longitudinal waves in the layer;

V – horizontal speed of vertical load;

D – diameter of the trace of an average vehicle;

q – specific load;

ρ – density;

E – elastic modulus.

When calculating the elastic deflections of typical pavements by the formula (11), their distribution by layers and the fraction of each layer in the total deflection were established. In Figure 2, these fractions are expressed by the coefficient $К_д^и$. It follows that the largest role in the formation of residual deformations and the depth of the track is played by cohesive subgrade and underlying layers of road pavement ($К_д^и$=0,83 and $К_д^и$=0,153). Therefore, it is necessary to strengthen these layers (for example, with rebar or cementation).

Forms of dynamic deflections along the trajectory of the vertical load with a velocity V [Fig. 3] are taken from [5,4,3]. As you can see, they are similar to the wave-like classical functions of Bessel, and alternating sign (the difference is 8 ÷ 16%).

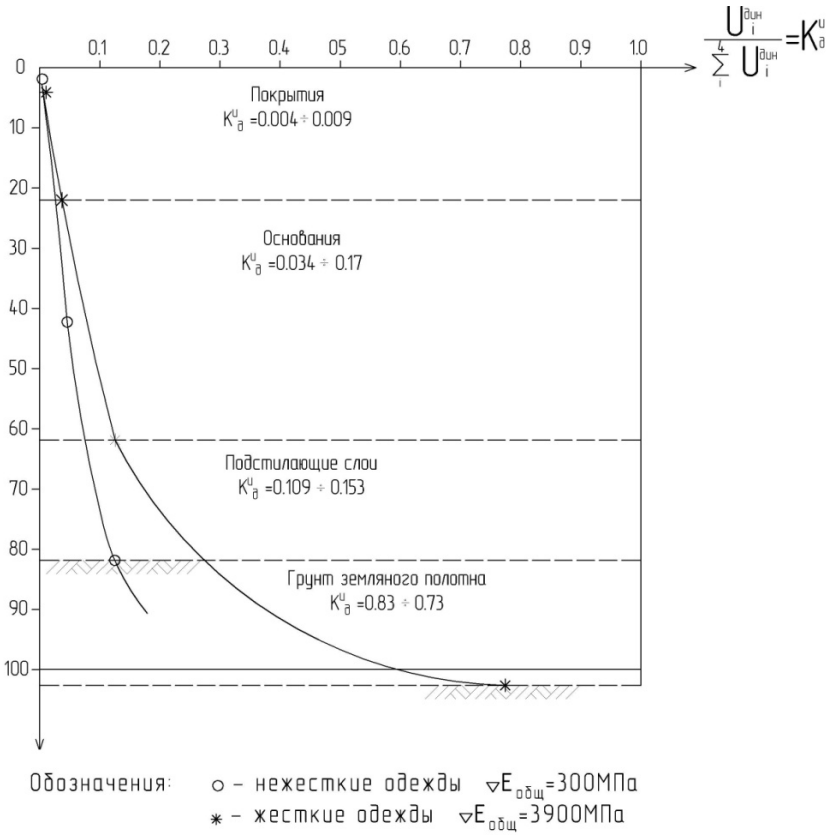


***Figure 2** – The distribution of the shares of dynamic deflections on the layers of pavement*

The greatest tensile stresses during bending occurs at the center of loading, lower at the crests and troughs of waves with a periodic change of sign.

With increasing horizontal velocity *V*, the deflection under load decreases [5], and the acceleration of oscillations increases. The tensile stress during bending is determined by the formula:

$$\sigma_r = \frac{E \cdot H}{2R}\sqrt{2}, \tag{13}$$

where E – modulus of elasticity of the coating,

H – coating thickness,

R – radius of curvature, defined as:

$$R = \frac{(1+U')^{3/2}}{U''}, \quad (14)$$

where U' and U'' – derivatives of deflection U.

For the example of Fig. 3, the finite difference method was used to obtain derivatives, radii of curvature, and tensile stress along the entire length of the propagation of strains (Fig. 4).

The greatest stresses under the center of loading under the static action of the load ($V = 0$) decrease with increasing thickness of the coatings, both asphalt concrete and cement concrete. The dynamic tensile stresses in cement concrete coatings are more than static and increase with increasing thickness. For example (Fig. 3), the frequency of vertical vibrations of the coatings at the load speed $V = 100$km/h is 12,8s^{-1}, and at $V = 60$km/h - 38,8s^{-1}.

The tensile stress criterion for coatings and monolithic substrates is presented as:

$$К_{пр} = \frac{\sigma_r}{[\sigma]} \leq 1, \quad (15)$$

Here - σ_r – dynamic tensile stresses,

$[\sigma]$ - limit (permissible) stresses.

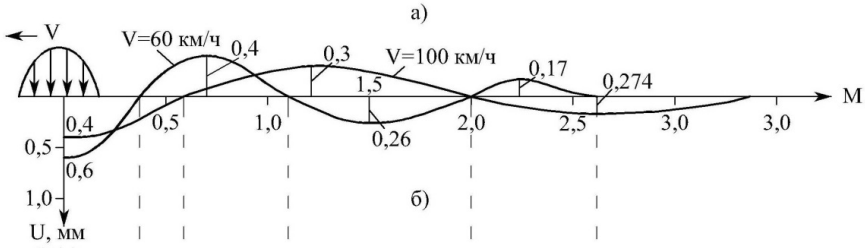


Figure 3 - *Forms of vertical dynamic deformations of the surface of road pavements with a common modulus of elasticity $E_{общ}$=400MPa, vertical load – 50 kN*

The third strength criterion, presented as the ratio of shear stress to resistance, can also be modified by introducing a plastic stability coefficient instead, which allows predicting residual strains on the surface of coatings in the form of subsidence and gauge.

Norms of accumulated roughness (gauge depths) exist in Germany, taking into account their size [7]. So, the depth of 20 mm and more corresponds to the unsatisfactory property of the coating surface, 10 mm - good, and 4 mm and below - excellent [1].

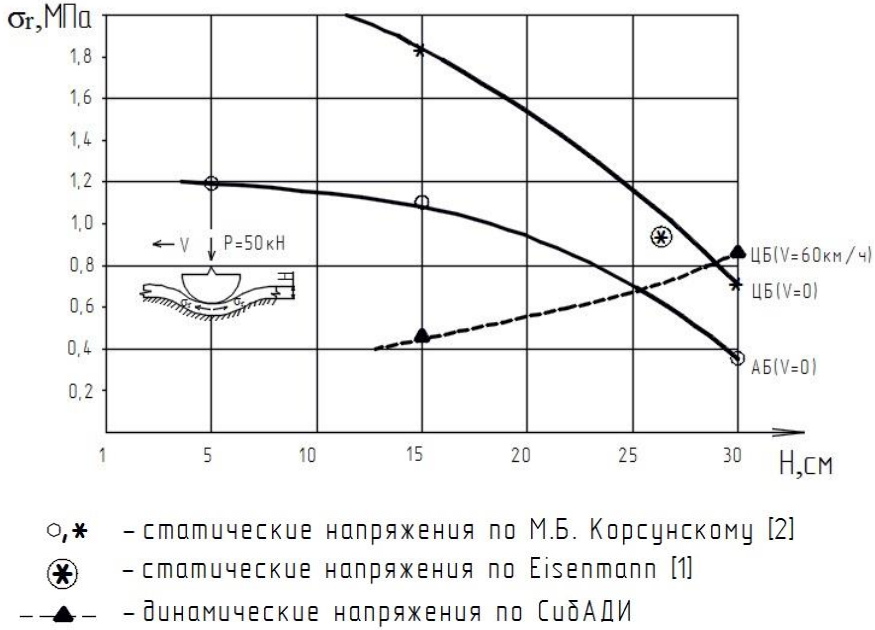


Figure 4 – *Tensile stresses in cement concrete and asphalt concrete pavements*

In Russia, for roads of category I, the final norm is the gauge with a depth of 21 - 34 mm, category II 27 - 37 mm, category III 28 - 41 mm [8].

The condition of plastic stability of road structures is expressed as:

$$U_T \le [U]_n,\ \text{К}_\text{т} \le \frac{U_\text{т}}{[U]_n} \le 1\ , \tag{15}$$

where $[U]_n$ – permissible (extreme) roughness of the coating;

U_T – accumulated roughness of the coating surface, determined by the formula

$$U_T = T \cdot \sum_{1}^{i} \sum_{1}^{M} \frac{\sigma_{ij(1-\vartheta_j^2)\cdot h_i \cdot lgN}^2}{E_{\partial ij} \cdot [R]_{ij}}, \tag{16}$$

where T – service life of the road structure;

N – average traffic intensity of cars per lane for month and per month, respectively;

M – the number of layers in the road structure, including the soil layer of the subgrade of the active (working) zone;

j – the number of the layer in which the residual (accumulated) deformations are determined, $1 \leq j \leq M$;

$E_{\partial ij}$, $[R]_{ij}$, ϑ_j – deformation modulus, compressive strength, lateral expansion coefficient (Poisson) of materials of layers of road structures;

h_j – the thickness of the layer of the road structure (for the soil layer of the subgrade, its thickness is taken as

$$h_{\text{акт}} = 150 - \sum_{1}^{M-1} h_i);$$

D – diameter of the circular wheel track of average vehicle wheel (for loading group A: D=33 cm);

i – the number of months in the year the road construction works on a thawed soil base (for III RCZ RF i=8 months);

$\sigma_{i,j}$ – the average compression stress in the structural layer, depending on the elastic moduli of the layers, their thickness, determined for each month of the warm period of the year;

K_T - coefficient of plastic stability.

Details of the rutting prediction methodology (Goryachev VG, MADI (TU) are not given here, but shown in [9]. It should be noted that the residual deformations according to this technique are stacked in layers starting from the subgrade, depending on the weighted average elastic modulus of pavements, service life (5.10 and 15 years), types of foundations, the total number of applications of the estimated load and security of 85%. Comparative results of calculating the track are shown in figure 5.

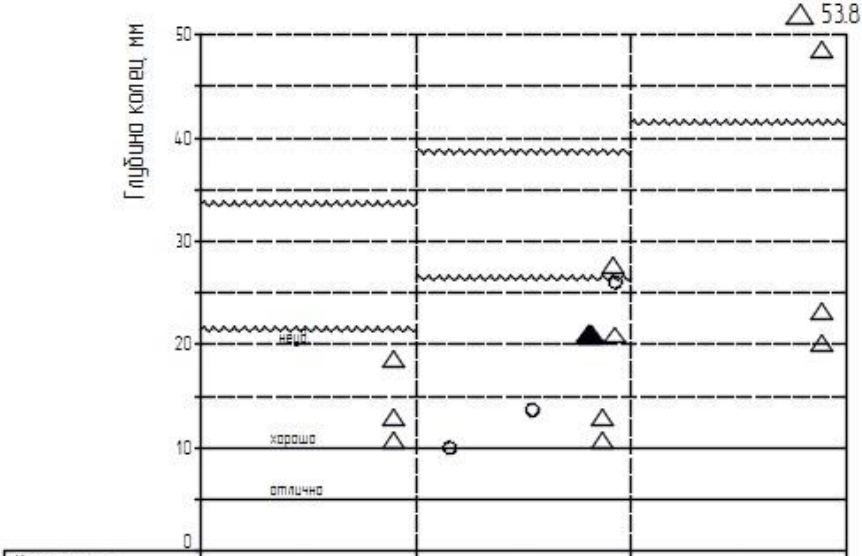


Рис. 2 Глубина колеи на дорогах с асфальтобетонным покрытием

Обозначения: ~~~ – предельная глубина колеи по О.А. Красикову

△ – глубина колеи по методике СибАДИ

○ – глубина колеи по методу МАДИ(ТУ)

——— нормы колееобразования Германия (BAST)

Figure 5 – *Track depth on roads with asphalt concrete pavement*

Therefore:

- Goryachev M.G. method (MADI, TU) and the SibADI method (Smirnov A.V.) coincide in terms of the predicted gauge;

- the values of the predicted track on the roads are within the tolerances of Germany (BAST method) and less than the limits of the Russian Federation.

Conclusion

1. To modify the three-criterion method for calculating pavement, it is desirable to calculate the first strength criterion (for deformations) as the ratio of the dynamic deflection of the pavements to the maximum (permissible).

2. The second criterion for tensile stresses should be calculated as the ratio of dynamic stresses to ultimate stresses under the action of a moving load.

3. Materials of road surfaces of motorways should be tested for endurance with alternating stresses with a frequency of 13 ÷ 40 vibrations per second.

4. If during the calculation process it is found that all three criteria are equal to 1, then this means that three limit states are reached equally.

If at least one criterion is less than one and contains a margin, then the thickness of the layers of the pavement and their physicomechanical properties should be reduced variationally, but with the remaining criteria being basically unchanged.

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基于满意度分析的萨马拉国立技术大学“ PCWT研究所”的生产可能性评估
ASSESSMENT OF THE PROBABILITY OF PRODUCTION OF THE SAMARA STATE TECHNICAL UNIVERSITY "INSTITUTE PCWT" BASED ON THE ANALYSIS OF SATISFACTION

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抽象。 描述了一种基于满意度分析评估萨马拉州立技术大学“ Institute PCWT”的联邦国家预算高等教育机构产品销售可能性的程序。 给出了竞争对手产品质量的比较特征。

关键字：概率，产品销售，满意度，消费者，产出

Abstract. *A procedure is described for assessing the probability of the sale of products of the Federal State Budget Educational Institution of Higher Education in Samara State technical university “Institute PCWT” based on satisfaction analysis. A comparative characteristic of the quality of competitors' products is given.*

Keywords: *probability, product sales, satisfaction, consumer, output*

Introduction

The main position of the concept of Total Quality Management (TQM) is to ensure the necessary degree of realization (sales) of products due to the high level of quality of products. The level of product quality is evaluated by the consumer. The consumer analysis is based on the procedure of comparing the quality of products from competitors, determining the value of satisfaction from a particular product, and the consumer thereby forms the probability of the sale of this product on the market.

Let the market in which products are sold be represented by “k” competitors, then with known values of customer satisfaction “ji” with products “ki”, the probability of product sales will be equal to:

$$P_{ki} = \frac{j_i p_n}{\sum_{i=1}^{k} j_i}$$

where ji – value of customer satisfaction with i-th product;

$\mathbf{p_n}$ – the percentage of products required by the market for the consumer of the total number of manufactured products by all competitors;

k – number of competitors in a given market.

$$\mathbf{p_n} = \frac{\mathbf{100\Pi}}{\sum_{\mathbf{i=1}}^{\mathbf{k}} \mathbf{\Pi_i}}$$

where Π – volume of products required by the consumer;

Π_i – the volume of production produced by the i-th competitor.

Then, when solving the problem of maximizing profits using linear programming, it is necessary to take into account $\mathbf{P_{ki}}$ when constructing restrictions on the volume of output.

Limitations:

- the value of regular customers is not taken into account;
- the consumer purchases products according to the value of satisfaction, there is no obligation to purchase competitor products in the absence of products from the selected organization.

Consequences:

- the appearance of any competitor, even with a quality level lower than that of the organization in question, reduces the likelihood of product sales;
- even in cases where the volume of products on the market exceeds the level of consumer demand, products with a high level of satisfaction may remain scarce;
- even in cases where the volume of products on the market is below the level of consumer demand, products with an insufficient level of satisfaction may remain excessive.

Experimental part

The main activities of the Research Institute for "Problems of Conversion and High Technology" of the Samara State Technical University (hereinafter FSBEI HE SamSTU "Institute PCWT") are the manufacture and testing of elongated cumulative charges (UKZ-P) [1,2,3].

Currently, such charges are used to perform national tasks (explosive cutting of oversized metal structures), tasks arising from the disposal or reuse of expired ammunition (explosive cutting of military equipment, ammunition), as well as solving special tasks of opening armored structures carried out by divisions of the Ministry of Internal Affairs.

For example, there are four competitors in the market with the values of customer satisfaction of the products presented in table 1. Production volumes are equal to the required volume of products for consumers.

Table 1 *– Production volumes for four competitors*

Organization	Satisfaction value	Production volumes (P)
CJSC «A»	0,8	40
LLC «A»	0,7	50
CJSC «B»	0,7	30
LLC «B»	0,9	20
		140

The probability of product sales will be distributed according to table 2.

Table 2 *– The probability of product sales for four competitors*

Organization	Satisfaction value	Production volumes (P)	Probability of sales
CJSC «A»	0,8	40	25,80
LLC «A»	0,7	50	22,58
CJSC «B»	0,7	30	22,58
LLC «B»	0,9	20	29,03
Total		140	

If a fifth joins, whose value of customer satisfaction with products is lower than that of competitors, the probability of product sales will change, according to table 3.

Table 3 *– The probability of product sales for five competitors*

Organization	Satisfaction value	Production volumes (P)	Probability of sales
CJSC «A»	0,8	40	15,13
LLC «A»	0,7	50	13,24
CJSC «B»	0,7	30	13,24
LLC «B»	0,9	20	17,02
LLC «C»	0,6	60	11,35

To build an optimal plan for maximizing profits, we determine the amount of cumulative charges necessary for the consumer of the following types of UKZ-P:

- UKZ-P-30M;
- UKZ-P-30A;
- UKZ-P-30L.

where 30 - outer diameter of the tubular workpiece, mm

M, A, L – tubular blank material.

For example, there are five competitive organizations on the market. Customer assessment showed that the values of satisfaction and production volumes are distributed according to table 4.

***Table 4** – Production volumes of five competitive organizations*

Organization	Satisfaction value	Production volumes (P)
CJSC «A»	0,8	40
LLC «A»	0,7	50
CJSC «B»	0,6	60
LLC «B»	0,7	30
LLC «C»	0,9	20
Total		200

Let the level of consumer demand for UKZ-P-30M type be less than the volume of production. For example, it will be equal to 150 (the percentage of the products needed by the consumer on the market of the total number of manufactured products will be 75%), then the probabilities of acquiring products will be distributed according to table 5.

***Table 5** – Probability of sales of the type UKZ-P-30M*

Organization	Satisfaction value	Probability of sales
CJSC «A»	0,8	16,21
LLC «A»	0,7	14,18
CJSC «B»	0,6	12,16
LLC «B»	0,7	14,18
LLC «C»	0,9	18,24

Thus, it is possible to calculate the amount of FSBEI HE SamSTU "Institute PCWT" products required by the consumer, which is

- type UKZ-P-30M – 32 pcs;
- type UKZ-P-30A – 43 pcs;
- type UKZ-P-30L – 54 pcs.

To determine the necessary plan for the output volume of products to obtain the maximum profit of LLC "A" enterprise, taking into account the limitations on time and resources, you can use the Microsoft Excel program.

Write the mathematical model of the problem.

Carry out data entry in the Excel table (Fig. 1).

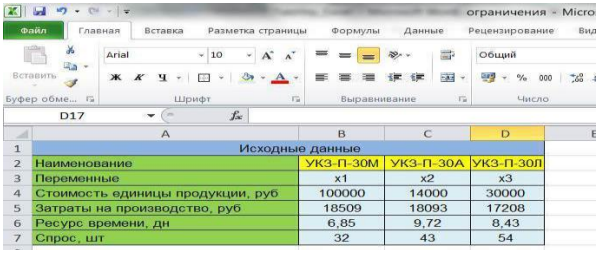


***Figure 1** – Initial data*

Assume x1, x2, x3 – number of types: UKZ-P-30M; UKZ-P-30A; UKZ-P-30L respectively.

To determine the profit from the sale of products, it is necessary to draw up a target function. To do this, we calculate the income from the sale of each unit of production (Fig. 2).

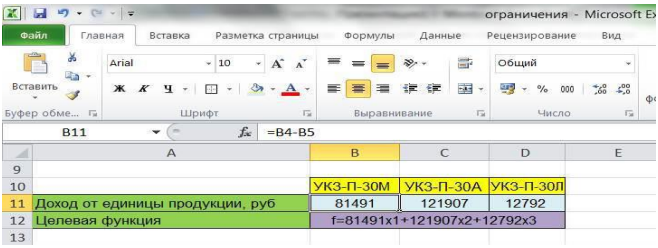


Figure 2 – *Income from the sale of a unit of production*

Based on the conditions of the problem, we have the following statement of the problem of obtaining maximum profit.

The target function will be equal to: F=81491x1+121907x2+12792x3→max

We introduce in the table in cell E17 the formula for calculating the maximum profit in the same way as the objective function. As a result, the page will take the form (Fig. 3):

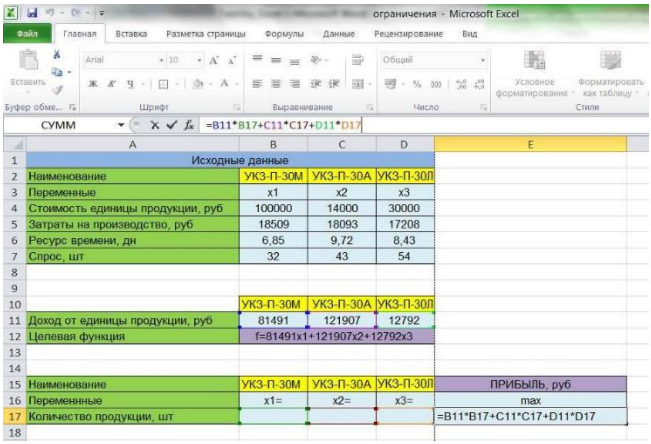


Figure 3 – *Page form after adding formulas*

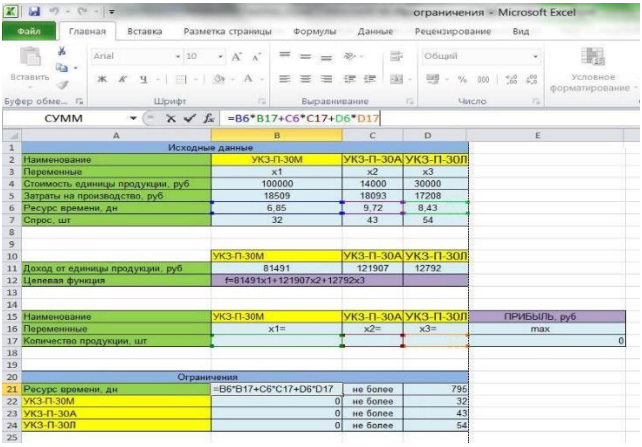
Based on the data, we make the following restrictions:

a) on time resources $6{,}85x1+9{,}72x2+8{,}4x3 \leq 795$,

b) on demand

- products of the type UKZ-P-30M $x1 \leq 32$,
- products of the type UKZ-P-30Ax2 ≤ 43,
- products of the type UKZ-P-30L $x3 \leq 54$.

The Excel worksheet will take the form shown in Fig. 4. The values of the cell into which the formulas were entered will be equal to zero so far, since x1, x2, x3 are unknown).



	A	B	C	D	E
1	Исходные данные				
2	Наименование	УКЗ-П-30М	УКЗ-П-30А	УКЗ-П-30Л	
3	Переменные	x1	x2	x3	
4	Стоимость единицы продукции, руб	100000	14000	30000	
5	Затраты на производство, руб	18509	18093	17208	
6	Ресурс времени, дн	6,85	9,72	8,43	
7	Спрос, шт	32	43	54	
8					
9					
10		УКЗ-П-30М	УКЗ-П-30А	УКЗ-П-30Л	
11	Доход от единицы продукции, руб	81491	121907	12792	
12	Целевая функция	f=81491x1+121907x2+12792x3			
13					
14					
15	Наименование	УКЗ-П-30М	УКЗ-П-30А	УКЗ-П-30Л	ПРИБЫЛЬ, руб
16	Переменные	x1=	x2=	x3=	max
17	Количество продукции, шт				0
18					
19					
20	Ограничения				
21	Ресурс времени, дн	=B6*B17+C6*C17+D6*D17	не более	795	
22	УКЗ-П-30М	0	не более	32	
23	УКЗ-П-30А	0	не более	43	
24	УКЗ-П-30Л	0	не более	54	
25					

Figure 4 – *Calculations for solving the problem of production planning*

To further solve the problem in the menu "Service" we select the procedure "Search for solution". In the window that appears (Fig. 5), you need to set the address of the target cell E17, the value of the target cell: maximum, the addresses of the changed cells B17: D17.

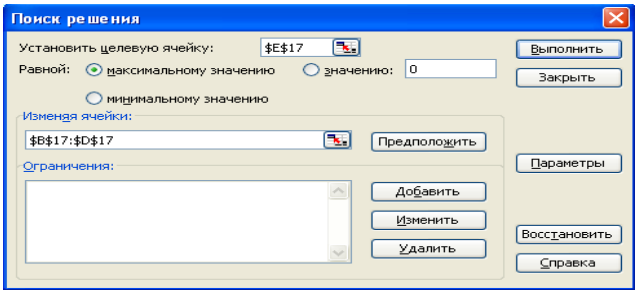


Figure 5 – *Search for solution*

To enter task restrictions, click the Add button. In the dialog box that appears on the left, enter the address B21 (time resource), then select the sign ≤ and on the right side the number of working days in a year equal to 265 (or the address of cell D21). After entering, click the "Add" button and similarly enter the following restrictions. In addition to the restrictions introduced in the spreadsheet, the task has one more restriction introduced by the management of the enterprise, products of each type must be present on the market for at least 5 products (x1, x2, x3≥5).

After entering the restrictions, we obtain the following view of the solution search window (Fig. 6):

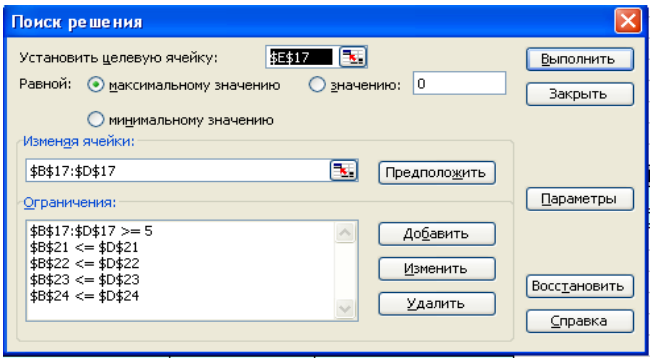


Figure 6 - *Result of adding constraints*

To solve the problem, in the "Search for solutions" window, click the "Run" button. If a solution is found, a window appears (Fig. 7).

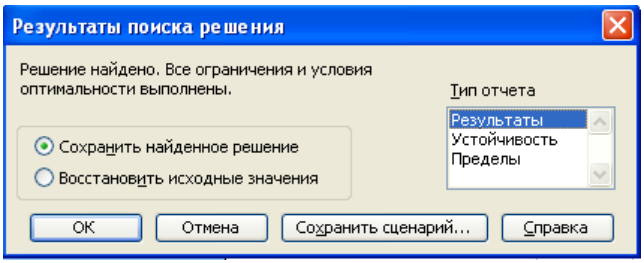
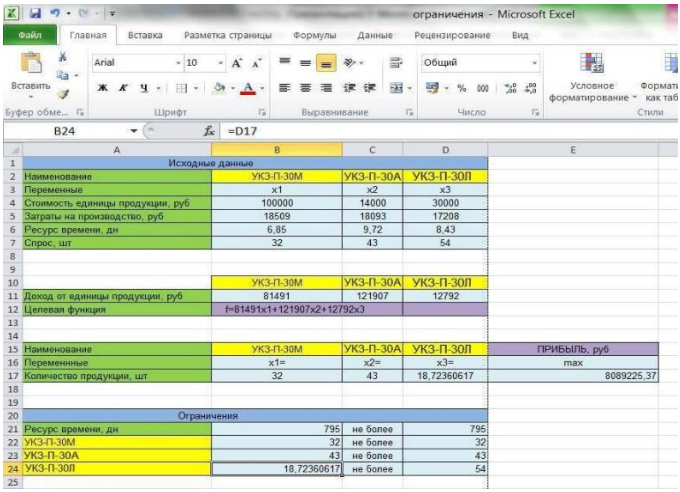


Figure 7– *Result of search for solution*

The original Excel spreadsheet is filled with the results obtained during the solution (Fig. 8).



ограничения - Microsoft Excel

Файл | Главная | Вставка | Разметка страницы | Формулы | Данные | Рецензирование | Вид

Вставить | Arial | 10 | Общий | Условное форматирование | Формат как таб

Буфер обме... | Шрифт | Выравнивание | Число | Стили

B24 | =D17

	A	B	C	D	E
1	Исходные данные				
2	Наименование	УКЗ-П-30М	УКЗ-П-30А	УКЗ-П-30Л	
3	Переменные	x1	x2	x3	
4	Стоимость единицы продукции, руб	100000	14000	30000	
5	Затраты на производство, руб	18509	18093	17208	
6	Ресурс времени, дн	6,85	9,72	8,43	
7	Спрос, шт	32	43	54	
8					
9					
10		УКЗ-П-30М	УКЗ-П-30А	УКЗ-П-30Л	
11	Доход от единицы продукции, руб	81491	121907	12792	
12	Целевая функция	f=81491x1+121907x2+12792x3			
13					
14					
15	Наименование	УКЗ-П-30М	УКЗ-П-30А	УКЗ-П-30Л	ПРИБЫЛЬ, руб
16	Переменные	x1=	x2=	x3=	max
17	Количество продукции, шт	32	43	18,72360617	8089225,37
18					
19					
20	Ограничения				
21	Ресурс времени, дн	795	не более	795	
22	УКЗ-П-30М	32	не более	32	
23	УКЗ-П-30А	43	не более	43	
24	УКЗ-П-30Л	18,72360617	не более	54	
25					

Figure 8 – *Result of search for solution*

Thus, it is advisable for FSBEI HE SamSTU "Institute PCWT" to produce the following volumes of products:

- products of the type UKZ-P-30M– 32 pcs;
- products of the type UKZ-P-30A – 43 pcs;
- products of the type UKZ-P-30L– 18 pcs.

With the production of such a number of products and taking into account the sales market, the maximum profit from the sale of products will amount to – 8089225,37 rubles.

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1. *Elongated-cumulative charges rolled (UKZ-P) specifications TU 3-2650-92.*
2. *Moskvicheva E.L. Development of a quality management methodology for the design and production of elongated cumulative charges. Dissertation for the degree of cand. tech. sci. – Samara, 2008. – 150 P.*
3. *Methodology for assessing the effectiveness of the quality management system "FSBEI HE SamSTU Institute PCWT." // Bulletin of Kazan Technological University. – Kazan: publishing house of KTU, 2016. №24 – P. 102-1*

确定壁厚变薄的旋转拉伸过程中变形程度的方法

METHOD FOR DETERMINING THE DEGREE OF DEFORMATION DURING ROTARY DRAWING WITH THINNING OF THE WALL

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Tula State University

抽象。 考虑了根据材料的机械性能通过转变确定变形程度的方法。 所提出的算法的计算可以在自动系统中用于计算过程参数。

关键字：旋转萃取器，变形元件，刀具进给速度，变形程度，压力元件的通过次数，塑性变形区，材料可塑性资源。

Abstract*. The method of determining the degrees of deformation by transitions depending on the mechanical properties of the material is considered. The proposed algorithm for their calculation can be used in an automated system for calculating process parameters.*

Keywords: *rotary extractor, deforming element, tool feed rate, degree of deformation, number of passes of the pressure element, plastic deformation zone, material plasticity resource.*

Introduction

In the manufacture of shell products, plastic forming processes with local application of load are widely used, such as: rolling, drawing, pressing, free forging, stamping. A variation of one of these processes of local deformation of a metal is a rotational hood. This process is a plastic shaping of the workpiece material, mounted on a rotating mandrel, by pressure elements moving along the mandrel with a given gap.

Research objective

Improving the efficiency of the technological process of rotational drawing with thinning the wall with a ball rolling tool based on a reasonable calculation of rational technological parameters.

Research methods and results

The process of manufacturing a hollow cylindrical part from a tubular cylindrical workpiece deformable on a rotating mandrel by deforming elements is considered (balls or rollers) [1].

When moving the deforming elements in the longitudinal direction by the amount of feed, the length of the workpiece increases, and the wall thickness decreases (Figure 1).

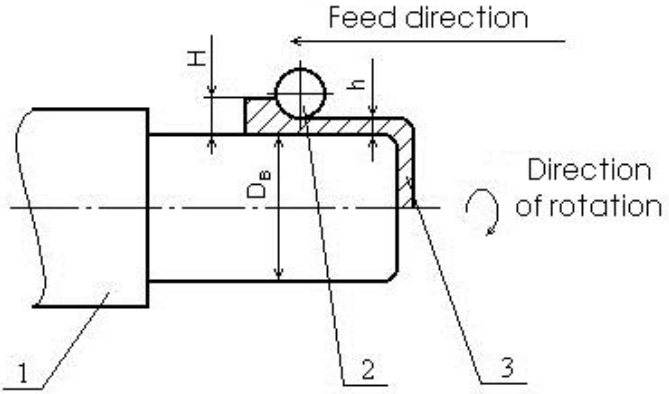


Figure 1. *Process diagram:*
1 is mandrel; 2 is pressure element; 3 is detail.

If in one pass it is impossible to achieve the required value of thinning the wall of the workpiece, then the deformation process is divided into several passes.

The wall thickness of the workpiece is determined as follows:

$$H = D_0(\psi - 1) + \sqrt{D_0^2(1-\psi)^2 - \frac{4h(\psi-1)(D_0+h)}{(1-\psi)}}, \quad (1)$$

where D_0 is inner diameter of the product equal to the diameter of the mandrel; ψ is total compression ratio; h is wall thickness of the finished product.

The outer diameter of the workpiece D_w is determined by the known internal diameter of the part and the calculated value of the wall thickness of the workpiece:

$$D_w = D_0 + 2H. \quad (2)$$

The length of the workpiece is determined by the formula:

$$L_w = L_0 + L_{\text{allowance}}, \quad (3)$$

where L_0 is the required length of the workpiece from the condition of equality of the volume of the workpiece and the part

$$L_0 = V_d / \left(\frac{\pi}{4} \left(D^2_{\text{allowance}} - D^2_0 \right) \right), \quad (4)$$

where V_d is volume the detail,

Stock allowance $L_{\text{allowance}}$:

$$L_{\text{allowance}} = D_{\text{allowance}} - D_B + L_1, \quad (5)$$

where L_1 is allowance for the output of the tool is selected according to the work tables [2].

To determine the number of passes, a measure of deformation is introduced $\varepsilon = \psi$

If the total deformation ε_Σ is less than the ultimate deformation ε_{ud} for a given material, taking into account the margin by the degree of thinning, then deformation is performed in one transition without intermediate heat treatment. Otherwise, the problem arises of the optimal distribution of deformations over transitions.

At the first stage, the possibility of performing the operation in two transitions is determined. In this case, the strain at the first transition is ε_1, and at the second is ε_2.

If at the first transition the ultimate deformation is ε_{ud}, then at the second transition it is given by the equation:

$$\varepsilon_{ud} = k \cdot \varepsilon_1, \quad (6)$$

where k is coefficient that takes into account the efficiency of heat treatment.

For «soft» materials $k = (0{,}1 \ldots 0.5)$, for «hard» materials $k = (0{,}5 \ldots 10)$.

The strains of the transitions are distributed so that the ratio of the strain at the transition in question to the corresponding ultimate strain is constant.

The probability of failure at all junctions should be the same.

As a result, we obtain the system of equations:

$$\begin{cases} \dfrac{\varepsilon_1}{\varepsilon_{\text{ud}}} = \dfrac{\varepsilon_2}{\varepsilon_{\text{ud}} - k\varepsilon_1}; \\ \varepsilon_1 + \varepsilon_2 = \varepsilon_\Sigma. \end{cases} \quad (7)$$

In the case j of transitions, the deformations of the transitions are determined by solving the following system of equations:

$$\begin{cases} \dfrac{\varepsilon_1}{\varepsilon_{ud}} = \dfrac{\varepsilon_2}{\varepsilon_{ud} - k\varepsilon_1}; \\ \dfrac{\varepsilon_1}{\varepsilon_{ud}} = \dfrac{\varepsilon_3}{\varepsilon_{ud} - (k^2\varepsilon_1 + k\varepsilon_2)}; \\ \qquad\qquad\qquad\qquad\qquad\qquad ; \\ \dfrac{\varepsilon_1}{\varepsilon_{ud}} = \dfrac{\varepsilon_j}{\varepsilon_{ud} - \sum_{i=1}^{j-1} k^{j-1}\varepsilon_1}; \\ \varepsilon_1 + \varepsilon_2 + \ldots + \varepsilon_j = \varepsilon_\Sigma. \end{cases} \quad (8)$$

The reduced system of equations (8) is solved by the iterative method. In a first approximation, it is determined

$$\varepsilon_1 = \frac{\varepsilon_\Sigma}{j}, \quad (9)$$

and the remaining deformations are found by the formula:

$$\varepsilon_j = \frac{\varepsilon_1}{\varepsilon_{ud}}\left(\varepsilon_{ud} - \sum_{i=1}^{j-1} k^{j-1}\varepsilon_1\right). \quad (10)$$

Then, in the second approximation at the first transition, the deformation is ε_1:

$$\varepsilon_1 = \varepsilon_\Sigma - \sum_{i=2}^{j} \varepsilon_i, \quad (11)$$

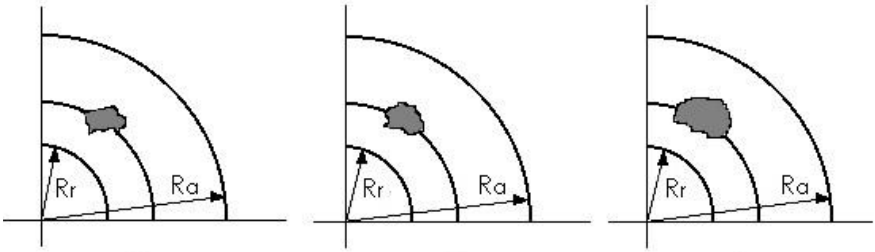
and the remaining deformations are again determined by the formula (9) and so on until the desired proximity between the two iterations is achieved.

As a result, the compression ratios for the transitions are found ψ_i.

The thickness of the wall of the semi-finished product by transitions is determined by the ratio:

$$h_i = \frac{h_{i-1}}{\psi_i}. \quad (12)$$

Figure 2 shows the propagation of ductility zones (shaded areas) when modeling the deformation of copper billets for various degrees of deformation.



a) *b)* *c)*

Figure 2. *Plastic deformation zones on copper blanks at various degrees of deformation:*
a) ε = 0,14; b) ε = 0,22; c) ε = 0,30.

It can be seen from the figures that the plasticity region almost uniformly spreads around the contact spot.

Summary

The analysis of the rotational drawing process allows the development of an automated methodology for determining the main technological parameters of the process: calculation of the workpiece; splitting the deformation process into transitions; tool size calculation; selection of technological equipment.

It was found that with an increase in the degree of deformation, the most intensive development of this region is observed towards the axial movement of the tool. At the maximum degree of deformation ε = 0,3, there is a small ductility zone behind the tool. It should be noted that this region of plasticity periodically appears and disappears during the modeling process.

References

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躯干型遮阳篷应力状态研究
INVESTIGATION OF THE STRESS-STRAIN STATE OF THE TORSO-SHAPED AWNING

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抽象。如今，薄壁壳型结构在建筑，民用和工业建筑，机械工程，造船等领域构成了广泛的类。每种表面都具有相对于其他表面的某些优势。躯干曲面可以通过其所有点扩展到平面，而不会折叠和折断，而曲线的长度和适合该曲面的任何曲线之间的角度都不会改变。今天以小体积研究了在底部具有导向椭圆的等坡度壳的应力应变状态。本文的目的是在研究以底部为导向椭圆的等坡度的躯干壳体的应力应变状态时获得新的数据。为了评估应力-应变状态，使用了SCAD Office计算机系统，该系统是基于有限元方法进行强度分析和结构设计的集成系统。在本文中，提出了一种以等坡度表面形式对建筑物入口处的雨篷进行新设计的方法，并对该结构的应力-应变状态进行了数值研究。

关键字：躯干壳，等坡壳，可展开曲面，几何建模，微分几何，SCAD OFFICE计算系统，Mathcad系统。

Abstract. *Thin-walled shell-type structures today constitute an extensive class in architecture, civil and industrial construction, mechanical engineering, ship-building, etc. Each surface has certain advantages over others. Torso surfaces can be expanded to the plane by all its points without folds and breaks, while the lengths of curves and angles between any curves that are appropriate for the surface do not change. The study of the stress-strain state of shells of equal slope with a director ellipse at the base is presented today in a small volume. The purpose of the article is to obtain new data when studying the stress-strain state of torso shells of equal slope with a director ellipse at the base. To assess the stress-strain state, the SCAD Office computer system is used, which is an integrated system for strength analysis and design of structures based on the finite element method. In the article, a new design of the awning over the entrance to the building in the form of a surface of equal slope is proposed, the stress-strain state of this structure is numerically studied.*

Keywords: *torso shell, equal slope shell, deployable surface, geometric modelling, differential geometry, SCAD OFFICE computing system, Mathcad system.*

Introduction

The current level of technical development in architecture, design and construction contributes to the use of various forms of shells and their combinations in various areas of the economy. When compared with other surfaces, torsos of the same slope have a number of advantages in terms of calculation and design. So, the coefficients of quadratic forms of the surface $F = L = M = 0$. Thus, the surface equation is set in the lines of curvature, that is, it is the simplest. One family of curvature lines on the torso surface is straight lines, hence the simplicity of defining a second family of curvature lines orthogonal to the family of these lines.

The monograph [1] and the review article [2] present the most complete list of works devoted to the study of the geometry and strength of thin torso shells.

Since 1963, Peoples' Friendship University of Russia (RUDN University) has been conducting continuous research in the field of geometry and theory of torso shell calculation. Doctor of technical Sciences, Professor V. G. Rekach and doctor of technical Sciences, Professor S. N. Krivoshapko (Department of civil engineering, Engineering Academy, Peoples' Friendship University of Russia (RUDN University) made an undeniable contribution to the development of the modern theory of calculation and the study of the geometry of thin elastic torso shells. Under their guidance, several PhD theses on this topic were developed and defended. To date, Professor S. N. Krivoshapko continues to study the geometry and stress-strain state of thin-walled torso shells [3].

Torso surfaces of equal slope, including torsos with a flat guide curve, are a subclass of torso surfaces [1]. Torsos of the equal slope are studied by methods of analytical and differential geometry [4], as well as by methods of descriptive geometry [5], and recently computer programs and complexes have been actively involved in solving problems [6].

Torso shell of equal slope with a director ellipse at the base

The torso of equal slope with the director ellipse at the base is a linear surface having a constant angle α between the straight generators and the corresponding main normals of the director ellipse (Fig. 1). Torsos with a director ellipse at the base, as well as all surfaces of equal slope are surfaces of zero Gaussian curvature. The monograph [1] presents the main properties of equal slope surfaces. The encyclopedia [7] lists 10 names of surfaces of the equal slope described in the technical literature to date.

If the director ellipse at the base is set by the equations

$$x = x(v) = a\cos v, \quad y = y(v) = b\sin v, \tag{1}$$

then the parametric form of setting the surface of the equal slope will be as follows:

$$x = x(u, v) = a\cos v - \frac{ub\cos\alpha\cos v}{\sqrt{a^2\sin^2 v + b^2\cos^2 v}},$$

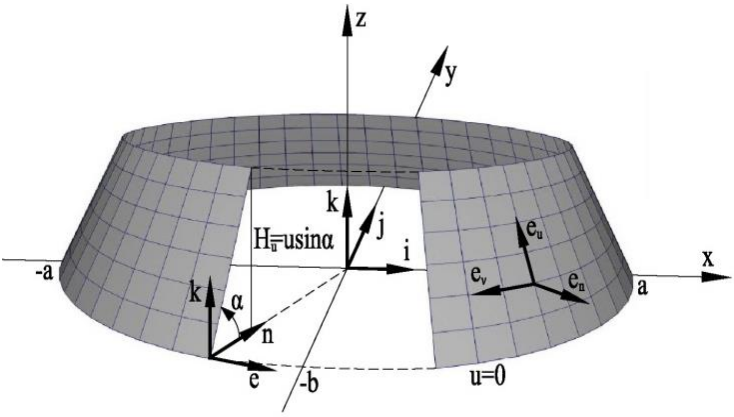

Figure 1. *An equal slope surface*

$$y = y(u,v) = bsinv - \frac{ubcosasinv}{\sqrt{a^2sin^2v + b^2cos^2v}},$$

$$z = z(u) = usina. \quad (2)$$

The coordinate line $u = 0$ coincides with the director ellipse, the family of lines u is the rectilinear generators of the torso of equal slope, α is the angle between the rectilinear generator and the main normal $\boldsymbol{n} = -\boldsymbol{e} \times \boldsymbol{k}$ (Fig.1) directed inside the director ellipse.

Coefficients of the main quadratic forms of the torso surface of equal slope with a director ellipse (Fig. 1) have the form:

$$A = 1, F = 0, B = \sqrt{a^2sin^2v + b^2cos^2v} - \frac{abucosa}{a^2sin^2v + b^2cos^2v},$$

$$L = M = 0, \qquad N = \frac{Babsina}{a^2sin^2v + b^2cos^2v},$$

$$k_1 = k_u = \frac{L}{A^2} = 0,$$

$$k_2 = k_v = \frac{N}{B^2} = \frac{absina}{B(a^2sin^2v + b^2cos^2v)}. \quad (3)$$

Investigation of the stress-strain state of the awning in the form of torso shell of equal slope

The inherent lightness of shells combined with high strength make them indispensable in a wide variety of industries: construction, shipbuilding, aircraft, etc.

The monograph [1] provides extensive information on the use of structures and structures in the form of torso surfaces.

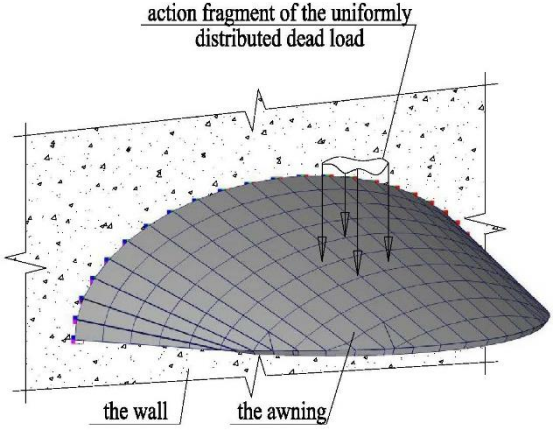

Figure 2. *Calculation model*

To study the stress-strain state of the torso shell of equal slope, a construction of a reinforced concrete monolithic awning made of class B20 concrete with a thickness of δ = 5 cm is proposed.. Geometric parameters of the ellipse in the base for constructing the calculation model are *a* = 2 m,

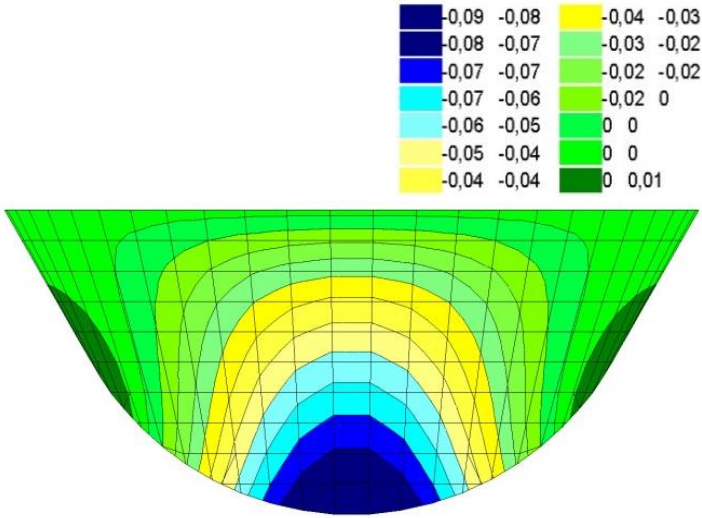

Figure 3. *Vertical displacements (mm)*

b= 1 m and the angle of inclination of the rectilinear generators is $\alpha = 60°$. The calculation is performed in the SCAD Office computer system, which is an integrated system for strength analysis and design of structures based on the finite element method. For rice. 2 shows the type of calculation model when approximating the median surface with a set of quadrangular and triangular plane elements. The average side size of the finite elements is 0.2 m. the Number of elements is 211, and the number of nodes is 234. Fixing along the guide ellipse is rigid. The design is calculated based on the perception of only static evenly distributed own weight. The calculation results are shown in Fig. 3-7.

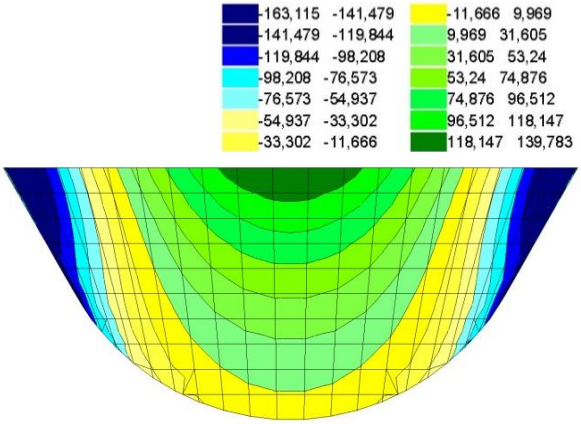

Figure 5. *Normal stress σ_u along the rectilinear coordinates u of the surface (kN/m^2)*

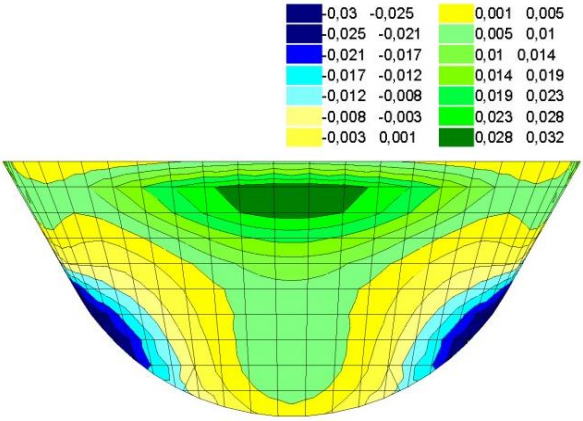

Figure 6. *Bending moment M_u along the rectilinear coordinates u of the surface (kNm/m)*

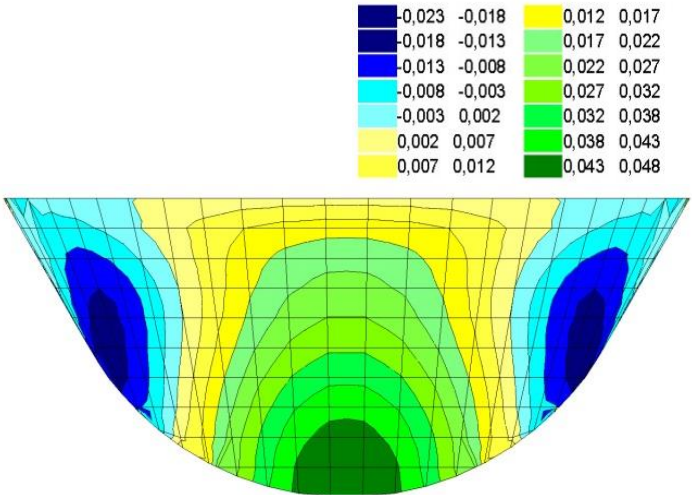

Figure 7. *Bending moment M_v along the curvilinear coordinates v of the surface (kNm/m)*

The maximum movement of the cantilever part of the visor is less than 1 mm (Fig. 3). The nature of the distribution of the isofields of the bending moment M_u along the rectilinear generators shows that the surface works as a cantilever beam in this direction. The maximum value of the bending moment M_u near the support is 0.032 kN·m/m, in the cantilever part -0.03 kN·m/m (Fig. 6). The nature of the distribution of the isofields of the bending moment M_v along the curved guides shows that the surface works according to the beam pattern in this direction. The maximum value of the bending moment M_v along the curved guides in the middle of the span is 0.048 kN·m/m, in the edge parts of the visor the value is -0.023 kN·m/m (Fig.7).

Conclusion

The article proposes a new design of a monolithic reinforced concrete awning in the form of a torso surface of equal slope with a director ellipse. Numerical results of the stress-strain state of the awning structure are obtained. The author continues to study this class of shells under various geometric parameters, boundary conditions with the possible addition of contour elements.

It is worth noting that torso surfaces, which have undeniable positive properties, reveal a great potential for creating interesting and unusual forms of structures and buildings from torsos and compositions of these surfaces. The class of unfolding surfaces is extensive, including cylindrical, conical, and torso surfaces. To date, 24 torsos of general appearance and 10 torso surfaces of the equal slope have been described in the technical literature [1, 7].

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确定堆焊工艺质量指标的参数
DETERMINATION OF PARAMETERS OF SURFACING PROCESS QUALITY INDICATORS

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注解。 在本文中，我们检查了一种用于等离子弧堆焊过程数值模拟的算法，该算法具有用于计算机模拟的等离子炬的横向振荡。 使用此算法解决了一个典型的技术问题（这是确定堆焊过程质量指标的参数）。 结果表明，应在主电弧电流发生周期性变化的情况下进行堆焊，必须选择电流振荡的幅度，以使温度波动最小。 我们确定了开始堆焊的参数。

关键词：激光粉末堆焊，计算机分析，横向振动，振幅，周期，主电流，层形成。

Annotation. *In this paper, we examined an algorithm for numerical simulation of a plasma-arc surfacing process with transverse oscillations of a plasma torch for computer simulation. A typical technological problem (this is the determination of the parameters of the quality indicator of the surfacing process) is solved using this algorithm. It is shown that surfacing should be carried out with a periodic change in the current of the main arc, the amplitude of the current oscillations must be chosen so that the temperature fluctuations are minimal.* we determined the parameters of the start of surfacing.

Keywords: *laser powder surfacing, computer analysis, transversal vibrations, amplitude, period, main current, layer formation*.

As a rule, solving engineering problems is the inverse problem of modeling, since we need to determine the process parameters that are required to obtain the specified quality characteristics.

We showed the solution of engineering analysis problems using the example of the process of surfacing a layer of a copper alloy on a substrate with a wall thickness of 15 mm from low-alloy structural steel. We needed to deposit a layer with a width of at least 50 mm and a thickness of at least 4 mm (the surfacing speed is 1.6

mm / s, the oscillation amplitude of the burner is ±20 mm, the oscillation period is 4.5 s). The filler wire had a diameter of 3 mm, therefore, for the surfacing of a layer with a given cross section, a wire feed speed of 150 mm / s is required. We considered a plasma torch, which creates a plasma torch with a diameter of 18 mm on the surface of the workpiece [1].

Determination of process parameters to ensure quality indicators in surfacing mode

We will determine the surfacing mode parameters:

- amplitude of transverse oscillations of the plasmatorch (cm);
- type of oscillations (sinusoidal, trapezoidal, rectangular);
- period of transverse oscillations of the plasma torch;
- current of the main arc (A).

The values of these parameters are determined from the following: weld bead dimensions; requirement for obtaining continuity; contact area of the surfacing material with the substrate; the maximum and minimum temperatures in the contact are set. We simulated the process until a steady thermal state was reached in the bath zone surfacing surfacing, Fig. 1.

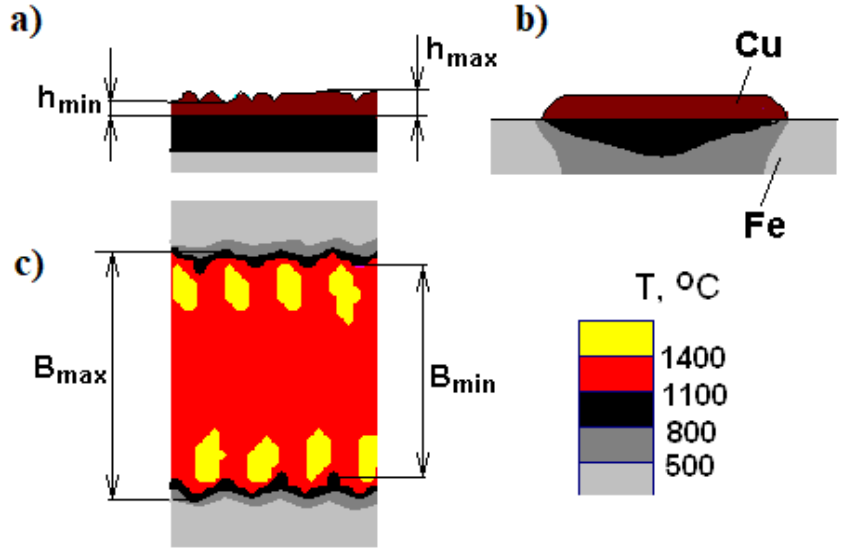

Fig 1. *Determination of the dimensions of the seam by the distribution of temperature in the steady state: a) the distribution of temperature in a longitudinal section; b) distribution of temperature values in the cross section; c) distribution of maximum temperatures in the contact zone*

If the values of the arc current and the rotation frequency of the substrate in the form of a pipe are constant, then with symmetrical transverse vibrations it is difficult for us to achieve constant weld dimensions [2]. Therefore, surfacing is required to be carried out with a periodic change in the current of the main arc. This is shown in Fig.2.

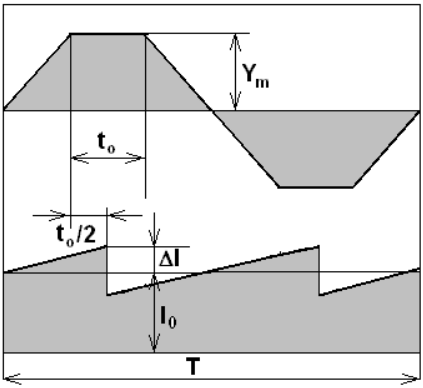

***Fig. 2**. The main mode of surfacing. A typical cycle of oscillations of the transverse displacement of the plasma torch Y_m, and the current of the main arc ΔI during time T*

The criteria for determining this amplitude (see Fig. 2) are the amplitude of the oscillation of the contact area of the melt with the substrate (this contact must exist continuously). And the maximum contact temperature (it should fit into the liquidus temperature range for copper and solidus for steel). These criteria are displayed in the form of graphs with a steady thermal state of surfacing, see Fig. 3. The oscillation amplitude *ΔI* of the current of the main arc must be selected so that the temperature fluctuations are minim.

Defining parameters for starting surfacing.

Surfacing begins on a cold substrate, which gradually warms up. In this case, the conditions for the formation of the layer change. During surfacing, the heat removal from the bath is greatly increased. This significantly reduces its size and temperature. Therefore, at the beginning of surfacing it is necessary to programmatically change the parameters to stabilize the formation of the layer. For example, at the beginning of the process, the substrate needs to be heated as shown in Fig. 4.

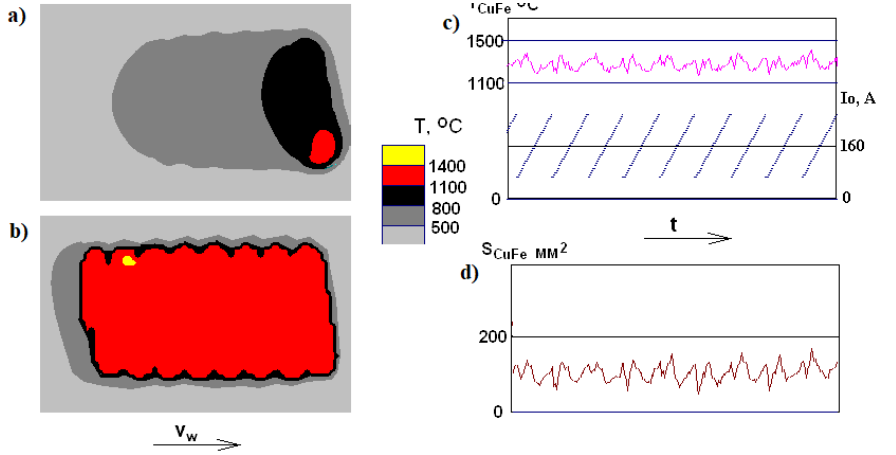

Fig. 3. *The simulation results with a periodic change in the current I_o of the basic arc: a) the temperature distribution T_{CuFe} on the substrate; b) the maximum temperature T_{max} on the surface of the substrate; c) a change in the maximum temperature T_{CuFe} in the contact and a change in the current of the main arc I_o in time; d) the change in the contact area of the substrate with the SCuFe melt in time.*

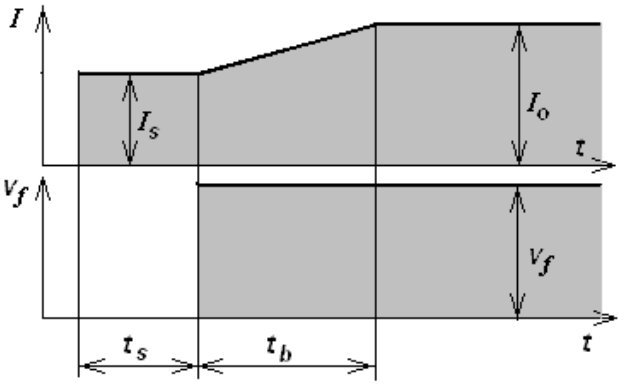

Fig. 4. *Change in the current of the main arc I and the wire feed speed v_f at the start of surfacing.*

Then the formation of the layer is simulated for a given time tb. It is initially set from the ratio of the amplitude Y_m of the transverse oscillations of the burner to the surfacing speed v_w [3]. The simulation results are shown in fig. 5. Depending on the result, it may be necessary to change the starting current of the arc I_s and the duration of the initial heating t_s.

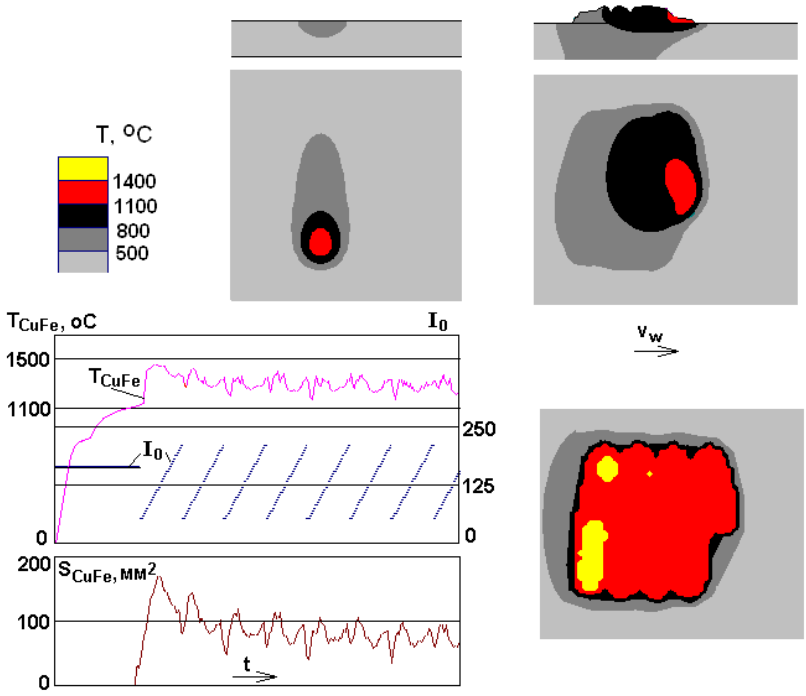

Fig. 5 *Results of modeling the start of surfacing*

Thus, we examined the sequence and procedures for solving typical technological problems in plasma-arc surfacing with transverse oscillations of the plasma torch. It is shown that surfacing should be carried out with a periodic change in the current of the main arc, and the amplitude of the current oscillations should be selected so that the temperature fluctuations are minimal in the contact zone.

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