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上合组织国家的科学研究：协同和一体化
国际会议

参与者的英文报告

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

Part 1: Participants’ reports in English

2019年2月26日，中国北京
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这些会议文集结合了会议的材料 – 研究论文和科学工作者的论文报告。 它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。

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

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Foreword

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

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

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

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

前言

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

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

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

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

UDC 336.7

评估电子支付手段发展的方法论方法
METHODOLOGICAL APPROACH TO THE EVALUATION OF THE DEVELOPMENT OF ELECTRONIC MEANS OF PAYMENT

Kara-ool Ayana Leonidovna
Postgraduate
Shmyreva A.I.
Doctor of Economic Sciences, Full Professor
Novosibirsk State University of Economics and Management
Novosibirsk, Russia

注解。决定在俄罗斯转用非现金支付的主要原则之一是：节省纸张技术，降低与现金收集和后勤相关的成本;支付的透明度。过去二十年的特点是支付方案发生了巨大变化。出现了远程银行服务，各种电子支付方式，具有差异化的功能。在相当短的时间内，新的支付工具在无现金支付市场中自信地获得了自己的利基，而且开始促进无现金支付总量的增长。由于最近在俄罗斯市场出现以及最近在单一概念下合并各种支付手段，电子支付手段尚未在科学界进行彻底研究。

关键词：电子支付方式，支付系统，信用卡，借记卡，电子支付手段的发展，信贷机构，移动支付，无现金支付。

Annotation. *One of the main tenets that determine the need for a switch to non-cash payments in Russia are: savings on paper technologies, reduction of costs associated with collection and logistics of cash; transparency of payments. The last two decades have been characterized by a drastic change in the payment scheme. Appeared remote banking services, various types of electronic means of payment, with differentiated functionality. For a rather short period of time, new payment instruments confidently gained their niche in the market of cashless payments, and moreover, began to contribute to the growth of the total volume of cashless payments. Due to the relatively recent appearance on the Russian market and the recent consolidation of various means of payment under a single concept, electronic means of payment have not been thoroughly studied in the scientific community.*

Keywords: *electronic means of payment, payment system, credit card, debit card, development of electronic means of payment, credit institutions, mobile payments, cashless payments.*

The study of electronic means of payment and the assessment of the level of their importance in the socio-economic development of the country and regions, is the subject of a large number of works by such researchers as N.V. Ogureeva, N.N. Kachanova, P.M. Shust, L.V. Dostov, A.V. Pukhov, V. Gladkovsky. Researchers have proved the importance of electronic means of payment in the cashless payment system and in the development of the country's economy. Thus, scientists have developed methods for analyzing indicators of the bank card market at the macro level, methods for evaluating the impact of electronic money on cash circulation, etc. At the same time, in the scientific community, unified approaches to the analysis of electronic means of payment (EMP) as an aggregate form of payment instruments, with a variety of their types on the market, have not been formed.

The dynamic development of EMP contributes to the growth of turnover of non-cash payments, which ensures the development of market infrastructure, reduces the demand for cash, and allows the government to control cash flow more closely. The EMP position at the macro level determines the criterion of "prevalence", which allows to evaluate the share of operations using EMP in the total amount of cashless payments, and the relation with GDP at the national level, and with GRP at the regional level.

We define the indicators that reveal the above criteria (Table 1).

Table 1 - *The list of indicators for evaluating the development of EMP*

Criterion	Name of the indicator	№	Characteristic
Availability	Payment card availability ratio.	КДпк	It characterizes the density of payment cards in the region, taking into account the population.
	The availability ratio of accounts with remote access.	КДсдд	It characterizes the density of accounts with remote access in the region, taking into account the population.
	The availability ratio of Pos-terminals.	КДт	It characterizes the density of Pos-terminals in the region, taking into account the population.
Prevalence	Indicator of the importance of payment cards in the total increase in non-cash payments.	УДпк	Reflects the level of significance of the number of transactions performed using payment cards (share) in the total number of transactions performed using EMP for a given period. The trend in a given period is taken into account.
	Indicator of the importance of Internet banking in the total increase in non-cash payments.	УДиб	Reflects the level of significance of the number of transactions performed using Internet banking (share), in the total number of transactions performed using EMP in a given period. The trend in a given period is taken into account.

Criterion	Name of the indicator	№	Characteristic
Prevalence	Indicator of the importance of Mobile-banking in the total increase in non-cash payments.	УДмб	Reflects the level of significance of the number of operations performed using Mobile Banking (share), in the total volume of operations performed using EMP, in a given period. The trend in a given period is taken into account.
	The coefficient of functional use of payment cards.	Кф	It is defined as the ratio of the volume of payment transactions for goods and services using payment cards to cash withdrawal operations. Reflects the involvement of the population in the calculations using payment cards. The trend in a given period is taken into account.
Significance	The prevalence of electronic means of payment in the total volume of non-cash payments.	УДбп	Calculated as the share of growth rates of transactions made using EMP in the total volume of growth in non-cash payments. Allows you to assess the impact of the increase in EMP on the increase in the total volume of non-cash payments. Calculated as an average.
	The proportion of payments made using EMP in the total amount of paid services provided to the public.	УДввп/ врп	It is defined as the ratio of the volume of transactions performed using EMP to GDP / GRP. The trend in a given period is taken into account..

Consider the mechanism for the distribution of markets for EMP typologies, according to the results of calculations of indicators.

With a backward level of development of the EMP market, there is:

1. The value of the КДпк coefficient is less than 1, which indicates the insufficient provision of the population with payment cards.

2. The value of the КДсдс is less than 1, which indicates the insufficient provision of accounts with remote access of the population and legal entities.

3. The value of КДт coefficient is less than the average indicators, therefore, the equipment of the market with the payment infrastructure is insufficient. The calculation of this indicator by experts and the Bank of Russia is defined as the ratio of the number of Pos-terminals to 10 thousand inhabitants.

4. The downward trend in the prevalence of EMP indicates a rejection by consumers of EMP as a payment instrument, as well as a decrease in confidence and a shift in consumer preferences from non-cash payments to settlements with cash.

At the conditionally promising level of development of the EMP market, the following is observed:

1. The value of the coefficient КДпк greater than 1 means that the population at a sufficient level provided with payment cards.

2. The value of КДсдс greater than 1 reflects the fact that the population and legal entities are sufficiently provided with accounts with remote access.

3. The value of КДт is higher than the average indicators determined by experts and the Bank of Russia, which indicates that the payment infrastructure is sufficiently equipped.

4. The downward trend in the indicators of the importance of EMP indicates a rejection by consumers of EMP as a payment instrument, a decrease in confidence and a shift in consumer preferences from non-cash payments to settlements with cash. In this case, a reduction in the coefficient for certain types of EMP is allowed.

5. The descending dynamics of indicators of the importance of EMP indicates a decrease in their impact on macroeconomic indicators.

The negative dynamics of the coefficients of significance and prevalence, despite the growing availability of payment instruments, suggests a prospective change in availability indicators in a negative direction in the future. In this case, consumers, despite the availability of all aspects of EMP, refuse to use them for functional purposes.

The prospective development of the EMP market is confirmed by the following indicators:

1. The value of the coefficient КДпк less than 1, that is, the population at an insufficient level provided with payment cards.

2. The value of the coefficient КДсдс is less than 1. In this case, the population and legal entities are not sufficiently provided with accounts with remote access.

3. The value of КДт is less than the average indicators determined by experts and the Bank of Russia, indicating a lack of equipment with a payment infrastructure, with an upward character of the dynamics of КДт.

4. Ascending in a given dynamics, the nature of the set of indicators of the significance of the EMP indicates an increase in consumer confidence in the EMP, and a shift in consumer preferences from cash settlements of non-cash payments. At the same time, a reduction in the coefficient for certain types of EMP is allowed, which indicates a decrease in consumer preferences for a specific type of EMP, but not EMP as a whole.

5. Ascending in a given dynamics, the character of the totality of EMP prevalence indicators indicates an increase in consumer confidence in the EMP, and a shift in consumer preferences from cash settlement of non-cash payments.

The positive dynamics of the coefficients of significance and prevalence, despite the lack of availability of the EMP and Pos-terminals, in accordance with the basic law of the market economy “there will be supply for the whole demand”, suggests a prospective change in the availability indicators in a positive direction.

The results of the calculation of the following main factors and indicators allow us to formulate a conclusion on the development of EMP:

1. The value of the coefficient КДпк greater than 1 means that the population at a sufficient level provided with payment cards.

2. The value of КДсдс greater than 1 indicates that the population and legal entities are sufficiently provided with accounts with remote access.

3. The value of КДт is higher than the average indicators determined by experts and the Bank of Russia, which indicates that the payment infrastructure is sufficiently equipped. At the same time, the dynamics of КДт is ascending.

4. Ascending in a given dynamics of the nature of the set of indicators of the importance of EMP. It indicates a rise in consumer confidence in EMP, and a shift in consumer preferences from cash payments to non-cash payments.

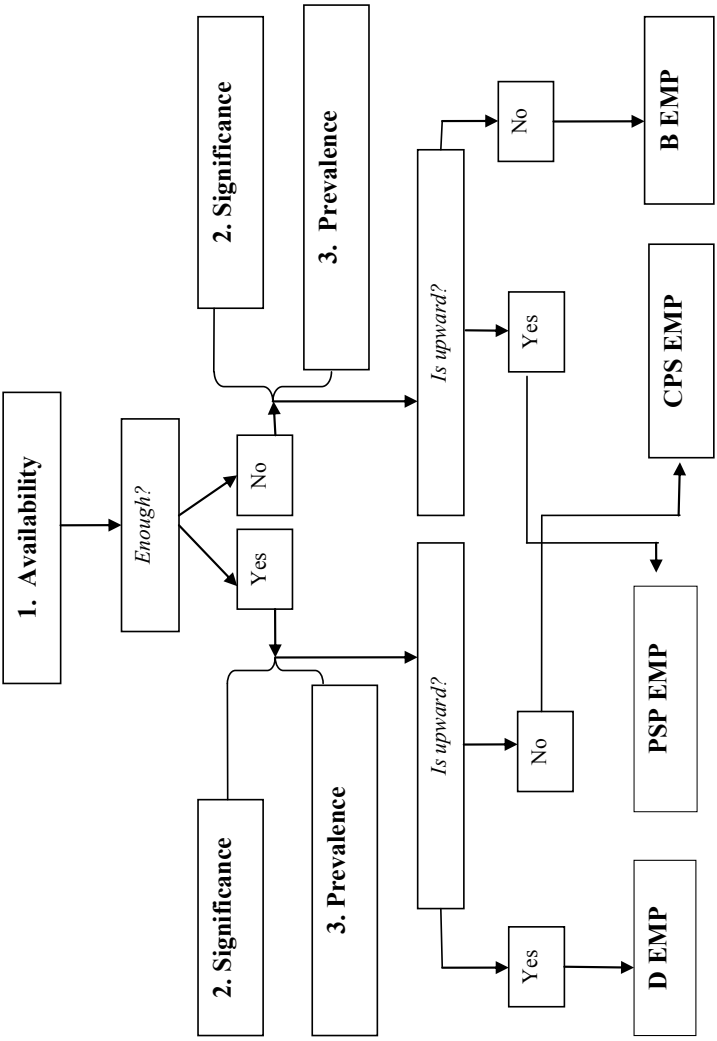
5. Ascending in a given dynamics of the nature of the totality of indicators of the prevalence of EMP. Indicates an increase in the importance of EMP, and their direct or indirect positive impact on macroeconomic indicators.

Thus, by comparing the considered coefficients and absolute indicators to the criteria for evaluating the development of EMP, we define schematically the rules for correlating their results to the typologies of the level of development of the EMP market (Figure 1).

Consider the interpretation of indicators on the example of the analysis of the EMP market of Russia, while the information base was the statistical materials of the Russian Federation for 2013-2017.

Accessibility indicators reflect sufficient security as of 01/01/2018, economically active population with payment cards - КДпк = 2.18, accounts with remote access - КДсдд individuals = 1.92. Consequently, for each economically active resident there were an average of 2 cards and 1 account with remote access. Indicators of security of legal entities with remote access accounts and Pos-terminals reveal the incompleteness of these aspects of the EMP market. КДсдд legal entities amounted to 0.65, which means only about 60% of legal entities and individual entrepreneurs have the opportunity to carry out their payments remotely. The availability ratio of Pos terminals Кт we calculated by the ratio of Pos terminals established in trade and service organizations to 10,000 people. - as of 01/01/2018 Кт formed at 19.88, while in developed countries the value is at the level of 100-200.

One of the most important indicators demonstrating the prevalence of EMP are indicators of КЗпк, КЗиб, КЗмб, and allowing to evaluate the peculiarities of the influence of the socio-economic environment on the development of the considered EMPs, and to identify the general tendency of the behavior of EMP holders. Practical calculations of these “prevalence” indicators show that payment cards are most popular with consumers (Fig. 2), and the proportion of such operations takes on average 89% of the total number of transactions performed using EMP. At the same time, payments made using mobile banking become the leader of promising consumer preferences. Thus, the average annual growth rate in the number of transactions amounted to 96.47%, outperforming the growth rate of payments by payment cards by 54.14%, and by Internet banking by 82.64%.



*D – developed EMP market, PSP EMP – market with perspective EMP development, CPS EMP – market with conditionally perspective development of EMP, B EMP – backward EMP market

Figure 1. *Algorithm for evaluating the development of EMP*

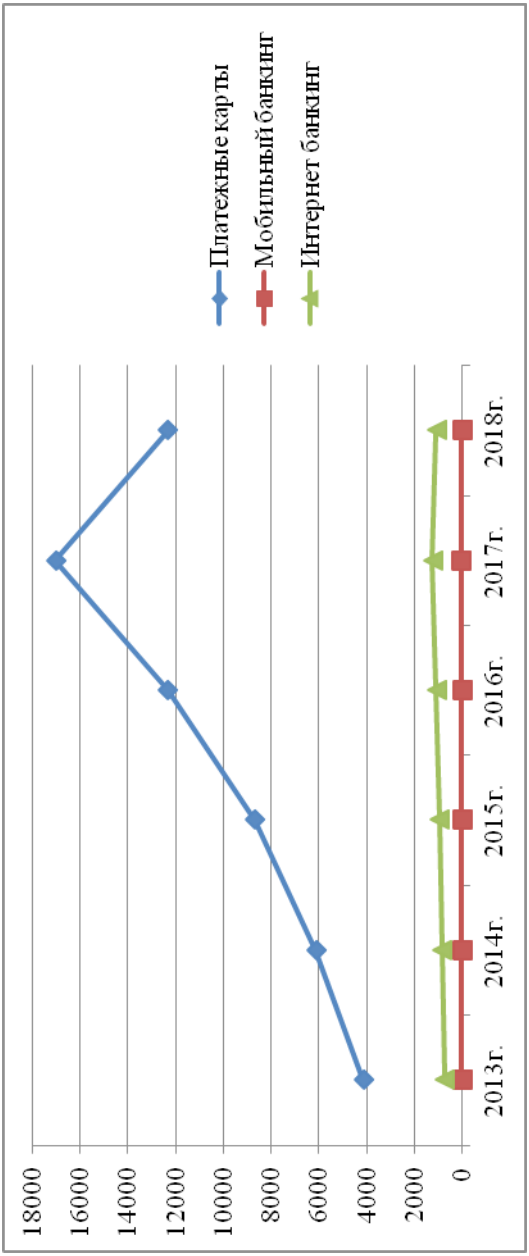


Figure 2. *- The number of transactions performed using EMP (million units)*

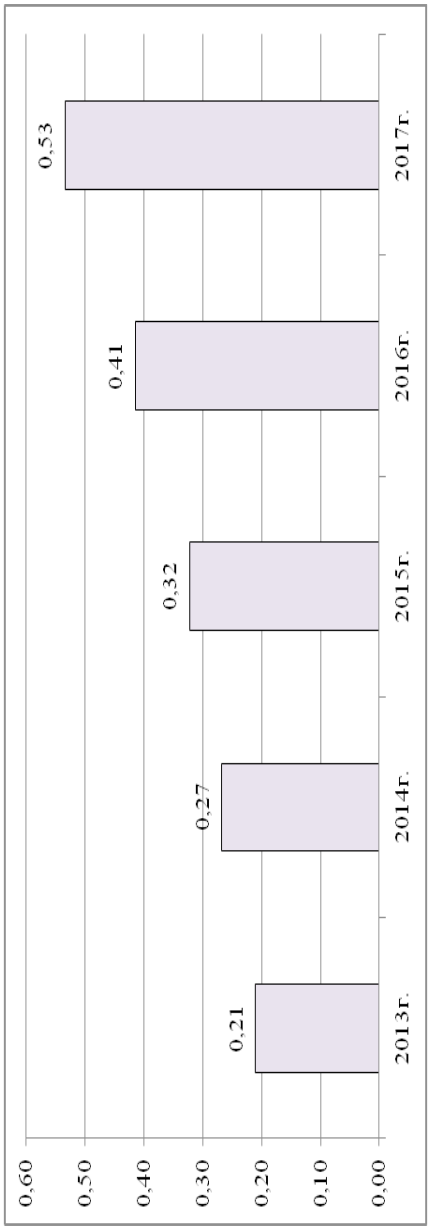


Figure 3. *- The coefficient of functional use of maps*

Another indicator that reveals the **prevalence** of EMP is the coefficient of functional use of payment cards. A number of speakers in Fig. 3 vividly illustrates the preference of cardholders to use a payment instrument for withdrawing cash in settlements in terminals for payment for goods and services. The value of the indicator at the end of 2017 Кф = 0.53 indicates that about 66% of the volume of transactions is performed to receive money using cards versus 34% of the volume of transactions that are made to pay for goods and services. The indicator Кф is interconnected with the indicator Кт, and the low share of security of the Pos-terminals market affected the share of payment operations for goods and services. At the same time, it is impossible not to note the dynamic growth rates of the functional use ratio.

To assess the **importance** of EMP, consider the indicators УДбп, УДввп/врп, revealing the scale of the EMP market. The average share of the volume of EMP growth in the increase in the total volume of cashless payments for the period from 2014-2017. amounted УДбп = 23.8%. Thus, on average, EMPs affect 23.8% of the total increase in non-cash payments in Russia. Of these, payments made using Internet banking come out on top positions - their share, according to the results of 2017, was 92.2% due to payments made by the remote method by legal entities. There is a positive trend in the development of all the types of EMP under consideration: the average growth rate for mobile-banking GDP was 0.05%, Internet banking –234.71%, and payment cards –8.06.

The index of the volume of operations of EMP to GDP is significant in terms of comparability, which allows us to compare regions with each other within the national economy. High growth rates of this indicator indicate the development of the market, the value may vary depending on the characteristics of economies. The dynamics of this indicator can also characterize the preferences of calculations using EMP. At the end of 2017, the total EMP to GDP ratio amounted to Кввп = 4.6, or 465% of GDP, of which the Internet banking market amounted to 449.2%, Mobile banking, 0.13%, payment cards - 15, 82%. Such impressive figures were formed due to high volumes of payments made using Internet banking by legal entities. However, the size of the market of payment cards remains 15.82% to GDP. In some countries with developing payment card market, this indicator varies from 10 to 50% of GDP.

Thus, the availability of EMP is ensured at an insufficient level, due to the low availability of Pos-terminals and the lack of security for accounts of legal entities with remote access.

The results of the assessment of the dynamics of the indicators of the "significance" criterion reveal the general positive trend of calculations using EMP - there is a positive trend in all their types. Every year the number of EMP operations increases, the population and legal entities increasingly prefer to make payments using them. In terms of importance, payment cards are the most popular of consumers; this type of EMP is more often used by consumers when transferring

money. At the same time, payments made using mobile banking become the leader of promising consumer preferences. Thus, the average annual growth rate in the number of transactions amounted to 96.47%, outperforming the growth rate of payments by payment cards by 54.14%, and by Internet banking by 82.64%. Also, there is a positive trend in the functional use of payment cards — Кф of payment cards is growing steadily, therefore, the population is increasingly calculated by cards in trade and services organizations, and less is withdrawing cash from cards.

According to the "prevalence" criterion, there is also an upward trend in all the types of EMP under consideration: the share of the growth rate of the volume of operations on the EMP in the total volume of growth in non-cash payments was 23.8%. Of these, payments made using Internet banking come in first place, their share was 92.2% at the end of 2017, due to payments made by legal entities, in second place are payment cards with a result of, and at last - mobile banking. There is a positive trend in the development of all the considered types of EMP to GDP: the average growth rate for mobile banking is 0.05%, Internet banking - 234.71%, payment cards - 8.06.

The study of this object allowed us to create a methodological approach to assessing the development of electronic means of payment. It is based on the use of abstraction methods, a combination of historical and logical, and the method of induction. Approbation of this methodical approach (according to the statistical data of Russia) made it possible to assess the degree of development of electronic means of payment at this stage. This is facilitated by the expansion of the Pos-terminal network and the stimulation of the expansion of such types of EMP as payment cards and mobile-banking.

The results of testing have shown that, in general, there is a positive trend (in terms of significance and prevalence of EMP), with insufficient availability of Pos-terminals and accounts with remote access. Consequently, in accordance with the proposed typology of the EMP market, Russia is of the type "country with a promising EMP market". For future development, an increase in the number and expansion of the geographical accessibility of the Pos-terminal network is required, as well as the promotion of consumer preferences through the development of a system of discounts and loyalty programs for payments made using Mobile-banking.

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上海合作组织的“软实力”
"SOFT POWER" OF THE SHANGHAI COOPERATION ORGANIZATION

Razumnova Lyudmila Lvovna
Doctor of Economic Sciences, Full Professor,
Moscow aviation institute (National research university)
Moscow, Russia
Migaleva Tatyana Evgenyevna
Candidate of Economic Sciences, Associate Professor
Plekhanov Russian University of Economics
Moscow, Russia
Podbiralina Galina Viktorovna
Candidate of Economic Sciences, Associate Professor
Plekhanov Russian University of Economics
Moscow, Russia

注解。 文章揭示了俄罗斯选择欧亚发展方式的原因; 分析了上海合作组织（SCO）演变的内外矛盾。 需要发展上海合作组织“软实力”政策的概念，该政策受到“上海精神”的启发，并证明了该领域的国际积极经验。

关键词：“冷战”，“转向东方”，上海合作组织（SCO），“软实力”，“上海精神”，“中国梦”。

Annotation*. This article reveals the reasons for the Russian choice of the Eurasian way of development. The authors analyze external and internal contradictions of the Shanghai Cooperation Organization (SCO) evolution and prove the need of improvement of the SCO "soft power" policy concept inspired by "the Shanghai spirit" and highlights the availability of positive international experience in this sphere.*

Keywords*: "Cold War", "turn to the East", Shanghai Cooperation Organization (SCO), "soft power", "Shanghai spirit", "Chinese dream".*

At the present stage the opposition in international relations between Russia and the West is treated by many experts as a return to the "Cold War", which ended a quarter of a century ago. However, the events of the last decade – a wave of "color revolutions" in different regions of the world, mass cyber-attacks in the electoral companies in the USA and some countries of Europe, not fading Rus-

sian-Ukrainian conflict, tough anti-Russian sanctions of the collective West, stop-the-clod of the Russian-American Intermediate-range Nuclear Forces Treaty (INF Treaty) − demonstrate that this opposition is more dangerous, than before.

Unlike the times of the "Cold War" during the post-military period (after World War II), now not two (the USSR and the USA), but five countries – China, India, Pakistan, Russia and the USA - hold keys from nuclear war or peace. In an effort to upgrade nuclear forces, each of these countries, destroying technological borders between the conventional and nuclear weapons, opts for the doctrine of limited use of nuclear potential.

1. Strategic choice of Russia

At what exact historical moment the way to this critical point of confrontation began? Estimates of experts in this question differ.

Some of them say that Russian forked road appeared right after the collapse of the USSR, at the same time till 2010 when the USA, Russia and fifty more national leaders undertook to transform the countries to inclusive Euro-Atlantic community of safety, the split between Russia and the West was not obvious. Non the less, already by this time the EU and Russia could see the distinction in ideological approaches to the former Soviet Union.[1]

The EU tried to achieve its main political goal - maintenance of stability and security in the European region - by means of "soft" instruments of expansion, implementing initiatives of the East Neighborhood Policy (ENP) and the Eastern Partnership (EaP). Avoiding the policy of "hard force", the EU based its liberal policy on the model of "concentric circles", or concepts of "normative power" by creating a ring of "friends" near the borders.[2]

Unlike the European Union, Russia, after the collapse of the USSR, kept the feeling of historical, cultural and economic unity with its former federal republics, continuing to consider the former Soviet Union to be the sphere of its interests and bearing responsibility for the development of these countries. The aspiration to strengthen influence in the Eurasian region was caused, primarily, by several external events, which threatened Russian cross-border security: expansion of NATO to the East -the events in Kosovo (1999) and a wave of "color revolutions" in the Arab countries ("the Arab spring"). The gas conflicts with Ukraine (2006 and 2009) had negative impact on the Russian-European relations. Temporary suspension of gas transit forced the EU to doubt the ability of Russia to be a reliable gas supplier on the European markets and stiffened its determination to pursue gas import diversification policy that institutionally was anchored in the Third Power Package (TPP) and Gas Target model (GTM). However, the example of the implementation of the international project "Nord Stream 2" (the sea gas pipeline construction from Russia to German territory) showed that there is no unity of opinions on the matter within Europe. Despite an obvious economic benefit from

the implementation of this project for the whole European region and an opportunity to avoid external transit risks, some East European countries and the USA take a stand in favor of its ban and keeping of Russia gas transit Post 2019 that give cash inflow to the budget of Ukraine of about 3 billion dollars annually.

The American establishment considers that it was Russia who is an unreliable supplier and bears responsibility for the gas crises of 2006 and 2009, therefore Europe should buy gas from anyone, but Russia. The USA plans to significantly increase LNG supply to European gas markets. [3] According to Kevin Doyle (the Center Davies) [4], approval of the construction of the sea gas pipeline is a treachery of interests of the young democratic state and the political consequences of this act can be equated to the signing of the Molotov-Ribbentrop treaty (1939)[1]. In case of implementation of the "Nord Stream2" Germany will become the largest gas hub of Europe and only under the pressure of other EU members it has expressed the need of renewal of the Ukrainian transit treaty after 2019.

For its part, Russia, which Ukraine considers an aggressor (in spite of remaining its large trade partner and the recipient of migrants remittances from Russia), made the decision on construction of additional infrastructure and roundabout routes of gas supply to Europe at its own expense, keeping in mind, first, the growth of its needs for additional gas supply by 2035 of 107 billion cubic meters a year and, second, long-term transit risks and striving to keep reliable supplier image.

This example shows that energy security of Europe has become the hostage of political ambitions of several countries. The high politicization of the gas issue in Europe is recognized even by the American experts, which suggest renaming the pipeline Nord Stream 2 into "Rorshakh", because this project could serve as a litmus piece of paper for identification of political sympathies[2].

The second point of view on the reason of dramatic change in Russian foreign policy were the events in Ukraine in 2014 (Euromaidan followed by civil war). However, proceeding from the above case, we believe that these events did not become a starting point of the big split, but are an important factor in adoption by the Russian Government of the decision on strengthening of economic and political cooperation with Asia-Pacific countries.

Thus, the end of the first decade of the XXI century became a point of bifurcation (line of a grate division), when Russia changed its Eurocentric cultural and economic course to the Eurasian alternative that reflected the formation of new Russian strategy which received the name "Turn to the East". According to M. Tyulegenova (Higher School of Economics, Russia), the reason for such transformation was the fact that the Russian leaders had reached a fatigue point from the inequality with the western partners, especially concerning decision-making in the common region. [2]

[1] The Molotov-Ribbentrop Treaty is a neutrality treaty of 1939 between the USSR and Germany.

[2] The Rorschach test (published in 1021) is a test by a Swiss psychiatrist and psychologist Hermann Rorschach, which is used to study the human psyche based on free association.

2. External and internal contradictions of SCO evolution Increase of political tension in the relations between Russia and the West took place against the background of the growing global scale contradictions between the West and the East - developed and developing countries, the rich and the poor - that was reflected in the tightening of the Doha round negotiations within the WTO, withdrawal of the USA from the Parisian agreement and the INF Treaty and its initiation of trade wars, as well as the growth of international terrorism, extremism, drug trafficking, irregular migration, social non-violent protests named as "color revolutions"[3].

The political instability and aggravation of global inequality has given rise to new formats of cross-country discussion about common issues, where the emerging markets began to play a more significant role – G20, BRICS, the Eurasian Economic Union (EAEU), the Shanghai Cooperation Organization (SCO), etc. In 2001 six states (Kazakhstan, China, Kyrgyzstan, Russia, Tajikistan and Uzbekistan) established the Shanghai Cooperation Organization. SCO was originally created as an organization aimed at maintenance of the Central Asian region security by means of suppression of acts of terrorism, separatism and extremism. Its influence has gradually extended to the economic, scientific, technical, educational, tourist and humanitarian spheres. The number of participants has significantly increased with the two new members (India and Pakistan), four observer states (Afghanistan, Belarus, Iran, Mongolia) and six dialogue partners (Azerbaijan, Armenia, Cambodia, Nepal, Turkey, Sri Lanka). The number of the countries, which submitted the application for participation, has risen to ten, including Syria, Vietnam, Israel, etc. Now SCO has partnership agreements with the UN, the CIS, the CSTO, EAEU and ASEAN.

The existence of objective assumptions – accumulated experience in state and territorial sovereignty, geographical proximity, complementarity of economies, common interest in maintaining security and stability in the Eurasian region - make a strong base for regional states' integration, which can develop well-balanced internal relations and collectively cope with external challenges. Wide country representation of the Shanghai Cooperation Organization, the achieved success in region security support, mutual strengthening of economic and cultural development, have proven the ability of the SCO to rally the states of Central Asia and become one of the powerful elements of the Eurasian regionalism.

Now the economic and humanitarian cooperation within SCO is rather important along with its political activity. One of the main SCO targets is to improve the living standards. The long-term economic aim of the Eurasian development format is the creation of the free trade zone.

The SCO future and its capability to achieve the planned goals depend on how

[3] Bulldozers in Serbia, roses in Georgia, the color orange in Ukraine, tulips in Kyrgyzstan, jasmine in Tunisia, the cedar in Lebanon. The word "color" highlights the importance of well-crafted and targeted political symbolism as a mass mobilization tool. 28 Ieva Bērziņa. Color Revolutions: Democratization, Hidden Influence, or Warfare? CSSR Working Paper Series. No. 1. 2014. [56 p.3]. https://www.naa.mil.lv/sites/naa/files/document/1_WP2014%20Color%20revolutions.pdf

effectively the organization can resolve the contradictions arising in the process of regional cooperation expansion, both within and outside of it.

A lot of scientific studies focus on this topic. Then, at the initial stages of SCO development experts were disturbed by the alleged lack of objective prerequisites for institutional unit of these countries except Russia's and China's aspiration to constrain US economic and political expansion in Asia. It' s a fact, the Russian Federation is interested in retaining its military presence in Central Asia as the instrument of control over the US influence on their southern borders and the penetration of Islamic radicalism. However, China from the very beginning has considered the economic cooperation as its priority within the SCO and, and having resolved by now the problem of Uighur separatism, is now much less interested in the anti-terrorist component.

Many experts were concerned about the growing presence of the Chinese capital and non-transparency of some transactions in SCO economies, that caused collisions between Russian and Chinese investors and dramatically augmenting credit debt of poor receivers. [6] There is also a difference between Chinese and Russian attitude towards the problem of delegation of state sovereignty to supranational institutes. Having joined the SCO, India began to get concerned about the increased economic activity of China in Pakistan. The UN warns that two big initiatives − " the Chinese-Pakistani Economic Corridor", connecting eastern regions of China with the Indian Ocean through Pakistan's territory, and " the Belt and Road" (BRI) can bring the region not only to prosperity, but also instability. [7]

At the same time, cooperation within the SCO becomes more and more attractive for the traditional allies of the West because of the new contradictions arising between them. So, for example, Turkey, which has the status of the dialog partner of the SCO, becomes a natural ally of Eurasian states in the situation, when the Western countries attempt to save their hegemony in the shaping multipolar world and ignore the interests of less strong players. Then, the USA support the banned Kurdistan Workers' Party through her Syrian wing, at the same time, Germany represents Turkey as the unsafe region for foreign trips and has not appreciated its efforts in holding back the Syrian refugees at the European frontier. Therefore, in this political context the development of Russia-Turkey cooperation (a good example is the sales contract on missile defense S-400 systems) demonstrates an increase of Turkey's possibility for maneuver in its relations with western powers. Some European experts believe that the developing situation can induce Turkey to modify the military-economic and foreign policy union with the West and join the Shanghai Cooperation Organization, sooner or later.[8] Meanwhile, there is also a number of issues concerning security and stability which cannot be solved just within the SCO and requires participation of third countries, in particular the USA. Firstly, it is necessary to pay attention to historical territorial borders con-

flicts. American political scientists consider that without a dialog with the USA, at least their non-interference, Russia (the international legitimization of annexation of the Crimea) and China (reintegration of Taiwan) will not be able to hunt down a question. [1]

Furthermore, it is generally thought, that the SCO represents alternative option of strategic rivalry, military competition and capacity-building for confrontation between Russia and China, on the one hand, and the USA, on another. At the same time, the famous opponent of the USSR, Zbigniew Brzezinski, claimed in his last essay that ‘‘the single most important long-term objective of U.S. policy should be a solution in which three dominating militarily powers – the USA, China and Russia - work together to support global stability’’.[1] The EU takes a similar position. The European Union, with its integration fatigue, views Eurasia as the European periphery, and do not mind if Russia together with the USA would cope with regional surges of instability and do not intend to compete with them for military domination in the region.

Many western experts underline that in the last decade the liberal values have been placed in doubt by some emerging markets. Therefore, the present slipping globalization and blooming regionalism could not be the end of history and a victory of the western democracy, according to F. Fukuyama, but the origin of modern civilization standoff of fading West and re-emerging East as different cultural and political worlds, where the West is a community of the weak liberal and democratic states, and the East – the consolidated unity of strong autocracies. [9] What is the danger of autocratic regime integration for the western societies according to European experts.

Firstly, autocracies are unstable societies, in which it is difficult to find the correct balance between the repressive/liberal methods of management and the redistribution of material resources.

Secondly, modern globalization with internationalization of criminal activity creates an opportunity for the Central Asian elite (and not just for them) to use enemies of the western country economies for money laundering and other illegal transactions.

Thirdly, modernization, which inevitably happens in autocracies, does not save their elite from transformation into kleptocrats (and in kleptocratic power), as it uses the possibilities of global economy (the international financial markets, the offshore jurisdictions etc.) to withdraw huge financial assets from national economy, that interferes with effective public administration. [9]

The main conclusion is that it is not culturological and economic contradictions that represent a watershed between the West and the East, but *the differences in political systems and regional elites' interests.*

According to the USA, the possible joining of Iran, the major and most con-

siderable sponsor of terrorism, the Shanghai Cooperation Organization as a full member contradicts one of the main goals of the organization − the opposition to terrorism[4]. Nevertheless, Russia believes that Iranian membership will be productive for the peace-building relations with the Islamic world, as Iran has repeatedly proven the ability to participate in conflict settlements in a constructive way and to reach stabilization in the region. Iran can also significantly contribute to the development of economic capacity of the SCO. [10]

India is especially interested in the membership of Iran as a significant participant of "Energy club", which will be established within the SCO. Gainful geographic location, richness in natural resources, the experience of the preserved social protection system during the market reform would allow Iran to become the power and transport center of the region in the future.

Despite the existing disagreements, the joining the SCO of such considerable economies as India, Pakistan, Iran, Turkey, could be compared to a reshuffle of cards in "a big game" for receiving the influence over Eurasian resources. As a result, the world could appear on the eve of revolutionary reorganization of the relations between key power players that will shake the power distribution structure bases, that had been established after the disintegration of the Soviet Union and prior to that.

3. The SCO "soft power" concept

The emergence of new challenges in the global economy and policy generates new technics of influence on political allies and opponents. The information technology and communication development provide a means to exercise such influence in a faster, hidden and more productive way. If official diplomacy, business negotiations, political discussions are powerless, «soft power" tools, according to Joseph Nye, allow to achieve the desirable not by coercion and payment, but by attraction and persuasion.[11, P.2-3] "Hard power ", on the contrary, means the "traditional" power with use of coercion and force.

Most of the Russian experts are convinced that recent "color revolutions" are the result of the "soft power" tools developed in the USA, which include the nonviolent factors created by means of cultural, economic and attractive valuable space.

The features of "soft power", apart from its nonviolent character, include: long-standing influence and a time lag in the obtaining results; a short-term period of possible weakening of its influence due to the unreasoned solutions of "hard power"; an arsenal of diversified instruments and long historical experience of its application by various countries (Rome, Byzantium, Britain, China, etc.). However, unlike other times, precisely since the beginning of the 90-s years of the last century "soft power" has become a conscious and theoretically reasonable tool

[4] In addition to membership in the UN, the OIC, and the inefficient ECO (includes ten countries - Pakistan, Turkey and Iran, Azerbaijan, Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) Iran is not a member of other global and regional alliances and alliances.

with target impact on internal and external objects. The policy of "soft power" quickly evolves, has many instruments and includes three components − culture, political values and foreign policy. [12]

The efficiency of “soft power” is high when the culture of the country is popular abroad, its political values are shared by other nations and external policy do not cause a protest, even if it is not approved. On the contrary, the efficiency of “soft power” is low in the countries, in which there are no viable economic and political models, there is degradation in the educational and technological spheres, and serious social problems. Despite the fact, that existing concept of "soft power" was conceptualized by the American scientific community, the tools of this policy are actively used in the EU, Russia, China and India. [11, P.3]

Whether the Shanghai Cooperation Organization uses “soft power” tools in its activities and what is their semantic content? According to the former General secretary of the SCO, Rasheed Alimov, “soft power” of the SCO realizes the main principle of this organization – the "Shanghai spirit", which was institutionally approved in the Agreement on Long-Term Neighbourly Relations, Friendship and Cooperation of August 16, 2007 as the outcome of the SCO summit in Bishkek. [13] The entity of "the Shanghai spirit" is far from the concept of "soft power", used by the West for imposing its stereotypes and concepts that lead to "color revolutions”, as R. Alimov said. [14] The concept of "the Shanghai spirit" was offered in 2001 at the foundation summit of the SCO by the Chinese President Jiang Zemin. Its core contains twenty hieroglyphs, which stand for "mutual trust, mutual benefit, equality, mutual consultations, respect of variety of cultures, aspiration for joint development". According to Pan of Guang (director of the Center of studying of SCO at the Shanghai academy of social sciences), the description of "the Shanghai spirit" comprises the gestalt of the new concept of security, which does not solve problems in a military-political way and as a game with the zero sum. [15] Security in this model gets global dimension and close to term of common security. Thus, "soft power" of the SCO is the expression of new international relations model, which includes: the fulfillment of commitments, the unacceptability of the armed pressure, the renunciation of political hegemony and the recognition of multipolarity, not imposing of own models of political and social system, etc. As the concept of "soft power" of the Shanghai Cooperation Organization describes, in fact, the alternative model of world order and is developed by the Chinese scientists, we should compare it with Chinese "soft power" policy and to reveal its correspondence to the current organization development level.

The modern policy of China's '"soft power" is based on semantic and ideological filling of the western concepts. It also incorporates Confucianism values, which are not only harmoniously combine with the socialism ideology, but also allow to improve the state image and legitimize the authoritative power of the

Communist Party of China (CPC).[16, P.113] Nonviolent methods are well tied with many Chinese stratagems – "war is based on deception", "to use soft means for fight against hard", etc. The moral leadership used in Confucianism is in accord with the authorial principles of governance and the "soft power" policy. For example, in response to moral superiority and making wise decisions of a governor, the subordinates are ready to be devoted and hardworking.

The "soft power" of China not only has its specific distinguishing features, but also its semantic constantly evolving content influenced by new factors and world development trends. The lack of democratic freedoms, the existence of media control by the authorities and low influence of NPO - all these factors single out the "soft power" of China in comparison to the EU and the USA and, along with it, taint China' image as the world leader. At the same time, the theory of "complex power of the state", created by Chinese scientist Juan Shchofen, as a combination of "hard power ", "soft power" and the coordinating force of the state, bridge the gap with the USA concept of the "soft power" as a mix of hard and soft methods [5].

Taking into consideration the bitter experience of the USSR, when the victory of the western "soft power" became a key factor in socialist disintegration, the Chinese scientists recommend the strengthening of nonviolent methods by means of developing cultural, educational and administrative aspects and through the protection of personal property and law. The CPC realizes that China has passed into a phase of growth rate reduction and difficult transformation of social structure. Therefore, it welcomes the discussion about political system future and weakening of state control over information flows. Like "the American dream", China has the concept of " Chinese dream", as a part of passive "soft power" policy. Aspiring to keep mobilization opportunities of the population, China has included in "the Chinese dream" two apparently opposite incentives – the promotion of individualism, individual business and collectivist values of "big Chinese family", work for common goal achievement. Thus, the concept of the "soft power" in the People's Republic of China not only improves for the country's external image, but also sets the purpose to turn "core values of socialism" into the instrument of the Chinese society consolidation, which is capable to resist external threat, including "soft power" of the USA. [16, P.118]

The research of the Russian HSE in 2017 proved that the USA, the EU and Russia have various ratio between "soft" and "hard" power. While in the USA "hard" and "soft" power are balanced, in the EU the "soft power" and in Russia - "the hard force" prevail. So, the absence of strong army of the EU weakens the attractive sides of the "soft power", especially during the emergence of new challenges. Unlike the USA and the EU, Russia has weak experience in public diplomacy, and some tools of "soft power" are mistakenly equated to propaganda.

[5] After political failures in the Middle East, when the nonviolent methods led this region to the civil wars, in 2004 J.Nai proposed the "smart power" approach - a combination of "smart" (winning) strategy and an effective combination of "soft" and "hard" power.

Russia attaches great value to methods which prevent the emergence of "color revolutions", in particular, to restriction of activity of NGO as "foreign agents" and "the undesirable organizations". Anyway, the imbalance of forces reduces the influence of state power. [11, P.7-10]

In light of the foregoing, we can draw to a conclusion, that the Shanghai Cooperation Organization, as a dynamically developing international structure, which aspires for the creation of new world order model, needs to update and develop its "soft power" concept based on "the Shanghai spirit". The updated concept will promote the understanding of integrity of all foreign policy activity aspects and will allow to effectively resolve arising contradictions. At the same time, it is necessary to consider that "soft power" is a strategic foreign policy resource, which provides an opportunity to develop the potential of the international leadership and resist new threats.

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俄罗斯联邦卡车行业企业战略规划因素的互联互通
INTERCONNECTION OF STRATEGIC PLANNING FACTORS AT THE ENTERPRISE OF TRUCK INDUSTRY IN THE RUSSIAN FEDERATION

Lyaschuk Alexandr Vyacheslavovich
Postgraduate, St. Petersburg State University of Economics
Tikhonova Maya Vladimirovna
Candidate of Economic Sciences
Associate Professor of the Department of Economics and Management of Enterprises and Industrial Complexes
St. Petersburg State University of Economics

注解。 文章讨论了影响俄罗斯联邦卡车行业战略规划的因素，显示了这些因素之间的关系。 此外，重点放在在卡车制造企业的战略规划中使用资源导向方法的可能性，强调这种方法在形成企业稳定的竞争优势中的作用。

关键词：战略规划，要素，资源导向，稳定的竞争优势，卡车制造。

Annotation. *The article discusses the factors that influence the strategic planning of the truck industry in the Russian Federation, showing the relationship of these factors. In addition, an emphasis is placed on the possibility of using a resource-oriented approach in strategic planning at a truck manufacturing enterprise, emphasizing the role of this approach in the formation of a stable competitive advantage of an enterprise.*

Keywords*: strategic planning, factors, resource-oriented approach, stable competitive advantage, truck manufacturing.*

The truck industry (TI) is of great importance for the economy of the state, including its international prestige. In addition, the social component of the TI sector, in which several hundred thousand people work directly and indirectly, is also of high importance. The importance of the long-term development of the industry in this context is obvious, and its long-term development is directly connected with an increase in competitiveness, as well as an increase in share in international markets. Such tasks cannot be solved without an appropriate system of strategic planning at the TI enterprises.

Strategic planning in a TI enterprise, like any other activity, is subject to the influence of various external and internal factors. It is clear that the combination

of such factors will vary depending on the particular enterprise, but there will also be general, peculiar to the entire industry, factors [3]. For TI enterprises, the number of external factors influencing strategic planning and independent of the enterprise itself will be significant, which is determined by the size and complexity of the TI sector itself and its importance for the national economy. Thus, the entire set of factors influencing the strategic planning of a TI enterprise can be formally divided into internal, sectoral and external.

Considering external factors that influence on TI enterprises significantly, the enterprises cannot in any way substantially influence these factors. Macroeconomic factors affect the entire national economy, and for the TI sector they will have one of the key values, due to its scale and significance of the products of the TI sector for many key sectors of the country's economy. Among macroeconomic factors, it is worth highlighting the growth rate of the economy, the rate of the national currency, the level of inflation, and, to a large extent, the raw nature of the Russian economy, makes oil prices an additional factor influencing the industry. The oil price factor has a double impact on the TI industry, first as a significant economic factor of the national economy, and then as a component in the price of fuel for the industry's products, which in turn is a certain incentive for the consumer when making decisions on purchasing equipment. Also among the external economic factors it is worth noting the factor of economic support of the industry by the state. Thus, during the crisis period of 2014-2016, the state allocated about 113 billion rubles to support the automotive industry, which went to fleet renewal programs, preferential car loans and leasing programs, as well as direct purchases of various types of automotive equipment at the expense of federal budget [2].

Along with macroeconomic factors, with strategic planning at a TI enterprise, it is worth considering factors of a political nature. The high sensitivity of the industry to economic factors, as well as its scope, make it also particularly sensitive to the political component of the state, as the situation with the sanctions imposed on Russia for purely political reasons, and the subsequent decline in production in the TI sector, showed. In addition, as part of the influence of the political factor, Russia's membership in the Customs Union and the WTO, as well as a number of other present and possible state participation in various political and economic entities should be taken into account. We should also note the judicial component of external factors affecting the TI company. In strategic planning at TI enterprise, various regulatory documents of technical, tax, antimonopoly legislation, etc. will be of great importance, not only the current state of which but also their possible changes must be taken into account.

No less significant for the TI industry, in which, according to various estimates, more than 50 thousand people are directly employed, and in related industries up to one million, are social factors. The demand of TI enterprises for highly quali-

fied personnel with special knowledge and training will only increase in the future [2]. Thus, the entire set of social factors should be taken into account in strategic planning at the TI enterprises.

The production of trucks is a high-tech industry, both in terms of the product being produced, and in terms of the technology used in the production of this product. And it shows the importance of such external factor as a technological factor, and the need to take it into account when strategic planning in the TI enterprises. Technological innovations of the world's leading manufacturers of trucks are a permanent benchmark for Russian enterprises, and to a large extent determine the future competitiveness of products and the enterprises of the TI sector themselves. Obviously, without taking into account technological factors, it is impossible to talk about the future development potential of enterprises in the TI sector and increasing their share in international markets.

It should also be noted that external factors are often very interconnected and the analysis of some factors inevitably leads to the analysis and considering of others. For example, political factors are closely intertwined with technological, and this is especially noticeable in the light of recent sanctions. Despite the fact that advanced technologies, technological equipment and licenses have a high cost, they are not available to everyone to purchase them. Political relations between various states here often come to the forefront and leave the economic component far behind. The neglect and misinterpretation of environmental factors in strategic planning at a TI enterprise can lead to the most dire consequences in the future.

Obviously, the external factors of the macro environment have an impact on the entire economy, on all its industries and enterprises. If we talk about the enterprises of the TI, the influence of the macroenvironmental factors on them is essentially the same, with some specific exceptions. In this regard, the displacement of the main focus in the strategic planning of the TI enterprise towards external sectoral factors (factors of the external microenvironment) and internal factors of the enterprises themselves looks quite logical.

Considering the Russian TI industry, it can be stated that the competition between domestic brands in various segments is low. But today, a sufficient number of assembly plants of foreign brands are operating in the TI industry, which position themselves in the same market segments as traditional domestic brands [3]. And, despite the fact that the percent of such industries in relation to traditional Russian manufacturers is currently small, the growth of this percent is quite stable and in the future will be even higher. In addition, there is a direct import of trucks on the Russian market, and an especially noticeable increase in the share of Asian manufacturers [3]. The Russian TI industry is characterized by a high degree of concentration, there are clearly defined leaders and their followers, in addition, there is a division of the industry into segments and niches.

Today, the Russian TI industry is mainly focused on the Russian domestic market, as well as the markets of the CIS countries and the Customs Union. At the global level, its products are poorly represented, but some promising areas still exist [3]. And in this regard, the strategic planning of the enterprise TI, among the factors of the external microenvironment worth noting competitive factors. With a certain isolation of the industry from the world market, competitive industry factors become essential, especially in confrontation with foreign competitors. Among such factors, it is worth highlighting such factors as the influence of consumers, the influence of suppliers, the current level of competition in the industry and the likelihood of new competitors. Due to the qualitative analysis and assessment of the sectoral factors of the external environment, TI enterprises can get a competitive advantage in the short and medium term. And those enterprises that receive a short-term and medium-term competitive advantage across the industry will be able to successfully resist external players, until the formation of their long-term competitive advantage based on factors of the internal environment.

Thus, the formation of a long-term competitive advantage is the main goal of strategic planning at the TI enterprise, which brings to the fore the factors of the internal environment of the enterprise. I.e. the focus of strategic planning will be shifted to the area of the internal environment of the enterprise and will lie at the junction of the enterprise's economy and strategic management. The methodological concept, which focuses on intercompany factors, as factors that determine a stable competitive advantage of an enterprise in the long term, is a resource-oriented approach [4].

The set of factors of the internal environment of the enterprise, which determine its stable competitive advantage, is a distinctive feature of each particular enterprise and constitutes the overall potential of the enterprise of the TI industry. First of all, among such factors are material and intangible resources of the enterprise at its disposal. It is the resources that form the basis of the static potential of an enterprise, which allows it to carry out its operational activities, where material resources are the totality of all current and non-current assets of an enterprise. The basis of intangible resources is the intellectual component of the enterprise, which is expressed in the form of technologies, competences and organizational skills mastered by the enterprise. The enterprises of the TI industry are high-tech, they carry out economic activities using a large number of industrial, managerial and other technologies. All this makes the technological component of the internal environment of the enterprise industry a very significant factor for strategic planning. At the same time, the presence of such a significant technological component raises the question of the qualifications of the personnel of the enterprise. In order to implement all the technologies of the TI industry in practice, an enterprise needs to have a sufficiently wide range of competences in various fields, which will

largely determine the enterprise and constitute one of its distinguishing characteristics. In addition, for the effective use of all available resources of the enterprise, it needs to possess certain organizational capabilities. It is organizational capability that allows an enterprise to gather together, put into practice, direct and redirect certain resources to various areas of its activity.

Thus, a set of factors that represent the static potential of an enterprise in the TI industry includes resources, competencies, technologies and organizational capabilities. The long-term competitive advantage of an enterprise is based on its overall potential, which is primarily based on a static potential that ensures the effectiveness of current economic activity. This efficiency is an advantage of the enterprise, which allows it to extract profits from its activities through a unique set of technologies, competencies, resources, and organizational capabilities that allow all of this to be used. Without effective economic activity, there can be no talk of the long-term prospects of the enterprise and the formation of a stable competitive advantage [5].

If the external environment were stable and did not imply any changes, then the competitive advantage based on the static potential would be stable and long-term. However, the TI industry is unstable. Enterprises of the industry are forced to constantly respond to changes of a different nature, to look for opportunities to gain a stable competitive advantage, which will allow forming high value added in the long term. Thus, the internal environment of an enterprise in the TI industry must be able to respond to external challenges, that is, be ready and able to change. To do this, the TI company must have certain resources, technologies, competencies, as well as certain abilities that would allow it to find it all, configure it in accordance with the situation and use it in the enterprise's activities. All these factors together constitute the dynamic potential of the enterprise, which is an important part of the overall potential of the enterprise in the TI industry, along with the static one.

The basis of the dynamic potential is formed by the competence of the enterprise in the field of training, the development of new products, etc., i.e. competences without which innovation activity is impossible. Competences of this kind fully enable the TI company to develop new technologies and implement them in the work of the enterprise, as well as to modernize the existing production, management and other technologies. Also, the composition of the dynamic potential will include tangible and intangible resources, but in their structure they will differ from the resources of the static potential. The intangible component dominates in the structure of dynamic potential resources. In addition, in order to search for and properly configure such resources, an enterprise needs to possess certain dynamic capabilities. Thus, the dynamic potential of an enterprise will be based on the competencies, technologies and resources necessary for innovation, as well

as dynamic capabilities that allow an enterprise to properly use all this to obtain additional increments of its potential, i.e. essentially forming its stable sustainable advantage.

Also, as part of the dynamic potential, it is possible to single out a component that determines the ability of a TI enterprise to recognize, implement and use in its activity useful information in the external environment of an enterprise. Within the framework of the TI industry, this ability is extremely important for the formation of a stable competitive advantage. The industry is in constant dependence on a large number of technical and technological innovations that are generated in the external environment, and the ability to prevent and properly respond to their emergence may be the main, especially in the long term. Such an ability of a TI enterprise, in the context of a resource-oriented approach, is called absorbing potential. Absorbing potential allows you to incredibly expand opportunities for the formation of a stable competitive advantage due to external information and knowledge. And the higher such a potential of an enterprise of the TI industry, the more competitive it is, and the greater its dynamic potential is diversified, due to the more stable and productive links of the internal environment of the enterprise with its external environment.

The combination of internal factors of an enterprise of the civil aviation industry that have a significant impact on strategic planning will be represented by the factors of the static and dynamic potential of the enterprise, which underlie its stable competitive advantage

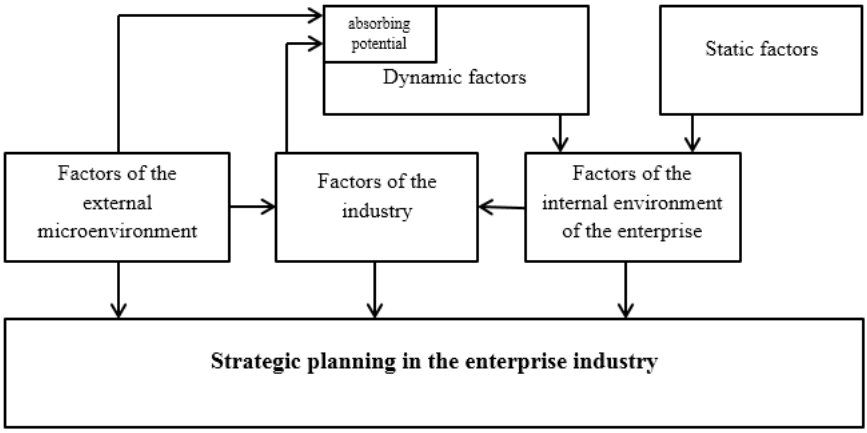

Fig. 1 Interrelation of factors of strategic planning at the TI enterprise

In strategic planning at an enterprise in a TI industry, three groups of factors should be taken into account: factors of the external macroenvironment, factors of the external microenvironment (industry), and internal factors of the enterprise (Fig. 1). Each group has its own particular significance and specific influence on the strategic planning process. For example, industry factors have a significant impact on the competitive advantage of an enterprise in the industry in the short and medium term, while the factors of the internal environment will form the basis of a long-term (stable) competitive advantage [6]. The scale of the industry, its importance for the country's economy, makes it necessary to take into account in the strategic planning for enterprises the economic and political climate in the country. In addition, among the key factors of the external macroenvironment, it is necessary to take into account such factors as the social factor and the technological factor. The factors of the external macro environment influence not only the specific enterprise of the TI sector, but also the entire industry and the economy as a whole. In turn, sectoral factors will to a large extent be influenced by the factors of the macroenvironment and under this influence will undergo certain changes. The change in the sectoral factors, and as a result, the economic conditions in the industry, will inevitably affect the internal factors of TI enterprises. The internal factors of the TI enterprise influence on the sectoral factors through a change in the competitive situation within the industry, due to a change or the emergence of new competitive advantages among industry enterprises (Fig. 1). The factors of the internal environment form the cumulative potential of each specific enterprise of the TI industry, which in turn results in a stable competitive advantage.

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国家经济集中调控过程研究：国外经验

RESEARCH OF PROCESSES OF STATE REGULATION OF ECONOMIC CONCENTRATION: FOREIGN EXPERIENCE

Velikorossov Vladimir Viktorovich
Doctor of Economics
Professor at the Department of Organizational and Management Innovations, Plekhanov Russian University of Economics

抽象。 生产集中，创建分支机构，吸收和合并企业的过程被认为是与提高经济效率相关的自然和客观过程。 一方面，在国家积极参与规范这些过程，支持国际商业在国际舞台上和游说商业利益的过程中，所宣称的完全自由化经济政策和完全没有政府干预的政策在实践中体现出来。。 本文介绍了国家对市场经济中公司结构经济集中度调控过程的研究结果，以确保社会问题的解决和国家社会基础设施的发展。

关键词：政府监管，社会经济问题，竞争，综合业务结构。

Abstract. *The process of concentration of production, the creation of branches, the absorption and merger of firms is considered as a natural and objective process associated with improving the efficiency of the economy. On the one hand, the proclaimed policy of complete liberalization of the economy and the complete absence of government intervention, in practice, is expressed in the active participation of the state in regulating these processes, supporting national business in the international arena and lobbying business interests. The article presents the results of a study of the processes of state regulation of the economic concentration of corporate structures in a market economy in order to ensure the solution of social problems and the development of the social infrastructure of the state.*

Keywords: *government regulation, socio-economic problems, competition, integrated business structures.*

Introduction. The development of the modern world economy is characterized by continuous processes of concentration of production, which are manifested in increasing the size of economic structures, the formation of TNCs, the spread of mergers and acquisitions of companies, as well as strategic alliances, and the direction of the company's key resources to expand production.

The state ensures the observance of national interests, solving such economic tasks as: regulating the reproduction process and smoothing cyclical fluctuations;

guaranteed continuity of the process and structural changes; the formation and development of social infrastructure; achieving social equilibrium, etc.

The solution of these problems in the context of a deliberate rejection of the system of directive planned management and a sharp reduction in the possibilities of direct state intervention in the work of enterprises in connection with denationalization and the formation of a multi-structured economy requires determining the extent and methods of government management and regulation in the system of realizing national interests [2, 4] .

Research problem: In many developed countries, retransmission and solution in economic practice of priority tasks of state regulation are provided by integrated corporate structures. Their creation and development is conditioned both by objective economic processes and by the state's activities aimed at forming a sectoral market structure.

At the same time, the principle of full liberalization of the economy is proclaimed, in which economic agents act solely at their own peril and risk, and the state is excluded from the impact on the economy.

The corporate structure of developed countries is characterized by the following basic features: the presence of 100–200 large corporations, as a rule, with subdivisions that are vertically integrated in the final product; production diversification; development of intrafirm planning; focus on the use of high technology; small volume of intercorporate communications, constituting 10 - 15% of the produced product (in physical terms). The development of large corporations is a prerequisite for improving the efficiency of the country's economy as a whole, facilitates the transition to a higher technological level and initiates the development of small and medium-sized businesses through a system of subcontracting relations, orders and contracts [1].

Along with the strengthening of the role and importance of the activities of corporate structures in national markets, the formation and activities of transnational corporations (TNCs), multinational trusts and concerns (MNCs), and also transnational banks (TNB) are becoming more and more active. It is large corporations, due to the ability to implement promising projects, high efficiency and stability, can compete in the global market and ensure the integration of the country into the global economy. Government policy has a direct impact on the process of creating corporations, managing them on the goals and nature of competition between them [6, 7].

The introduction of a market economy of corporations with international scope of activity into the economy of states is an objective reality of modernity and is carried out by creating branches and subsidiaries, taking over national firms, forming holdings, through a system of joint participation in the capital of local enterprises, by concluding agreements on cooperation, etc. [8].

Without the help of the state, corporations of Western European countries could

hardly have implemented the planned programs for concentrating production, achieving its profitability and resisting competition from American or Japanese over corporations [5]. As a special form of public mobilization of capital, financial assistance from the state to the private sector is carried out through direct and indirect financing in the form of grants, subsidies, loans, and government procurement, through cheaper credit, differentiation of tax deductions, etc.

The whole complex of levers of economic policy of the countries of the European Union is aimed at encouraging concentration and centralization of capital. In Italy, for example, a more preferential tax regime was introduced for companies combining their capital, tax rates for mergers of West German concerns were reduced in Germany, and a special committee on organization of assistance to mergers of companies was approved in France within the framework of the Planning Commission. The formation of integrated structures (chaebols) in South Korea has been facilitated by the provision of government loans to large firms at below-market rates. In a number of countries, government institutions have been created and are functioning, whose activities are aimed at strengthening the competitiveness of national producers. Among them, first of all, are the Institute of Industrial Development (IID) in France, the Corporation for Industrial Reorganization (CIR) in the UK and the Institute for Industry Reconstruction (IIR) in Italy.

In each country, the state's influence on the development of production has its own specifics: the specific weight of state ownership in industry, the size of its financial support from the state, the degree of state regulation of the economy, and foreign economic policy are different. [9,10]. For example, the proportion of state-owned enterprises in the industry of countries such as France, England, Italy, where some industries were wholly nationalized, and in some state-owned companies played a leading role, was for much of the post-war period substantially higher than in the US, Japan, Germany.

In a number of countries, private firms could not ensure the modernization of industry, and this function was forced to assume the state. This situation has developed in Belgium after the Second World War. In Italy, in the mid-1970s, under conditions of a deep economic crisis, state-owned companies participated in the rescue of private bankrupt firms, fulfilling, according to Italian economists, the function of "preserving the country's industrial system." State enterprises have made a significant positive contribution to the development of many industries in the most dynamic countries of Southeast Asia. Thus, in Taiwan, large state-owned enterprises in the early stages provided more than half of industrial production and laid the foundation for the development of the cement industry, ferrous metallurgy, shipbuilding, fertilizer production, heavy engineering and machine-tool construction.

The government also, as a rule, actively promotes the entry of domestic producers into the international market. Particularly taken into account in economic development programs is the fact that increased foreign competition directly within national farms [3]. For the sixth plan of the socio-economic development of France, for example, the concept of a "competing economy" was developed, and the basis of the plan was a model of an open economy for foreign competition.

At first glance, a strong anti-monopoly policy, especially concerning horizontal mergers, alliance and collusion between firms, contradicts the main trends of state regulation of concentration processes. However, as M. Porter notes, the activation of domestic competition not only strengthens the position of firms in the local market, but also forces them to enter the world market in search of opportunities for further growth, ultimately contributing to an increase in the competitiveness of the country as a whole. In contrast, a complacent attitude toward mergers and alliances proved to be counterproductive in the United States, Italy, Sweden, Switzerland, and Germany. The absence of strong anti-cartel laws in Switzerland has led to the erosion of national competitive advantage in industries such as the watch industry and beer production.

Thus, the practice of microeconomic regulation combines measures aimed at restricting monopolies and maintaining competition, as well as stimulating processes of concentration, centralization and restriction of competition.

It should be noted that, as a rule, the desire to actively use the state to influence the sectoral structure is especially characteristic of countries that are lagging behind for some reason from the country that is a leader in economic development. This desire was clearly manifested in the first post-war decades in the countries of Western Europe and in Japan, which were significantly lagging behind the United States in terms of economic development. To an even greater degree, this applies to some of the new industrial states of Southeast Asia. In the United States, on the contrary, to date, the state's influence on manufacturers has not been determined in any explicit way by the goals of increasing their efficiency and competitiveness or by any clearly defined structural adjustment objectives.

The methods and forms of organizational and legal regulation in various countries are very specific, so when studying them, one should take into account the historical features of the development of individual countries, cultural factors: the dominant socio-economic doctrine, social relations, national psychology. Thus, in France and Italy, the tasks of forming and modifying the sectoral structure of the economy are solved through the nationalization of enterprises and entire industries; in Germany - at the level of entrepreneurial unions with minimal interference by the state power, in Japan - through joint efforts of the state administration and corporate entrepreneurship, in the USA - on the basis of targeted programs.

France, Germany, Italy, Spain, Portugal are the countries in which neoconserva-

tive approaches are combined with reformist ones; the weakening of the regulatory role of the state is accompanied by the modernization of the mechanisms of state intervention in the economy, especially in the field of R & D, in the field of social policy. For France, in particular, the state sector maintains a strong position in the country's economic potential for a high proportion of GNP redistributed through the budget, and a transition to recommendatory strategic planning.

The United States and the United Kingdom, with a different role of the public sector in the economy, are united by the most consistent implementation of the course on "minimal government intervention." In the USA, with a small share of state ownership in business, flexible and diverse forms of government intervention are used (contractual system, specific forms of state participation in mixed business, transfer of regulatory functions to state and local governments).

The Swedish model of "functional socialization" implies the interaction of public and private beginnings on a fundamentally different functional basis. Socialization of distribution, based on the redistribution through the state budget of more than half of the GNP, in many respects leveled the influence of the dominant in the production of the private sector.

Neo-industrial countries of Southeast Asia have managed to combine the industrial stage with the transition to the post-industrial one. The most representative South Korean model is characterized by close integration of state and private principles in the scientific, technical, investment, structural, and foreign trade spheres.

The Japanese model is inherent in the systemic nature of government intervention at all levels of the economic structure, a long-term strategy of economic policy. Regulation is based on a system of economic laws that were adopted by parliament in the first post-war years and in a period of high growth rates. Some of them are directly related to the direct intervention of the state in entrepreneurial activity and the functioning of the market [11].

In the area covered by direct state regulation by legislative and administrative means, about 40% of GNP is created, including 17-18% with a high degree of state intervention. The sectors that are most intensively regulated by the state, mainly on the basis of special branch laws, occupy a special place in the competitive corporate-state economic system. For example, 3/5 of Japan’s GNP is produced by corporations directly incorporated into the system of corporate and state-corporate regulation.

The postwar decartelization, initiated by the occupational authorities, eliminated the domination of the powerful zaibatsu (the leading four: Mitsui, Mitsubishi, Sumitomo, Yakuda), which occupied almost monopolistic positions on certain industrial markets . The main directions of the “zaibatsu liquidation” policy were: the destruction of the parent holding companies; downsizing of 325 major

corporations; the introduction of antitrust laws in the form of laws; the creation of a special governmental body controlling the observance of these laws (fair and fair transaction commission) and, finally, a strict restriction on the mutual holding of shares. Subsequently, the effect of antitrust legislation was deliberately weakened and the processes of centralization and concentration of capital unfolded with a new force.

Currently, on the basis of existing laws, the regulatory bodies of the Ministry of Foreign Trade and Industry (MFTI), as well as other ministries and departments of Japan, carry out active administrative activities that go beyond the legally established standards and act as an independently acting factor.

In Japan, government regulation in a huge degree accelerated the process of concentration and the formation of the mechanism of corporate regulation of markets. In the second half of the 60s, mergers of large corporations in the metallurgical industry, heavy engineering and other key industries were sanctioned. In the 1960s and 1970s, state intervention extended to all the most important aspects of business. The transition to the second stage of the development of state sectoral regulation in the 70s and 80s (administrative and financial reform) was due to the increased role of corporations and new relations between corporations and the state. The crisis situation that arose in the relationship between MFTI and private business in the 70s reflected the urgent need for a radical change in the forms of economic regulation. In this regard, the state began to limit the extent of its direct intervention in leading industries and to abandon the most rigid forms of control. Regulatory regulation was extended to new areas of corporate activity: balance sheets and reporting system, audit control functions, vertical communications. [12]

The study of foreign experience shows that in a market economy, direct state intervention is allowed in all the most important areas of activity of integrated entrepreneurial structures.

The organizational and legal impact of the state on the process of reproduction includes the planning and forecasting of economic and social development carried out by the state on a national scale.

Of particular complexity and scientific interest is the state management of economic structures on the basis of the realization of the right of ownership. At present, issues related to the management of the state share of ownership of mixed enterprises are practically not well developed, which has an extremely adverse effect on the activities of integrated structures focused on the implementation of general state problems.

In the modern economy, in close connection with the market competition of goods and capital, there is at the same time competition between various types of property, structures and management methods. All world experience con-

firms that the decisive role in the economy is played not by a property trader, but by the real conditions of its functioning, and by the relationship between property and management. Determining the degree of dependence of the competitive beginning as a necessary factor of economic efficiency on the types of ownership, on their transformation is one of the main directions of economic analysis.

Based on the foregoing, it should be noted that the study of the problem of growth and development of corporate structures, their interaction with government authorities requires the involvement of extensive and disconnected theoretical material. The choice of specific forms and methods of organizing the interaction of the state with integrated business structures used in reforming national economic complexes is determined by three groups of factors:

- specific forms of implementation of the general universal principles of functioning of modern economic systems;
- specific for each country, the conditions and forms of formation of a polyformal society, reflecting the totality of various specific historical factors: economic, political, socio-psychological, cultural, national, etc. It is they that form the basis on which the general principles are implemented which can not be identified and understood features of each model;
- the stage at which the country is in its movement towards a modern, highly developed industrial and post-industrial information society, the degree of completeness of technological and structural restructuring, the formation of economic, social and political mechanisms adequate to the society of an information type.

Conclusions. At this stage of development, government regulation of concentration processes should be aimed at the formation of the corporate sector of the economy and be expressed in the planning and design of the creation of corporate structures, their support and stimulation in order to increase the efficiency and competitiveness of the economy.

The study and analysis of foreign experience in this direction will help in achieving the overall goals of the policy of socio-economic reforms in Russia in the context of stabilizing the economy, ensuring national security and political stability.

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企业作为经济范畴的投资吸引力：选择因素的本质，原则，评价问题

THE INVESTMENT ATTRACTIVENESS OF AN ENTERPRISE AS AN ECONOMIC CATEGORY: THE ESSENCE, PRINCIPLES FOR THE SELECTION OF FACTORS, THE PROBLEM OF EVALUATION

Velikorossov Vladimir Viktorovich
Doctor of Economics, Professor at the Department of Organizational and Management Innovations,
Plekhanov Russian University of Economics
Shcherbakova Olga Ivanovna
Doctor of Psychology, Professor of the Department of Psychology,
Plekhanov Russian University of Economics
Balakhanova Dariko Kenjebaevna
PhD of Economics, Associate Professor at the Department of Organizational and Management Innovations,
Plekhanov Russian University of Economics

注解。本文讨论了确定企业投资吸引力的各种方法，并提出了作者对这一概念作为经济范畴的解释。它还讨论了影响现代经济条件下国内产业企业投资吸引力动态的多方向因素影响的理论问题。作者分析了评估企业和企业集团投资吸引力的相关问题，并提出了投资吸引力指标的分类。考虑选择决定投资吸引力的因素和指标的原则，作者可以证明有必要从投资者的角度考虑这一类别的性质。

关键词：工业企业，经济体制结构，投资环境，投资决策，投资资源，投资吸引力，积分指标。

Annotation. *The article discusses various approaches to determining the investment attractiveness of an enterprise and proposes the author's interpretation of this concept as an economic category. It also discusses the theoretical issues of the influence of multidirectional factors that influence the dynamics of investment attractiveness in relation to enterprises of the domestic industry in modern economic conditions. The authors analyze the problems associated with assessing the investment attractiveness of enterprises and groups of enterprises and propose a classification of indicators of investment attractiveness. Consideration of the principles of selection of factors and indicators determining investment attractiveness allows the authors to justify the need to consider the nature of this category from the perspective of an investor.*

Keywords: *industrial enterprise, structure of the economic system, investment climate, investment decisions, investment resources, investment attractiveness, integral indicator.*

Introduction. Nowadays, the ways of improving the investment climate in Russia and increasing the investment attractiveness of the Russian economy is being much discussed. Of course, today the creation of a favorable investment climate in the Russian Federation and the attraction of investments in the real sector of the economy are a priority task, which can be accomplished only by properly managing the process of increasing the investment attractiveness of individual segments of the investment market.

To solve this problem, we need a toolkit that allows the effective and flexible structuring of the economic system, to monitor changes in the structure and development of the economic system as a whole. These trends determine the relevance of the problem of economic and industrial policy.

Attracting investments to the economy as never before is a key task in the current economic situation. There are a lot of interpretations of this economic category; researchers have been engaged in their description and grouping a lot in the past few years.

Nevertheless, the scientifically based definition of the term "investment attractiveness" and its classification are still the subject of scientific discussions, this definition is not an established terminological construction.

The issue of assessing and increasing the investment attractiveness of enterprises and organizations is reflected in the works of such scholars as Alexander G., Bailey J., Blank I.A., Vilensky A.A., Gitman J., Glazyev S.Yu., Jonk M., Kovalev V.V., Krushvits L., Livshits V.N., Mertens A.V., Perar J., Smolyak S.A., Fabozzi F., Fisher P., Sharp U., Sheremet V.V., Yasin E.G. and others. [1-3].

Various aspects of evaluating the investment attractiveness of enterprises are reflected in the works of Volodina I. N., Zholudeva E. G., Kaplina A. A., Korenkova A. V., Melnikova V. S., Mlyava S. G., Petukhova N. N. and others [4-11].

Study. Our analysis of scientific publications revealed several interpretations of the concept of "investment attractiveness" in relation to a specific investment object. In these studies, there is a fairly large number of interpretations of the essence of this concept, describing various aspects of this very important economic category.

Different authors have various points of view on this category. Here are some of them:

Endovitsky D.A. and Babushkin V.A. consider that the investment attractiveness of an enterprise is a set of interrelated characteristics of the economic potential, profitability of operations with assets and investment risk of an economic

entity that has a certain ability to sustainably develop a competitive environment and meets the assumption of continuity of activities [12, p. 158].

In the work of Volynskaya, O. A. investment attractiveness is defined as a set of financial and economic characteristics that allow to evaluate environmental factors, the level of enterprise positioning in the market, its competitiveness, and show how effectively to invest resources in the development of the enterprise. [13]

According to I. B. Maksimov, investment attractiveness is "a subjective assessment by an investor of a country, region or enterprise regarding the decision to invest their funds in a country, region or enterprise, respectively". [14]

According to T. Teplova's interpretation, investment attractiveness is a characteristic of an asset that takes into account the satisfaction of a particular investor's interest in terms of the "risk – return on invested capital – asset ownership horizon" correlation [15].

The investment attractiveness is also understood as a system or a combination of various objective signs, means and opportunities, which together determine the potential effective demand for investments in a country, region, industry, enterprise [16, p. 8].

The same idea is expressed by V. V. Allaverdyan, saying that "it is, above all, its ability to arouse a commercial or other interest from a real investor, including the ability of the enterprise to" take investments "and skillfully dispose it" [17].

In the opinion of M. Yu. Zhukov, "the investment attractiveness of an enterprise is the totality of the properties of a company, which predetermines its ability to function effectively and develop on the basis of the development of its own and attracted investment resources" [18].

In the work of Smirnova E.V., Zhukova M.Yu., a formula for calculating investment attractiveness as an integral coefficient was proposed , based on an analysis of investment attractiveness factors. [19]

In the work of N. Krasovskaya, it was proposed to use as an assessment:

- evaluation of innovation activity indicators;
- evaluation of the financial subsystem of the enterprise;
- evaluation of the production subsystem of the enterprise;
- evaluation of the personnel subsystem of the enterprise;
- evaluation of the marketing subsystem of the enterprise;
- evaluation of indicators of the information subsystem of the enterprise. [21]

From the above theoretical analysis it follows that investment attractiveness is a subjective concept, i.e., a generalizing characteristic of the advantages and disadvantages of investing individual enterprises from the point of view of a particular investor. A more detailed description is given in the work of Sokolnikova I. V.: "it is expedient to understand the investment attractiveness as the property of an enterprise as a socio-economic system, characterizing its potential ability to

ensure the inflow of investments" [20]. This definition, in our opinion, more adequately reflects the essence of investment attractiveness as an economic category and is the most acceptable in practical terms.

Since the real investment process is carried out in specific economic entities - enterprises, it is extremely important for potential investors to know the investment attractiveness of an enterprise, however, the concept of “investment attractiveness of an enterprise”, as well as the concept of “classification of enterprises according to investment attractiveness”, is not sufficiently covered in the scientific literature.

Therefore, from the side of the investment market, we propose the following definition: “The investment attractiveness of an enterprise is a system of factors characterizing an enterprise’s effective demand for investment.”

The above definitions of basic concepts provide the key to understanding the importance of assessing the investment attractiveness of an enterprise, because in any case, investors are faced with the problem of choosing as an investment object those enterprises that have the best development prospects and can provide the investor with the desired return on invested capital. Based on the understanding that investment attractiveness is an integral assessment, let us single out the factors that have no impact on it (Fig. 1).

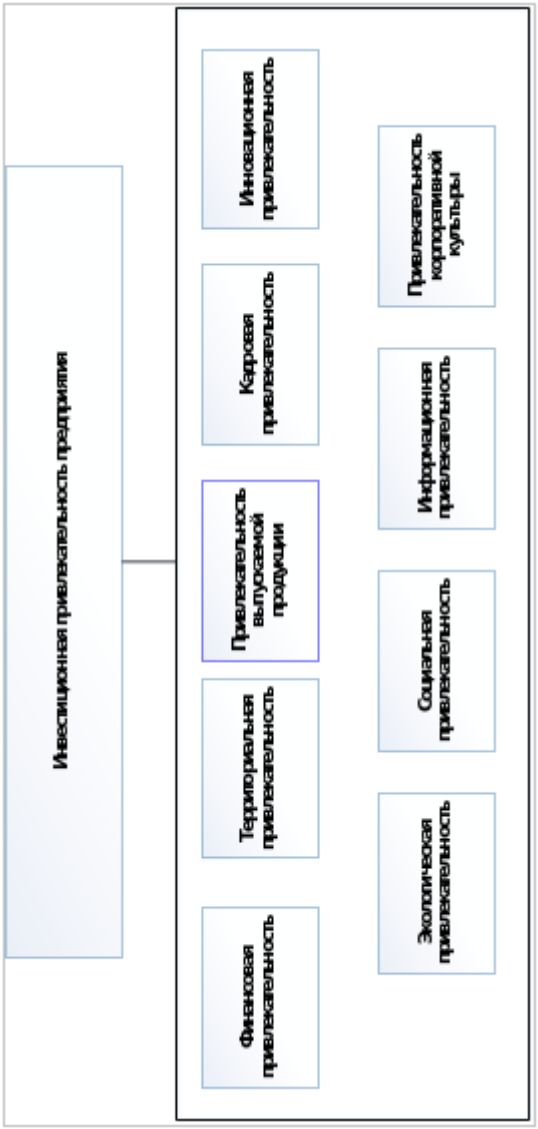

Figure 1. *Factors affecting the investment attractiveness of the enterprise*

Our studies have also shown that nowadays there is practically no classification for choosing a method for evaluating investment attractiveness depending on the goals of investors.

The subjects (participants) of the investment market interested in assessing investment attractiveness are:

• investors - creditors (investment funds, banks and other commercial organizations);

• recipients of investments - capital borrowers (enterprises of various ownership forms);

• investment promotion organizations (audit and consulting firms, insurance companies, etc.).

The objects of evaluation of investment attractiveness are the country, region of the country, industry and enterprise. It should be noted that most of the research on investment attractiveness of investment market objects is devoted to issues of investment attractiveness of the country, region and industry and to a lesser extent, to enterprises.

Currently, the most widespread are two approaches to assessing the investment attractiveness of an enterprise. When using the first approach, the position of the enterprise in the stock market, the exchange rate of its securities is assessed [4].

The second approach is based on the analysis of criteria for the investment attractiveness of an enterprise, the characteristics of its functioning, and financial indicators [5; 6; 7].

The main disadvantage of the first approach is the insufficient validity of the thesis on which it is based. The essence of this thesis is that the investment attractiveness of an enterprise is fully reflected in the dynamics of its securities rate, which is not always true even in conditions of highly developed western stock markets. For many methods based on the second approach, in addition to the general shortcomings noted in the analysis of methods for assessing the investment attractiveness of the industry, there are disadvantages associated with a weak analysis of the relationship between investment attractiveness and investment activity.

The first method is expert in nature and is based on a survey of representatives of various types of investors.

The second method is analytical and involves the processing of financial and economic information. The expert and analytical assessment methods have variations that correspond to various methods for assessing the investment attractiveness of investment market objects (for example, valuation based on market capitalization, analysis of financial and economic indicators, quality of corporate management and surveys of professional securities market participants).

However, these methods have several significant drawbacks. For example, the lack of an analytical assessment method is that a number of qualitative factors

characterizing the investment attractiveness of an enterprise, such as the technical level of production, demand for products, prospects for the industry, environmental situation, quality of corporate management, etc., cannot be obtained by calculation. The drawback of an expert assessment method can be attributed to the deliberate bias of experts, which can be reduced by applying complex special procedures for organizing and conducting an expert survey.

To assess the investment attractiveness of foreign investors, the concept developed by J. Dunning, which includes the analysis and evaluation of such components of investment attractiveness as comparison of the advantages of various companies in the country and the advantages of the national economy, the level of competition between investors, has become widespread; for countries with transition economies, "the Beri Index" method is often used, - a synthetic indicator developed by Business Environment Risk Intelligence SA, which is an average of 15 different criteria, individual components of investment attractiveness, determined by experts; the investment climate is constantly evaluated by well-known foreign consulting companies that annually publish "confidence indices" (CONFIDENCE INDEX). In Russia, the ratings published by Expert Magazine are best known for evaluating investment attractiveness.

Investments objectively determine the level of economic development of the enterprise, at the same time, investment attractiveness characterizes its condition.

In a broad sense, investment attractiveness is a combination of properties of an investee [22, 24, 25].

In a narrow sense, investment attractiveness is a combination of characteristics that allows an investor to determine the attractiveness of an object for investment.

Conclusions: the need of enterprises for investments as a source of financing is very high. Attracting an investor is impossible without a constant assessment and analysis of the investment attractiveness of the enterprise, which is a prerequisite for calculating the expected effectiveness of any investment in this object.

In our opinion, the proposed methods for assessing investment attractiveness should be used in combination with each other. On this basis, it is possible to use a qualimetric method based on the reduction of qualitative and quantitative factors to a single integral indicator using a point system [23, 26, 27].

The calculation of the integral index simplifies the procedure for assessing investment attractiveness. In addition, the integral indicator has such advantages as the complexity of accounting for all factors, dynamism and universality of application in any industry, it combines the assessment of both internal and external factors that have an impact on the activities of the enterprise.

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俄罗斯食品市场的模仿建模
IMITATION MODELLING OF THE RUSSIAN FOOD MARKET[1]

Belova Tatiana Nicolaevna
Doctor of Economic Sciences
professor of the Economic and Management Department
Academy of the Federal Penitentiary Service of Russia, Ryazan
Kupriyanova Marina Vladimirovna
Candidate of Economic Sciences, associate professor of the State, Municipal and Corporate Management Department
Ryazan State Radio Engineering University, Ryazan

摘要。 对食品进口的禁运导致了俄罗斯消费市场的深刻变革。 农业生产部门的各种增长率和进口减少导致消费者市场因饱和标准而分化。 此外，由于生活水平下降，俄罗斯食品市场的消费需求下降。 为了更好地分析复杂的情况，有必要使用模仿建模的方法。 本文提供了一个为家禽市场制定系统动力学模型的例子。 建模结果表明，获得市场均衡需要家禽出口的三倍增长。 作者建议将模仿模型用于食品市场的国家监管。

关键词：食品市场，模仿建模，系统动力学，经济政策，进口，出口，进口替代。

Summary. Embargo on food import has led to profound transformation of the Russian consumer market. Various growth rates in agricultural production sectors and the import reduction have resulted in consumer markets differentiation by criterion of saturation. Moreover, the Russian food market shows decline in consumer demand due to decreasing level of life. To better analyze the complicated situation it is necessary to use methods if imitation modelling. The article provides an example of working out a model of system dynamics for the poultry market. The results of modelling show that acquiring market equilibrium demands a triple growth of the poultry export. The authors suggest using the imitation model for the purpose of state regulation in the food market.

Key words: food markets, imitation modeling, system dynamics, economic policy, import, export, import substitution.

Introduction. The process of import substitution in agriculture has recently become

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a priority task of state regulation. Despite considerable financial state support, the situation in food markets reveals their profound differentiation by criteria of growth rates and levels of saturation with domestic products [1, 2, 3]. For instance, growth of domestic poultry production together with import reduction has led to saturation of the domestic market. The loss of the purchasing power strongly affects the consumer markets. At the same time it is obvious that the expected growth of real income will cause change of consumer preferences in favor of more valuable and expensive meat products, for example, beef. It will consequently transform the meat and meat products market structure, thus giving rise to risks of bankruptcy for poultry producers. It is therefore possible to achieve equilibrium in this specific market sector only in case of rapid export growth.

Mathematic modelling can serve an appropriate instrument for analyzing and forecasting such complicated, contradictory and interconnected problems in the food market. The contemporary range of scientific instruments includes a number of imitation models which are easy-to-use and provide a logical description of complex processes in economic systems.

Methodology of mathematic modelling in agriculture. Since the beginning of market transformation in Russia, there appeared a methodological shift from models of optimal planning to a different type of models based on the neoclassical paradigm in microeconomics. These include models of total equilibrium for agro production markets in developing countries. OECD and the World Bank introduced these models in publications since 1990: RUNS (Rural-Urban NorthSouth, Goldin and Knudsen) [4], MRT (Regional Trade MRT, Harrison), etc.

For the purpose of analyzing and forecasting agricultural state policy, OECD has proposed models of partial equilibrium, among which AGLINK is the most widely known. The model provides modules for developing countries including Russia: AGLINK-COSIMO (Commodity Situation Model) [5,6]. AGLINK-COSIMO is a recursive dynamic model of partial equilibrium that includes almost all countries of the world and world markets of all types of agricultural products[2]. The modelling results are equilibrium (world) prices for the main types of products.

Specific character of state regulation in the Russian agrarian economics requires different approaches to food markets modelling. It is necessary to take into account such factors as the necessity to increase agricultural production in order to ensure food security, to take into account the influence of custom protection, etc.

The above-mentioned approaches are different from the modern methods of system dynamic modelling. The latter make it possible to study the behavior of complex systems in the course of time and to understand how the component structure, direction and character of their interaction may influence the results and other characteristics of the system [7, 8]. For the purpose of the research, it is proposed to design a system dynamic model for a one-product poultry market in Russia.

[2]Resource: OECD publication with the description of the AGLINK-COSIMO model [13]

Poultry market analysis. The domestic poultry market has been demonstrating growth since approximately 2001. In 2008-2017 this process acquired characteristics of a permanent trend. According to the results of regression analysis, the annual average gain of production volume was 295.7 thousand tons (coefficient of reliable approximation 0.99). The success relied not only on the technological characteristics of the production sector but also on the state support [9]. Starting from 2006 this sector received 200 billion rubles of investments within the framework of the state national program "Development of the Agricultural Production Sector"[3].

The domestic production growth took place with simultaneous decrease of import. It declined annually by approximately 100.1 thousand tons (coefficient of reliable approximation 0.86). The total share of poultry import reduced from 35.6% in 2008 to 4.5% in 2017. In this period the production volume reached 4 941 thousand tons which was 2.2 times more than the volume of production in 2008. This output of poultry production of approximately 5 million tons may be considered (with a certain degree of probability) the point of saturation for the domestic market. The indicator of saturation is the slower pace of growth in consumer prices in 2016-2018 as compared to CPI[4]. The profit of poultry producers has become lower. The sector shows a decline in the amount of current assets and investments. Experts report that the average profitability of poultry farming was only 8% by the end of 2017 and the total financial loss caused by the falling prices was over 40 billion rubles[5].

For the producers the only way to cope with the complicated situation is to increase poultry export which is not an easy-to-implement strategy under the conditions of broken trade relations with several countries [9]. Russian export of agricultural products constitutes 5-6% of the total food export, one third of it being in grain export [3]. Meat and meat products export, mainly poultry export, does not exceed 1.6% of the exported food products. In 2017 poultry export was only 163.6 thousand tons.[6] The main buyers are Ukraine (31% of the total amount), Vietnam (28%), Kazakhstan, and Kirgizia. In 2018 it was expected that poultry export would increase up to 190 thousand tons[7]. However, judging by current reports of the Federal Customs Service, the expectations were too optimistic.

[3]Resource: URL: http://www.rps.ru/ (date of reference 30.12.2018).

[4]To keep liquidity at a sufficient level suppliers had to reduce prices. The Russian Association of Poultry Farming reported a 22% reduction of prices for eggs and a 13% reduction of poultry prices in the fourth quarter of 2017. The production cost of poultry products raised by approximately 20% in 2015-2017. Resource: URL: http://svetich.info/publikacii/zoovetsnab/kak-vystroit-yekonomiku-pticevodstva-i-s.html (date of reference 30.10.2018)

[5]Resource: URL: http://stat.customs.ru (date of reference 30.10.2018)

[6]In 2017 we imported poultry from Brazil at the price of 1.63 dollars per kilogram, from Belorussia – 1.54 dollars per kilogram.

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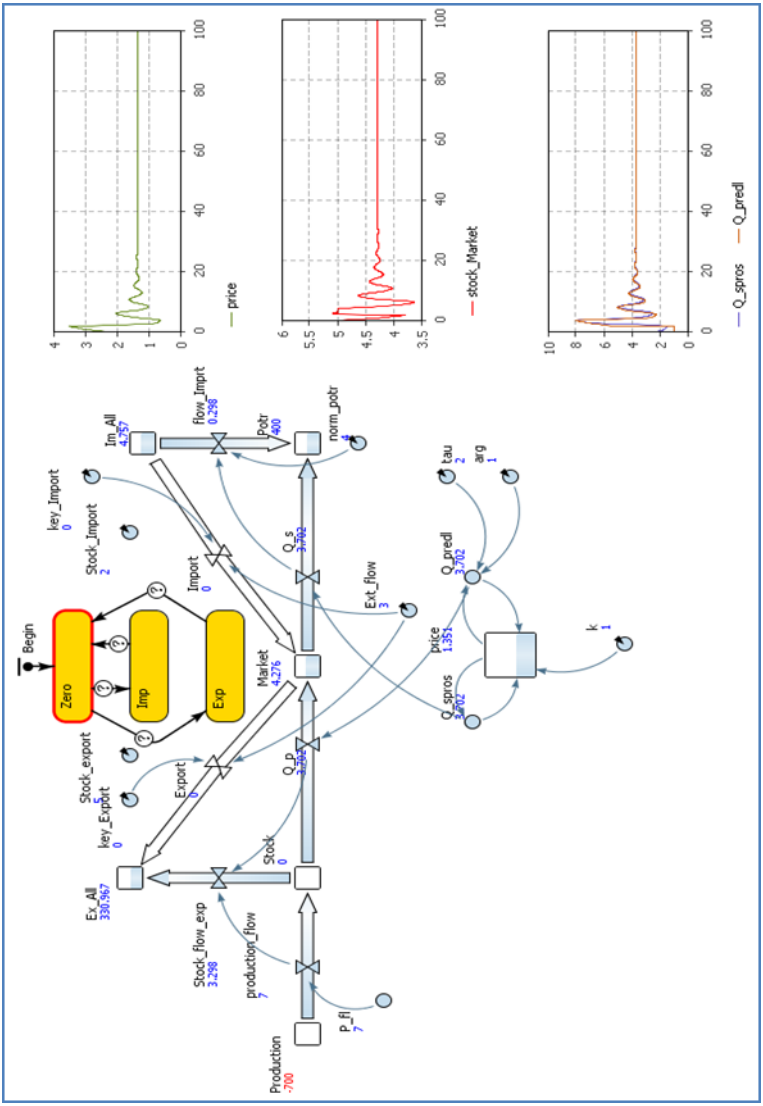

***Figure 1** – The general framework of the system dynamic model: poultry market*

Description of the system dynamic model for a one-product market. The key modules (blocks) of the model correspond to the elements and laws of market functioning. These are the basic conditions (demand and supply), market structure, behavior of suppliers, state policy, results [7, 8]. The model describes a one-product market (Figure 1).

The price dynamics reflects the market law of demand and supply. It is described by the general Evans model. The demand and supply curves are assumed known. Supply demonstrates a lag in response which is included as a model parameter (Module 1). The demand function is downward sloping and non-linear (Q_spros=β/price). The demand curve is constantly changing. There are numerous factors affecting the demand. These are availability of alternative goods, seasonality, price elasticity, income, etc. The supply curve is upward sloping, and yields power laws: (Q_predl=1+γ*pow(delay(price,tau),0.8).

Suppliers do not immediately respond to demand change. Therefore the supply function includes a parameter of delay. The price is estimated by the equation:

$$\frac{dprice}{dt} = k * (Q_{\_spros} - Q_{\_predl}).$$

The model includes production, inventory, market reserves, products (Module II). Supply in Module I consists of domestic production and import. Part of the accumulated amount of produced goods is transferred to inventory (reserves). Extra reserves (surpluses) form the flow of exported products.

Consumers are described in the model with rate of consumption of the target product (Module III). This affects consumer behavior and import parameters. Demand in Module I is related to consumption. The limited rate of consumption can vary in different scenarios. The gap between the volume of domestic production and the rate of consumption is compensated with import.

The model includes a regulator (instruments of state support). Its functions are management and support for the purpose of stabilizing the domestic market of suppliers and consumers of the target product (Module IV). The limits (parameters) are settled and changed as the model runs. The process dynamics is reflected with linear and non-linear functions acquired in the course of preliminary data consolidation. The model uses a "relay" instrument of control to regulate the market equilibrium. Four triggers are used for shifts between the statuses of the regulator. These are "to leave the market", "to increase/to decrease export/import". They are used if necessary to provide for stabilization of reserves and prices.

The results of modelling show that the maximum annual volume of the poultry market is 4.4 million tons. This level was totally covered by volumes of domestic production (4.9 million tons) in 2017. If there is a necessity to preserve the import level of 231.5 thousand tons (de facto), then the market equilibrium can be gained in case export is 1.3 million tons. However the poultry export actually was at the level of 163.6 thousand tons in 2017. The model took it as an assumption that the average consumption rate was 34 kilograms per year.

There is a possible scenario of rising income per capita. In this case the preferences will shift towards beef consumption. It is only due to surplus export that the domestic market can reach equilibrium. The model shows that the volume of production is also affected by the profitability rate of suppliers (the margin rate).

Thus the poultry market equilibrium is achieved under the conditions of rising export. In 2018 the export (mostly to EAEU countries) increased by 20% which is far from being sufficient. The main barriers for increasing export are prohibitions of the veterinary services caused by flue outbreaks, ruble stabilization, price and quality competition in the domestic markets of the importing countries, etc.

The above-given model of system dynamics has a potential for development. Adding factors and modules may improve the quality of the model. As a follow-up to this model, analogous models can be used to study other food markets.

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工业企业创新能力的构成结构分析
ANALYSIS OF THE COMPONENT STRUCTURE OF INNOVATIVE CAPACITY OF THE INDUSTRIAL ENTERPRISES

Tashenova Larissa Vladimirovna
Post-graduate student of the Peter the Great St. Petersburg Polytechnic University (St. Petersburg)
Researcher of the LLP «Rational Solutions» (Karaganda)
Master of Economic Sciences.
Babkin Aleksandr Vasilevich
Professor of the Higher School of Industrial Management and Economics of the Peter the Great St. Petersburg Polytechnic University (St. Petersburg)
Head of the Research Laboratory «Digital Economy of Industry»
Peter the Great St. Petersburg Polytechnic University
Doctor of Economics, Professor.

注解。 本文讨论了“企业创新潜力”概念的概念方法； 分析了基于研究来源的创新潜力的构成要素； 本文展示了作者的计划，描述了工业企业创新潜力的基本构成。

关键词：工业企业的创新潜力，创新可用性，智力潜力，研发，资源潜力，创新活动。

Annotation. *The article discusses conceptual approaches to the concept of "innovative potential of an enterprise"; the component composition of the innovation potential based on the studied sources was analyzed; the author's scheme, characterizes the elemental composition of the innovative potential of an industrial enterprise, was shown.*

Keywords: *innovative potential of an industrial enterprise, innovative availability, intellectual potential, R&D, resource potential, innovative activity.*

In the conditions of modern economic development, the transition of industrial enterprises to a qualitatively new level is defined as the determinant - innovative renewal associated with the process of innovative production, the advantage of which is the effective using of the material, technical, production and intellectual resources that constitute the innovative potential, the growth of which further

determines development of industrial enterprise, its competitive position on the markets, as well as production of the products with high added value.

In the literature, the concept of "innovation potential of an industrial enterprise" is given special attention, but, along with this, it should be noted, that there is no single, generally accepted definition of "innovation potential" as an economic category; the structure of the innovation potential has not been fully investigated.

The conceptual approaches to the essential characteristics of the concept of "innovative potential" are presented in Table 1.

Table 1. *Approaches to the definition of the concept of "innovative potential of the enterprise"*

Author	Definition
Zhic G.I.	Innovation potential is the maximum possible amount of economic resources that society can engage in the field of scientific and technological development of social production for a given amount of resource constraints and without reducing the size of final consumption.
Dan'ko M.	Innovative potential is the accumulated a certain amount of information about the results of scientific and technical work, inventions, design development, samples of new equipment and products.
Nikolayev A.I.	Innovation potential is a system of factors and conditions necessary for the implementation of the innovation process.
Kulagina N.A.	Innovation potential is a special cumulative state of the internal potentials of an enterprise (human, environmental, scientific, financial and investment, organizational and technical, marketing), which makes it possible to develop and successfully implementation the innovations in all areas of activity of a particular business entity, to make a choice of strategic development alternatives from the sustainability of the level of innovative development of the company / enterprise.
Shapovalova T.A.	Innovation potential is the degree of an organization's ability to implement innovation through its existing financial, material, technical and other resources necessary for its implementation.
Volkova G.L.	The innovative potential of an enterprise is a combination of three components: all types of resources, potential opportunities, and a scientific and creative component available to an enterprise that can be mobilized to achieve the goals of innovative development.
Korshunova Y.D., Il'icheva Y.S.	Innovation potential is the ability to develop based on the innovations in order to increase the competitiveness of functioning.
Matuzova I.V.	Innovation potential is a measure of the organization's readiness to innovate.

Author	Definition
Ustinova L.N., Ustinova A.Je.	The innovative potential of an enterprise is a synthesis of several types of intellectual, financial, managerial and technical resources, which together will provide an enterprise with the ability to create and implement innovations.
Mingaleva Zh.A.	The innovative potential of an industrial enterprise is a combination of various tangible and intangible characteristics of an enterprise, determining its potential for innovative activity.
Shubina N.V.	In a narrow sense, the innovative potential of an enterprise is a combination of the resources available to the enterprise, means, and opportunities for the using of innovations in production, financial, managerial and commercial activities in accordance with the innovative goals of its development. In a broad sense, the innovative potential of an enterprise, which most fully reflects its essence and most closely corresponds to the objectives of this study, refers to the interaction of the socio-economic system with subjects of the external and internal environment that arise at the macro level in the process of achieving the innovative goals of an enterprise embedded in its development strategy, subject to the availability of innovative opportunities that are created at the expense of other components of the potential.
Romanchin V.I.	The innovative potential of an enterprise is a measure of readiness to accomplish tasks that ensure the achievement of an established innovation goal, i.e. measure of readiness for the implementation of a project or program of innovative strategic changes.
Zhuravlev Ju.V., Kuksova I.V.	Under the innovative potential refers to the ability of the company to create new value by attracting all existing tangible and intangible assets with a view to its innovative development.
Note - compiled by the authors according to the sources [1-13].	

Today, the question, nevertheless, it is advisable to understand by the innovative potential of an industrial enterprise, given the capacity of the concept, remains open and not fully understood.

In our days, there are many variants of the structure of the innovative potential of an industrial enterprise, often, as a rule, contradicting each other; the border between the concept of “economic” and “innovative” potential of an industrial enterprise has not been clearly identified. It is important to note, that the innovation potential is not equivalent either in size, or in scale, or in its components to the economic potential.

Given the existing diversity in approaches to the structure of the innovative potential of an industrial enterprise, it is advisable to consider its component composition (Table 2).

Table 2. *The structure of the innovative potential of industrial enterprises*

Author	Structure
Stanislavik Y.V., Svinareva A.B.	*Material and technical potential* (potential of fixed assets, potential of working capital) + *intellectual potential* (potential of intangible assets, potential of marketing resources, potential of administrative resources, potential of labor resources).
Korshunova Y.D., Il'icheva Y.S.	*Product innovation potential* + *technological innovation potential*, including resource, organizational, managerial and functional units.
Kokurin D.I.	Resource + internal + productive components.
Matuzova I.V.	*Innovative availability* (technical equipment, personnel and intellectual security, financial equipment) + *innovative susceptibility* (organization's ability to develop and absorb innovations, employee readiness for innovation) + *organization of the innovation process* (organization of innovation activity, organization of innovation management) + *innovation performance* (performance and the effectiveness of the innovation process).
Babkin A.V.	*The aggregate financial* (part of R&D expenditures in sales, the number of licenses acquired, profitability indicators, etc.) + *personnel* (the number of scientific publications, the number of received scientific degrees, the level of staff development, etc.) + *organizational and managerial* (share of new equipment in the total, capital productivity, capital-labor ratio, etc.)+ *research / innovation* (R&D, the number of sold licenses, the number of research-experienced themes, etc.) + *production and technical* + *market* (part of the enterprise market in the industry, the cost of marketing research, the number of exported goods / services) + *information component* (the level of the enterprise informatization, the degree of protection of the information, the value of information, etc.).
Ustinova L.N., Ustinova A.Je.	*Intellectual potential* (research and development potential, which is formed based on the human potential) + *material and technical* (indicator of the share of intangible assets, indicator of distribution of personnel, etc.).
Lapteva Y.A.	*Human resources* (share of employees engaged in research and development; education level of senior and middle managers, etc.) + *financial potential* (own capital, share of expenditures on technological innovations) + *scientific and technical potential* (provision of intellectual property, efficiency of innovation, the share of costs for research and development) + *production and technological potential* (availability of fixed assets, development of new equipment, etc.) + *organizational and management potential* (enterprise scale, industry affiliation of the enterprise and others.) + i*nnovation activity factors* (the willingness of employees to innovate).
Mingaleva Zh.A.	The innovative potential of an industrial enterprise consists of ten main elements: 1) personnel; 2) material and technical; 3) informational; 4) organizational; 5) financial; 6) managerial; 7) legal; 8) social; 9) creative and 10) effective.
Kochetkov S.V.	Personnel + production + investment potentials.

Author	Structure
Skljar Y.N., Gracheva N.V.	The set of components: *the material resources of R&D and innovation activities* (total cost of the equipment; the cost of equipment necessary to perform R&D; the cost of technical re-equipment; the cost of fixed assets acquired by the enterprise during the year, etc.) + *personnel* (the share in the intellectual sphere the number of employees, the proportion of persons under the age of 35, the proportion of persons with high qualifications in the specialty and job profile, the proportion of persons with higher education in the special type of work, etc.) + *information* (a set of various types of scientific information and information on innovation and innovation activity, scientific and technical literature, literature on patents, inventions, new high-tech technologies, systems and equipment, computer systems, etc.) + *market* (the level of competitiveness of new products, availability of demand, necessary marketing measures) + *organizational and managerial* (organizational structure, technology of processes for all functions and projects, organizational culture) + *financial* (investment in R&D, intangible assets, sources of financing, financial availability and solvency).
Roshhina L.N.	Scientific and innovation potential are considered together in the framework of the following parameters: *science resources* (human resources, material and technical base, information resources, financial resources) + *results of research and development* (execution and implementation of research and development, scientific publications, technologies) + *resources of the innovation activity* (financial resources) + *results of the innovation activity* (production of innovative products, the impact on the performance of the enterprise).
Note - compiled by the authors according to the sources [14-23].	

Analyzing the table 2, it can be noted, that in the conditions when the innovative development of the economies of many countries is the leading direction of government activity, the innovative potential of an industrial enterprise is increasingly becoming a reflection of the phenomenon of innovation and the process of commercialization of products of intellectual labor.

The authors attempted to present the component composition of the innovative potential of an industrial enterprise, which is shown in Figure 1.

Analyzing the composition of the potential was presented in Figure 1, it should be noted, that, in our opinion, the innovative potential of an industrial enterprise should be understood as a set of material, financial, scientific, technological and management subpotentials, the realization of which is impossible without taking into account the intellectual subpotential. At the same time, it is important to note, that the innovation potential is realized within the framework of the information and communication subpotential represented by the information environment (including modern information resources, such as: the blockchain, BigData, etc.) within which an industrial enterprise functions and interacts with suppliers, consumers, contractors and with the internal structural divisions.

***Figure 1**. The composition of the innovative potential of industrial enterprises*

Note - developed by the authors

Thus, the existing discrepancies in the understanding of such a category as “innovative potential of an industrial enterprise” and its component composition make it possible to talk about the versatility and complexity of the studied economic phenomenon, which predetermines further directions in the research: in studying methods and developing tools for assessing innovative potential.

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土地地籍 – 土地关系管理的信息基础
LAND CADASTRE - INFORMATION BASIS FOR THE REGULATION OF LAND RELATIONS

Azimzoda Alimardon Shoimardon
Candidate of Juridical Sciences
Deputy Head of the Department of Agriculture and Environmental Protection of the Executive Office of the President of the Republic of Tajikistan

注解。 本文讨论了塔吉克斯坦共和国土地干部的概念和内容。 土地监管法律框架和土地干部监管法律法规存在的不足之处。 注意国家土地登记和新技术的实施。 有必要将土地国家地籍估价结果用于财政，土地使用规划和城市规划目的。 关于建立土地使用权的标题证明文件的土地立法规范存在法律冲突，建议根据共和国法律实施“塔吉克斯坦共和国土地法”的规范。 塔吉克斯坦“关于国家登记及其权利”。

关键词：土地地籍，立法，土地估价，国有土地登记，法律争议，土地使用权证明文件。

Annotation*. The article discusses the concept and content of the land cadaster in the Republic of Tajikistan. The legal framework for land cadaster regulation and the existing deficiencies in the regulatory legal acts governing the land cadaster. Attention is paid to the state land registration and the introduction of new technologies in their implementation. The necessity of using the results of the state cadastral valuation of land for fiscal, land use planning and urban planning purposes is indicated. There are legal collisions in the norms of land legislation regarding the establishment of a title certifying document for the right to use land and it is proposed to bring the norms of the Land Code of the Republic of Tajikistan in accordance with the Law of the Republic of Tajikistan "On State Registration and Rights to it".*

Keywords*: land cadastre, legislation, land valuation, registration of state lands, legal controversy, right certifying document on land use rights.*

Land cadastre is reliable information about the quantitative and qualitative state of land. These characteristics are obtained as a result of land surveying, geodesic, cartographic, geobotanical and soil works.

The modern concept of a land cadastre, both in Russia and in many countries of the world, is gradually drawing closer to the concept of a land information system supported by the state and intended to take into account physical, economic, legal and special documented information about single properties, as well as fiscal (taxation), legal (protection of property rights) and management purposes [1].

The land cadastre creates a legally significant information base, necessary for the protection of property rights and other land rights, for ensuring and developing land turnover (in particular, the land market), as well as for reliable data on the necessary state "interference" with respect to land ownership in order to ensure thereby realizing its "social function". In addition, this information base is an initial condition for state planning of land use and control over ensuring their rational use in the interests of the whole society in accordance with its needs [2].

In the Republic of Tajikistan, to determine the quantitative characteristics of land, state land registration is performed. In accordance with the legislation, state registration in the irrigated zone is carried out every 5 years, and in the rainfree zone - in 10 years. Since the accounting is carried out at the border of the administrative-territorial unit and there are mainly irrigated and rainfed lands in them, the aforementioned terms are practically not respected.

The legal basis of the land cadastre is the Land Code of the Republic of Tajikistan and other regulatory legal acts adopted in accordance with it.

In accordance with the provisions of the Land Code of the Republic of Tajikistan (Article 61), the purpose of the state land cadastre is to obtain reliable information about the natural, legal and economic status of the lands of the single state land cadastre [3].

The State Land Cadastre contains information about the land for the organization of its rational use and protection, regulation of land relations, justification of the amount of payment for land, land management, assessment of economic activity. It performs one of the management functions of the single state land fund of the republic. The rules of the land cadastre are established by the Government of the Republic of Tajikistan. These Rules are approved by the Resolution of the Government of the Republic of Tajikistan dated October 3, 2006 No. 447 [4].

In accordance with the Rules, the object of maintaining the state land cadastre is the single land fund of the Republic of Tajikistan, and the subject is information about the correct and rational use and protection of land, comprehensive study and assessment of natural properties, legal status and use of land, and streamlining of land relations.

Information on the legal status of land plots is reflected in the state cadastral book of land and contains data on objects and land uses, on the intended purpose of land plots, and the mode of their use. Amendments to the state land cadastre book are made on the basis of decisions of the relevant authorities on the provi-

sion or withdrawal of land for use after clarifying the boundaries of plots in kind, processing and issuing documents certifying the right to use the land plot [5].

In accordance with Art. 4 of the Federal Law of December 4, 2000 No. 28-ФЗ "On the State Land Cadastre" [6], the State Land Cadastre is created and maintained for information support purposes:

1) state and municipal land administration;
2) state control over the use and protection of land;
3) measures aimed at the preservation and improvement of land fertility;
4) state registration of rights to real estate and transactions with it;
5) land management;
6) economic valuation of land and accounting for their value;
7) establishing a reasonable payment for the land;
8) other activities related to the possession, use and disposal of land plots.

In almost all cases, the land cadastre serves as the basis for regulating land relations. It is impossible to make a withdrawal, submission, withdrawal and other actions without reliable information about the land plot, which can only be obtained by land cadastral works.

It is necessary to conduct a comprehensive study and analysis of the state of existing cadastral materials and the need for cadastral works, after which to plan, organize and carry out land cadastral work directly.

Accounting for the quantity and quality of land is carried out in accordance with the instructions, instructions and regulations that are developed and approved by the state body for land management of the republic.

The authorized state authority on regulation of land relations with the purpose of maintaining the state land cadastre developed the Instruction of the state land registration, the Instruction for land registration of cities and towns and the Instruction of land registration of settlements.

Despite the fact that these regulatory legal acts were adopted relatively recently, they cannot fully meet the requirements of today. The reasons why regulatory legal acts do not correspond to today's realities can be divided, as it were, into internal and external. Internal causes are flaws in the normative legal acts themselves. Moreover, we have in mind the existing legal gaps and conflicts in both a single regulatory legal act and between them.

An external factor in the inconsistency of regulatory legal acts with today's realities is their "moral aging". It no longer depends on the regulatory legal acts governing the state cadastre of lands, but on the adoption of other regulatory legal acts that are implemented in practice. These include the Law of the Republic of Tajikistan "On Registration of Real Estate and Rights to It" [6], as well as other regulatory legal acts adopted in accordance with it.

It should be noted that, in contrast to the legislation of the Russian Federation,

which provides for mandatory cadastral works in the process of selecting a land plot, the legislation of the Republic of Tajikistan does not provide for special cadastral works when granting land plots for construction. When granting land plots for construction during the selection of a land plot, in order to determine its characteristics, materials from previously conducted state land registration are used.

Land accounting is carried out by two subordinate design organizations (Tajik-Giprozem and Fazo design institutes) of the State Committee on Land Management and Geodesy of the Republic of Tajikistan mainly due to the state (republican) budget, and it is almost impossible to carry out cadastral works in the above terms insufficient funding.

Land accounting in settlements is carried out in rural settlements, towns and cities, in general, since 2005, and earlier (even in times of the Union) cadastral work in settlements has not been carried out. Until the beginning of the 90s of the last century, the cities did not have a land management service and the architectural service was involved in the allocation of land.

Cartographic materials are one of the main sources of the state land cadastre to obtain accurate information about the location and boundaries of the land plot, land use, types of land category and area. After the collapse of the Union, aerial photographs, on the basis of which photographic plates and cartographic materials were prepared, were not produced in the republic. It should be noted that since 2008 a new technology for preparing digital maps has been introduced at the Design and Research Institute "Fazo". The essence of the new technology lies in the processing of satellite images of the photogrammetric station and linking them to the coordinate system. For this purpose, a satellite geodetic network of I and II classes has been created in the Republic of Tatarstan in the ITRF - 2005 (unclassified) coordinate system. Today, thanks to this technology on an area of more than 40 thousand square kilometers. (1/3 of the territory of Tajikistan), mainly in the part where the intensity of cadastral works is higher, orthophotoplans (cartographic material) are prepared, which will be used in the state cadastre of land and registration of real estate. It should be noted that at the time of the Union, cartographic materials were prepared in the coordinate system Pulkovo - 42 and - 63, but it was impossible to use them to all consumers because of the “Secret” stamp.

An open coordinate system makes it possible to determine the boundaries of land plots (characteristic points) and indicate their coordinates. At present, when granting land plots in title documents and title documents, the boundaries of land plots being allocated are described by coordinates.

We consider it necessary for the completeness and accuracy of information, in order to turn and register land plots and other real estate, to complete state registration of land in populated areas, especially in cities, as soon as possible. In the conditions of the Republic of Tajikistan, due to the fact that land is the exclusive

property of the state, it is impossible to refuse to conduct state accounting at the expense of the state budget by state organizations for land management, especially since there are qualified specialists in stock. The materials of the state registration of settlements can also be used in various sectors of the national economy, especially in terms of real estate taxation, since previously there was no state registration of this category of land, therefore there is no reliable information on this issue. In our opinion, only at the expense of taxation in the shortest possible time can the cost of state accounting be paid off.

The authorized state authority of the Republic of Tatarstan on regulation of land relations makes cadastral assessments of lands, as a result of which the weighted average price of one hectare is determined for each land user. It should be noted that the results of cadastral valuation of land are practically not used for taxation, for the allocation (placement and construction of various facilities, structures) of land and other land management and urban planning. Then, when approving the results of the state cadastral valuation of land for farms of districts by a decree of the Government of the Republic of Tajikistan, the relevant ministries and departments are obliged to use the results of the state cadastre of land valuation for relevant purposes.

According to Clause 4, Article 79 of the Land Code of the Russian Federation, agricultural land whose cadastral value significantly exceeds the average cadastral value for a municipal area (urban district) may be included in the list of lands that are not allowed for other purposes in accordance with the legislation of the constituent entities of the Russian Federation.

By analogy with this, it is proposed to introduce a norm into the land legislation of the Republic of Tajikistan in order to prevent the reduction of valuable agricultural land. For the implementation of this norm, it is necessary to use data from the state cadastre of land valuation for land management.

One of the components of the land cadastre is its registration. In accordance with the Law of the Republic of Tajikistan "On State Registration of Immovable Property and Rights to It", the authorized body for state registration of immovable property and the right to it is the State Committee for Land Management and Geodesy of the Republic of Tajikistan.

In accordance with Art. 8 of the aforementioned Law of the Republic of Tajikistan "On state registration and rights to it", state registration of a right, restriction (encumbrance) of a right to immovable property is a legal action on recognition and confirmation by the state of the occurrence, transfer, termination of a right, restriction (encumbrance) of a right to immovable property.

In accordance with the Law of the Republic of Tajikistan "On State Registration of Immovable Property and Rights to It", the certifying document of the occurrence of the right to use a land plot was a certificate for the right to use land

and a certificate for registration of immovable property. The legislator at the same time proposed two credentials. Under the existing legislation, the land user for the right to use a land plot should have received both a certificate for the right to use land and a certificate for registration of real estate. This procedure instead of simplifying increased the amount of land users' work on obtaining a certification document.

In this regard, it should be noted that this issue was fairly resolved by the legislation of the Russian Federation (Article 14 of the Federal Law of the Russian Federation of July 21, 1997 "On State Registration of Rights to Immovable Property and Transactions with It"), in accordance with which the emergence and transfer of rights to land plots are certified by state registration certificate. The certificate is issued to the copyright holder (when registering any real right to land); the tenant (when registering the right to rent); mortgagee (when registering a mortgage) [8].

The author has repeatedly made a proposal to leave in the legislation of the Republic of Tajikistan as a right-certifying document - a certificate for the right to use real estate (including the right to use a land plot), and to exclude a certificate for the right to use land from the legislation; Moreover, land users who previously had a certificate can use it to obtain a certificate of registration of real estate.

It is fair to say that on January 5, 2018, the Law of the Republic of Tajikistan "On state registration of immovable property and rights to it" was amended, according to which the right of certifying document is a certificate of registration of the right to immovable property. But since, in accordance with Article 17 of the Land Code of the Republic of Tajikistan, the right of land use is certified by a certificate for the right to use land, there is still a legal conflict in land legislation. In this connection, it is proposed to bring the norms of the Land Code of the Republic of Tajikistan and other regulatory legal acts in terms of the right-certifying document in accordance with the norm of the Law of the Republic of Tajikistan "On state registration of immovable property and rights to it".

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REQUIREMENTS FOR THE DEVELOPMENT OF A MULTIFUNCTIONAL EDUCATIONAL TECHNOLOGICAL COMPLEX TO CONTROL THE LEVEL OF KNOWLEDGE OF STUDENTS AND TRAINING HIGHLY QUALIFIED SPECIALISTS

Baranov Yevgeny Fedorovich
Candidate of Technical Sciences, Senior Lecturer
Lazareva Larisa Yuryevna
Candidate of Technical Sciences, Leading Specialist
Institute of International Standards of Accounting and Management
Larin Sergey Nikolaevich
Candidate of Technical Sciences, *Leading Research Officer*
Central Economics and Mathematics Institute
Russian Academy of Sciences
Moscow, Russia

注解。该文章描述了形成多功能教育技术综合体（METC）的有条不紊的方法。它基于使用各种方法对教育学科的学科领域模型的描述。统一建模语言（UML）以UML图的形式和谐地结合了结构和对象建模方法的优点，被用作域的建模的可能方法工具。领域模型允许我们用一系列属性来说明概念类的词汇表，这些属性是为了反映实习知识控制系统（TKCS）的要求而形成的。此方法允许您创建面向对象的可扩展模块的包作为METC的一部分。同时，对于这些模块中的每一个，都可以描述TKCS的功能性能和形成测试任务基础的技术特征。

关键词：高素质专家培训，培训，知识水平控制，多功能教育技术综合体，软件知识水平控制系统。

Annotation. *The article describes a methodical approach to the formation of a multifunctional educational technological complex (METC). It is based on the description of the subject area models of educational disciplines using various methods. The Unified Modeling Language (UML), which harmoniously combines the advantages of structural and object modeling methods in the form of UML diagrams, was used as a possible methodological tool for modeling the domain. The domain models allowed us to illustrate a glossary of conceptual classes with a list of attributes, which was formed to reflect the requirements for the trainee knowledge control systems (TKCS). This approach allows you to create packages of object-oriented extensible modules as part of METC. At the same time, for each*

of these modules, it becomes possible to describe the functional capabilities of the TKCS and the technological features of the formation of the base of test tasks.

***Keywords**: training of highly qualified specialists, training, knowledge level control, multifunctional educational technological complex, software knowledge level control systems.*

Introduction

In the modern development of the system of higher professional education, special importance is attached to the improvement of knowledge control techniques. The active introduction of informatization tools by educational institutions has provided the prerequisites for the creation and use of special software and hardware tools to control students' knowledge at all stages of the educational process. It is known that the best is the continuous monitoring of the knowledge gained and the identification of gaps in each student. This work is very laborious, it takes a significant portion of time from students and teachers. To solve this problem, you can use automated knowledge control systems. However, in order not to turn testing into a simple learning of facts, the tests themselves must have advanced functionality that allows computer specialists to easily create many tests of various types [1].

Main part

The multifunctional educational technological complex (METC) developed by the staff of Institute of International Standards of Accounting and Management, which includes the trainee knowledge control systems (TKCS), falls into the category of complex automated software systems. Experience in developing such systems using advanced technologies of the software industry has shown that an object-oriented approach is appropriate, which provides the iteration and flexibility of the development process, allowing you to perform a gradual increase in the functionality of the system [7].

The object-oriented approach is based on object decomposition, applied to the stage of analysis, this means the separation of a complex software system into objects and entities of the subject domain [7]. One of the first and key stages in creating TKCS was the construction of a visual domain model, reflecting those parts of the educational process for which the system is being built to automate. The requirements of an object-oriented approach are met by a methodology implemented on the basis of the Unified Modeling Language (UML) [2, 4]. A UML model (UML model) is a collection of a finite set of language constructs, the main ones of which are entities and relationships between them. For convenience of review, entities in UML can be divided into four types: structural (object, class, interface, component, etc.); behavioral (state, action, activity, use case); grouping (package - a group of model elements); annotational (note - description of all other components not included in the first three types).

Therefore, at the stage of analysis, an identification was made of the essence of the basic concepts of the domain, which were then presented as a domain model. The most important were the following concepts: a database of system users; the event log; test model; job generation module; student profile; test specification; test.

The domain model made it possible to illustrate a glossary of conceptual classes with a list of attributes that was formed to reflect the requirements for TKCS. When creating a domain model, conceptual classes were considered in terms of symbolic description and content; for this purpose, definitions, words and images representing separate classes of concepts were used. Identification of conceptual classes took place in a way that combines several strategies:

- the use of a categorical list of terms, objects and concepts of technology control and assessment of knowledge;

- the selection of nouns as a result of linguistic analysis of previously created detailed descriptions of precedents [6].

Due to the need to describe some elements of TKCS regardless of the existence of specific instances of these objects, as well as to eliminate duplication of information, several classes of specifications were introduced into the domain model, including the test specification for a group of students. In the process of developing a domain model, relations (associations) between conceptual classes that meet the information requirements of the developed scenarios were identified, and those that contribute to a better understanding of the model were identified [3].

The construction of domain charts yielded the following results:

- functional-oriented representation of the system, defining internal and external communication;

- object-oriented representation of TKCS;

- list of software interfaces that regulate the interaction of subsystems.

TKCS, which are part of the METC modules, are developed on the basis of elements of new information and educational technologies. They allow you to fully simulate the examination situation and provide all the features of a traditional exam with the following properties:

1) the test system with each new appeal to her examiner forms an examination card, which, according to the law of random sampling, includes a specified number of test tasks;

2) the tasks included by the test system in the examination ticket from the base of test tasks for each subject of the discipline, ensure the objectivity of the control of knowledge on all educational material;

3) significantly reduces the time spent on the exam for each examinee;

4) the protocol with the results of the exam can be protected from falsification by a special software and hardware procedure - “password of the methodologist-organizer (examiner)”;

5) the use of the law of random sampling in the formation of a ticket from the base of test tasks makes the preparation of cheat sheets meaningless;

6) the exam mode and the exam preparation mode can have the same computer screens, which, while providing the same psychological conditions for the examiner, reduces the stress component of the exam for him;

7) the inclusion in the examination card of open test tasks allows, if necessary, to conduct an additional interview, and with less time-consuming compared with the traditional academic form [5].

Each TKCS is a standalone software product that is implemented on standard tools in the Windows environment. The system provides the organization of knowledge control in three modes:

1) self-control on any of the topics of the chosen discipline;

2) interim control (offset) on a separate subject of the discipline;

3) final control (exam) for the entire educational material of the discipline.

In the regimes of midterm and final control before it is held, a procedure for registering the student is provided, and after the test - recording the results of the control, which, in addition to statistics, include the texts of the test tasks offered in the ticket and selected answers. To protect the results of the monitoring, the following possibilities are provided:

1) creating an electronic copy of the protocol of control results on the key of the methodologist-organizer (examiner);

2) access to this electronic copy with printing only by the key of the administrator of the educational process.

Each TKCS includes the Test Constructor (CT), which provides for the creation of a Test Task Base (TTB) for each topic of the academic discipline and allows you to cover a wide range of types of test tasks using the following 5 basic algorithms for their formation:

Type 1 - alternative test questions / tasks involving answers like YES or NO;

Type 2 - test questions / tasks, offering to complete a text phrase by selecting the correct option from the list (up to 9 options);

3 type - test questions / tasks, implying the choice of one or several variants of the correct answer from the suggested list of answers (up to 9 variants);

4 type - test items, offering to fill in the missing words or groups of words in the test phrase, selecting these words from the list (up to 9 variants);

Type 5 is an open task that requires a written response in a free form of presentation [4].

The first 4 types of test items can be used in the organization of the midterm control or self-control, and the final knowledge control - exam or test. The 5th type of test items is more expedient to use only for the exam.

The CT and TKCS interface is quite simple and does not require special

knowledge and skills when using the program. This allows you to create a TTB and organize all types of control independently to any teacher with minimal computer training.

Processing test results is quite a difficult task and requires the use of a special mathematical apparatus of mathematical modeling (Rush, Birnbaum, and others models [8, 9]). For the practical use of the programs of these models and analysis of the results obtained, test data must be placed in the test data bank (TDB), which is an important part of the entire METC information system. The data bank includes an automated computer-aided testing system, a data processing program for testing according to the G. Rush model, and an information storage system and issuing data processing results.

The METC information system includes a set of TDB, a program shell of the system interface, a data conversion program, a set of queries and reports for convenient presentation and output of data. TDB of the METC information system is automatically created and populated (corrected) using automatic data conversion (conversion) procedures. They contain information about the content of test tasks, extended test results, logits of difficulty of tasks and other information on data processing in G. Rush's model [9].

The main feature of the TDB information system METC is the fact that the basis of the data structure here is a test task. For each test task is the process of accumulating information. Requests are also mainly aimed at sampling data for individual test tasks. Thus, the main goal of the information system is the gradual accumulation of test tasks and the assessment of their effectiveness and difficulty. This information enables the gradual creation of truly effective and objective tests.

The software shell of the system interface is an integrated system that includes a set of windows / forms for issuing data and messages, a set of control elements and a system for automatically checking the integrity and consistency of data from various related databases. Data conversion procedures are created for automatic filling and possible correction of databases. Data on test tasks, test results, test data processing results are selected by the user and read from files and databases of computer-aided computer testing and data processing systems by G. Rush model [9]. The processing of this data, the creation and filling of databases is performed in a semi-automatic version, in which the user can pause and adjust the process. Conversion programs allow you to store and use test tasks of three types - text, RTF format files (without associated objects in separate files), HTML files.

Query and report programs are designed to conveniently present the results of the information system. Queries are designed in SQL and allow you to select and sort data according to various criteria. The total number of requests is several dozen and is constantly increasing as a result of the creation of new requests. This system is in the process of development and is being upgraded if necessary. In

the process of creating and operating the METC information system, the process of accumulating experience in data presentation and processing is underway. The developed METC information system is gradually being filled with data and currently contains several hundreds of test tasks for various disciplines and different complexity.

Conclusion

The requirements for forming a multifunctional educational technological complex for controlling the level of students' knowledge and training highly qualified specialists described in the article are successfully implemented in the Institute of International Standards of Accounting and Management to develop adapted test programs in a number of leading educational disciplines. As a result of this work, most of the modules of these disciplines included in METC are filled with tests of various complexity implemented in special software products that allow you to quickly track the level of students' knowledge and to train highly qualified specialists on this basis.

Thanks

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现代教学测试和技术作为一种有条理的设备模块化学习技术和电子学习资源，用于组织控制学生的知识水平

MODERN PEDAGOGICAL TESTS AND TECHNOLOGIES AS A METHODICAL APPARATUS MODULAR LEARNING TECHNOLOGIES AND E-LEARNING RESOURCES FOR THE ORGANIZATION OF CONTROL OF THE LEVEL OF KNOWLEDGE OF STUDENTS

Larin Sergey Nikolaevich
Candidate of Technical Sciences, *Leading Research Officer*
Gerasimova Lyudmila Ivanovna
Lead Engineer
Gerasimova Elena Vladimirovna
Researcher
Central Economics and Mathematics Institute, Russian Academy of Sciences
Moscow, Russia

注解。 本文的主要目的是证明使用测试和测试技术来控制学生的知识水平。选择现代方法分析测试方法和数学方法的基本概念，以评估测试形成期间教学结构的教学测量的准确性特征作为研究方法。 建立了教学测试发展的教学要求的组成。 简要回顾了国外和我国用于控制学生知识水平的现代软件测试技术。

关键词：教育过程，信息化，知识水平，控制，技术测试。

Annotation*. The main purpose of this article is to justify the use of tests and testing technologies to control the level of knowledge of students. An analysis of modern approaches to the basic concepts of testing methodology and mathematical methods for assessing the accuracy characteristics of pedagogical measurements of didactic constructs during test formation were chosen as the research method. The composition of didactic requirements for the development of pedagogical tests is established. A brief review of modern software testing technologies used abroad and in our country to control the level of students' knowledge is given.*

Keywords*: educational process, informatization, level of knowledge, control, technology testing.*

Introduction

Since the beginning of the practice of teaching certain kinds of vocational training in the life of society, it has become necessary to assess and control the level of knowledge of students. Since then, the practice of learning has been transformed into modern national education systems, in which the problem of assessing and controlling the level of knowledge of students is solved in various ways. Expansion of informatization in the field of education and the development of the knowledge economy contributed to the rapid growth of information, as well as a fundamental change in the organization of the educational process. Indeed, without the introduction of modern pedagogical technologies (MPT) as part of modular learning technologies (MLT) and electronic educational resources (EER), students can no longer receive new professional competencies, knowledge and skills to meet the qualification requirements of a particular profession [6]. In modern conditions, this circumstance has further increased the relevance of the problem of assessing and controlling the level of knowledge of students.

As pedagogical practice shows, objective control of the level of knowledge of students can be ensured throughout the entire period of their educational training at the university only on the basis of expanding the practice of using MLT and EER as part of MPT. This circumstance leads to the need to develop and implement new forms, methods, tools and information systems to control the level of knowledge of students during the educational process [4]. One of the most technologically advanced forms of knowledge control today is the technology of testing students. They ensure the effectiveness of all types of control, allow systematically monitoring the level of knowledge of students, and also promptly identify inconsistencies of their professional competencies with the qualification requirements of specific educational disciplines [6, 7].

This article will discuss the practical features of using the basic concepts of testing methodology and software testing technologies when organizing students' knowledge level control based on MLT and EER as part of MPT.

Main part

1. Pedagogical tests: definition, main characteristics, approaches to their measurement

The rapid growth in the scale of informatization of the educational sphere and the transition of the organization of the educational process to the use of MLT and EER as part of MPT make it possible to consider pedagogical tests as an effective tool for objective measurement and control of the level of knowledge of students. It should be noted that at the moment most of the scientists and qualified teachers have not come to a common understanding of the concept of “pedagogical test”. In order to avoid the ambiguity of the definition of the concept we are exploring, we will try to systematize the approaches to its understanding.

The term "test" came to us from English - test, which can be translated as "test" or "test." In modern scientific research, the definition of this term is given a different semantic content. However, practically in each of them there are several basic features that allow to correctly identify this term. These features include the following:

1) a set of tasks, formed by increasing complexity;

2) tools for measuring and controlling the level of knowledge of students;

3) the possibility of forming a system of tests for the effective assessment of the level of knowledge of students in the process of their learning [8].

Given this set of features, the interpretation of the notion “pedagogical test” was most accurately revealed in the works of V.S. Avanesova [1]. He presented the “pedagogical test” as a system of interrelated and increasing in complexity tasks, allowing with a high degree of reliability and validity to assess and control the level of knowledge of students during the educational process. This allows us to consider the concept of "pedagogical test" as an ordered system in some way designed to control the level of knowledge of students and combines different sets of different tasks for functional purposes.

The results of pedagogical tests are formed after measurements using well-known mathematical methods. The use of these methods predetermines the need to match the results obtained with the standard accuracy characteristics of measurement procedures. In particular, a qualitative pedagogical test should correspond to the main characteristics of the accuracy of measurement procedures, namely, reliability, validity, and efficiency [6, 7].

The value of the reliability of the pedagogical test can be defined as the ratio of the correct and incorrect answers of students to the test tasks. The reliability of the test, in fact, reflects the accuracy of the measurements and the stability of the results obtained to the effects of random factors. In practice, this means that if there are insignificant changes in the test tasks and the level of students' knowledge during testing, the results will change slightly.

To calculate the values of the reliability of the pedagogical test, the coefficient of the test reliability (K_H) is used, which is determined using the Küder-Richardson formula. Typically, the values of the coefficient of reliability K_H range from 0.69 to 0.99. At the same time, a larger value of this coefficient means high reliability of the test. Improving the reliability of the test can be obtained by increasing the number of tasks included in it.

The validity of the test is a characteristic of the full, comprehensive and proportional representation of the didactic content of the studied educational discipline. Its essence is that a highly qualified teacher who is fluent in MPT, is able to set goals and specific tasks to control the level of knowledge of students [6, 7] should participate in the process of test development. Only in this case, the devel-

oped tests can be an effective tool for monitoring the level of knowledge of students. Without specifying the validity of the test can not be considered a reliable tool for measuring the level of knowledge of students. The validity of the test is considered high if the correlation coefficient (linear, rank, etc.) of correct answers and the total number of tasks varies from 0.3 to 0.8.

Thus, the validity of the test, in fact, characterizes its effectiveness. However, it is necessary to take into account the fact that the value of validity is almost never constant. It depends on the conditions of testing, the level of knowledge of the contingent of students, their ability to apply the learned amount of knowledge in the future. That is why, in one case, a specific test will be considered a high value, and in the other - just useless. The validity of the test allows you to interpret its results regarding the goal of controlling the level of knowledge.

Another important characteristic of tests is their effectiveness. This characteristic refers to the number of measurable and is determined by the ratio of the magnitude of the effect itself to the magnitude of the costs necessary to achieve it. Also to assess the effectiveness of the test often use its differentiating ability. This indicator is considered to be higher if, in the process of using a specific test, there are significant differences between the total points scored by the trainees. As an indicator of the differentiating ability of the test, you can apply a dispersion. Then, of the two tests in the same educational discipline for the same contingent of students, the one with the larger variance will be more effective.

Expand the concept of differentiated effectiveness of the test. As you know, no test can be effective throughout the entire training period for trainees. The effectiveness of the test in each case is determined by the didactic knowledge content, for which the set of test assignments fully corresponds to the level of complexity. Therefore, each specific test can be effective for one level of knowledge and not be such for another level of knowledge. Therefore, for objective control of students' knowledge it is necessary to form a system of effective tests, each of which will be the best tool for measuring the level of knowledge of students at certain stages of their training.

In order to use pedagogical tests as effective tools for objective measurement and control of the level of knowledge of trainees in organizing the educational process based on the use of MLT and EER as part of MPT, they must meet a number of basic didactic requirements. The following didactic requirements for test content are among the most significant:

1) compliance with the goals of controlling the level of knowledge of students;

2) the presence of a comprehensive and systematic representation of tasks;

3) the relationship between the content and forms of assignments;

4) unambiguous determination of the level of knowledge of students;

5) compliance with the current level of development of a particular field of science [7].

2. Modern testing technologies and their application to control the level of knowledge of students

The modern theory of testing is considered to be the theory of IRT (Item Response Theory), which was developed in the late 80s of the XX century [5]. On the basis of its key positions in modern pedagogy, there is an active development of new information technologies to solve the problem of objective control of the level of knowledge of students. Mathematical models of the theory of IRT became the basis for the formation of algorithms and test items designed to control the level of knowledge of students. At the same time, a variety of software was actively developed. The results obtained made it possible to widely use the capabilities of personal computers (PCs) and information technologies for testing trainees. The combined use of the methodological apparatus of traditional and IRT theories made it possible to use information technology testing to control the level of knowledge of students and ensured an increase in the quality of pedagogical measurements in the educational process.

Abroad, as a means of advanced pedagogical experience, various testing technologies developed by Assessment Systems Corporation (ASC), which today is considered to be the worldwide recognized leader in the creation of information testing technologies, are widely used to control the level of students' knowledge. In particular, this corporation developed such well-known programs for testing the level of knowledge of students, such as ASCAL, ConQuest, LOGIMO, MSP, PARELLA, Quest, RASCH, RASCAL, XCALIBRE, as well as a number of others [5]. Separate testing programs of the ASC Corporation, such as MieroCAT and CAT, provide practical implementation of adaptive varying algorithms with variable pitch, and also allow the generation of adaptive tests to control the level of knowledge of students [9].

In our country, the most well-known software testing technology is the VeralTest package, which is able to work in local networks [3]. This technology has the necessary functionality, which is presented in three software modules - for the formation of tests, for managing the testing process itself, as well as for its administration in various sections. With the help of technology VeralTest teacher can independently develop adaptive tests, the tasks of which do not go beyond the level of knowledge of a particular student, measured on the basis of certain didactic constructs. Opportunities for this are provided by the presence of a bank of tasks that are relevant to the measured area of didactic constructs. In addition, tasks in the tests can be ranked by level of complexity.

In order to control the level of knowledge of trainees in our country, the software testing technology SunRav TestOfficePro is widely used, which is included in the Unified Register of Russian Programs [2]. In this testing technology, three functionalities are also implemented: for developing tests, for testing students, for

analyzing test results. The SunRav TestOfficePro testing technology successfully functions both in local networks and on individual computers (without connecting to the network). At the same time, it provides opportunities for testing using flash drives and / or compact discs without the need to install it on a server or a hard disk of a computer.

The indisputable advantage of using software testing technologies in comparison with traditional means of controlling the level of students' knowledge is the ability to process large information arrays of variants of test tasks and their formation on the basis of a random sample of numerous combinations. The results of the use of software testing technologies in pedagogical practice clearly show the level of knowledge of the students and the quality of their professional competence assimilation [6].

Conclusion

In the course of the research the following results were obtained:

1) the rapid growth of informatization of the education sector has led to the need for qualitative changes in the organization of the educational process and the introduction of modern educational technologies;

2) objective control of the level of knowledge of students has become an integral function of the organization and management of the modern educational process;

3) in terms of using MLT and EER as part of MPT, pedagogical tests can be used as effective tools for objectively controlling the level of knowledge of students;

4) concretized the modern concept of "pedagogical test";

5) the essence of the main characteristics of the accuracy of measurement procedures is disclosed and the composition of didactic requirements for the formation of pedagogical tests is determined;

6) to organize the control of the level of knowledge of students, modern software testing technologies should have the necessary functionality.

Conducting a systematic monitoring of the level of knowledge of students using software testing technologies helps to improve the management of the educational process. At the same time, the test results are not only visual and informative, but also easily transformed into concrete assessments of the level of knowledge of the students.

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学校法制教育：理论方面

LEGAL EDUCATION IN SCHOOL: THEORETICAL ASPECT

Nechaev Mikhail Petrovich
Doctor of Pedagogical Sciences, Associate Professor
Head of the Department
Academy of Social Management
Kunitsyna Svetlana Mikhailovna
Candidate of Pedagogical Sciences, Associate Professor
Academy of Social Management

注解。 本文作者考虑了普通教育组织中法律教育组织的问题； 从狭义和广义上给出法律教育的定义； 说明法律教育的目的和目标； 确定一些有利于有效法律教育的条件。

关键词：法学教育； 目的，普通教育组织的法律教育任务； 法律教育； 法律教育的内容。

Annotation. *The authors of the article consider the problems of the organization of legal education in a general educational organization; give a definition of legal education in the narrow and broad sense; indicate the purpose and objectives of legal education; identify a number of conditions conducive to effective legal education.*

Keywords*: legal education; purpose, tasks of legal education in a general education organization; legal education; content of legal education.*

Currently, the Russian Federation is actively working on the formation of the rule of law. This is not only a goal, but also a means of solving many of the tasks facing Russian society in the 21st century. Creating conditions for the legal protection of every citizen of the Russian Federation is one of these main tasks.

Our state needs the formation of a new approach to legal education, because not a single legal relation is implemented in practice if it does not have an appropriate socio-psychological basis in the mind of the individual. The formation of a legal democratic state is possible only if the level of the legal culture of its citizens increases, the ideals of law are formed in the public consciousness, and the attitude to the law as the universal value of society. To achieve these goals is only possible with the help of effective mechanisms of education.

The theory of legal education has recently been developing more and more actively in pedagogical science. Its various aspects are reflected in the works of E.V. Agranovskaya, P.P. Baranova, A.B. Vengerova, N.V. Vitruka, V.I. Goiman, N.L. Granat, V.P. Kazimirchuk, D.A. Kerimov, N.M. Keizerova, B.A. Kistyakovsky, V.N. Kudryavtseva, E.V. Kuznetsova, E.A. Lukasheva, N.I. Matuzova, A.V. Mickiewicz, B.C. Nersesyants, V.V. Oskamytnij, M.F. Orzykh, T.N. Radko, A.R. Ratinova, I.F. Ryabko, V.P. Salnikova, L.P. Semitko, E.N. Trubetskoy, I.E. Farber, B.N. Chicherina, V.A. Shegortsova, L.S. Yavicha. The development of the foundations of the organization and management of legal education is devoted to the work of such scholars as V.V. Golovchenko, G.A. Golubeva, B.C. Kaptar, S.N. Kozhevnikova, A.A. Pogoradze, V.P. Fedorina, O.R. Shapieva.

Despite the fact that scholars consider the most diverse aspects of legal education, many of them agree that the formation of students' legal conscience means the creation of conditions under which they have a positive attitude to the law, the authority of the law as an immutable social value increases, stable orientation to lawful behavior, attitudes and habits of law-abiding, skills and abilities to participate in justice and other forms of legal activity are formed, and also ATM is created the scope of the protest and intolerance to all cases of violations of the law, the inevitability of punishment.

The formation of legal culture and law-abiding human behavior occurs in school. Legal education of students is one of the priorities in the educational system of the educational institution.

Legal education can be viewed in a broad and narrow sense.

Legal education in a broad sense is the socialization of a person, his education in the environment as a whole (the practice and behavior of people, officials - representatives of the state apparatus in the legal sphere).

Legal education in the narrow sense is aimed at improving the legal culture of a person, a group of people, and society as a whole.

Considering the legal education of the individual (narrow meaning), it is impossible not to touch upon such a thing as legal culture. The structural elements of the legal culture of an individual include: knowledge of the system of basic legal regulations, understanding of the principles of law, deep internal respect for law, laws, law and order, conviction in the need to comply with legal requirements, active life position in the legal sphere, ability to realize legal knowledge in the process legitimate socially active behavior. Raising legal culture and law-abiding behavior of students is a goal-oriented system of measures that forms the principles of citizenship, respect for and observance of the law, civilized methods of resolving disputes, and the prevention of offenses. Legal education in the conditions of a general educational organization is defined as a systematic, controlled, organized, systematic process of influencing the mind, psychology of children by

a set of diverse legal education forms, means and methods, **with the aim** of forming deep and stable legal knowledge, beliefs, needs, values in the legal consciousness of children, habits of lawful behavior.

Among the main tasks of legal education are the following:

- the formation of a high legal culture that includes all elements of legal awareness and legal behavior. The implementation of this task involves the development of sustainable, solid social qualities of the individual and social responsibilities;
- mastering students with the necessary legal knowledge;
- development of skills and abilities, conscious desire for legitimate behavior and independent legal assessment of reality;
- approval in the minds of a young citizen of the Russian Federation of views and beliefs that ensure high respect for the laws of the state, intolerance for offenders;
- promoting the manifestation of high legal activity, creative participation in the application of the law and their improvement, the protection of the rule of law.

Legal education has two components: legal education and the involvement of students in practical legal activities.

Legal education includes teaching and informing schoolchildren about the basics of law. Involvement in practical legal activity has the goal of practicing and applying the knowledge gained in practice.

Legal education should contribute to the formation of a specific legal conceptual apparatus of thinking, through which the selection, classification and processing of incoming legal information. The formation of such a conceptual apparatus is one of the most important tasks of legal education of students of the school; only with its help can one develop the ability to independently, correctly and consciously assimilate legal knowledge. The ability to correctly and consciously perceive legal information and the phenomena of legal reality is a necessary condition for both legal education and legal education of an individual [1,4,6].

The content of legal education of minors includes the study of legal documents, as well as different branches of law, familiarity with which is most important for students entering independent life. This is administrative, labor, family and criminal legislation. It is on their content that the meaning and significance of constitutional principles and provisions should be disclosed.

In addition, there are a number of bylaws, familiarity with which is mandatory, for example, the school charter.

Addressing the problems of the organization of legal education in school, it is necessary to identify a number of conditions that contribute to the effectiveness of this process.

1. Organizing educational work on the law, it is necessary to create a positive emotional attitude among students to law enforcement.

2. Each pupil in the process of legal education should show an active position, initiative, independence. It is this attitude that contributes to a deeper understanding and assimilation of legal norms by students, sharpens a sense of responsibility, strengthens communication with the team.

3. Any educational event is rightly necessary at the end to analyze. This optimizes the process of formation of the legal consciousness of students.

4. The focus of activities on the maintenance of discipline and law and order among minors, its implementation with the mandatory participation, control and guidance from adults.

5. Pedagogical position of the teacher. The effectiveness of the legal education of students depends largely on the purposeful and systematic work of teachers to improve their own legal culture.

Legal education in school should take into account a number of principles to which we refer: the presence of a systematic and differentiated approach to pupils; increasing students' interest in acquiring legal knowledge; the connection of legal information with facts from the daily life of students, their training in the conscious evaluation of their actions; ensuring the conscious assimilation of legal knowledge; accounting psychological and age characteristics of students.

Among the forms and methods of legal education are the following; class hours, lessons, electives; lectures, workshops, conferences, forums; legal essays; social projects, actions; legal project competitions; tours; legal interactive conversations, discussion conversations; discussion of books and articles, which allows not only to replenish the stock of legal knowledge, but also to form their attitude towards them; use of cinema and television materials; meeting evenings and theme nights; evening of questions and answers; disputes, the subject of which are important moral and legal issues; trainings on the topic of law, morals; visual agitation (thematic stands, clippings of newspaper and magazine articles, special literature, video and audio recordings); legal corner (includes information on the rights and duties of schoolchildren, phone numbers of services where students can find themselves in difficult life situations); publication of manuals, booklets and leaflets on legal topics; holding competitions of drawings, posters, essays, etc. on legal topics; Prevention Council (assisting students with behavioral and learning problems, monitoring the upbringing of children in asocial families); meetings with prosecutors, passport office, consumer rights specialists, etc .; week, decade, month of law; school law olympiads; the work of the circles “Young Lawyer”, “Young Friends of the Police”, etc .; self-education activities; individual work, etc. [2,3, 6].

Organization of legal education in school is necessary, since a theoretical and practical resolution of legal problems allows raising the prestige of law and instilling respect for the law among students, creating conditions for the development of their civic and legal activity, organizing the study of law at all levels of education, forming the foundations of the legal culture of an individual .

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回顾问题分析十二至二十世纪辛比尔斯克省历史条件下的成人教育再培训
RETROSPECTIVE ANALYSIS OF THE PROBLEM OF PEDAGOGICAL RETRAINING OF ADULTS IN HISTORICAL CONDITIONS OF THE XIX-XX CENTURIES OF THE SYMBIRSK PROVINCE

Biriukov Andrei Alekseevich
Postgraduate
Ulyanovsk State Pedagogical University named after I.N. Ulyanov
Plotnikov Dmitry Yur'yevich
Postgraduate
Ulyanovsk State Pedagogical University named after I.N. Ulyanov

注解。 本文分析了辛比尔斯克省现有的十九世纪和二十世纪教育系统的教师培训，寻找改善教育培训和教育系统人员再培训的历史，教学，公共事实。 突出了突出的启蒙者，为该地区教育发展做出贡献的知识分子，新公立学校，高等公立学校，体育馆的名称。

关键词：公共教育，高等教育形成，高学历人民的奉献精神，伟大的启蒙者。

Annotation. *The article analyzes the training of teachers for the existing education system of the nineteenth and twentieth centuries in Simbirsk province, the search for historical, pedagogical, public facts of improving pedagogical training and retraining of personnel for the education system. The names of prominent enlighteners, intellectuals who contributed to the development of education in the region, the opening of new public schools, high-level public schools, gymnasiums are highlighted.*

Keywords: *public education, the formation of advanced teaching, the dedication of highly educated countrymen, the great enlighteners.*

Introduction

The great Russian historian N.M. Karamzin, creating "The History of the Russian State", wrote on December 7, 1815: "There are three kinds of history: the first is modern, for example, Fukididovs, where an obvious witness talks about incidents; the second, like Tacitov, is based on fresh verbal legends at a time close to the actions described; the third is extracted only from monuments, like ours until the very eighteenth century... The third genus is the most limited for talent:

one cannot add a single trait to the known; cannot ask the dead; we say that our contemporaries passed us; we are silent if they keep silent ... to represent only what has been preserved from centuries in the annals, in the archives" [2, p. 36].

B.O. Klyuchevsky believes that "Defining the tasks and directions of our activities, each of us must be at least a little historian in order to become a consciously and conscientiously acting citizen. The human person, human society and the nature of the country - these are the three main historical forces that build a human society" [3, p. 21].

These views of great scientists contributed to our appeal to the analysis of education in its historical development. **That is the purpose of our work.** We consider the educational process against the background of economic development, politics, that is, as the ratio of the part and the whole, the general and the unit.

Relevance of the work. In this regard, only against the background of general education, we can consider the processes of additional education of adults, the processes of advanced training and retraining, that is, the development of new knowledge in our field. acquiring new skills and abilities, necessary competencies (universal-UC, general professional - GC, professional - PC). Therefore, a retrospective analysis of education will allow us to isolate the problem we are looking for, to understand its pedagogical nature and importance, to highlight difficulties, difficulties, mistakes, as well as perspectives and patterns.

The main content of the work. Pursuing a retrospective analysis of the desired problem, we studied documents on the development of education in the Simbirsk province of Russia of the 19th and 20th centuries as a typical, developed province, acquainted with archival documents, scientific, literary and historical works of our countrymen. We became acquainted with the memories of compatriots about the work of the great enlighteners of the Volga region and, in general, the Russian state, who made a great contribution to the development of public schools. In Russia, since 1869, the post of inspector of public schools was established. The first inspector and director of public schools of schools of the Simbirsk province became I.N. Ulyanov. He did a lot of work to strengthen the network of public schools in the province. When it was closed, 164 small and formally existing only documented schools opened 250 new schools. On January 1, 1886, public schools in the province became 427. Among the figures who had a noticeable influence on the school setting in the Simbirsk province are also V.N. Nadgoreva, a landowner from retired military, a magistrate and a member of the College Council; N.A. Yazykov, Chairman of the Simbirsk School Council on the Regulation of 1864, L.V. Persianinov, as well as Archpriest A.I. Baratynsky. Archbishop of Buinsky district, Simbirsk province A.I. Baratynsky was an ardent supporter of "clerical" education - a strong connection between primary school and the church. It was under him that the principles of Orthodox pedagogy reached their apogee. Ilya

Nikolaevich Ulyanov as an inspector of public schools in the Simbirsk province, getting acquainted with the activities of primary public schools, with the work of teachers, made many changes to the teaching methods, taught on the spot how to conduct classes with students. In fact, **he was engaged in improving the teaching skills that teachers had.** According to I.N. Ulyanov, training in district schools of Simbirsk province lagged behind life, was conducted according to the old method, kept on cramming and harassing students. Characteristic of these institutions were the inhumane relationship between teachers and students, physical and mental violence, punishment with rods; low pedagogical and methodical training of teachers, their culture, unwillingness to work in the field of education. The anti-human relations between the participants in the educational process were complemented by the same heartlessness to the problems of teaching and, in general, to institutions of general education on the part of the ruling circles. At the same time, history witnessed the germs of attention to the education system of Simbirsk: the nobility and merchants open up their own funds of various types and types of educational institutions, contribute to their material and technical equipment, and support the poor. In the 70s, half of all schools were transformed into two-year and three-year city schools. The formation of advanced teaching is due to the dedication of highly educated countrymen. Since 1872 new advanced schools have been opened in Simbirsk province with the aim of delivering children of all classes of primary education. The course was six years old. “The opening of these advanced schools, giving a complete lower education, was regarded as a very important success of the public education of the province, as a response to the very essential needs of society” [1, p.33].

In the early 70s of the 19th century, under the pressure of the public, the government allowed the authorities to open higher level institutions in rural areas. These were elementary schools of advanced type - two-class model schools. Such schools opened only 7 in the period from 1874 to 1882 due to lack of funds. «Ulyanovtsy» graduates of pedagogical courses in Simbirsk and Poretskaya teacher’s seminary worked as teachers in them. On January 1, 1886, by the end of the activity of I.N. Ulyanova, in 7 model schools enrolled 489 children, including 75 girls. In 1891, there were already 27 model schools, in 1900 - 59, in 1904 - 111. Well-organized, they, like model schools in cities, more promoted the progressive development of primary public education in Simbirsk province and met with support and respect from side of the local peasant population.

Simbirsk province was a multinational province. The percentage of non-Russian peoples living in it was significant. Mordovians, Chuvashs, Mari and Tatars, the indigenous inhabitants of the region, at the beginning of the XVIII century made up 70% of the total population. At the end of this century, their number, due to an increase in the Russian people, was reduced to 30%. As of literacy, non-Rus-

sian peoples were at an even lower stage of development than the Russian people. In the 60s of the 19th century, many of the volosts of the Simbirsk province with the Chuvash and Mordovian population had no schools at all. I.N. Ulyanov - a staunch supporter of teaching non-Russian children in their native language in the development of public education among the Chuvash, Mordovians and Tatars of the Simbirsk province did a lot. **I.N. Ulyanov influenced the content of education, and the teaching methods, improving it, and the training and retraining of teachers.** On the initiative of I.N. Ulyanov Chuvash schools were opened in Simbirsk (November 15, 1871), in the village of Hodyari, Kurmyshsky district (December 6, 1870), in the village of Koshki, Buinsky district (October 11, 1871), in many other schools and villages of the province.

A special place in the development of education in Simbirsk province is occupied by the "miraculously arisen" **Chuvash school of high-school student I.Ya. Yakovlev**. On January 1, 1898, there were 168 boys and 63 girls. **I.YA. Yakovlev developed a more progressive system of education, covering all aspects of the activities of the public school:**

- organization and management of the educational process in a bilingual primary school;
- training of teachers for rural schools;
- adult education;
- a new system of leadership of the Chuvash school.

To the most important aspects of the pedagogical system I.Ya. Yakovlev includes four years of education in elementary "foreign" schools, the implementation of the process of education and training in the first two classes in the native language; compulsory study of the Russian language in all classes, the native language being the subject of study during the entire course of study, the combination of training with difficulty in the workshops, on the agricultural farm and school district. I.Ya. Yakovlev established a certain sequence in the study of languages: native and Russian in the first year of study were not studied simultaneously, as was Ilminsky's, but consistently - first native, and then Russian, which corresponds to the didactic requirements of pedagogy. I. YA. Yakovlev developed and implemented three types of a four-year bilingual school in the system of education of national minorities. **The rules of 1906 legalized the pedagogical system of I.Ya. Yakovlev and subsequently improved were extended to the Caucasus, Kazan, Orenburg, Odessa, West Siberian school districts and other areas with non-Russian population. The basis of the development of school affairs among the Chuvash population was an experimental-demonstration school,** opened with the help and with personal funds of the great educator of the Chuvash people - I.Ya. Yakovlev in October 1871.

In 1905, M.F. Superansky, analyzing the state of education in the province,

wrote: “Recently, our provincial zemstvo has abandoned its previous view, in which concern for public education is a matter of county zemstvos exclusively and, having embarked on the path of cultural impact on the life of the population, recognized (January 13 1905) the need for their participation in the expansion of public access to education; our school should generally embark on a new path, since our entire political system is currently changing: the legal state is replacing the police state ”[8, p. 6].

Thus, from the 70s of the 18th century to 1917, the elementary schools of the Simbirsk province went a long and difficult path of development. Primary public schools, both in the cities and in the countryside, were opened, built and maintained mainly with funds from the urban and rural population itself. According to their departmental affiliation and organization of educational work, folk schools were of different types. Not only the Russian Orthodox school, but also the national school created by the representatives of the peoples inhabiting the Simbirsk region developed successfully. The best of them were rightfully considered to be primary national, urban and rural exemplary, parochial schools and advanced schools, which were properly organized, had good results of training and education of students and enjoyed the confidence of the population.

Not for long there were folk schools; educational reform took place on November 5, 1804, when Emperor Alexander I approved the new statute of educational institutions on the opening of universities, gymnasiums and district schools. According to this charter, there must be a gymnasium in every provincial city. In Simbirsk, the Simbirsk male gymnasium (existing to our time as the general educational institution Municipal Grammar school № 1 named after V. I. Lenin) and the Mariinsky female gymnasium (existing to our time as the general educational institution Mariinsky gymnasium) was opened

Studies of our contemporaries in terms of the work of the Simbirsk gymnasiums show that some teachers of the gymnasium were authors of textbooks, and many students and graduates of gymnasiums became prominent scientists, cultural figures, and social movements. Each of them, without the presence of state regulatory documents on the improvement of education and retraining of teachers, contributed to the development of education and education in the region. P.L. Martynov, analyzing a galaxy of great graduates of the first Simbirsk male classical gymnasium, wrote: “From the students of the Simbirsk gymnasium, the father and son of Minaev and in a later time (1867) writer Dmitry Nikolaevich Sadovnikov acquired loud fame” [5, p.161].

In 1874 - 1883 here studied A.I. Ulyanov, awarded a gold medal at the end of the course; in 1879-1887 V.I. Ulyanov (Lenin), who graduated from the gymnasium with a gold medal.

Conclusion.

Completing a retrospective analysis of the development of education in Simbirsk province, we can say that we did not find official data on additional pedagogical education of teachers, educators, school leaders in the 19th - early 20th centuries and their retraining. But analyzing on the whole the development of education in the region, the reorganization of small, outdated schools, the creation of a large number of new schools, the birth and development of primary national, urban and rural exemplary schools, parish schools and advanced schools that were properly organized, had good learning outcomes and education of students and enjoyed the confidence of the population - this development took place in an evolutionary way, with the participation of the best educators of the Simbirsk region and the country. Without the official status of institutions of additional education for adults, teaching pedagogical work and the profession of a teacher, improving their skills, knowledge, methods went on constantly. This is indicated by those particles of experience, which we narrated in this part of the study.

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楚瓦什共和国的旗舰大学
FLAGSHIP UNIVERSITY OF THE CHUVASH REPUBLIC

Pupyshev Igor Vasilyevich
Postgraduate student at Department of national history named A.V. Arsentyeva,
The I.N. Ulyanov Chuvash State University
Sokolova Larisa Yuryevna
Senior lecturer at Department of philosophy, sociology and pedagogy,
The I.N. Ulyanov Chuvash State University

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抽象。文章分析了楚瓦什共和国境内基础大学的创建问题。调查了高等教育机构面临的目的和任务。研究了大学在现代社会转型过程中的贡献。考虑了对基础大学的要求。描述了从州获得的基本大学的特权。给出了楚瓦什州立大学活动的特点。在与权力和商业互动的基础上，推动了大学分工的形式和不足。提供了以楚瓦什州立大学为例实施大学使命的选择。研究表明，大学可以是区域的社会经济发展，在管理和监管模式的结构中，通过专家社区的形成，通过管理机制隐含表达。
关键词：基础大学;楚瓦什共和国;楚瓦什州立大学。

Abstract. *In article the problem of creation of the basic university in the territory of the Chuvash Republic is analyzed. The purposes and tasks facing higher educational institutions are investigated. The contribution of the universities in processes of transformation of modern society is studied. The demands made to the basic universities are considered. The privileges provided to the basic universities from the state are described. The characteristic of activity of Chuvash state University is given. The formality and inexpediency of division of the universities on the basis of interaction with the power and business is reasoned. The option of implementation of a mission of the university on the example of the Chuvash state university is offered. It is shown that the university can be the social and economic development of the region which is implicitly expressed by the mechanism of management by means of formation of expert community in structure of model of its management and regulation.*
Keywords: *basic university; Chuvash Republic; Chuvash state university.*

In modern society, the role of science and education is increasing, and not only in the field of technical and technological processes, but also in the sociocultural space of human existence, questions are raised that reflect the role of interaction between various spheres of human activity. Extensive research on the contribution of universities in the transformation of modern society leads to an ambiguous assessment of their activities in society, where we meet fundamental social transformations. There are changes in the relationship between the university and society, in the university space are emerging new values [6, p. 157].

A university education is usually a process of cognition, the hallmark of other forms of higher education and the side of the process is the integration of learning and research. Against the background of social transformation, in the functions of the university, systematic training of an active specialist possessing professional competences is combined with the assimilation of the general culture and the development of his personal qualities demanded by society [2, p. 1102].

The main activities of the university, reflecting its essence and being its methodological basis, are considered the integrity of higher education and basic scientific research, compliance and improvement of educational, as well as scientific traditions, educational and scientific base, the implementation of scientific and pedagogical schools. The main qualitative result of university education is the production of knowledge, and not their reproduction as in elementary school.

The priority tasks of universities are to provide the state with highly qualified personnel, enhance the competitiveness of Russian fundamental science, education, economics, as well as access the world markets for educational and information services, technologies and scientific developments.

Regional state universities are turning into educational and scientific diversified innovation and cultural centers of the Russian Federation in the localities. They have the potential to create self-regulatory, university associations (associations, unions). The object of our scientific research is the supporting university of the Chuvash Republic. As a subject of study, we are interested in the problem of creating a support university in the territory of Chuvashia. The study was conducted in The I.N. Ulyanov Chuvash State University, which formally does not have the status of a reference, but has all the characteristics of supporting universities. The purpose of the work is to identify and assess the links of the supporting university with the activities of Chuvash State University. To achieve this goal, we will consider the features of higher educational institutions that have the status of supporting universities, and also establish the signs of Chuvash State University, confirming that they belong to supporting universities [4, p. 85.].

In 2013, the government of the Russian Federation adopted a resolution on the organization of a new type of higher education institutions, which should be called reference universities. The idea of creating support universities became a logical

continuation of the higher education development initiative when solutions of innovative complex socio-economic tasks were integrated with the construction of a certain social institution model responsible for training highly qualified personnel on the principle of equal interaction between science and business, and state management of social life.

The pivotal university is a promising university in the region responsible for resolving issues of regional socio-economic development by providing the local labor market with highly qualified personnel within the fulfillment of its role of rebuilding and increasing human capital.

Due to the emergence in the educational space of the Russian Federation of the idea of supporting universities in the region, the problem of a social and philosophical analysis of the interaction between the university and society becomes relevant. We believe that the very idea of supporting universities appeared because of the need to regulate social development against the background of globalization and social transformations.

Supporting universities are aimed at the implementation of not only the socio-economic and other technical tasks of staffing the region's human resources, but also the education of the spiritual and moral content of human capital. Within the base university, a personality type must be formed, reflecting the originality of regional and national Russian culture.

It follows from the foregoing that the most important task of the university is to provide social reproduction institutions with intellectual, social and human resources capable of creating and realizing the potential of the economic, political, social and spiritual spheres of the region. Its main goal, connected with the idea of a supporting university, is to transform the university space into a factor of innovative prosperity of the region as a whole [6, p. 161-171].

There are certain requirements for a supporting university. The first one concerns the number of students studying. According to the established standards, at least ten thousand students should study at the institution. The second requirement concerns the income of the establishment, which must be at least two billion rubles. In addition, higher education institutions located in Moscow and St. Petersburg cannot participate in the qualifying competition.

There are also a number of privileges granted to supporting universities from the state:

1. The increase in the number of budget places. At the same time, an increase in budget places is envisaged exclusively for training in graduate and postgraduate studies.

2. Obtaining government subsidies for the implementation of research projects within the university and the region.

3. Funding from the state to improve the technical support of the institution.

In 2016, the Ministry of Education and Science of the Russian Federation selected eleven such universities. In 2017, the number of supporting universities increased to 22. Support universities were divided into two groups:

1. The first group consisted of higher education institutions that received funding from the state budget of the country.

2. The second group included educational institutions funding regional budgets [7].

The idea of creating support universities is justified by the need for effective management of the regions and is supported by the state. Currently, the idea is not covered by all regions, since there is a certain "bar" for universities claiming to be a reference. In our opinion, such a formal approach weakens the implementation of the idea of supporting universities, because virtually every region has universities that are responsible for the development of the region.

To substantiate the above idea of the need for state support of universities, we propose to consider the main tasks facing and being solved in the university space of The I.N. Ulyanov Chuvash State University, formally not having the status of base university [6, p. 171-172].

From the very beginning of its existence, Chuvash State University was considered as a complex university association, having in its composition the classical university specialties of the humanities, natural sciences, medical profile, as well as engineering, information and energy areas.

By the beginning of the XXI century. Chuvash State University in the course of purposeful work has become a center of education, science and culture of the Chuvash Republic. It has become possible to implement in practice the system of continuous education and implement large innovative projects and programs - from research to the transfer of products and technologies to education, industry and the social sphere, and the efficiency of using intellectual, material, information resources has increased. In the end, the university has become one of the largest multidisciplinary universities in the region.

At the turn of the XXI century, the university is actively developing and conducts systematic work in almost all areas: infrastructure, educational and scientific activities have improved; material and technical, educational and laboratory, as well as social and household base has increased [4, p. 97-98].

Today, Chuvash State University plays a key role at the republican level. It brings together more than 50% of students in the region, contributes to the implementation of key programs for the socio-economic development of the country: it takes part in programs for the development of electrical engineering, chemical and engineering clusters, training, and scientific support. In addition, the university participates in the implementation of the "Program for the perspective development of the republic's power industry". Therefore, Chuvash State University solves important integration problems for the development of the region.

At present, the university is considered to be the largest research center uniting about 1,000 teachers, 127 doctors and 526 candidates of science, most of whom are doctors and candidates of science of the republic. The basic departments of the Chuvash State University are available in JSC "ChPO named after V.I. Chapaev", JSC Elara", PJSC "Khimprom", Concern "Tractor Plants", enterprises of electrical engineering cluster.

Thus, the integration task of an associative association of organizations belonging to various structures and departments is carried out, and new opportunities for creating internal sources of development, for example, cooperation between departments, faculties, institutes and organizations, appear.

Chuvash State University is also the largest educational (pedagogical) center. It includes the Scientific Library, Center-Internet, the department of intellectual property, the department of international relations, the research department, 18 research laboratories, 14 student design bureaus, the center for working with gifted youth, the center for youth innovation creativity, the center for collective use of scientific equipment, 140 teaching and research laboratories, a university clinic, sports camps, 6 museums and other social and cultural facilities. Consequently, the university creates all the conditions for the formation and improvement of the most important qualities of a person [1, p. 40].

Within the strategic goal, Chuvash State University implements the following tasks:

- the construction of university research schools in the sociocultural space of the republic in organizing effective cooperation between the scientific, industrial, managerial and business communities;

- targeting the professorial and pedagogical staff of the university to the realization of the educational and methodological tasks of the unified educational and information space of the Chuvash Republic to develop and substantiate the value orientations of the educational sphere from the point of view of modern pedagogical axiology;

- the creation of a corporate culture of the university, showing the degree of its high reputation and image in the context of inter-university competition [3, p. 44-45].

Thus, the mission of the regional support university, which is actually considered to be The I.N. Ulyanov Chuvash State University, is to provide social reproduction institutions with intellectual, social and human resources capable of creating and realizing the development potential of the economic, political, spiritual and social spheres of the peoples of the Chuvash Republic.

Therefore, the priority task of the development of the region is the creation of a support university of the Chuvash Republic on the basis of the classical university complex The I.N. Ulyanov Chuvash State University, which is considered a social institution that accumulates in itself the functions of a scientific and educational organization of an innovative type [5, p. 59].

In conclusion, it can be noted that in the course of the study, the formality and inexpediency of dividing universities on the basis of interaction with government and business was argued. A variant of the mission of the university on the example of Chuvash State University. It is shown that a university can be an unclearly expressed mechanism for managing the socio-economic development of a region through the formation of an expert community in the structure of its management and regulation model. We are talking about the relationship of regional culture and the parameters of the space of the supporting university with the help of scientific forecasting algorithms. The presence of positive feedback on the decisions made, based on the scientific and expert findings of university scientists (including practitioners from industry) contributes to the creation of conditions for effective functioning of all subjects of the region and ensures its sustainable development [6, p. 178].

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后现代形势下的恐怖主义
TERRORISM IN THE CONTEXT OF THE POSTMODERN SITUATION

Smirnov Roman Kamilevich
Candidate of Philosophical Sciences, Associate Professor
Kazan branch "Volga State University of Water Transport"

注解。本文讨论了后现代社会中对恐怖主义一词的定义问题。该专题的相关性是由于今天恐怖主义和恐怖主义威胁的作用和重要性日益增加，以及在此背景下缺乏明确界定这一类别的定义。这项工作的主要部分突出了恐怖主义问题的各个方面，将现代性和后现代主义的特征描述为定义审议恐怖主义原则的话语实践。结果部分强调了话语思维实践在理解和研究界定恐怖主义问题方面的重要性。强调了在现代性和后现代主义背景下考虑恐怖主义的特征。结论部分证明了在后现代情境下不可能界定恐怖主义，并提出了一种基于对话原则建立与这种社会现象互动的模式。最后，有人指出，恐怖主义的合理化和文化融合将形成恐怖主义和恐怖主义威胁的文化，从而为制定有效的政策以制止恐怖主义活动的可恶表现奠定基础。

关键词：恐怖主义，现代，后现代，问题，社会现象，话语，对话。

Annotation*. The article deals with the problem of the lack of a definition of the term terrorism in a postmodern society. The relevance of the topic is due to the increasing role and significance of terrorism and terrorist threats today, as well as the absence of a well-defined definition of this category against the background. The main part of the work highlights aspects of the problem of terrorism, describes the characteristics of modernity and postmodernism as discursive practices that define the principles for the consideration of terrorism. The results section emphasizes the importance of discursive thinking practices in understanding and studying the problem of defining terrorism. The features of the consideration of terrorism in the context of modernity and postmodernism are highlighted. The conclusions section proves the impossibility of defining terrorism in a postmodern situation, and suggests a model for building interaction with this social phenomenon based on the principle of dialogue. In conclusion, it is indicated that rationalization and inculturation of terrorism will allow to form a culture of perception of terrorism and terrorist threats, and thus lay the foundations for the formation of an effective policy for stopping the odious manifestations of terrorist activity.*

Keywords*: terrorism, modern, postmodern, problem, social phenomenon, discourse, dialogue.*

Thanks to the media, terrorism occupies one of the most significant places among the problems of concern to modern society. Therefore, turning to the topic of terror, the terrorist threat is always interesting and relevant.

Today, despite heightened public attention to terrorist threats, the definition of terrorism is absent both in international and in Russian socio-legal thought. This circumstance puts the following question on the agenda: why is there no definition of terrorism if its threat is so significant today? It seems that without addressing this issue, the study of terrorism as a social phenomenon will be incomplete. So, the goal of our article is to consider the problem of the existence of a definition of terrorism in the context of a postmodern situation.

The basis of the work is the following corpus of research, both domestic and foreign authors: A.I. Moiseev [6], B.V. Sidorov and V.G. Kirshin [7], G.V. Yaroshenko [9], M.U. Medov [5], B. Latour [3], J. Deleuze [2], M. Foucault [8], A. Magen [4], and others.

The first aspect of this problem is connected with the variety of interpretations of the notion of terrorism. Points of view differ from the rejection of terrorism as a social phenomenon (N. Rockefeller), to the recognition of terrorism as one of the most important threats of the 21st century [1]. Nevertheless, at least two approaches can be distinguished in this pluralism of opinions that determine the content of the concept of terrorism. The first approach tries to answer the question of what is terrorism, what is its essence, the aspects that make up this phenomenon. The second approach considers terrorism in terms of its manifestations in society. An illustration of the latter is the Islamic interpretation of terrorism. Within its framework, A. I. Moiseev distinguishes the material and target aspects [6]. The material aspect involves identifying the amount of damage caused by a terrorist activity to a person and society. Target aspect - considers terrorism from the point of view of goals that terrorists set for themselves. As we can see, the correlation of different points of view on the content of the concept of terrorism within the framework of the designated approaches, or the choice of one of them as the basis for understanding that there is terrorism is not an easy task. The search for its solution requires an appeal to the socio-historical context in which terrorism exists as a social phenomenon.

The sociohistorical context is the second aspect of the problem of defining terrorism.

The concept of a socio-historical context is volumetric in its content. Therefore, we will limit its characterization to a brief review of the fundamental principles that determine the logic of people's perception of social reality. Within the framework of the needs of the theme of such systems, principles, there are two: modern and post-modern.

From the New time modern is replacing traditional society premodern. It is based on two pillars: rationalism and a linear-vertical way of perceiving time and organizing social space. From here, the world of modernity is clear and understandable for

man; it is permeated with faith in the power of the human mind, in the possibility of changing the order of things in accordance with the individual interests of the individual. Changes made by man in the world are not chaotic, they are progressive in nature in accordance with their short-term and long-term goals, under constant control of the mind. The most important tool of this control is the causal relationship between phenomena. It allows you to track the logic of human actions, to identify strong and weak moves. The hierarchical structure of the world of modernity reflects and confirms the correctness of the individual's conviction that the world can progressively change in accordance with a rationally justified plan.

In the last third of the twentieth century, the postmodern comes to replace modernism, which is a rethinking of the heritage of modernity. Postmodern refuses to believe in the power of the human mind, the responsible attitude of the individual to the world around her, the idea of progressive transformation of the world in their own interests. To all this, the postmodern contrasts the fluid, situational, syncretic model of reality, in which the boundaries between phenomena are erased, and the vertically built hierarchical structure of the modern collapses into a horizontal plane. The life of an individual here turns out to be split into a conglomerate of situations, the interrelationship of which is becoming less and less understandable for his mind, because the causal tool of understanding the world ceases to work effectively in the conditions of the folding being of postmodern. At the same time, a postmodern person is not a passive subject who meekly accepts his fate. Like an individual of modernity, he retains his creative activity in relation to the world, calculation and responsibility to himself and others for the success or non-success of his actions, but only in situations where the unpredictable, from the point of view of rational calculation, life of a person falls apart. now postmodern era.

As we can see, modern and postmodern are different ways of perceiving reality that cannot be reduced to each other. Consequently, terrorism in each of the models presented acquires its own features and characteristics.

Research results

1. The problem of the definition of terrorism can only be considered through the interrelationship of its key aspects highlighted by us: working with the content of the concept of terrorism, analysis of discursive practices, underlying approaches to understanding and defining this concept.

2. Within the framework of a structured world of modern, the definition of terrorism is possible. Here, terrorism, like any other social phenomenon, has its strictly defined boundaries, features and characteristics. Consequently, the problem of defining terrorism in modernity exists only as a technical problem associated with the search for the most complete and comprehensive definition of the concept of terrorism.

3. The absence of the well-established definition of the category of terrorism in modernity is explained by the following circumstances:

- terrorism was one of the instruments for achieving certain goals, therefore people who carried out terrorist acts did not associate themselves with terrorism;
- there was no media coverage of terror and terrorist threats, therefore, there was no mass request for the definition of this phenomenon;
- within the framework of the modern, a clear definition of the terror underlying the terrorist activity was given, it seems that no more was needed.

4. In the context of the emerging postmodern situation, the issue of terrorism has become much more popular than in the modern period. This is due to a number of circumstances. Firstly, in the context of the situational rupture of human life, terror becomes one of the effective tools for achieving personal success. In the broad sense of the word, we are all relevant or potential terrorists, ready for terror for the sake of obtaining situational benefits. Secondly, the media turns terrorism into a significant element of the fear industry, and also forms an ambiguously evaluated image of a terrorist as a source and carrier of terrorist threats. Thirdly, in the framework of the fluid, syncretic world of the postmodern, terrorism becomes a diffuse phenomenon in its nature, permeating all spheres of society. Therefore, it is within the framework of the postmodern that the issue of the definition of terrorism becomes not a technical, but a genuine, real in its essence problem.

5. The problem of defining terrorism in a postmodern situation can be divided into two components. The first of these is the methodological component associated with the complexity of localization (as one of the important conditions for a clear definition of the concept), diffuse in its nature of terrorism, as a social phenomenon in a postmodern situation. The second component is connected with the absence of the ruling elite, both in individual countries and around the world, of an order to define the category of terrorism. This is explained by the fact that the generally accepted definition of terrorism will limit the possibility of manipulating this concept by various social groups for their situational political and other purposes. Indeed, terrorism is a powerful tool for influencing public consciousness. Hence, the range of its use is extremely large: terrorism can also serve as a political spoiler, and a way to divert people's attention from one problem to another, and as a convenient means of manipulating public opinion. Thus, the same phenomena can be assessed as terrorist or not, depending on the interests and goals pursued by certain social groups. Thus, the question of the definition of terrorism is not just complicated, but also gives rise to another closely related problem - how expedient is it to expend efforts to find a definition of terrorism in a postmodern situation?

Findings

1. The question of the definition of terrorism can only be revealed in the context of discursive practices that define the principles of existence and perception of a given social phenomenon. Otherwise, the efforts of scientists aimed at formulating the definition of the term terrorism will not lead to the final result, since no social phenomenon, including terrorism, exists outside the historically determined ways of thinking.

2. The search for the optimal definition of the term terrorism is the legacy of the modern research program. In a postmodern situation, this task is unsolvable. First, because here one phenomenon cannot be defined through another or relative to another, since each of them is unique, situational, blurred within its borders. Secondly, for the same reasons, there are no forces in the postmodern world that are interested not in words but in deeds in successfully solving the task of defining terrorism. At the same time, this does not mean that within the framework of the postmodern the technical definitions of the category of terrorism cannot be formulated in order to solve certain situational problems. However, these definitions cannot in any way bring us closer to an understanding of the essence of the phenomenon of terrorism, since they do not initially pursue this goal. Consequently, the quantitative growth of the definitions of the term terrorism contributes not to the solution, but rather to the conservation of the problem of defining this category in a postmodern situation.

3. The insolubility of the problem of defining terrorism in the postmodern does not mean removing the relevance and significance of this social phenomenon for us today. On the contrary, the growth of terrorist threats and manifestations of terrorism speaks of the need to expend efforts aimed at finding approaches to work different from the modern program with the notion of terrorism.

4. It seems that the search for new approaches to work with the concept of terrorism should be based on the assertion that terrorism in a postmodern situation is a diffuse phenomenon dissolving and permeating the diversity of everyday practices. Hence, a modernist program focused on a rigid definition of the notions of terrorism can be replaced by a postmodern program that involves not defining this concept, but building interaction with it, which is based on the principle of always situationally oriented and personally directed dialogue.

5. Substitution in the postmodern situation of the problem of defining terrorism with the possibility of building interaction with it, opens up new space for working with this social phenomenon. So, the postmodern allows us to talk not only about the opposition of terrorism to society, but also vice versa, the inclusion of terrorism into the fabric of social relations through its enculturation and objectification. Such an approach has a great heuristic potential, because without denying the need

to counter terrorism, it allows you to create a culture of perception of terrorist activities. This concept means the rationalization of terrorism, awareness of the role and significance of terrorist threats in a series of other challenges that constantly arise before a person in the postmodern situational world. Due to the formation of this culture, terrorism can be deprived of the halo of demonism, as well as laid the mechanisms for stopping the fear of the consequences of terrorist threats due to the inflation of fear in the public consciousness.

Conclusion

The source of the problem of the definition of terrorism lies in the complexity of the combination of different points of view on the content of this concept, determined by the difference in principles determining the interpretation and perception of terrorism. In the framework of the modern postmodern society we believe, it seems that we should abandon the search for what is terrorism and focus attention on the interaction with this phenomenon. This is a difficult, but solvable task that will allow localizing terrorism as a cultural phenomenon and, therefore, creating effective situationally oriented mechanisms to combat the most odious manifestations of terrorist activity.

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克服语言冗余是语言系统中信息增长的原因

OVERCOMING LANGUAGE REDUNDANCY AS A CAUSE OF INFORMATION GROWTH IN THE LANGUAGE SYSTEM

Nekipelova Irina Mikhaylovna
Candidate of Philological Sciences
Head of the Department of Russian as a Foreign Language
Izhevsk State Technical University named after M.T. Kalashnikov

注解。本文致力于研究俄语中发生的词汇语义变化的语言冗余。语言冗余在某种程度上能够简化和复杂语音通信。但是，它在语言的运作和发展中起着特殊的作用，增加了它的信息内容。信息的增长主要有两种方式：由于语言冗余的形成以及由于其克服。研究表明，这就是信息领域的扩展，构成语言冗余机制的媒体过程决定了语言的运作和发展机制。语言冗余及其克服的过程是一种不稳定因素，有助于语言系统的变化，实现关于世界的独特思想进入语言。然而，这些相同的过程使语言稳定和系统化，使其成为人类交流的通用工具。

关键词：语言发展，语言冗余，克服语言冗余，信息增长。

Annotation. *The article is devoted to the study of language redundancy on the example of lexico-semantic changes occurring in the Russian language. Language redundancy, to a certain extent, is capable of both simplifying and complicating speech communication. However, it plays a special role in the functioning and development of the language, increasing its information content. The growth of information occurs in two main ways: due to the formation of language redundancy and due to its overcoming. The study showed that this is how the expansion of the information field occurs, and the media processes that form the mechanism of language redundancy determine the mechanisms of functioning and development of the language. Language redundancy, as well as the processes of its overcoming, being a destabilizing factor, contributes to changes in the language system, actualizing the entry of unique ideas about the world into the language. However, these same processes stabilize and systematize language, making it a universal tool of human communication.*

Keywords: *language development, language redundancy, overcoming language redundancy, growth of information.*

In our study, we proceed from the assumption that the language is a constantly evolving, open dissipative system that tends to self-organization [4]. It is also a major factor in the survival of a human as a biological specie, since it implements the genetic ability to adapt inherent in a person.

Change is a way of adaptation that determines a person's survival. Adaptation is the key to survival. In turn, the changes that occur in a language are a condition for the survival of the language itself and a way for a person to adapt to the environment, which is carried out by developing the consciousness and awareness of his existence in the world. The origin of the language was in itself a "natural logical continuation of the adaptation to mental activity, which primates began " [2]. In addition, diversity within the language makes its evolution possible, since, in general, "diversity has the potential for adaptation" [3].

Describing language phenomena from the point of view of synergetics, it should be noted that in many scientific papers the concept of synergetics is adapted to the needs of linguistics, but does not fully explain such language processes as the emergence of language and the growth of information. That is why they require a separate study.

Any natural language system has a logical basis and is subject to the main ways of human thinking - analysis, synthesis and analogy. Implementing them, the language seeks to formalize and standardize, fulfilling primarily cognitive and consolidating functions. Obeying logical thinking, it strives for self-organization. However, the logical basis of the functioning of the language are not the only ones. In the language there are processes that go beyond the boundaries of logical relations and destabilize the system. The unity of these multidirectional processes - disorganization and self-organization of the language system - is the development pattern of the language, the essence of its historical changes.

Language should be understood as a kind of code that has logical grounds. These bases are due to human thinking, so language is a natural multi-level classification of a high degree of reliability [5]. Therefore, we can say that the language is an organized system, which consists of elements that have the ability to change. This ability to change, expressed primarily in the self-organization of the language system, as a whole ensures the integrity, viability and stability of the language in the context of the emergence of dissipative structures. The tendency of language to change is caused by the desire of society and the individual to change.

The language is constantly changing, as human thinking is undergoing constant changes. And in this respect, no language will ever fully obey logical grounds, since a language that has no way out will be unable to adapt to a constantly changing external environment and will eventually cease to satisfy human needs for communication.

Language is a product of society and men, therefore its nature is full of contra-

dictions. Language is as controversial as human thinking is. And it is the linguistic "structures and grammatical structure - often bizarre - that show how diverse human thinking can be" [6].

One of the factors destabilizing the language system, along with many others, is language redundancy. Language redundancy is the presence of such linguistic phenomena, within which it is intended to duplicate linguistic elements.

Language redundancy is represented in the language in different forms: at the grammar level, these are primarily repetitions, partial coincidence of grammatical categories in the forms of words entering into syntagmatic relations, and at the vocabulary level - synonymy, homonymy, euphemisms, hyper-hyponymy, etc. Language redundancy is always represented only partially, in an incomplete form, since the coincidence of the two units in terms of content and in terms of expression is impossible - it is meaningless, since it is not informative.

Despite the fact that linguistic redundancy contradicts the logical basis of the functioning of a language, it is necessary because it plays an important role in the development of a language system - in increasing its volume, leading to an increase in its informativeness.

Considering the phenomenon of linguistic redundancy, it is necessary to note the phenomenon of synonymy, in the framework of which it can be clearly stated that there are no two absolute synonyms. Such correlation of synonymous words in modern science is defined as quasi-synonymy. Quasi-synonyms differ in either shades of meanings, or stylistic coloring or degree of use. But the divergence of synonyms is a long historical process.

Even in cases where historical processes in a language led to the formation of two linguistic units with the same meaning, the language begins to breed these units. For example, in this respect, the implementation of full and non-full pairs of words in Russian is indicative. The process had a long history and has not been fully completed until now. The divergence of the Eastern Slavic and South Slavic branches of the Common Slavonic proto-language gave rise to the realization of full vocalism in the form of *-oro-/ -olo-* and *-ere/-ele-* on the East-Slavic ground and the lack of full vocalism in the form of *-ra- /- la-*, *-re -/- le-* on the South Slavic ground. However, the further convergence of languages led to the mixing in the Russian language of forms with full and lack of vocalism.

As a result, in the history of the Russian language, the following correlations of variants were possible: 1) the preservation of the East Slavic and the loss of the South Slavic realization: *ворона* and *врана*, *болото* and *блато*, *корова* and *крава*; 2) the preservation of the South Slavic and the loss of the East Slavic realization: *враг* and *ворог*; 3) the divergence of variants in the stylistic aspect: *мрак* and *морок* (colloquially); *город* (general) and *град* (lit.), *дерево* (general) and *древо* (lit., spec.), 4) the divergence of variants in meanings: *прах* and *порох*;

страна and *сторона*. Thus, it can be seen that four local ways to overcome language redundancy were found in the language: 1) abandonment of the traditional language unit, 2) preservation of the traditional language unit as the only possible one, 3) dilution of language units based on their belonging to different language styles, 4) dilution of linguistic units on the basis of assigning to each of them a unique lexical meaning.

Such processes are even more interesting in the way they affected other linguistic units. So, from the word *град* was formed the word *гражданин* in the meaning of a resident of the city. However, later on, desemantization of this meaning took place, and it began to denote the "resident of the country" and ceased to correlate in semantic terms with the word *град*.

Also the development of relations between the words *страна* and *сторона* is interesting. Even when these two words were not aparted according to their meanings, people living on the other side were called *сторонними (*outsiders), they were not our, but strangers. They were *сторонние* and *странные*. Later, when the word *страна* began to denote 'state', the inhabitants of another country began to be called *иностранными* (foreign), and the word *странный* lost its semantic links with the word *страна*.

Such cases are not isolated. The language system keeps track of complex language processes. So, for example, the word *морок* as such was lost by the Russian language, giving way to the word *мрак* in its basic meaning. It remained only as a variant having a narrow stylistic orientation: *морок* (trad.-fol.) - "gloom, mist", "something stupefying, clouding the reason" and is practically not used in the speech of native speakers. However, in modern Russian, words that are motivationally associated with the word *морок*: *обморок* - "sudden loss of consciousness" and its derivatives - *предобморочный*, *полуобморочный*, etc. - still function successfully. Some derivatives of the word *морок* have a limited sphere of use: *мороковать* (def.) - "to understand", *морока* (colloq.) - "about any lengthy, tedious, monotonous work, occupation", *морочить* (colloq.) - "to mislead; deceive, fool " *выморочный* (official) -" left without a master after the death of the owner, who had no heirs or successors ", *заморочить* (colloq.) -" mislead, confuse, complicate ", *заморочка* (colloq.) - "life problem, difficulty", *обморочить* (colloq.-def.), "to deceive, to fool", *заморачиваться* (slang) - "to trouble, burden yourself with something". The presence of reduced stylistic nuance makes it clear that the language tried to get rid of lexical units, which correlated with the word *морок* as unwanted, inconvenient to use, unsuccessful in the implementation of communication, but at some point this process was suspended: the units themselves remained in the language, however at the given moment of time they are essentially limited in their use stylistically.

In the lexico-semantic relation, language redundancy is also represented by

direct and indirect reference, metonymy, metaphor, hyponyms and hyperonyms. In any of these cases, redundancy is partial, since, of course, any figurativeness and any generalization is based on already known information about the world and contains it at the same time, however, denoting something more than is contained in the original information.

In general, the information content of the system increases in the following order: language data (units, its relations and rules) are used to create text or produce speech (text or speech is information - interpretation of language data) → information - everything new that appears in the text or speech, or ignored, not perceived by other native speakers and the language system, or assimilated by the language → information perceived by the language expands the volume of the language and changes its composition - information is converted into new language data → the information content of the language system is enhanced by introducing new knowledge about the world and expanding the linguistic world view.

Expansion of the volume of a language must necessarily be accompanied by a change in the composition of the language: in order to be included in the language, a language unit must comply with the following requirement: it must not coincide with any other unit at the same time in content and form (although in other open systems this situation is possible). The appearance of a unit that coincides in meaning and meaning with another unit is unacceptable for a language, since within the same language space one denotation cannot correspond to absolutely the same on the side of the language characteristics language units, therefore the language system divides these units. The appearance of redundancy in the language system implies a slightly different situation, since it determines the functioning of units that are not absolutely identical, but partially duplicate one another. Consequently, linguistic redundancy is an important means of not only understanding, but also evaluating and emotional speech.

Redundancy should be distinguished from duplication, which is basically impossible in a language: a language does not need a unit having the form X and a value Y, if there is already a unit in the language with such indicators. In many open systems that have a material structure, this situation is not only possible, it is objectively normal. It should be noted that linguistic redundancy is not unnecessary for a language: complicating the relationship between linguistic units, linguistic redundancy creates a choice situation in the language, resulting in a disordered language system, an increase in entropy and, as a result, the appearance of information accepted or not accepted by the language system. Redundancy, which is accompanied by variability, is inevitable when the literary and non-literary form of the language is contrasted, and it is a transitional stage in the development of a language in a competitive environment of options. From the side of the entropy of the language, there is a competition between the elements of subjective and objec-

tive language systems; from the point of view of the entropy of speech, the necessary and possible units of language are selected. Verification of language units and their uses is performed in speech, therefore the entropy of speech is preceded by the entropy of language.

Deviations are formed on the basis of competition of options, and any variation is a sign of entropy. And in this case, the unjustified preservation of the old version and the unjustified adoption of the new version is possible. The competition of variants as a result of linguistic redundancy, which is a deviation from logical relations in a language, contributes to the accumulation of linguistic facts in the language, which can be interpreted as logical errors of the language, constituting a feature of each language.

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政府管理和语言规则的词汇 – 语义子系统
LEXICAL-SEMANTIC SUBSYSTEM OF GOVERNMENT MANAGEMENT AND LINGUISTIC RULES

Zavarzina Galina Anatolyevna
Doctor of Philological Sciences, Head of Department
Voronezh State Pedagogical University

注解。 本文致力于对法律的描述，以便确定俄语词汇系统发展的主要趋势。特别注意研究语言法对最新俄语语言中“主导”词汇 – 语义子系统的功能的作用，并与关于政府机构旨在确保实施的活动细节的想法相关联。 法律和宪法权利以及公民自由。

关键词：词汇系统，词汇语义子系统，词汇语义场，状态管理，词汇发展规律，词汇语义学，语言符号，系统内关系。

Annotation*. The article is devoted to the description of the laws, allowing to identify the main trends in the development of the lexical system of the Russian language. Particular attention is paid to the study of the action of language laws on the functioning of the "dominant" lexico-semantic subsystem of state management in the newest Russian language, associated with ideas about the specifics of government bodies' activities aimed at ensuring the implementation of laws and constitutional rights and freedoms of citizens.*

Keywords*: lexical system, lexico-semantic subsystem, lexico-semantic field, state management, laws of vocabulary development, lexical semantics, linguistic sign, intrasystem relations.*

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It is well known that the lexical system of any language is in constant development, determined by the influence of intralinguistic and extralinguistic factors. Dynamism is also characteristic of the lexical-semantic subsystems or lexico-semantic fields (LSF) that are included in the lexical system. Obviously, the diachronic model of any LSF reflects the influence of various trends aimed at both maintaining existing units within a given subsystem, and at their elimination or, conversely, at expanding their composition, at the emergence of fundamentally

new or relatively new components, as well as at transformations and changes within subsystems. In the process of dynamic language development in some LSFs, changes in their composition and structural organization may occur. It seems that such transformations are most often observed precisely in the "dominant" (in the terminology of Prof. O. Zagorovskaya [7, p. 12; 8, p. 99]) LSF, corresponding to the most significant for the society at one or another stage of development spheres.

The LSF "State administration" undoubtedly belongs to such dominant fields, associated with ideas about the specifics of the activities of state bodies aimed at ensuring the execution of laws and the constitutional rights and freedoms of citizens. The change of "dominant" fields in the lexical system of the language is especially characteristic of crucial periods in the development of society, to which, undoubtedly, the newest stage in the development of the Russian language belongs.

The development of the lexical system of the Russian language as a whole and the lexico-semantic subsystem of public administration in particular occurs according to certain laws, understood as constant and regular tendencies.

Thus, on the basis of the semiological interpretation of the nature of language in linguistics, the law on *a verbal sign is formulated, which has three dimensions*: semantics due to indirect connections of words and objects, syntagmatics due to word relations to each other, and pragmatics due to relations of words and communicants (see works by G. Paul, G. Stern, A. Potebni, V. V. Vinogradov, E. Kurilovich, F. Mikush, S. O. Kartsevsky, L. Bloomfield, etc.). Such a representation of the lexical system necessitates the study of it as an integral system. However, the typical models of the main types of intra-system relations are not diverse, which is confirmed by the simplicity postulate put forward by G. Guillaume: "The fundamental operations on which the structure of the language rests are not too numerous and not diverse, they do not have excessive complexity, but rather mostly minimally variable, differing amazing homogeneity" [3]. Traditionally, there are four main types of logical oppositions that characterize the relationship of elements of the lexical system: 1) identity, which manifests itself as synonymy; 2) inclusion, which corresponds to hyponymia, represented by taxonomy and partonomy; 3) the intersection, which manifests itself as the compatibility of two lexical units; 4) an exception that manifests itself as incompatibility of two lexical units. Such types of semantic oppositions in vocabulary, of course, reflect the objective relationships between objects and their properties in the real world and are quite vividly represented in the lexical-semantic system of public administration in the Russian language of the newest period. Compare, for example, paradigmatic taxonomic relations of the genus and species: *управление – электронное управление, рыночное управление, управление без правительства, органы власти – органы исполнительной власти, органы законодательной власти,*

органы судебной власти; synonymy relationship: *премьер-министр – премьер, председатель правительства, глава правительства; президент – глава РФ; мэр – глава администрации города – градоначальник; сенатор – член Совета Федерации; парламентарий – член Федерального Собрания; вице-премьер – зампред правительства* and antonyms: *вертикаль власти – горизонталь власти, вертикальные отношения – горизонтальные отношения*, *вотум доверия – вотум недоверия*; *поручения – команды, приказы,* as well as syntagmatic relations and relationships realized in new stable phrases: *государственное управление, федеральное агентство, канцелярия президента, органы местного самоуправления, Совет Федерации* etc. [5].

On an important postulate of two interrelated states of linguistic signs - discreteness and continuity - a fair statement is formed about the absence of similarity in paradigmatic relations and syntagmatic connections of words as a reflection of the dialectical unity of the linguistic system and speech (see F. de Saussure, N.V. Krushevsky, D.N. Shmelev, M.V. Nikitin and others). The pattern of *semantic word matching*, which is determined by certain rules of semantic combinatorics, is formulated as the "law of semantic word matching," which states that "... combined words must have at least one common system, not have incompatible semes and have specific, different semes" [2, p. 367]. Wed: the phrase "*государственное администрирование*" [4] with the common semeam «связанное с управлением», «основанное на директивных методах».

The postulate of identities and differences as the basic principles that determine the systemic relationships of verbal signs is based on the "distribution law", according to which words, once synonymous, gradually differentiate and cease to be interchangeable. L. Bloomfield argued that complete synonymy in the language is impossible: "Each language form has a constant and specific meaning. If some forms are phonematically different, we assume that their meanings are also different. ... we believe that genuine synonyms do not really exist "[1, p.123].

Indeed, the following official names are used to name the legislative authorities in the constituent entities of the Russian Federation, which are synonymous at this stage of development of the Russian administrative language, but are not interchangeable: *Парламент – Государственный совет – Государственное собрание – Народное собрание – Народный хурал – Законодательное собрание – Верховный хурал – Верховный совет* (for 21 republics of the Russian Federation); *Областная дума – Законодательное собрание – Государственная дума – Совет народных депутатов – Областной совет народных депутатов – Областной совет депутатов – Областное собрание (депутатов) – Собрание депутатов – Окружное собрание – Городская дума – Окружная дума – Дума (автономного округа) – Законодательная дума – Губернская дума - Законодательный суглан* (for edges, areas, autonomous region and cities

of federal value), which is connected, first of all, with the serious extra-linguistic processes that have taken place in the country in recent decades. The formation of new synonymous relationships covering the lexico-semantic system "Public administration" testifies to the dynamics of the development of this sphere and the three directions of transformations manifested: a) in the oxidativeization of the Russian state-administrative language, b) in the actualization of nominations reflecting the realities of pre-revolutionary and Soviet reality , c) in the consolidation and use of original names.

At the same time, the differentiation of synonyms can be realized in different ways: it can affect the content of the words in question, their emotional nuances, social status or stylistic characteristic. As a general principle of synonymy, S. Ullman substantiated the "law of attraction of synonyms," the essence of which is manifested in the tendency to designate the realities that are vital for this group by a large number of synonyms [12, p. 172]. For example: *новое государственное управление – новая модель управления обществом – новый государственный менеджмент; спикер – председатель верхней палаты Федерального Собрания – председатель Совета Федерации – председатель Государственной Думы – председатель нижней палаты Федерального Собрания.*

The discussion postulate on the arbitrariness of a linguistic sign provides a basis for a law on limited motivation of verbal marks and the conclusion that the complexity of morphemic and semantic structure is inversely proportional to the words: "... the more complex the derivational structure of lexical units, the simpler their semantic structure" (see S.D. Katsnel'son, B. N. Golovin, N. D. Golev, A. V. Bondarko, etc.).

The law on the presence of epidigmatic, or derivational (in a broad sense) connections as a special type of systemic relations inherent only in vocabulary, explains the interdependence of associative-semantic and word-formational connections of words, which is the "third dimension" of lexical meaning [11].

In the lexico-semantic subsystem "Public administration", derivational links and relations are actively represented, actively developing under the influence of various word-building processes. Actually, Russian and foreign non-derivatives and derived lexical units are currently producing for the formation of numerous derivatives. Word-generating paradigms, represented by lexical units formed on the basis of non-derivatives of foreign-language words, are quite numerous: *аппарат – аппаратный, аппаратчик, бюджет – бюджетирование, бюджетный, бюджетник*; *комитет – комитетский, комитетчик; дотация – дотировать, дотирование, дотационный; оппозиция – оппозиционер, оппозиционный, оппозиционно, оппозиционность; коррупция – коррупционер, коррупционный, коррупциоемкий, коррумпированный, коррумпированность* и др.

Insignificant in the lexico-semantic system of the "Public administration" sphere are word-formation paradigms, represented by verbal signs derived from non-derivative Russian-language words (*дума – думец, думский, сила – силовой, силовик*) and derived tokens (*управлять – управление, управленческий, управляемый, управляемость, управленец*; *дебюрократизировать – дебюрократизация, задекларировать – задекларированный, непрозрачный – непрозрачность* and etc.).

Derived compound words can be used as generating (motivating) words: *одномандатный – одномандатник.*

An indispensable condition for the evolution and functioning of the language is the law on the variability of vocabulary according to different parameters: phonetic, morphological (for example, *ГД – Государственная Дума, СФ – Совет Федерации, силовики - силовые структуры власти* and etc.) and semantic (for example, «*формат*» - «о способе расположения и представления данных в памяти компьютера, в базе данных или на внешнем носителе информации» и «способ общения представителей государственных структур»*: новый формат оказания государственных услуг*) (see the work of O.I. Moskalskaya, A.I. Smirnitsky, V.N. Yartseva, etc.). The law on the interaction of the center and periphery determines the principles of the systemic organization of lexical-semantic groups and semantic fields.

LSF "Public administration" is currently one of the dominant fields of the language picture of the world of the Russian people. The LSF core "Public administration" is formed by lexical and phraseological units, different in origin and time of occurrence, which are included in the thematic group "Names of public authorities and administration" (*Президент, Правительство, Совет Федерации, Государственная Дума, Министерство* and etc.). The center of the lexical-semantic field is formed by units of various thematic relatedness with a smaller number of differential semantic signs (TG "Legend of concepts, which name the features of the organization of the public administration system", "Names of areas of government activity and their specificity", "Legend of the principles of government" , "Names of public administration documents", "Designations of negative phenomena in the field of public administration", "On designations of methods of encouraging and punishing officials", "Names associated with the election system of state officials", etc.). To the periphery, on the contrary, are units with a large number of differential semantic features, among which it is advisable to single out new words that are part of the previously known TG, including the highly specialized neologisms (*веб-присутствие* (authority), *неделимые общественные блага* etc.) and metaphorical and metonymic character (*верхушка кабмина, бюрократический коридор, замятые поручения президента, грязные избирательные технологии, карманное правительство* etc.), obso-

lete names and verbal signs drawn from the previously unrelated thematic areas of government (*ребрендинг государственного органа, нанотехнологии* etc.). The periphery of semantic fields is the zone where the interaction takes place, the "superposition" of one semantic field on another.

The interaction of the center and the periphery is regulated by centripetal forces, renewing the center at the expense of the periphery, and centrifugal forces replenishing the periphery. It should be noted that the existence of the periphery of the field is explained by the law of asymmetry of the linguistic sign formulated by S.O. Kartsevsky [9, p. 85-90].

The system-functional method of studying vocabulary allowed to extend the law of asymmetry of a linguistic sign from individual words to semantic fields and thereby discover the close interaction of adjacent fields, their mutual transition into each other. Thus, the LSF "Public Administration" consists of intersecting sub-fields "Political and Administrative Management", "Economic Management", "Social Management", which represent lexical and phraseological units corresponding to the notation of phenomena and concepts associated with one or another direction of public administration. and the functions it performs.

Important for diachronic studies of the lexical system of the language is the law on the enrichment of the seminal structure of the word, or the presence of the main methods of semantic derivation: expansion and contraction (deterioration and improvement) of meaning, as well as methods based on metaphorical and metonymic associations, justified by S. Ullman as historical universals in semantics [12, p. 274-276].

Changes in the semantic structure of verbal signs that form the lexico-semantic subsystem of public administration, are now manifested in its expansion through new lexical-semantic options (*команда* – «ближайшее окружение должностного лица государства, работающее над реализацией его программы»: *президентская команда, властная команда, путинская команда; настройка* – «снятие с ключевых постов тех или иных членов правительства»: н*астройка правительства* etc.). A very numerous group of verbal signs in the studied lexico-semantic subsystem of the Russian language of the post-Soviet era is formed by the so-called "thematically reoriented semantic neologisms" (in accordance with the concept of Prof. O. Zagorovskaya [6]), represented by verbal signs that came from unrelated state administration of the spheres (economy, sports, medicine, etc.): deputy immunity, government infrastructure, election rally, etc.

The law on the struggle of contradictions as the main driving force for the development of the lexico-semantic language system is based primarily on the results of fundamental diachronic studies of the language [10, p.225]. The controversial process of development and changes in vocabulary manifests itself in

typical tendencies of lexical dynamics, summarized in the following oppositions: a) the transition from external signs to internal and vice versa [eg, assimilation of borrowings: *эффективное управление* (good governance), *правительство без швов* (seamless government), *сочлененное правительство* (jointed-up government) [4] etc.]; b) transition from complex to simple and vice versa [eg, changes in semantic (*чистка* - «проведение сокращений в органах государственного управления», *продавить* – «добиться принятия решения государственного органа» etc.) and word-formation (*сетевик* in meaning «представитель политических сетей», *социалка* – социальный заказ, *госуправление, госдума* etc.) word structures]; c) the transition from the old to the new and from the new to the old, but on a different level - archaization (*Верховный Совет СССР, президиум Верховного Совета*, *милиция, проводить партийную линию, встречное обязательство, перевыполнение плана* etc.), development of neologisms on the basis of archaisms, receiving modified connotation (*президент, мэрия, мэр, префект, полиция, сенат* etc.); d) the transition from random to necessary and vice versa - the formation of homonyms as a result of the collapse of polysemy, the transition of occasionalisms to regular word usage (т*андемократия, бюджетополучатель* etc.).

The significance of general laws is that they allow us to determine the main trends in the development of both the lexical system of the Russian language as a whole, and its individual subsystems and the linguistic signs that form them.

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体外受精方案中育龄妇女的个人特征和生活质量

PERSONAL CHARACTERISTICS AND QUALITY OF LIFE IN WOMEN OF OLDER REPRODUCTIVE AGE IN THE IN VITRO FERTILIZATION PROGRAM

Kalina Svetlana Andreevna
Assistant of the Department of Psychotherapy PSF
Pirogov Russian National Research Medical University

注解。为了研究人格结构和生活质量的特征，对75名育龄妇女进行了检查。所有人都进行了心理诊断，评估了患者的个人情况，他们的生活质量，研究焦虑和抑郁的程度，述情障碍。据透露，自然怀孕的女性患有甲亢，不孕妇女具有爆发性的高尚性，不孕妇女和捐赠细胞患有焦虑症。此外，发现健康女性的平均生活质量高于不育女性（有和没有供体细胞）。

心理学家在组织IVF计划的女性准备时，可以考虑对人格特质的诊断，促进对患者的更好支持以及及时任命有效的心理治疗影响。

关键词：女性，不孕症，人工授精，年龄较大，性格特征，生活质量。

Annotation. *In order to study the characteristics of the personality structure and quality of life, 75 women of reproductive age were examined. Psychodiagnosis was carried out with all of them with an assessment of the personal profile of the patients, their quality of life, studying the level of anxiety and depression, alexithymia. It has been revealed that women who become pregnant naturally have hyperthyme, women with infertility have an explosive exalted character, and women with infertility and a donor cell have anxiety. In addition, it was found that the average quality of life in healthy women is higher than in women with infertility (with and without a donor cell).*

Diagnostics of personality traits can be taken into account by psychologists when organizing the preparation of women for an IVF program, to promote better support of patients and the well-timed appointment of an effective psychotherapeutic influence.

Keywords: *women, infertility, artificial insemination, older reproductive age, personality traits, quality of life.*

Introduction. An analysis of current trends in late childbearing shows the need to develop a system of medical, psychological and social preventive mea-

sures for women of the older reproductive group undergoing treatment in the in vitro fertilization program [1,3]. At the same time, the characterological features of women of older fertile age are poorly understood. Therefore, it is extremely important to assess the peculiarities of women's personal response to their own infertility, which allows to increase the effectiveness of psychotherapeutic support in the IVF program.

Objective: to identify personal characteristics and determine the level of quality of life in women of older reproductive age in the IVF program.

Sample characteristics and research methods:

A total of 75 women of older reproductive age (44.5 ± 7.5 years) treated at the National Medical Research Center for Obstetrics, Gynecology and Perinatology of the Ministry of Health of the Russian Federation took part in the study:

Table 1.

Sampling characteristic

Group №	Group name	Group description	Group size
Group 1	Experimental group	Women with infertility	25 women
Group 2	Control group	Women with a favorable pregnancy	25 women
Group 3	Experimental group	Women with infertility and a donor cell	25 women

A set of psychological tests was used: Beck Depression Inventory; Spielberger — Hanin's scale of reactive and personal anxiety; Personal questionnaire by Shmishek; Nonspecific questionnaire to study the quality of life; Toronto Alexithymia scale; Lazarus copying test.

The results of the study and its discussion. As a result of our study, various aspects of psycho-emotional state and personal characteristics were studied in a group of older reproductive age women in the IVF program, the control group of healthy women and the group of women with infertility, whose program uses a donor cell [6, 7].

We found a difference in the average questionnaire by Shmishek. It has been established that hyperthyme is inherent in women of the control group, women with infertility tend to have an explosive exalted nature, and anxiety is a characteristic of women with infertility and a donor cell (Fig. 1). It should be noted that when studying the level of personal anxiety with the help of the Spielberger-Hanin test in women of older reproductive age with infertility and a donor cell in individual IVF programs, in isolated cases, high personal anxiety was noted [1].

At the same time, no statistically significant differences were found when comparing the indices of the group of women with infertility and the women of the control group on the Shmishek questionnaire.

This indicates the need for a study on a larger sample of women of older reproductive age undergoing IVF treatment.

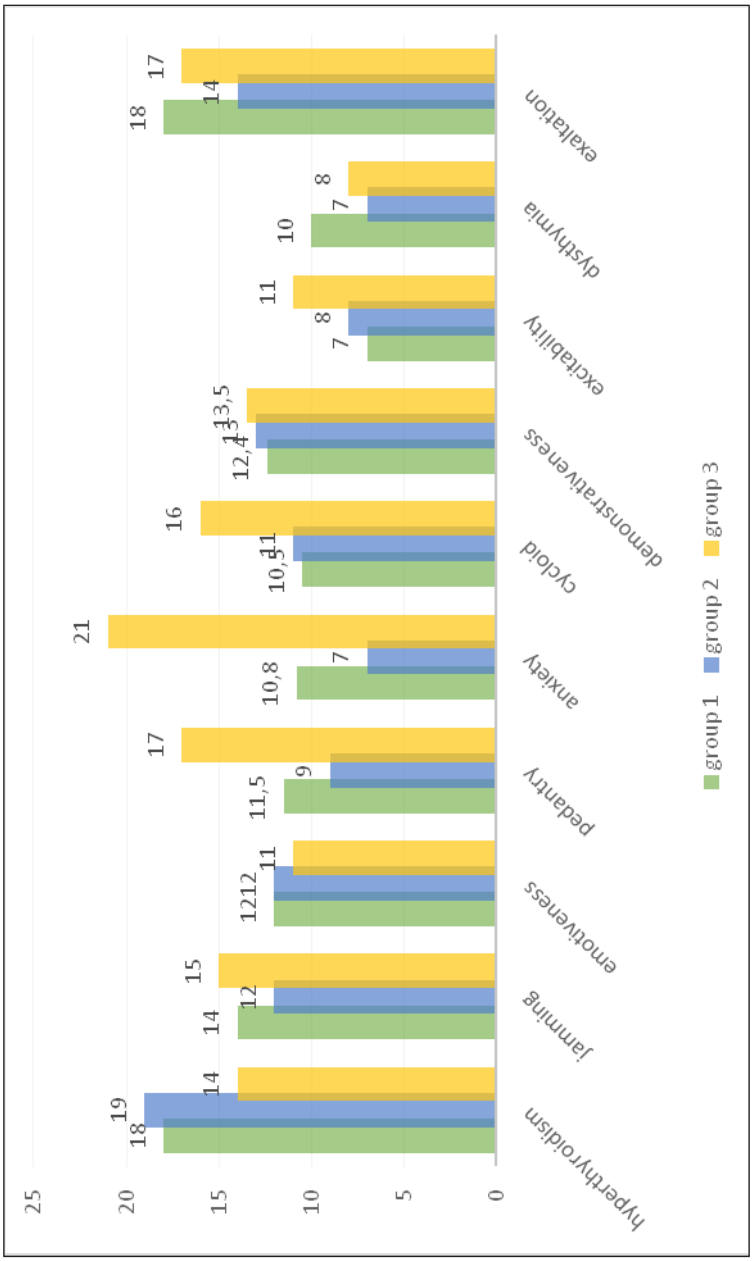

Fig. 1. *Indicators of the scales of the Shmishek questionnaire in three groups*

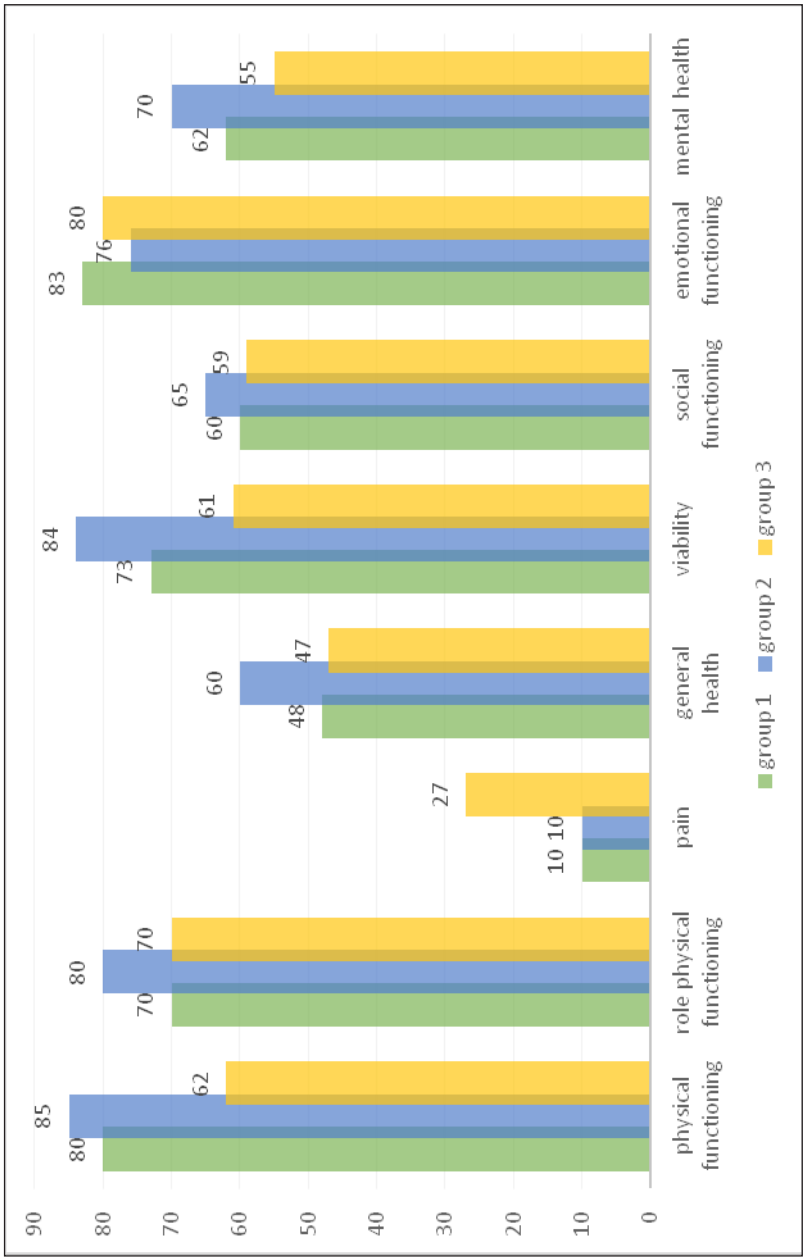

Fig.2. *Indicators of average values of the SF-36 questionnaire in three groups*

The study of the quality of life of pregnant women on the SF-36 questionnaire showed no statistically significant differences. Meanwhile, health indicators such as physical functioning, role-playing, body pain, general health, vitality, social functioning, emotional state and mental health in women in the control group are higher than in women with infertility in the IVF program with and without a donor cell (Fig.2).

Perhaps the absence of statistically significant differences is associated with high achievements in the field of career growth, since most of the tested women achieved success in their own professional field [4, 5].

Summarizing the results, we can draw the following conclusions:

1) Most women of older reproductive age in the IVF program with a donor cell are disturbing in nature, most women with infertility and without a donor cell in the IVF program have an explosive exalted type of character.

2) The quality of life in healthy women is higher than in women with infertility (with and without a donor cell). At the same time, no statistically significant differences were found.

3) Most women of older reproductive age in the IVF program (with and without a donor cell) are at risk of alexithymia.

4) Women with infertility in the IVF program have mild and moderate depressive states, unlike women in the control group.

In women with infertility and a donor cell, in the IVF program, average and severe depressive states are more common.

5) Situational anxiety in women with infertility in the IVF program (with and without a donor cell) is at a high level.

6) Women with infertility and a donor cell in the IVF program are at risk of disadaptation, using a coping strategy for finding social support. Women with infertility and without a donor cell in the IVF program are prone to maladaptive self-control.

Conclusion. The study aimed at studying the structure of psycho-emotional and characterological features in women of the older reproductive group in the in vitro fertilization program noted that the majority of women in the IVF program with a donor cell are disturbing, most women with infertility and without a donor cell in the IVF program have an explosive exalted type of nature, and women who become pregnant naturally are characterized by hyperthyme.

The average quality of life for women in the control group is higher than for women with infertility in the IVF program with and without a donor cell. Older women of childbearing age undergoing IVF treatment are characterized by higher rates of alexithymia than women who become pregnant by natural means. At the same time, there are no significant differences between the group of women with a donor cell and the group of women with infertility in the IVF program without a donor cell.

In addition, it is noted that women with infertility in the IVF program have mild and moderate depressive states, unlike women in the control group. Situational anxiety in women with infertility in the IVF program (with and without a donor cell) is at a high level.

Women with infertility and a donor cell in the IVF program are at risk of disadaptation, using a coping strategy for finding social support. Then, as women with infertility and without a donor cell in the IVF program are prone to maladaptive self-control.

The problem of infertility in women is now particularly relevant. In this regard, remedial work aimed at improving the quality of life and the adaptive capacity of women of older childbearing age should include both medical and psychological support for patients undergoing IVF treatment.

Thus, the timely diagnosis and identification of the personality characteristics of patients can be an important factor for the introduction of a differentiated approach to effective therapy for this group of patients.

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大都会Nikodim（罗托夫）和俄罗斯东正教会参与普世教会
METROPOLITAN NICODEMUS (ROTOV) AND THE PARTICIPATION OF THE RUSSIAN ORTHODOX CHURCH IN ECUMENISM

Zinchuk Sergey Mikhailovich
postgraduate
Kostroma State University

注解。 文章揭示了大都会Nikodim（罗托夫）在俄罗斯东正教会（以下简称“中华民国”）干预基督教运动中的作用。

关键词：ROC和普世主义，大都会Nicodemus（罗托夫）。

Annotation. *The article reveals the role of Metropolitan Nikodim (Rotov) in the intervention of the Russian Orthodox Church (hereinafter — the ROC) into the ecumenical movement.*

Keywords: *ROC and ecumenism, Metropolitan Nicodemus (Rotov).*

The topic is relevant due to the ambiguous view on the participation of the ROC in the ecumenical movement. However, it is quite obvious that it was Metropolitan of Yaroslavl and Rostov Nicodemus (Rotov) who played one of the key roles in the revitalization of the external church activity in the Soviet period.

In the world, his name was Boris Georgievich Rotov. He was born on October 15, 1929 in the village of Frolovo, Korablinsky District, Ryazan Region. The first twenty years of his life were spent in Ryazan, where he graduated from high school in 1947. Apparently at an early age, Boris Rotov felt a vocation to church service. In 1944-1946 he was a subdeacon of the Archbishop of Ryazan (since January 1947, Archbishop of Yaroslavl) Dimitry (Gradusov). On August 17, 1947, in Yaroslavl, he received ordination as a deacon from Archbishop Dimitry and on August 19, he tonsured the name Nicodemus. (Subsequently, his monastic name Metropolitan registered as civilian.) In 1947-1949 he studied at the Ryazan Pedagogical Institute; left it after finishing the second course. On November 20, 1949, Hierodeacon Nicodemus was ordained as Hieromonk by Archbishop Dimitry and appointed to the parish in the village of Davydovo in the Tolbukhinsky District, then served as a full-time priest of the Pokrovsky Church in Pereslavl-Zalessky and as a senior priest of the Dimitry-Cemetery Church in Uglich. From January 1952, he was in the clergy of the Theodore Cathedral in Yaroslavl and was ϕ sec-

retary to the Archbishop of Yaroslavl and Rostov, soon he was appointed as sacrist of the cathedral. In 1955 he graduated from the Leningrad Theological Academy. From December 1954, he served as the senior priest of the cathedral in Yaroslavl under the governor of the Yaroslavl eparchy, Bishop of Uglich Isaiah (Kovalev). On February 25, 1956, hieromonk Nicodemus was appointed a member of the Russian Ecclesiastical Mission in Jerusalem, on March 31, 1957 he received the rank of hegumen, and on September 25 he was appointed a head of the Mission, exalted to Archimandrite (on November 3). In Jerusalem, he worked on his candidate essay «The History of the Russian Ecclesiastical Mission in Jerusalem», which he defended at the Leningrad Theological Academy in 1959. The years of ministry in the Mission laid the foundation for the external church activity of Metropolitan Nicodemus. He visited the Holy Land several times and later, and from 1964, through his efforts, pilgrim groups from the Russian Orthodox Church began to go there regularly. On October 20, 1958, Archimandrite Nicodemus was dismissed from the post of the Chief of Mission, with the appointment to the Administration of the Moscow Patriarchate. From March 1959, he was in charge of the office of the Moscow Patriarchate, and from 4 June at the same time he became deputy chairman of the Department for External Church Relations (hereinafter referred to as DECR). On October 22, 1960, after the death of Bishop Isaiah of Uglich (Kovalev), he was appointed a temporary administrator of the Diocese of Yaroslavl; on November 23, approved by the Bishop of Yaroslavl and Rostov. On March 16, 1961, Bishop Nicodemus became a permanent member of the Holy Synod of the Russian Orthodox Church by the position of DECR chairman; June 10, exalted to the rank of archbishop.[11]

In December 1959, he participated in Moscow talks with the leaders of the World Council of Churches (hereinafter referred to as the WCC) about joining the Russian Orthodox Church. As a result, on November 20, 1961, at the third assembly of the WCC in New Delhi, its solemnly entered this organization. Together with the Russian Orthodox Church, the Orthodox Church of Eastern Europe (Romanian, Bulgarian, and Polish) was accepted into the WCC and soon all the other Local Orthodox Churches joined. Moreover, from 1961 to 1975 archbishop (from November 3, 1963 — Metropolitan) Nicodemus (Rotov) was a member of the Central Committee of the WCC. On August 3, 1963, archbishop Nicodemus was appointed Chairman of the Commission of the Holy Synod on Christian Unity, exalted to the rank of Metropolitan. Since 1961, the ROC has demonstrated a dialogue with the Vatican, that was clearly stated by the participation of the delegation of the Moscow Patriarchate at the Pan-Orthodox Conferences of 1961, 1963, 1964 on the island of Rhodes.[22] Thus, at the Ist Meeting in September 1961,

[1]Metropolitan Nicodemus and Pan-Orthodox unity. On the 30th anniversary of the death of Nikodim (Rotov), Metropolitan of Leningrad and Novgorod, / Comp. Prof. Archpriest Vladimir Sorokin. Spb.: Knyaz, 2008. - 4-5 p.

[2]Pospelovsky D.V. The Russian Orthodox Church in the XX century. - Moscow: Republic, 1995. - 79 p.

archbishop Nicodemus noted that "the Orthodox Church is faced with the task of sorting out centuries-old stratifications that complicated the interrelationship between the great churches — the Orthodox and the Roman Catholic — and led to the modern dismal on this issue, "and in November 1964 at the opening of the III Pan-Orthodox Conference he stated that the teachings and traditions of the Catholic Church" ... are less distinct from other Christian Churches than the teachings and traditions of the Orthodox Church".[33]

The ROC began to actively participate in other international Christian organizations — for example, in June 1961 its representatives took part in the First General Christian Congress for Peace, held in Prague and called for «...working in various ways so that all people showed patience in relation to other people, so that people persistently seek mutual understanding and were ready for mutual sacrifices."

Thus, during 1945-1964. The church experienced a transition from the categorical rejection of ecumenism to the official entry into the ranks of the WCC. But in the history of interfaith contacts of the Russian Orthodox Church in the XIX – XX centuries there was no other event that would be assessed so ambiguously. On the one hand, the fact that the participation of the Russian Church in the WCC led to the expansion of the theological basis of the international Christian movement, strengthened the Orthodox representation in the ecumenical movement, made the ROC open to various theological dialogues, seems undoubted. In addition, the Khrushchev persecutions put the Church in an extremely difficult position, so it could relatively freely realize itself only in the international arena. Metropolitan Nikodim played a significant role in this. According to the metropolitan of Krutitsky and Kolomna Juvenalia, when interchurch relations began to develop, thanks to joining the WCC, it became possible to show "the love of our Holy Church, often defending its honor and dignity" [44]. As noted by Metropolitan of Minsk and Slutsk, Patriarchal Exarch of All Belarus, "thanks to Vladyka Nicodemus, the Russian Orthodox Church gained a voice that sounded all over the world, and therefore it was no longer so easy for the authorities to destroy its body." [55] On the other hand, the ROC was not free from" custody" and control of the state. To a large extent, its decision to participate in the ecumenical movement was driven by government pressure. Entry into the WCC took place without free conciliar discussion, which simply could not take place in those historical conditions.

[3]Metropolitan Nicodemus and Pan-Orthodox unity. On the 30th anniversary of the death of Nikodim (Rotov), Metropolitan of Leningrad and Novgorod, / Comp. Prof. Archpriest Vladimir Sorokin. Spb.: Knyaz, 2008. - 50 p.

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“瓦解”是20世纪初俄罗斯的问题
“DISINTEGRATING” IS THE PROBLEM OF RUSSIA AT THE BEGINNING OF THE 20TH CENTURY

Safonov Dmitry Anatolyevich
Doctor of Historical Sciences, Professor
Orenburg State University

注解。 在二十世纪初观察到的传统农民社会的破坏过程，农民价值观和国内史学中的态度，往往与一些国家暴力导致农民社区从外部遭到破坏有关。 笔者认为，在不否定后一因素的情况下，传统农民社会在资本主义关系发展，人口流动性增加和其他价值影响下退出自我孤立的自然过程遭到破坏。 方向应该被认为是决定性的。

关键词：农民社区，世界观，农民，俄罗斯，二十世纪

Annotation. *The process of destruction of traditional peasant society, peasant values and attitudes in domestic historiography observed at the beginning of the twentieth century is most often associated with the destruction of the peasant community from the outside, as a result of some state violence. The author believes that without denying the latter factor, the natural process of destruction of the traditional peasant community as a result of its withdrawal from self-isolation under the influence of the development of capitalist relations, increasing population mobility, and the impact of other value orientations should be considered decisive.*

Keywords: *peasant community, worldview, peasantry, Russia, twentieth century*

The peasant community has always acted as a tangibly deterrent factor, the effectiveness of which, in turn, was supported by the stability of the peasant life, the traditional character of his own, limited peasant mobility.

Historically, traditionally, the peasant community (the “world” in the previous writing) was perceived as something permanent, as a kind of constant inherent in the Russian peasant community. It was the community that the Slavophiles pointed out, believing it to be an important element of peasant life and identity, it was in the community that the Narodniks saw the guaranteed basis for the future socialist reorganization, it was Stolypin’s critics who advocated its preservation, and it’s precisely that its destruction was put to him by Soviet historians as almost

the main goals of the whole reform process. Indeed, for a sufficiently long period the peasant community was the only conceivable form of the organization of farmers. The fact that the community existed for centuries was a weighty argument in favor of its usefulness and demand by the peasants, and any violent actions against it were assessed as an attempt on the holiest of the peasants. Hence, the corresponding account was presented (at different times by representatives of different political views) to P. A. Stolypin, and then to the Bolsheviks / Communists, who destroyed each particular peasant community by their class approach and setting one part of the village's population on another. It is appropriate to mention the existing opinion that the communists, creating collective farms, used a "collective" memory, taking from the past primarily a fiscal function.

The concrete village was a certain organism, and its community had a number of points: political, economic, spiritual, and all of them evolved in a certain sense. But the initial idea was precisely community, unity. For a long time, the microcosm of the village was rather closed, and "inward".

Undoubtedly, inequality has always existed in the community, but equality has been maintained. Despite the seeming casuistry of this promise, we see no contradiction. With an equal right to land share, the family, which has more men, had clear advantages against the family with their daughters. Equality was not in reality, equality was in possibilities. Yes, the village had its own poor, their own (let's say conventionally) rich, their own kulaks, the world-eaters (it is probably worth mentioning that these were not the kulaks of the "Soviet" time, in the 19th century the members of the community who were not engaged in agricultural labor were so called) as if at the expense of the "world" - merchants, holders of pubs, etc.): but still, they were first "their own", and only then everything else was taken into account. The inner life of the world community was fastened by the great many personal connections between its members that are unobservable from today: sympathies and antipathies, friendship and neighborhood; in other words - coexistence, and coexistence of stable, permanent, uncontested - that is, community was perceived not only as a given, but as the only possible one. Let's not forget that for quite a long time the population of the villages lived sedentary and stable (excluding immigrants, of course).

In the peasant worldview, reality was perceived through the division of all into "we" and "they" - when the "world" confronted the rest of the world: the authorities, the landowner, etc. In any conflict situation, village society was a unified force. This is what we observe both in the pre-reform time and in the post-reform time. In all land disputes around the conditions of the same charters, the community acted as one of the parties. There are quite a few examples of when a gathering demanded general approval of a decision, in a certain sense, forcing dissent. However, over time, situations where the dissenters refused to obey or

began to act independently became more and more. It is quite traditional for Soviet historiography to link the appearance of this phenomenon with the penetration of capitalist relations into the countryside, the growth of inequality and, as a result, the appearance of a difference of interests. What, in fact, gives reason to talk about real equality in the "pre-capitalist" era — meaning not the onset of capitalism in Russia, but the arrival of capitalist relations in the rural environment. The most popular proof was the fact that some poor peasants at gatherings essentially supported the point of view of the rich, due to being economically dependent on them. But even the apparent equality of votes at the assembly, which each fellow villager possessed, judging from the materials of the beginning of the twentieth century, did not guarantee real democratic decisions. Sources state the influence that the more prosperous villagers had on the less well-off in making the "right" decisions. But here it is necessary to clarify - is this really the result of the capitalist stratification? Manipulation of this kind of events we see even in the evening of Novgorod.

There are general principles that the community as a closed social group demanded from its own. However, there is no absolute dominance of speech, the above examples of deviant actions are confirmed by this.

Starting from the second half of the XIX century. The situation is changing significantly. A long process begins, which, in our opinion, can be defined as the process of "peasant dredging". The notion of "peasants", despite the sufficient frequency of its use, still does not have a single and comprehensive interpretation: various authors put their understanding into it, most often linking it directly with the purposeful policy of the Soviet state during the period of collectivization. Meanwhile, this process can be viewed as if stretched in time, and taken somewhat broader - as changes, breaking the traditional peasant mentality, values, moral and ethical ideas. In the same way, it is difficult to unequivocally talk about peasant values, complex and multifaceted concepts, including respect for agricultural work and respect for the norms of the hostel in the village, the subordination of power, "monarchical illusions", etc. These values are traditional primarily because for quite a long time period the way of life of peasants, their occupation, etc. remained virtually unchanged. Hence, the "deformation" of those is, first of all, a change, a distortion, in principle, not necessarily with a "minus" sign. One of the important factors determining the deformation was the city. In this case, the "city" is a rather conventional concept, it appears more like the antithesis of the village, something that lives and exists in a different way, "non-peasant"; as a special urban environment.

For a long historical period, the city-village relations in Russia were quite specific: the phenomenal gap between the village where the absolute majority of the population lived and the city remained. The peasantry was not very mobile, and the outflow of citizens to the village was not massive - so that the vector of influence of the city on the village dominated.

For centuries, the peasantry was perceptibly isolated from the rest of the population - in legal, social, economic terms. This thesis does not require much justification and considerable reasoning. But at the same time, we always unconditionally view the peasantry as an integral part of the people inhabiting a given country. And this is true - how could it be otherwise? But when we start talking about society, in this case, Russian society, we are equally traditionally taking peasants beyond its borders, emphasizing its heterogeneity and lack of unity. For quite a long time, the existing thesis about the split between the working and exploitative classes ("two cultures") has lost its perfection. Undoubtedly, the Russian society was not united; rather, it is more appropriate to talk about its "mosaic" structure. But at the same time, a split, even polarization into two camps took place. We may be extremely subjective, but it seems to us that in the ordinary consciousness of the majority of Russians, a split in Russian society in the past occurred between the people and the elite. Perhaps this opinion was confirmed not without an influence on the consciousness of the educated part of Russian society of the novel of L. Tolstoy War and Peace.

The sociologist Pitirim Sorokin proposed a different division: the peasantry = the village, and the antipode of the village is the city (peasant VS citizen). Back in 1923, he wrote that the "scope of the "experience" of the mental" outlook "... of a city dweller is much broader than the" peasant ". But he is incomparably less stable and much more superficial ... a huge part of his experience, beliefs, his tastes and assessments are unstable, inconstant and changeable. " The peasant, on the other hand, is "not subject to rapid fluctuations," he is largely conservative, but what he means here is not his reactionism, but constancy [1, p.11,13]. In other words, on the other side of the invisible border that separates the peasantry, we have citizens. But it is important to consider: living in the city is far from being a homogeneous mass.

What society knew about the peasantry; What did the peasantry know about peace outside rural communities? The village lived its own closed life, in a state of conditional isolation. Hence the rigid simple perception of the world, in which there is "we" and "they" - where "we" is the world, the rural society, and all others - "they", and "we" are, if not in a state of war, then least able to defend against external influence.

Contacts were individualized and isolated; and, most importantly, they are not needed, because, in principle, the peasants could not give anything useful to the "world" outside the village, and it did not. Peasant environment of the XIX century. has a very limited information return: there are very few sources of actual peasant origin; although their limitations are also certain information.

Information "from the other side" is orders of magnitude more. But what exactly was the knowledge of "society" about the peasants? The thesis of the "peasant country" should not deceive us; let's try to analyze what the townspeople knew and what the townspeople knew? Direct contact with village realities was essentially absent; logically,

no matter how strange this was about the village, noblemen who still had family estates could have known: childhood memories, visits to parents still living there, etc. For all others, at best, writers were the source of information about the life of the village, in general, artists. How exactly they refracted reality is simple to see. Whether A. G. Venetsianov's fantastic pastorals ("The Barn", "On the Harvest. Summer", "On the Plowing. Spring"), very far from reality, or the "Notes of the Hunter" by I. S. Turgenev, where peasants are shown like it would be normal people, but the background is the author's slight surprise - men, and they are characterized by human feelings and experiences, like other people.

In the new conditions (we mean the development of capitalism), not only the stratification of the peasants occurred, but the peasant mobility sharply and significantly increased - conditionally going beyond the limits of the village. The world began to unfold to the world - the peasants went to the cities in search of a better life; at the same time, they inevitably perceived urban being with all its positive and negative sides; something to adopt. As a result, these multiple threads began to tear one after another, so fastening the community as a whole. And even the returnees were already a bit different - with new connections and contacts "there", outside their village. And what is even more important: those who see a different life, different morals, other bans and permits, including, as it were, the legalization of what was, as it were, forbidden in rural society, for example, prostitution.

Upon his return, the peasant could not continue to exist according to these new principles - the rural "world" leveled everything, and it was impossible to root something else, different. As a result, the person was faced with a choice: to submit to society, once again become "like everyone else", or go back. In the city, such a migrant joined the already existing social group of the urban population, breaking with his "village" past. One of the unspoken conditions of "adoption in the townspeople" was the perception of the peasantry according to the general scheme - haughtily; It is significant that even the working environment perceived the peasants accordingly. Such a system worked until the beginning of the twentieth century: the village was losing people, but it kept itself, at the same time evolving under the influence of capitalist relations in the country.

It is indicative, in our opinion, that already at the end of the XIX century. local newspapers lamented the "fall of morality" among the peasants who went to work in the cities, bearing in mind, above all, the emergence of other value orientations among them and the disappearance of the former piety regarding "their" community, its rules, its values, and so on. Just one example: So, in the late 1890s. in the "Orenburg newspaper" complaints about the fall of peasant mores because of the influence of the city were supported by an example - quoting a chastushka recorded in the Orenburg district: "I will take a knife, I will take a fork // I will cut my milky" [2, p.119.].

When we talk about the "destruction" of the community by the Stolypin reform, we somehow do not pay due attention to the fact that the latter did not so

much destroy the community, but transferred a number of important moments of intra-village relations - in this case related to land - to the nationwide legal space. As for the internal relations / interconnections of the community, no one specifically or purposefully destroyed them - in any normative act related to the reform, in any public statement, as, indeed, in the well-known practical steps, no one attempted to “human factor".

If we make a certain tolerance, namely: there would be no reform of Stolypin, and then there would have been no 1917 with its “agrarian revolution” —that is, hypothetically exclude external factors of influence, then is the community then left? In our opinion, no. The inner world of the community began to collapse even before these events, and this process would proceed under any external conditions, regardless of the political system or the dominant economic relations. Of course, the “political” component would inevitably influence this process; moreover, it would have a tangible, effective effect — but it would only influence, and not lead it.

The community, exactly as a community, collapsed on its own, slowly but surely, to the extent that internal ties were torn, and they were torn, because the informational penetration of the external world began to increase at times. And this ongoing process still inevitably broke all closed communities.

If earlier, when a peasant faced new, incompatible ideas, he had a certain opportunity to choose, now the “city” definitely imposed his world view, which essentially excluded options.

As a result, this process was even more accelerated - however, it would be more correct to say - blown up by the world war - millions of villagers were marginalized at once - having lost the traditional peasant regime in many respects, they did not acquire the “urban” one. It is important that this happened largely by force - in peacetime only volunteers left the village, although of course, conditional, sometimes forced, but still with free will. Even if the war ended in victory, then with the return of the front-line soldiers, the former traditional life in the village would in principle end.

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跨越中国←→布里亚特在情况和人民的命运
CROSS MIGRATION CHINA ←→ BURYATIA IN CIRCUMSTANCES AND THE FATE OF PEOPLE

Tsibudeeva Nadezhda Tsidenovna
Candidate of Art Criticism
East Siberian State Institute of Culture

注解。 这篇文章涉及移民，作为为自己及其后代寻求更好生活的内部人。 移民在新栖息地的社会适应有助于识别潜伏在人体中的隐藏机会，并将其带入新的质量水平。

关键词：移民，难民，侨民，海外中国，探矿者，矿山，阿特尔，文化革命，修正主义，首席，极端，域外，激情。

Annotation. *The article deals with migrants, as internally persons in search of a better life for themselves and their descendants. Social adaptation of migrantsin new habitats contributes to the identification of hidden opportunities that lurk in the human body, and brings it to a new qualitative level.*

Key words: *migration, refugees, diaspora, china overseas, prospector, mine, artel, cultural revolution, revisionism, chief, extreme, extraterritorial, passionary.*

Migration as a voluntary move from one country to another takes place for various reasons. Mass migration can be caused, as a rule, by major sociopolitical or natural-climatic cataclysms; individual migration is caused by the achievement of material well-being or reunification with the family.

The history of the neighboring peoples of Russia and China experienced several waves of migration, mainly due to socio-economic reasons. In our case, we will talk about mutually reversible migration processes from China to Buryatia and from Buryatia to the north of China to the Autonomous Region of Manchuria in the People's Republic of China established for the Buryat diaspora. In such a transition to a foreign land, the destinies of people who adapt to new conditions and not just survive, intertwine in the most unexpected way, but by revealing the hidden possibilities of their bodies, they are somewhat ahead of their fellow tribesmen, who continue to remain in their usual conditions.

Thus, in the musical and theatrical art of the Republic of Buryatia, two half-breeds have left their mark: “huaqiao”, i.e. Chinese living abroad. These are two soloists of the Buryat State Academic Opera and Ballet Theater named after G.Ts.

Tsydynzhapova, People's Artists of the RSFSR - Nikolay Yan Ventun (Sayan Radnaev) and Vladimir Yan Chinfan (Buruev). The natives of the Kurumkansky district of the Republic of Belarus, from childhood showed their singing inclinations, performed in school amateur performances and took place on the stage as professional vocalists. In the Buryat opera troupe they lived for about a century for two, and the general audience sincerely loved them as relatives, feeling that the theater had become the element for them, which allowed them to fully and naturally realize themselves in their work.

People's Artist of Russia, laureate of the State Prize of the Republic of Buryatia, Nikolay Yan-Ventun (1935-2013) personified such a type of actor who carried the hard burden of backstage everyday life without fail in order to show the audience a holiday on the day of the performance. Courageously charming and unusually textured, he disposed the public with a rare combination of acting with a beautiful appearance and voice of an extraordinary range.

The artist convincingly got used to the image and truly recreated the whole range of emotional experiences of his characters from human greatness to his fall: the patriotic pathos of Prince Igor and the confusion of Tsar Boris, tormented by the nightmare of bloody visions, the victorious glory of the bullfighter Escamillo and the Jesuit insidious Yago[1]. It was attended by the breed grace and at the same time the unprecedented prowess of the white officer Pan Gritsian Tavrichesky in the operetta "Wedding in Malinovka" B. Alexandrov and at the same time the capricious erratancy of Erhe-Margen in the first Buryat opera "Enhe-Bulat bator" M. Frolov, when a Kazakh singer of Buryat origin, Irina Atanova, put it: "in the scene of breaking bows, the young actor takes all the attention of the hall".

On tour, the audience of the Buryatia Opera Theater, which included N. Yan Ventun for many years, covered a vast space from the Far East and Siberia to Ukraine and Stavropol, abroad: in China, Korea, Japan and Mongolia. Irkutsk reviewers noted his work in Attila by G. Verdi as a hero combining cruel barbarism with forgiving generosity.

The creative way of N. Jan Ventuna began at the Ulan-Ude Music College, in the class of the Buryat singer-bass, People's Artist of the USSR L. Linhovoin, where he worked with his classmate and countryman Vladimir Jan Chinfan. The owner of the velvet lyric baritone - People's Artist of the RSFSR, laureate of the State Prize of the Republic of Belarus Vladimir Yakovlevich Yan-Chinfan (1936-99) also had an innate sense of the scene. The subtle inner intelligence and peculiar aristocratic polish have always been noted by devoted admirers of the artist.

Having become one of the winners of the art shows of the district, then the city stage, the young man entered the Ulan-Ude Music School and made his debut in 1961 as Valentin in the opera "Faust" by S. Gounod. However, his most beloved

[1]N. Tsibudeeva. Buryat vocal school, its origins. Factors of becoming. Ulan-Ude: IPK FGBOU VSGIK, 2016 – p. 118.

hero was Figaro - the embodiment of young joy, bold ecstasy of life, young, bright enthusiasm, the media said [2].

As for the origin of N. Yang Ventuna and V. Yang Chinfang, their distant ancestors once lived in the Chinese province of Shandong, the birthplace of the great thinker Confucius. However, due to the shortage of land for economic needs, they were forced to take on the harvest on the side. So they were on the territory of the Trans-Baikal north with climatic hardships and significant temperature differences. "In winter, from the great cold, neither a beast nor a bird live there," wrote in the 13th century. Venetian traveler Marco Polo[3]. But in addition to living a colorful mixture of different ethnic Russians, Buryats, Evenks, Poles, Chinese, this harsh region served as a place of re-education for political exiles and convicts.

This little-known Siberian taiga was a well of infinite riches from natural resources, "soft junk" in the form of furs, etc. When, in 1846, gold-bearing deposits were discovered on Bohorigtu, they became bait for seekers of good luck.[4]. For artisanal gold mining was carried out at that time by the efforts of artel miners from civilian singles. Since the sparsely populated territories of the Far East did not represent for some time economic and practical interest and an object for research, until 1858 Russia did not have a clearly defined border with China. The Beijing Treaty on Land Delimitation was signed in 1860.

So the previous generations of N. Yan Ventuna and V. Yan Chinfan found themselves in Transbaikalia, where they found their interest in the gold mines of Bount and Kurumkan. "It can be said with certainty that there is no such family in Shandong, the members of which would not go to the Russians to work in the Amur Region, Siberia or Northern Manchuria," wrote V.V. Grave in his report "The Chinese, Koreans and Japanese in the Amur Region"[5].

Having married local girls, the parents of our heroes settled with their families in the area of Baraghan near Kurumkan and lived earthly joys and needs. Father N. Jan Ventuna joined the collective farm. Lenin, where for half a century of hard work, earned a number of government awards, including the honorary title "Drummer of Communist Labor" for creating a feed base for the Kurumkansky district. He was planting potato seeds, tomatoes, watermelons, tobacco, etc. from planting seeds from the Celestial Kingdom. Father V. Yang Chinfan established manual production of building bricks and supplied the villagers who built houses with stove heating with the results of their work. The sons successfully performed in the city of Ulan-Ude.

[2]Eltsov Yu. Ah, bravo, Figaro, bravo, bravissimo! // Tip. teacher, 1996. №5

[3]Notes IRGO on Dep. ethnography I.P.Minaev. The journey of Marco Polo. Translation from fr. text. St. Petersburg, 1902 - p. 92 – 93.

[4]Tsidendbaev, Ts. B. Buryat historical chronicles and pedigrees / Ts. B. Tsydendbaev. - Ulan-Ude: Buryat. Prince publishing house, 1972. - p. 143.

[5]Chinese, Koreans and Japanese in the Amur Region: report of the Representative of the Ministry of Foreign Affairs V.V. Grave. - St. Petersburg: type. V.F. Kirschbaum, 1912. – p. 16.

The deterioration of relations between countries as a result of the "cultural revolution" in the PRC and the policy of "revisionism" in the USSR in the 60s led to the change of the names of N. Yan-Ventuna and V. Yan Chinfan to the mother: Radnaev and Buruev. But it did not affect the sympathy for them from the side of the ordinary spectator and higher bodies. This is eloquently shown by the facts of their biographies, with the award of high government titles and awards.

As for the reverse process and the exodus of the Buryat population from the USSR to the territory of a neighboring state, several waves of organized migration were caused by the local peasantry's misunderstanding of the revolutionary events of the twentieth century and unwillingness to participate in the bloody meat grinder of the civil war that followed. The villagers, who were originally engaged in breeding large and small horned animals, were frightened by the policy of the new government in relation to the system of inter-strip land use and collectivization measures with their unification into large farms and the socialization of livestock. Therefore, in 1921, several thousand Buryats, with a total of 300,000 souls, left their historic homeland and settled in the area of the city of Hailar.[6].

The government of the People's Republic of China allocated to refugees a territory of about 9,000 km, called Shenehen (from the Buryat word "new"). During the long transition, they kept the livestock of cattle and continued its breeding in a new place, creating the food base of the country that gave them shelter.

The leader around whom the internally displaced people of various classes and states consolidated was the rural teacher Urzhin Garmayev (1888-1947), who grew up to be a gurda - the head of the entire Buryat emigration [7]. After graduating from the officer school, he made a military career, rising in 1934 to Major General Cavalry and Commander of the North-Khingan Military District of the army of the independent state of Manzhou-Go, which existed in 1932-45. in the north of the PRC with a population of 30 million people.

However, the Soviet government did not forgive Urzhin Garmayev for his position on creating the idea of a Pan-Mongolian state during the Great Troubles of the 1920s and combat reconnaissance actions in favor of militarist Japan during the Great Patriotic War of 1941-45. In 1947 he was arrested with the subsequent confiscation of all property and executed, and after years, in 1992 he was rehabilitated.

The tragedy of the mass migration of Buryats is devoted to the play Wind of the Past Times (*Унгэрһэн сагай һэбшээн*) based on works by playwright Valery Basa in the Buryat Drama State Academic Theater named after H.N. Namsaraev.

Today, the outstanding figure of Urzhin Garmayev is perceived ambiguously

[6]Bazarov B.V. Lieutenant-General Manzhou-Go Urzhin Garmaev. Ulan-Ude: Publishing house BNTS SB RAS, 2001. – p. 10.

[7]Bazarov B.V. Lieutenant-General Manzhou-Go Urzhin Garmaev. Ulan-Ude: Publishing house BNTS SB RAS, 2001. – p. 13.

on both sides of the Russian-Chinese border, causing controversy and discussion around the assessment of his voluntary or involuntary participation on the enemy side during 1941-45. However, all this does not detract from the scale of his personality, which in extreme and extraterritorial circumstances has managed to manifest his passionate qualities and perform risky acts that threaten his personal safety.

Thus, the harsh conditions of the newly acquired homeland found creative tendencies with descendants of Chinese peasants with the ability to martial art - the son of Buryat shepherds.

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儒家思想对中国园林建筑的影响
INFLUENCE OF CONFUCIANISM ON THE ARCHITECTURE OF GARDENS IN CHINA

Kruglova Ekaterina Alekseevna
Moscow Architectural Institute (State Academy)

注解。 儒家思想在自然界中的主要思想是一种全能的宇宙思想，并将其设备复制为对自然界万物本质的一种借鉴。 儒家和新儒家影响了私人和寺庙花园的风格特征的形成。 本文探讨了中国古代教义和哲学对其现代建筑的本质和影响，特别是园林的设计和目的。 作者的贡献是澄清和解释这种影响的本质。

关键词：儒学，中国哲学，中国美学，新儒学，山水艺术。

Annotation. *The main idea of Confucianism in nature is the idea of an all-generating Cosmos and copying its device as a reference to the essence of all things in nature. Confucianism and neo-Confucianism influenced the formation of the stylistic features of private and temple gardens. The article examines the essence and influence of the ancient teachings and philosophies of China on its modern architecture, in particular, on the design and purpose of gardens. The contribution of the author is to clarify and explain the essence of this influence.*

Keywords*: Confucianism, Chinese philosophy, Chinese aesthetics, neo-Confucianism, landscape art.*

China is Russia's largest and most numerous neighbor. The history of relations with this country goes back a long way. The USSR became the first foreign state that on October 2, 1949 announced the recognition of the PRC and established diplomatic relations with it.

Every year, Russia is increasingly cooperating with China in all spheres of public life. This is evidenced by China's goods traffic with our country, which has increased tenfold over the past 5 years and by close cultural ties. [1]

In order these ties and relationships to be strong, it is necessary to deeply understand cultural traditions, to know the language and history of our partners, whose roots go back to ancient Chinese philosophy.

The Chinese philosophy, worldwide and in Western Europe from the middle of the XVII century, when the fashion for all Chinese appeared and in general for Eastern exoticism, began to be spoken about in sublime and admiring tones. And it is really worth it.

The teachings of the ancient thinker and philosopher Confucius had a profound impact on the lives of China and East Asia, becoming the basis of a philosophical system known as Confucianism. By the II century BC Confucianism has become a state doctrine, the dominant ideology of the nobles, determining the development of social thought, science and art for the next 2000 years.

This influence did not bypass the architecture of China, which was expressed in the formation of the well-established principles of construction and design of architectural structures, subjected to the rules of strict regulation in accordance with the social position of the owner of the house. On the one hand, it became the style and landmark of China, on the other — it significantly limited the creativity and thinking of Chinese architects.

In contrast to the doctrine of Lao Tzu (the ancient Chinese philosopher of the VI-V centuries BC), Confucianism had a strong influence on the aesthetics of the Chinese garden, especially in its social and functional area.

Confucianism trended to exclude everything that could not be structured from the sphere of culture, i.e. could not be covered by the "ennobling influence of the ritual (li)." [2] This trend gave rise to a special, unique principle of Chinese aesthetics. Each object of nature in art was considered to be aesthetically perfect when it underwent a certain structurization, processing and change of its qualities in accordance with cultural traditions. For example, the breeding of new plant varieties from a limited species set was determined by their symbolism. The variations of the forms of the symbol itself in the Chinese cultural tradition are not limited. This is the essence of understanding the nature of the Chinese garden.

By tradition, Chinese gardens are divided into: imperial parks, private gardens, landscape parks, gardens at temples, which include gardens at the Taoist temples and monastic (Buddhist) gardens [3]. The building principles of gardens, as well as their aesthetic characteristics, are repelled from common cosmological ideas.

The main core of the philosophical and artistic awareness of nature in the culture of medieval China was the relationship of cosmic nature with the Confucian integrity of the personality. The main idea of Confucianism in nature was "the idea of a naturally functioning and all generating Cosmos". [3] Cosmos in Confucianism is the main and perfect standard, the main object of ritual influence and philosophical reflection. It was the relationship of the Confucian personality with the cosmos that became decisive both for the transformation of nature in the aesthetics of China, and for Chinese art as a whole.

At the heart of the creation of Chinese gardens according to Confucianism lies the tendency to imitate the finished, given pattern, the prototype of the depicted object or spatial structure. In later epochs in China, the practice of creating landscape compositions resembling the gardens of antiquity, which originated in Confucian ethics, took root.

In addition, the teaching of Confucius brought to the tradition of landscape art a strong humanistic beginning. In China, not only landscape design, but in general, all architecture and all forms of art are created and comprehended through Confucianism. Never becoming formal, they are subject to the program of human development, and in the aesthetics of gardens, this is manifested in the desire to avoid extremes that bring the qualities of the object to the maximum concentration of its properties. Therefore, the program for the development of Chinese culture is usually referred to as the "middle way".

Model of the Chinese garden, which had already formed by the IV — VI centuries and developed in the IX— XI centuries, embodied the program of the middle path, realizing in its further development features of the artistic, spatial thinking, determined by the tasks of Confucian ethics, the whole Confucian system of education of the individual as a whole.

The ethical character associated with the doctrine of the "middle", over time, was acquired by the Confucian category of Tao, which is important for the realization of the creative process, and which is central to all Chinese philosophy. Tao began to be perceived as the true path of the creative process, genuine creativity. Respectively the culture of contemplation of the garden from the standpoint of Confucian philosophy was aimed at improving the ethical qualities of a person.

The famous Chinese philosopher, historian, writer, poet, Confucian Han Yu (768-824) said that for self-improvement one must go out into nature — into forests and mountains. But very busy "state" people who cannot afford it can compensate the search of solitude and "accumulation of aesthetic sensations" in their own or urban gardens.

Appeal to nature among Confucianists was usually associated with the search of truth and self-realization. The art of gardens gave them this opportunity without any ethical and cultural contradictions. Therefore, in China there was born an activity to create parks and private gardens as part of an art movement.

The philosophy of Taoism, Lao Tzu and Chuang Tzu contrasted the Confucian social and ethical function of art with the doctrine of artlessness of basic ethical norms that are embodied at the level of artistic practice. Despite this, Taoism gave a significant impetus to the creative development of Chinese thought. The central place in it was given to the inner world of a man.

Later, during the Sung era (X-XIII c.), the influence of the ideas of Taoism and Buddhism on Confucianism led to numerous attempts of its transformation. An example of these changes is neo-Confucianism, with its increased attention to the essence of nature, which also affected the formation of the stylistic features of private and temple gardens.

Nature in aesthetic sense was perceived in Chinese Buddhism as an equal start in the process of creative acquisition of reality. It played the role of a factor recon-

ciling the «cultural» and «natural» beginnings in a man. Buddhists' attention was attracted by the most ordinary things: a dry branch, an overgrown pond, a mossy stone, etc. They saw a deeper essence than the one that the unaware person saw.

Neo-Confucianism advanced to the first most important philosophical understanding of the topic of the relationship between nature and man. In accordance with this dramatically increased the symbolic significance of landscape art. The garden of an intellectual has become an artistic expression of important philosophical categories.

Neo-Confucianism focuses on the sensual, intuitive perception of the surrounding world, affirming the unity of man with nature. To know tai-chi (essence, core) of a particular object meant to reveal its principle Li. An important feature of the first principle was that, being in a phenomenon, it did not break up into parts, but realized itself entirely there. This property was realized in landscape art. The desire to see in the lotus flower or in the bamboo branch the first principle originates in the neo-Confucian philosophy. The viewer's attention was focused on individual elements of nature or miniature compositions. Therefore, dwarf trees and miniature “gardens on the table” are characteristic for Chinese gardens. They reflected the idea that Li is able to dwell in everything, even in small things. An important point here is the requirement “to approach things in order to study their first principle”, reflected in the contemplation of landscape gardens.

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心脏血管内介入治疗期间心肌状态的预处理和电生理监测
PRE-OPERATIVE PREPARATION AND ELECTROPHYSIOLOGICAL MONITORING OF THE MYOCARDIUM STATE WITH HEART ENDOVASCULAR INTERVENTIONS

Shevchenko Yury Leonidovich
Academician of RAS, Doctor of Medical Sciences, Professor
The Head of the Clinic of Thoracic and Cardiovascular Surgery named after St. George
The President of the FSBI "National Medical and Surgical Center named after N.I. Pirogov" of the Ministry of Healthcare of the Russian Federation
Marchak Dmitry Igorevich
Candidate of Medical Sciences
therapist for endovascular diagnosis and treatment, Department of X-ray methods of diagnosis and treatment
Gerashchenko Alexander Vitalevich
Cardiovascular surgeon
Department of surgical treatment of complex rhythm disturbances and cardiac pacing
Ermakov Dmitry Yuryevich
Clinical resident, Department of Thoracic and Vascular Surgery with a course of X-ray endovascular surgery
Institute for Advanced Medical Studies of
Clinic of Thoracic and Cardiovascular Surgery named after St. George, FSBI "National Medical and Surgical Center named after N.I. Pirogov" of the Ministry of Healthcare of the Russian Federation

抽象。缺血和再灌注损伤是冠心病手术中的紧迫问题，因为心肌缺血区域中的血流恢复可导致由于不利的代谢变化导致的心肌细胞损伤。由于线粒体ATP敏感性钾通道的激活，缺血预处理是干预冠状动脉期间心脏保护的有效方法。同时，目前，在冠状动脉血管内干预中监测缺血的常规方法是标准的心电图和来自患者肢体的增强导联。 ECG电极在患者胸部的定位使荧光透视期间的可视化恶化，并且

冠状动脉内ECG的表现与技术困难相关并且由部门中消耗品的存在决定。

RAS Yu.L.院士舍甫琴科提出了一种统一的侵入性心电图方法，在冠状窦中使用电极定位，以控制冠心病血管内介入治疗期间的术中缺血。为了研究冠状窦心电图的信息含量并确定预处理的有效性，将20例患者分为2组：主要组包括10例接受心脏保护的患者和10例直接冠状动脉支架置入术。作为计划操作的一部分，将电极连接到所有患者的冠状窦电生理检查站。

与心电图评估的标准方法相比，所提出的术中监测缺血的方法显示出更高的效率。这项原始技术为经皮介入术中的术中心肌缺血研究提供了额外的机会，并可作为研究心肌生理学的高度信息工具。与心电图评估的标准方法相比，所提出的缺血术中监测方法显示出更高的效率。这项原始技术为经皮介入治疗术中心肌缺血提供了额外的机会，可以作为研究心肌生理学的高度信息工具。

关键词：缺血性心脏病，术中监测缺血，冠状静脉窦心电图，缺血预处理。

Annotation. *Ischemic and reperfusion injury is a pressing issue in the coronary heart disease surgery, since restoration of blood flow in the ischemic region of the myocardium can lead to cardiomyocyte damage due to adverse metabolic changes. Ischemic preconditioning is an effective method of cardioprotection during interventions on the coronary arteries due to the activation of mitochondrial ATP-sensitive potassium channels. At the same time, at present, the routine method of monitoring ischemia in endovascular interventions on the coronary arteries is electrocardiography in standard and enhanced leads from the patient's limbs. The positioning of the ECG electrodes on the patient's chest worsens visualization during fluoroscopy, and the performance of the intracoronary ECG is associated with technical difficulties and is determined by the presence of a consumable in the Department.*

Academician of RAS Yu.L. Shevchenko proposed a unified method of invasive electrocardiography with electrode positioning in the coronary sinus in order to control intraoperative ischemia during endovascular interventions for coronary heart disease. In order to study the information content of the ECG from the coronary sinus and determine the effectiveness of preconditioning, 20 patients were divided into 2 groups: the main group included 10 patients who underwent cardioprotection and 10 patients with direct coronary stenting. As part of the planned operations, an electrode was connected to the station for electrophysiological examination in the coronary sinus for all patients.

The proposed method of intraoperative monitoring of ischemia showed a higher efficiency compared with the standard method of ECG assessing. This original technique opens up additional opportunities for the study of intraoperative myocardial ischemia within percutaneous intervention and can serve as a highly informative tool for studying the myocardium physiology. The proposed method of ischemia intraoperative monitoring showed a higher efficiency compared with the standard method of ECG assessing. This original technique opens up additional opportunities for the study of intraoperative myocardial ischemia with percuta-

neous intervention and can serve as a highly informative tool for studying the myocardium physiology.

***Keywords**: ischemic heart disease, intraoperative monitoring of ischemia, coronary sinus electrocardiography, ischemic preconditioning.*

In the first place among the causes of disability and mortality is the pathology of the cardiovascular system, largely represented by coronary heart disease (CHD) [1]. However, the negative effects of reperfusion and ischemic effects at the time of balloon inflation or stent implacement into the coronary artery can adversely affect the state of cardiomyocytes after percutaneous coronary intervention (PCI).

The adaptation methods of the heart to short-term ischemic episodes that increase myocardial resistance to the damaging factors of ischemia and reperfusion are of interest. This is explained by the fact that, despite modern advances in the field of X-ray endovascular surgery (REVS), the restoration of coronary blood flow after prolonged ischemia does not lead to a complete normalization of the cardiomyocytes contractile function. The ischemic effects during performing PCI exacerbate this process [2]. Such negative effects can be avoided using ischemic preconditioning (IP) - the phenomenon of increasing tissue resistance to ischemic and reperfusion injury by performing several short episodes of ischemia and reperfusion [3]. At the stage of ischemia, the ATP-dependent potassium channels of mitochondria are considered to be proven PI effectors. Activation of these structures leads to a moderate protective edema of the mitochondrial matrix, a decrease in the current of calcium ions inside the mitochondria and a decrease in the formation of reactive oxygen species. At the reperfusion stage, the effects of IP are confined to nonspecific mitochondrial pores. At present, it has been convincingly shown that overloading cells with calcium and oxygen radicals at the ischemic stage leads to the discovery of these structures already in the first minutes of reperfusion, which leads to a sharp increase in the permeability of the mitochondrial inner membrane, as a result of which low-molecular compounds enter the matrix of mitochondria from the cytosol. As a result, mitochondrial edema, a proton gradient decline, and the dissociation of oxidation and phosphorylation, with subsequent inevitable damage to mitochondria until their destruction, develop. The discovery of mitochondrial pores is considered one of the most important mechanisms leading to fatal reperfusion injury of the myocardium due to necrosis and apoptosis of cardiomyocytes. The closure of these pores leads to a decrease in the transmembrane current of calcium in the mitochondria, which prevents their destruction and the death of cardiomyocytes [3].

Along with the heart protection from the negative ischemic and reperfusion effects in PCI, the question arises of the effective intra-operative monitoring of the myocardium state in endovascular surgery of IHD. Currently, a standard elec-

trocardiography (ECG) technique is used to control the heart electrical activity (EAH) in REVS, in which three standard, three enhanced and six chest leads are used to obtain a graphical recording of EAH in three planes and map myocardial ischemia zones. However, the placement of electrodes on the patient's chest deteriorates visualization during fluoroscopy, which makes difficulties to PCI. Poor resolution of the cardiogram obtained using the leads from the patient's limbs led to the development of alternative methods for evaluating EAH with REVS. For the first time, a method of ECG modification for monitoring myocardial ischemia in REVS, called intracoronary ECG (ICEG), was suggested by Friedman P. et al. (1986) [4]. The essence of the method was in introducing a coronary conductor (CC) with a low electrical resistance into the coronary artery, after which it was connected to an ECG apparatus. At the time of stenting, intracoronary and standard ECG were recorded. Greater informativeness of IECG with respect to monitoring of ischemia compared with the routine procedure was proved on the basis of the difference in the deviation of the ST segment from the isolineHowever, the ability of the emplacement the coronary conductor into coronary artery to assess the electrical activity of the heart in each case is determined by the anatomy of the coronary bed, as well as the location and type of atherosclerotic lesion. At the same time, a request is being formed for the presence in the department of x-ray surgery of certain types of consumables, which, moreover, require an analysis of their conductive properties. . All of the above determines the lack of unification and universality of the invasive ECG technique in the intracoronary ECG format [5, 6].

In the Pirogov Center, Academician of the RAS Yu.L. Shevchenko proposed a unified method of invasive electrocardiography with positioning of the electrode in the coronary sinus (Csin) for control of intraoperative ischemia in endovascular surgery. A multichannel electrode connected to an electrophysiological study station is placed in the coronary sinus by peripheral transvenous access. At the same time, four electrodes are mounted onto the patient's body, which also join the workstation. Coronary anatomy and the type of atherosclerotic lesions of the coronary artery do not affect the possibility of catheterization of CA, which technically distinguishes this method of controlling the electrical activity of the heart from IECG. In addition, the use of EFIS software and intracardiac leads allows to obtain and analyze ECG data with high accuracy.

Materials and methods.

The results of intra-operative control of ischemia were analyzed using EFIS for invasive ECG monitoring in 20 patients with stenotic atherosclerosis of the CA and stable coronary artery disease admitted for planned coronary stenting (CS). At the same time, 10 patients underwent ischemic myocardial preconditioning (IP), and 10 patients were included into the control group. The effect of IP on the degree

of ischemia during stent placement and the level of sensitivity to changes in EAH and IECG compared with a standard ECG were analyzed.

The study was carried out on the basis of the departments of X-ray surgical methods of diagnosis and treatment of the National Medical-Surgical Center named after. N.I. Pirogov. At the same time, the electrode inserted into the coronary sinus served as a temporary pacemaker. There were 8 men (40%) and 12 women (60%). All patients signed an informed consent to conduct the study.

Objectification of IHD presence was carried out according to generally accepted recommendations. The treadmill test was performed on a GE Ergometr 900ERG apparatus, echocardiography (EchoCG) was performed on a GE Vivid E9 sonograph. If necessary, myocardial perfusion scintigraphy ("Discovery NM / CT 670" GE) was performed in patients with IHD. All patients underwent selective polypositional coronary angiography as a method recommended by the European Society of Cardiology to verify coronary lesions in patients with stable angina.

Criteria for the inclusion of patients in the study: stenosis of the anterior descending artery (PNA)> 50% with documented ischemia. Exclusion criteria from the study: multivessel coronary disease, atrial fibrillation and flutter (AF and AF), chronic and acute renal failure, inability to prescribe antiplatelet therapy, severe anemia, cardiomyopathy of various origins, chronic diseases of the respiratory and digestive systems in the decompensation stage.

After the initial examination of the patients, myocardial revascularization was performed according to the stenting method of the CA. Endovascular intervention was carried out according to standard methods on angiographic installations using a coronary computer program to assess the gravity and extent of coronary artery stenosis. In the IP group, preconditioning was performed using balloon occlusion (BO) of the coronary artery as part of the predilation of the affected area, or in the form of an immediate stop of blood flow before the intended stent localization. The IP protocol is presented as follows: occlusion of the anterior descending artery of the heart with a balloon for 5, 8, and 12 seconds, respectively; the interval between the first and second occlusions is 90 seconds; the reperfusion period after preconditioning prior to the installation of the stent is 240 seconds.

Before coronary stenting, a catheterization of the left subclavian vein (LsCV) was performed, into which the 7F introducer was inserted. A ten-channel endovascular CS-electrode (EE) was inserted into the coronary sinus through the LsCV. The mouth of the coronary sinus is catheterized under X-ray guidance. EE was connected to the EFIS EP WorkMate Recording System along with four standard electrodes attached to the limbs. Simultaneously with six leads (I, II, III, aVL, aVF, aVR), of ECG bipolar electrodes (CS 3-4, CS 5-6, CS 7-8, CS 9-10) ECG charts were recorded using the WorkMate Recording System EP.4 EP software.

Endovascular CS-electrode leads were independent of the zero electrode on the surface of the patient's body and were not connected to each other.

Topographically, the electrode in accordance with the anatomy of Csin was located on the posterior basal area of the left ventricle (LV). At the same time, the vector of electrical conductivity was projected onto a plane passing through the fibrous ring of the mitral valve, and therefore the possibility of recording changes in the electrical activity of the heart in the form of depression or elevation of the ST segment, characteristic of ischemia, was achieved.

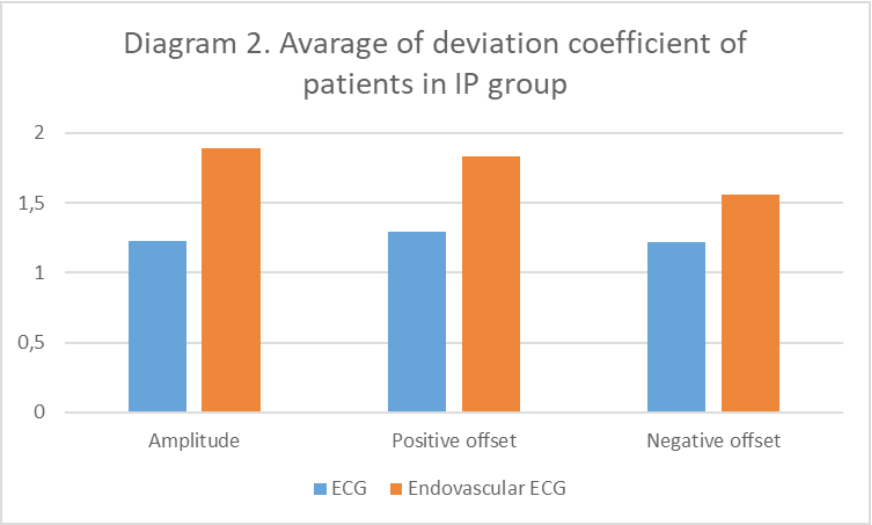
The recording of endoECG and transesophageal ECG was made before endovascular manipulations in the coronary bed (baseline) and at the time of coronary stenting. The analysis of the voltage of the STT complex was performed by 3 parameters: displacement above the isoline, below the isoline and changing the total amplitude. The results are presented in tables 1 and 2.

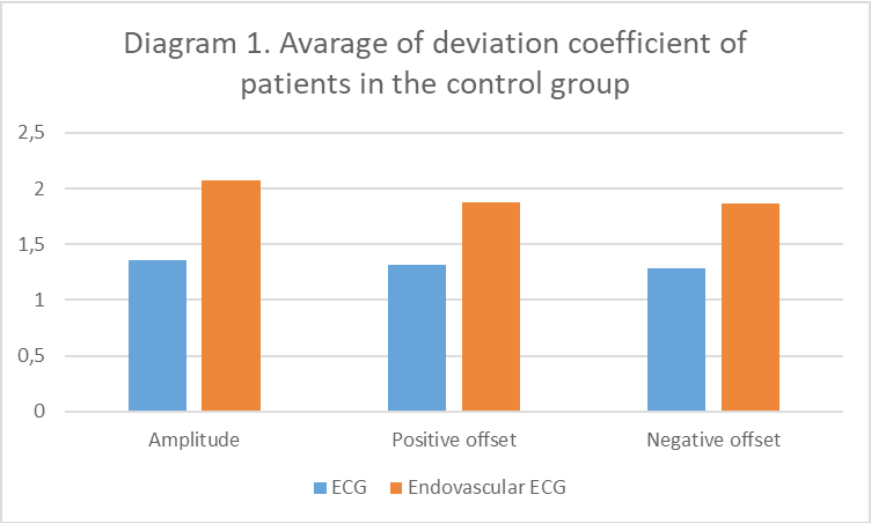
	Amplitude			Positive offset			Negative offset		
	Baseline	Stent implantation		Baseline	Stent implantation		Baseline	Stent implantation	
ECG lead	Avarage of deviation (mV)	Avarage of deviation(mV)	CoD	Avarage of deviation(mV)	Avarage of deviation(mV)	CoD	Avarage of deviation(mV)	Avarage of deviation(mV)	CoD
I	0,2465±0,0945	0,2925±0,1145	**1,18***	0,1355±0,0725	0,146±0,057	**1,07***	0,117±0,016	0,1465±0,0575	**1,25***
II	0,219±0,124	0,255±0,054	**1,16***	0,1285±0,0715	0,1645±0,0415	**1,28***	0,1165±0,0665	0,132±0,054	**1,13***
III	0,209±0,076	0,165±0,0065	0,78	0,1285±0,0045	0,209±0,076	**1,62***	0,1235±0,0285	0,054±0,035	0,44
aVR	0,186±0,106	0,190±0,0865	1,02	0,092±0,073	0,0885±0,0715	0,96	0,094±0,033	0,1375±0,0375	**1,46***
AVL	0,1345±0,0355	0,233±0,1	**1,73***	0,108±0,057	0,113±0,0355	1,04*	0,097±0,049	0,172±0,1365	1,77
aVF	0,1825±0,0875	0,145±0,071	0,79	0,119±0,043	0,0765±0,0505	0,38	0,2345±0,0445	0,048±0,041	0,2
CS 1-2	0,0145±0,0045	0,058±0,048	**4,14***	0,005±0,001	0,0175±0,0115	**3,5***	0,005±0,001	0,015±0,0365	**3***
CS 3-4	0,1055±0,0355	0,1135±0,0435	**1,27***	0,0465±0,0335	0,0495±0,038	**1,06***	0,0655±0,0085	0,065±0,0065	0,99
CS 5-6	0,188±0,143	0,088±0,053	0,46	0,1205±0,1075	0,037±0,011	0,3	0,0675±0,0355	0,051±0,042	0,76
CS 7-8	0,1075±0,0145	0,134±0,07	**1,25***	0,0605±0,0065	0,045±0,003	0,74	0,0485±0,0195	0,054±0,032	**1,11***
CS 9-10	0,0815±0,0305	0,1315±0,0455	**1,6***	0,045±0,013	0,0495±0,0275	**1,1***	0,0495±0,0305	0,074±0,026	**1,49***

Table 1. Changes in the STT segment of patients in the control group

	Amplitude			Positive offset			Negative offset		
	Baseline	Stent implantation		Baseline	Stent implantation		Baseline	Stent implantation	
ECG lead	Avarage of deviation (mV)	Avarage of deviation (mV)	CoD	Avarage of deviation (mV)	Avarage of deviation (mV)	CoD	Avarage of deviation (mV)	Avarage of deviation (mV)	CoD
I	0,2461±0,0935	0,2391±0,1139	0,97	0,1347±0,0737	0,117±0,054	0,87	0,123±0,017	0,1201±0,057	0,97
II	0,216±0,126	0,233±0,051	**1,08***	0,1279±0,0703	0,1267±0,0414	0,99*	0,1158±0,0659	0,104±0,052	0,9
III	0,199±0,069	0,158±0,0063	0,79	0,1278±0,0054	0,165±0,073	**1,29***	0,124±0,0291	0,05±0,03	0,4
aVR	0,184±0,109	0,178±0,0857	0,97	0,094±0,081	0,0865±0,071	0,92	0,089±0,029	0,11±0,037	**1,24***
AVL	0,1357±0,0346	0,189±0,13	**1,39***	0,103±0,054	0,097±0,0347	0,94	0,101±0,052	0,122±0,136	**1,2***
aVF	0,1831±0,0881	0,139±0,069	0,76	0,126±0,047	0,0749±0,0497	0,38	0,2349±0,0452	0,044±0,04	0,19
CS 1-2	0,0139±0,0049	0,046±0,047	**3,31***	0,006±0,002	0,011±0,0109	**1,83***	0,006±0,002	0,012±0,036	**2***
CS 3-4	0,1059±0,0363	0,0886±0,0423	0,84	0,0471±0,0324	0,0386±0,034	0,82	0,0648±0,0083	0,06±0,0063	0,93
CS 5-6	0,192±0,147	0,085±0,051	0,44	0,1198±0,1073	0,034±0,01	0,29	0,0679±0,0351	0,05±0,04	0,74
CS 7-8	0,1067±0,0134	0,109±0,05	**1,02***	0,0598±0,0061	0,04±0,002	0,67	0,0491±0,0202	0,045±0,03	0,92
CS 9-10	0,0809±0,0297	0,1091±0,0447	**1,35***	0,043±0,015	0,0387±0,027	0,9	0,0503±0,0299	0,057±0,023	**1,13***

Table 2. Changes in the STT segment of patients of the ischemic preconditioning group





The effectiveness of the methods was compared by analyzing the amplitude ratio, the STT complex offset above and below the ECG isoline (positive and negative bias in Table 1, 2) to the original STT voltage for each patient. The deviation coefficient (CO; CoD, deviation coefficient) - arithmetic average (AA) from the obtained data is the degree of STT change in the case of stent installation. In diagrams 1 and 2, for better visibility of the result, the average of deviation coef-

ficient is presented, which is the AA for all reliably changed in response to the ischemia of the CDs.

As can be seen from Tables 1, 2 and Diagrams 1, 2, the degree of change in the STT complex after preconditioning based on a comparison of the average CD is lower than after direct stenting, with higher resolution of the intracardiac ECG.

Conclusion:

Methods of intracardiac electrocardiography from the coronary sinus, proposed by Academician Yu.L. Shevchenko seems to be an effective method of invasive control with endovascular interventions in patients with coronary artery disease. The unification of an invasive ECG involves the rejection of technically complex manipulations for the introduction of conductors into the coronary artery and the requirements for consumables. The technique allows, by catheterization of the coronary sinus, to continuously obtain reliable information about the state of the myocardium at the time of endovascular intervention and be performed routinely. This original technique opens up additional opportunities for the study of intraoperative myocardial ischemia in PCI and can serve as a highly informative tool for studying the physiology of the myocardium.

At the same time, myocardial IP in the framework of planned endovascular interventions on the coronary arteries allows leveling the ischemic component of myocardial damage in the process of performing coronary stenting. Invasive control of the electrical activity of the heart and preparation of the heart for intervention artery using PIs can improve the results of treatment of patients with coronary artery disease in endovascular surgery, and can be recommended for routine use.

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在怀孕期间接触主动和被动吸烟的妇女的社会人口学特征
SOCIO-DEMOGRAPHIC CHARACTERISTICS OF WOMEN EXPOSED TO ACTIVE AND PASSIVE SMOKING DURING PREGNANCY

Chursina Olga Andreevna
Postgraduate Student, Department of Obstetrics and Gynecology, Orenburg State Medical University
Konstantinova Olga Dmitrievna
D. Med. Sciences, Professor
The Head of the Department of Obstetrics and Gynecology, Orenburg State Medical University
Loginova Elena Andreevna
Postgraduate Student, Department of Obstetrics and Gynecology, Orenburg State Medical University

注解。 本文涵盖了孕妇主动和被动吸烟的社会方面：评估了教育水平，社会地位，婚姻状况和伴侣的吸烟态度。 高等教育和工作的存在，官方婚姻保护孕妇免受最有害的习惯，但不吸入二手烟草烟雾，其来源往往是吸烟配偶。

关键词：孕妇，主动吸烟，被动吸烟，吸烟配偶。

Annotation. *The article covers social aspects of active and passive smoking among pregnant women: the level of education, social status, marital status and smoking attitudes of partners are assessed. The presence of higher education and job, the official marriage protect pregnant women from the most harmful habits, but not from inhalation of second-hand tobacco smoke, the source of which is often a smoking spouse.*

Keywords: *pregnant woman, active smoking, passive smoking, smoking spouse.*

According to an assessment by the World Health Organization, currently, the tobacco epidemic has affected a third of the adult population of the planet. About 200 million of the 1 billion smokers in the world are women of reproductive age, many of whom do not give up smoking during pregnancy [1, 3].

In the US, up to 50% of pregnant women smoke, in the UK and Australia - up to 40%. In Japan, with the onset of pregnancy, only 4.4% of women smoke. In

Russia, on average, 52-55% of women do not give up smoking during pregnancy, and 20-25% smoke during the entire gestation [1, 2].

With such a large number of actively consuming tobacco products, due to the imperfection of anti-tobacco laws and the lack of family members readiness to quit tobacco, passive smoking is also indisputable. Studies conducted in 14 countries with a high smoking level have shown that almost half of women of reproductive age undergo passive smoking at home [3].

Due to researches in the demography and health field, it was learned about the prevalence of passive smoking during pregnancy in some countries: 9.3% in the Dominican Republic, 17.1% in the Democratic Republic of the Congo, 82.9% in East Timor, 91.6 % - in Pakistan. There are no official statistics on the frequency of occurrence of passive smoking during pregnancy in Russia [3].

The data of domestic and foreign authors indicate the negative impact of smoking on obstetric and perinatal outcomes. Often, the social portrait of pregnant smokers is also described: the link between the harmful habit and the level of education, marital status, and partner's smoking attitude is traced [2, 3].

The number of studies devoted to the problem of passive smoking during pregnancy is extremely small. The study of this issue is of our scientific interest and in this article we touch upon the social aspects of not only active but also passive smoking.

Objective: to make a socio-demographic characteristic of women exposed to both active and passive smoking during pregnancy.

Material and research methods. This article includes the results of study of 282 women with gestation period of 37 weeks, registered for pregnancy in 2017-2018 on the basis of women's counseling in Orenburg.

All pregnant women were divided into three groups. Group 1 included 91 (32.3%) pregnant women with nicotine addiction. 122 (43.2%) were attributed to group 2, who denied the fact of tobacco use, but were exposed to environmental tobacco smoke throughout the gestation period. The 3d, control group included 69 (24.5%) women with no indication of active and passive smoking during pregnancy.

In our study, the nicotine status of pregnant women was clarified in two stages. Prior to the study inclusion, the voluntary written informed consent from all women was obtained.

The first stage was a questionnaire aimed at determing the attitude to smoking of the pregnant women themselves and their family members. For smokers the smoking experience, the number of cigarettes per day was analyzed. The possibility of outside exposure to cigarette smoke on the mother and fetus was also estimated.

The second stage was an express test for the nicotine in the urine. The method

is intended for rapid qualitative detection of the nicotine metabolite (cotinin) in vitro by immunochromatographic analysis. The sensitivity of the determination corresponds to 200 ng / ml cotinine, the accuracy of the method is 99.9%. A positive test for cotinine was a prerequisite for the distribution of patients in groups 1 and 2.

Statistical processing of material was performed using the standard statistical software package Excel MS Office XP and Statistica 6.0. Pearson's $\chi 2$ squared was used to find the relationship between two nominal variables. The level of critical statistical significance was $p<0.05$.

Results. The average age of women in the studied groups was 24.78 ± 3.77 years in the 1st group, 27.13 ± 4.87 years in the 2nd, 26.74 ± 3.27 years in the 3rd group.

Analyzing the level of education presented in Fig. 1, it was found that pregnant women with secondary education presented only in the 1st (18 out of 91) and 2nd (17 out of 122) groups ($p<0.001$).

Among passive smokers and non-smokers there are fewer women with secondary special education (27 out of 122 in group 1 and 18 out of 69 in 2) and more with higher education (78 in 1 and 51 in 3) than among active smokers (out of 91 special - 52, higher - 21) (p (0.001).

Among the surveyed presented students, working and housewives. Pupils in secondary and higher educational institutions are more often noted in 1 (19 of 91) and 2 (20 of 122) groups ($p<0.01$) than in 3 (4 of 69). The proportion of workers (in 1-60.4%, in 2- 67.2%, in 3- 76.8%) and housewives (in 1- 18.7%, in 2- 16.4%, in 3- 17.4%) in all groups was not significantly different.

When studying the marital status of women (Fig. 2), it was found that active smokers are more likely to be in civilian marriage and less often in official marriage ($p<0.001$).

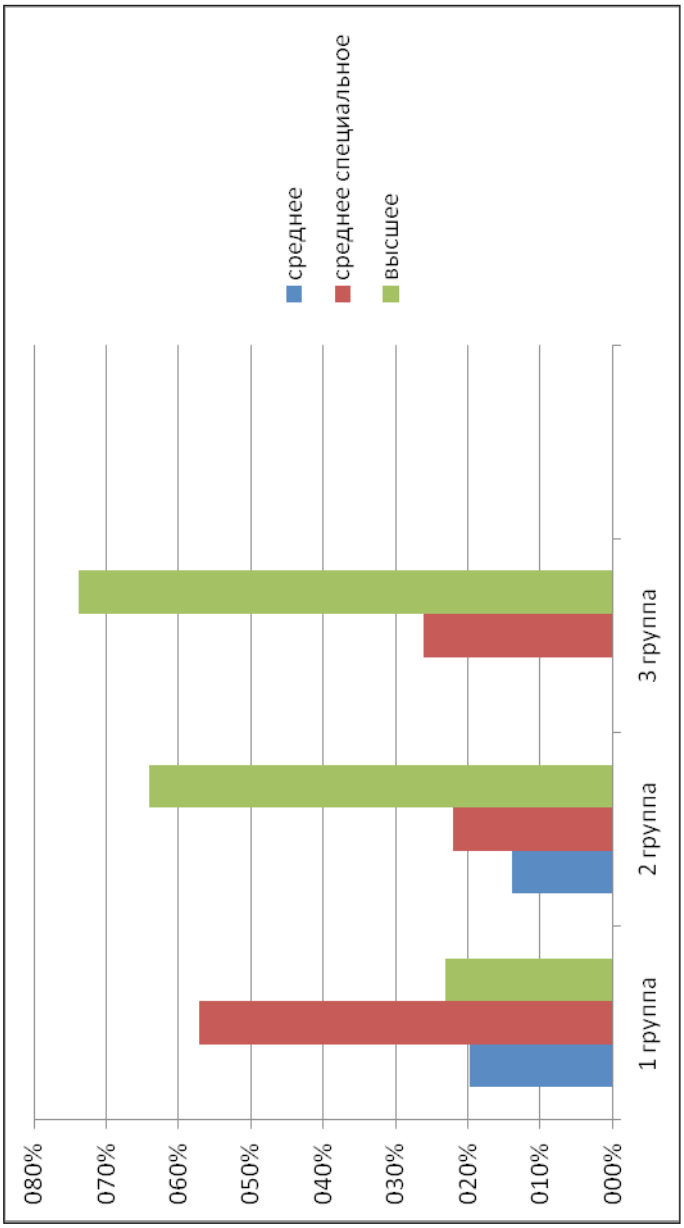

Fig. 1. *The women education level in groups.*
(“среднее” - secondary education, “среднее специальное” - secondary special education, “высшее” – higher education).

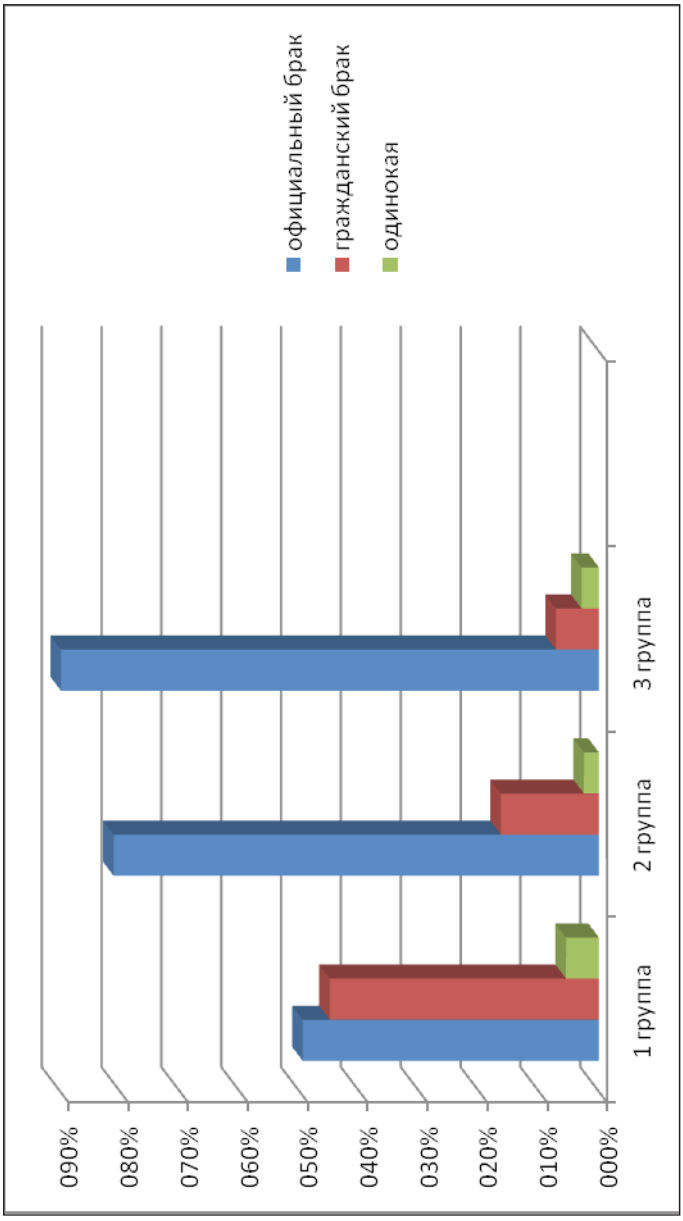

Fig 2. *Marital status of women in the studied groups.*
(“официальный брак” – official marriage, “гражданский брак” – civil marriage, “одинокая” – single)

The smoking experience in patients of group 1 (Fig. 3) was more often 3-5 years (in 42 out of 91).

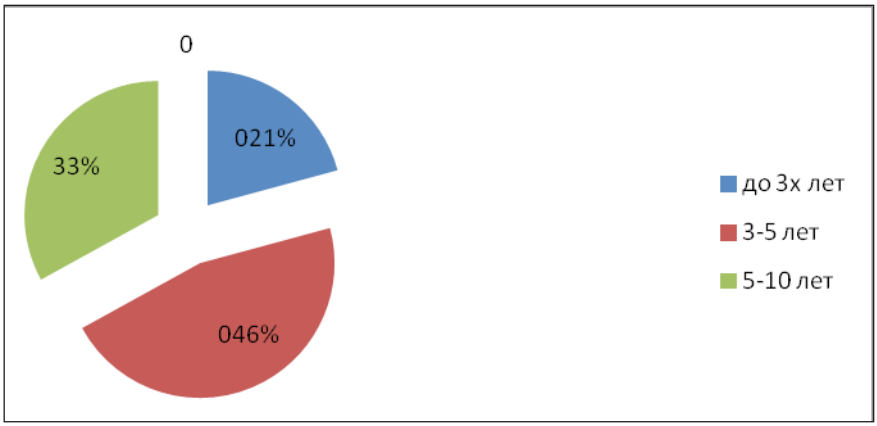

Fig. 3. *Smoking experience in pregnant women of the 1st group (blue – up to 3 years, red – 3-5 years, green – from 5 to 10 years)*

In group 1, the intensity of smoking was estimated, which amounted to 10 cigarettes / day in 58 (63.7%) and 10-20 cigarettes / day in 33 (36.3%) pregnant women.

Of the 91 groups studied, only 19 (20.9%) gave up smoking: 5- at an early period, 6- up to 12 weeks, 4- up to 24 weeks, 4- after 24 weeks of pregnancy.

Analyzing the nicotine status of the spouses, it was found that 80 of 91 women in the 1st group and 91 of the 122 in 2nd had smoking husbands ($p<0.001$). In 12 smoking patients ($p<0.001$) of 26, susceptible to the influence of tobacco smoke ($p < 0.01$), the partners gradually gave up smoking during the spouse pregnancy period. In the control group, only 4 of 69 women had smoking husbands and they all quit smoking right away as they learned about the fact of the pregnancy of their wives.

Considering the high prevalence of smoking among partners, when answering a questionnaire regarding the place where a pregnant woman was more likely to be affected by cigarette smoke (Fig. 4), the “house” and “outdoors and house” responses were among the leading ones.

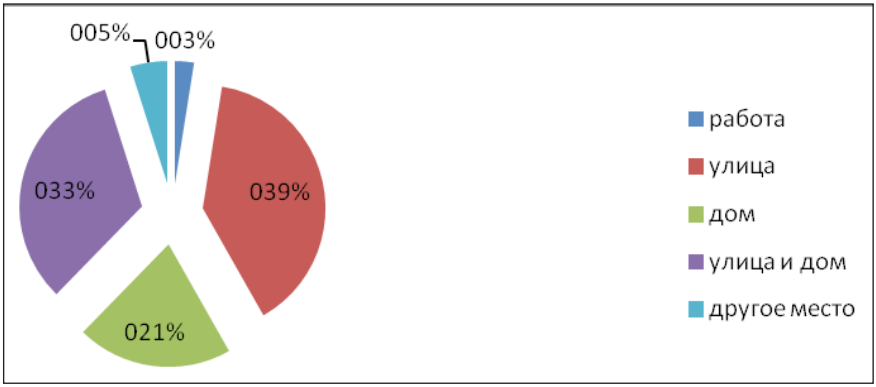

Fig. 4. *The main places in which pregnant women of 2 groups were exposed to cigarette smoke.*
("работа" – job, "улица" - outdoors, "дом" - home, "улица и дом" - outdoors and home, "другое место" - other places)

Conclusion. In our study, we confirmed the assumption that not only active (32.3%) is widespread, but also passive smoking (43.2%) among pregnant women.

A favorable social portrait in the form of having a higher education and permanent job, a state of marriage often plays the role of a barrier that prevents smoking in pregnancy. In the case of passive smoking, this is not enough.

Due to the widespread prevalence of harmful habits among partners, anti-tobacco laws become impotent, since they cannot affect the high level of smoking in homes and, consequently, the susceptibility of pregnant women to cigarette smoke.

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提醒药剂师了解孕妇药物治疗的特殊性

AWARENESS OF PHARMACISTS ABOUT PARTICULARITIES OF PREGNANT WOMEN DRUG THERAPY

Ovod Alla Ivanovna
Doctor of Pharmaceutical Sciences, Professor
Khorlyakov Kirill Vladimirovich
Postgraduate Student,
Department of Management and Economics of Pharmacy
Komissinskaya Irina Gennadievna
Doctor of Pharmaceutical Sciences, Professor
Solyanina Victoria Alexandrovna
Candidate of Pharmaceutical Sciences, Associate Professor
Kursk State Medical University

注解。 使用药物制剂（MP）会对怀孕和胎儿或新生儿造成严重后果。 药剂师在为这类患者分配药物时，应注意根据怀孕的三个月，其胚胎毒性和胎儿毒性，副作用给药的特殊性。 为防止药物对这组患者产生不良影响，应告知药剂师孕妇药物治疗的特点，并可获得专门的数据库。

关键词：妊娠，药物，药物治疗，意识。

Annotation*. The use of medicinal preparations (MP) can lead to serious consequences for both pregnant and the fetus or newborn. Pharmaceutists when dispensing medicines for this category of patients should pay attention to the particularities of administering the drug depending on the trimester of pregnancy, its embryotoxicity and fetotoxicity, side effects. To prevent adverse effects of drugs on this group of patients, pharmacists should be informed about the features of drug therapy of pregnant women and have access to specialized databases.*

Key words*: pregnancy, drugs, drug therapy, awareness.*

Pharmacotherapy of pregnant women requires special attention, as experience shows that numerous drugs have a significant effect on the fetus and the newborn child [5]. In this regard, teratogenic information systems are widely used all over the world, allowing to provide objective information for specialists - physicians and pharmaceutists, and for pregnant women.

About half of pregnant women administer medicines, which is connected both

with the physicians' recommendations as well as the self-treatment of women in labour [3]. In connection with the enactment of the Order of Ministry of Healthcare of Russian Federation the dated August 31, 2016 No. 647n "On approval of the rules of good pharmacy practice of drugs for medical use", pharmacists are obliged to carry out pharmaceutical counseling, therefore, when dispensing drugs to a pregnant woman, a pharmacist should have knowledge of the particularities of drug therapy in this category of patients and the teratogenic effects of drugs, or have access to special databases.

The aim of our study is to determine the level of awareness of pharmaceutical workers on drug therapy for pregnant women.

Materials and methods: specially designed questionnaire, 150 pharmacists; methods: logical, sociological, statistical, grouping.

Results. The sociological study involved mainly pharmaceutical workers with higher education - 72%. To assess the competence of respondents, such a criterion as work experience was analyzed, which ranged from 10 to 15 years - 81%. It should be noted that respondents work in pharmacies located in urban areas - 95%.

Approximately half of the pharmacists responded that in 47.3% of cases, pregnant women apply medicines independently due to ailments without physician's recommendation.

An important criterion in the drugs appointment for pregnant women is to take into account the possible teratogenic effects. To assess the potential risk of using drugs during the gestational period, there are several classifications of drugs according to risk categories during pregnancy. The most widely used is the classification developed by the Food and Drug Administration (FDA) according to which all drugs are divided into five categories A, B, C, D, X in dependence to their risk for the embryo and fetus [4].

This classification is published in our country and is presented in the Encyclopedia of Drugs (Internet version), which is freely available on the Internet [1].

It was revealed that the overwhelming majority of respondents are well informed about it and follow this classification when recommending a drug to pregnant women - 60%. Important in the appointment and application of medicines is to know its negative effects on the fetus and the pregnant, taking into account the trimester of pregnancy. Favorable is the fact that 67.3% of respondents consult these features and take them into account when dispensing drugs.

Modern digitalization of the health care system implies the availability of electronic databases of drugs, which makes it possible to extensively use of up-to-date information about the risk and safety of drugs, possible side effects and effects on the fetus, their interaction, including during pregnancy. Therefore, in order to increase the awareness of pharmaceutical workers, there is a need for such a databases in a pharmacy organization, which allows to provide quality pharmaceutical

care to pregnant women, as well as reduce the waiting time for a pharmacy visitor. About the need for such a base was noted by 71% of respondents.

To provide pharmaceutical assistance, WHO recommends to maintain special documentation that allows us to further evaluate all the risks associated with the use of drugs. 70% of respondents answered negatively to the suggestion of introducing a "pharmaceutical dossier" for a pregnant woman, which can be justified by negative experience with this procedure and the desire to avoid wasting time on serving pharmacy visitors.

Due to the workload of a specialist working directly on the sales floor, respondents were asked to evaluate the need for a pharmacy special department of counseling. Only 45.5% of pharmaceutical workers supported his discovery, but about a fourth share (41.5%) - "do not see this as a necessity."

A favorable outcome of the disease course is possible within full compliance by pregnant women with drug therapy prescribed by a therapist. However, only 36.4% of respondents answered that pregnant women always purchase the medications recommended by the physician, but 60% noted that very often women cannot buy all the recommended drugs or ask for a replacement at a lower cost. To increase the availability of medicinal care for pregnant women, an important component is the ability of the family of pregnant woman to purchase medicines. Government policy takes into account the social characteristics of this category of population. In our country, since 2007, free drug treatment is available for pregnant women, which is included in the birth certificate program. This program provides for partial or full provision of drugs in this category of patients, provided registration in the antenatal clinic [2]. When assessing the need to provide pregnant women with free drugs at the outpatient treatment stage, more than half of pharmaceutical workers agree with this condition - 57.3%; one third of the respondents (27.3%) noted that free provision should be partial and not be applied to all drugs on the pharmaceutical market.

When recommending drugs to pregnant women, pharmaceutical workers proceed from personal experience (95.5%), safety for pregnant women (89.7%), instructions for use of the drug (78.9). When dispensing medicines, the respondents most often provide the following information: they recommend to see a doctor if they have any adverse reactions and malaise after administering drugs (83.2%), about drug dosage (78.5%), special information about drugs during pregnancy (63.3%)). Among the groups of drugs that are most frequently purchased by pregnant women were indicated: drugs for the treatment of anemia (76.5%), vitamins (73.2%), agents affecting the gastrointestinal tract (62.2%), drugs for cardio -vascular system (61.5%), for the treatment of acute respiratory diseases (58.9%), antibacterial drugs (42.6%) and others.

To improve their competence in connection with the constantly changing range

of drugs, the publication of new data on preparations, pharmaceutical workers need to increase their knowledge and for this it is very important to have access to modern proved information sources. The respondents noted the most reliable source of information were conferences, symposia organized by pharmaceutical companies - 73.6%, as well as analytical and short reviews on medicines - 54.5%, automated information retrieval systems indicated only 17.3% (many do not have the access); periodic scientific articles - 16.7%.

Thus, sociological studies conducted among pharmaceutical workers have shown that when providing pharmaceutical assistance to pregnant women, the specifics of drug therapy and its effect on the fetus are taken into account. The difficulties caused are related to the unavailability of modern information about the drug, as well as the lack of automated specialized databases on the teratological effects of drugs, which reduces the availability of high-quality drug care for this category of patients.

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白海潮汐带优势植物叶片的结构和功能特征
STRUCTURAL AND FUNCTIONAL PARAMETERS OF THE LEAVES OF PLANT DOMINANT SPECIES IN THE WHITE SEA TIDAL ZONE

Markovskaya Eugenia Fedorovna
Gulyaeva Elena Nikolaevna
*** Kosobryukhov Anatoly Aleksandrovich**
Morozova Kira Vladimirovna
Institute of Biology, Ecology and Agrotechnology
Department of Botany and Plant Physiology
Petrozavodsk State University, Petrozavodsk, Russian Federation
** Institute of Basic Biological Problems Russian Academy of Sciences, Group of Ecology and Physiology of Phototrophs, Pushchino, Russian Federation*

抽象。提出了关于优势盐生植物叶片结构和功能特征的数据。 (Plantago maritima L.，Triglochin maritima L.，Glaux maritima L.，Tripolium vulgare Ness) 在白海西海岸的各种生态环境中。获得的所研究物种的叶子的形态学，解剖学和生理学指标的定量数据。已经确定，在沿海地区，淹水梯度增加，观察到叶面积减少，叶片厚度增加和每叶面积气孔数增加。根据光合作用强度的物种比较表明它在系列中减少：P. maritima，G。maritima，T。vulgare，T。maritima，这与它们的特殊结构特征一致并且依赖于不同的环境组属于。

关键词：车前草，三叶草，海洋，三叶草，适应性，叶片解剖结构，光合作用强度，蒸腾速率，气孔导度，潮汐带，白海。

Abstract. *The data on the structural and functional features of the leaves of dominant halophyte species are presented. (Plantago maritima L., Triglochin maritima L., Glaux maritima L., Tripolium vulgare Ness) in various ecotopes of the White Sea western coast. Quantitative data on morphological, anatomical and physiological indicators of the leaves of the studied species obtained. It was established that on the coastal zone with an increase in the flooding gradient, a decrease in leaf area, an increase in leaf thickness and in the number of stomata per leaf area is observed. Comparison of species according to the photosynthesis intensity has shown that it decreases in the series: P. maritima, G. maritima, T. vulgare, T. maritima, which is consistent with their specialized structural features and depends onto different environmental groups belonging.*

Keywords: *Plantago maritima, Triglochin maritima, Glaux maritima, Tripolium vulgare, adaptation, leaf anatomical structure, photosynthesis intensity, the rate of transpiration, stomatal conductance, tidal zone, White Sea.*

The tidal zone of Holarctic seas is characterized by heterogeneity and formation of a wide variety of local conditions for biota, and the plants inhabiting it belong to the azonal floristic complex (Sergienko, 2008, Markovskaya et al., 2010) and have a number of adaptations to unstable environmental conditions in daily and seasonal dynamics (temperature gradient, light, humidity, seasonal changes in the photoperiod, daily gradient effect of pouring, varying soil salinity). Under these conditions, a limited number of species can dwell.

The coastal flora of the entire Russian Arctic includes 113 species of vascular plants (12% of the entire flora of the Arctic), belonging to 62 genera and 31 families. The partial seaside flora of the White Sea coasts includes 56 taxa in the rank of species and subspecies belonging to 21 families and 42 genera. Of them, in the White Sea tidal zone, the dominant halophytes (settling on the oozy drains in the estuaries of rivers and standing the strong soil salinization) are 4 types:: *Triglochin maritima* L., *Tripolium vulgare* Ness, *Glaux maritima* L. and *Plantago maritima* L. (Markovskaya et al., 2010).

The study of leaves anatomical structure is a recognized method for identifying the adaptive plants capabilities to different environmental conditions. Changes in the number, size and shape of tissue cells are specific ways to create the optimal leaf structure depending on environmental conditions (Mokronosov, Borzenkova, 1978). The most informative indicators to characterize the functional state of plants are the activity of the photosynthetic apparatus: photosynthesis intensity and pigment content (Pyankov, Mokronosov, 1993; Golovko, 2007, etc.).

The objective of the study is a comparative structural and functional features analysis of the leaves of dominant halophyte species growing on different ecotopes of the White Sea coast.

MATERIAL AND RESEARCH METHODS

Place of study. The study was performed during the summer field seasons 2012-2015 on the coastal areas of the White Sea coast, differing in the geomorphological structure of the coast and its position in relation to the open sea, the slope exposure, the lithological composition of the main rocks, the mechanical composition of the soil grounds, the size of the coastal zone.

Three model transects were laid on the Pomeranian coast: the coast near the village of Rastnavolok (64˚58'N, 34˚91'E, Belomorsky district), the coast near the settlement of Kolezhma (64.22'N, 35.93'E, Belomorsky district), the coast near Keret, Nikolskaya Bay (66˚16'N, 33˚33'E, Loukhsky District).

Fig. 1 *Sampling points.*
1 - Pomeranian coast (Kolezhma settlement); 2 - Pomeranian coast (Rasnavolok village); 3 - Karelian coast (Keret river)

On each transect, from the line of the water edge to the maximum ebb to the foot of the native coast, 2 test areas (TA) were laid: at the foot of the indigenous coast (TA_1) and the waterline to the maximum ebb (TA_2).

Objects of study. The work is performed on the dominant halophytic species - eugalophytes: *Plantago maritima L.* (*Plantaginaceae*) - hypoarctic eurasian species; *Triglochin maritima L.* (*Juncaginaceae*) - boreal eurasian circumpolar species; *Tripolium vulgare Ness*. - hypoarctic eurasian species (*Asteraceae*), and crynohalophyte *Glaux maritima L.* - hypoarctic eurasian species (*Primulaceae*).

Sampling. For morphological, anatomical and physiological analyzes, plants in the flowering phase were used. For anatomical studies, 10 healthy, well-developed and well-lit plants of each species were sampled from the test plots. 3 leaves were taken from the middle part of the stem of each plant and fixed in 70% ethanol.

All physiological studies were carried out in clear weather with high insolation (1200–1400 μmol $m^{-2} s^{-1}$) and air temperature at day / night of 22–25 / 18–22 °C. The number of 3-5 well-developed blossoming plants was sampled from each

TA. Samples of leaves (completed growth) were placed into a wet chamber and transported (2-5 minutes) to the place of study.

Research methods.

Morphological and anatomical. The anatomical structure of the leaves was studied in cross sections using a MIKMED-6 light microscope (LOMO, Russia) with magnification of x 40 and x 100. Permanent preparations were obtained by the standard method (Mokronosov, Borzenkova, 1978), staining was performed with safranin.

Physiological. The field assay of CO_2 assimilation rate and plant transpiration was carried out in the middle of the day in the natural environment. using a portable LCPro gas analyzer from ADC BioScientific Ltd.. The diffusion resistance of stomata and intracellular CO_2 concentration were calculated automatically using a microprocessor gas analyzer. Biological repetition studies of 3-4-times.

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

RESULTS AND DISCUSSION

The study of dominant plant species (*P. maritima*, *T. maritima*, *T. vulgare*, *G. maritima*) leaf anatomy growing in the coastal areas of the White Sea showed that they have an anatomical structure similar to these species growing in European coastal areas and salt marshes in conditions of lower latitudes (Bavaru, Bercu, 2002; Evert, 2006; Bercu et al., 2012; Grigore et al., 2014, etc.).

This comparison confirms the concept of a coastal zone, such as an azonal structure (Walter, 1960; Markovskaya et al., 2010, etc.), as for *P. maritima*, this is isopalisadic leaf structure, in the center of which is located a water-retaining tissue, whose cells contain mucus and water.

The stomata are located on the lower and upper epidermis, the palisade mesophyll consists of 2-3 layers, marked development of mechanical tissues is noted. *T. maritima* is characterized by the presence of a hypodermis layer under the epidermis, the centric structure of the lamina, a 2-3-layer palisade mesophyll, the presence of aerenchyma with air-cavities of different diameter in the leaf, stem and rhizome. *G. maritima* has a dorsoventral leaf structure, the stomata, which are located on both sides of the leaf. There is aerenchyma with cavities of few number and small size in the stem. For *T. vulgare* - isopalisade leaf structure, stomata on both sides of the leaf, the presence of aerenchyma in stem and rhizome, the hypodermis in the leaf.

These species have leaf succulence characteristic of the halophyte group. Succulent leaves are characterized by high values of the ratio of the volume of the leaf

to its surface, which is more characteristic of asters and plantains, which have a water-saving parenchyma in the leaf. In this regard, the plant has a relatively high intensity of transpiration with a small total flow of water (Walter, 1960). Such a limited flow of water is important to prevent the chlorides and sulfates present in excess in saline soil from penetrating too quickly into tissue. For all four species, the presence of a dense cuticular layer is characteristic, which provides protection against overheating at low tide.

Presented in *T. maritima, T. vulgare, G. maritima* aerenhima is also an adaptation to the environment. Growing up in a tidal zone under periodic flooding, plants experience hypoxia and can use gases stored in aerenhima (Schulze et al., 2005). The presence of a similar structure is also observed in mangroves growing under similar conditions (Waisel, 1972). These specific features have provided these species with the formation of similar adaptive traits and help to cope with the "physiological drought" and hypoxia during tidal dynamics.

The tidal dynamics causes the heterogeneity of the studied territory, associated with varying degrees of height of the water column and the duration of the plants under water. Quantitative determination of the features of leaves anatomical structure in all studied species along the transect showed that the cell sizes of the epidermis, palisade and spongy mesophyll, as well as the number of chloroplasts in the cell do not significantly change. The differences (Table 1) were obtained in terms of the area and thickness of the leaves in all four species: the area is larger in plants at the native shore, and the thickness is in the edge of the waterline. Plants at the water's edge are exposed to more prolonged flooding and a strong tidal wave, which leads to the formation of smaller, thicker and more resistant to mechanical action leaves, reducing plant height.

Table 1. *Morphological parameters of leaves of dominant halophyte species in different habitat conditions (using the example of Rasnavolok)*

Species	TA_1 off the coast		TA_2 at the water edge	
	Leaf area, mm²	**Leaf thickness, µm**	**Leaf areA, mm²**	**Leaf thickness, µm**
Tripolium vulgare	1976.0±324.6	720.2±41.6	461.0±52.6	943.2±61.2
Plantago maritima	651.7±129.0	728.6±12.5	1506.4±974.4	688.4±76.6
Glaux maritima	53.7±16.3	415.8±70.1	51.2±7.8	458.7±58.1
Triglochin maritima	1199.4±346.6	428.1±53.7	637.7±145.9	527.4±58.3

Significant differences were obtained in the number of stomata per 1 mm² (Table 2). As it turned out, for two species (T. *vulgare* and *G. maritima*), as we move from the water edge to the coast, the number of stomata decreases. A similar situation was obtained in the work on *T. maritima* (Kosobryuhov, Markovskaya, 2016). Our numerous studies have shown that in conditions of flooding all species

have open stomata. This may mean that under the conditions in the aquatic environment they can absorb carbon dioxide from the water. Earlier, on the example of *T. vulgare*, a hypothesis was put forward on the optional connection of bicarbonate CO_2 absorption under conditions of flooding, that is, the presence of CCM (Markovskaya et al., 2015), which allows the body to perform photosynthesis in both air and water.

Table 2. *Characteristics of the stomatal apparatus in the upper leaf epidermis of dominant halophyte species in various growing conditions (using the example of the coast of Rasnavolok)*

Species	TA_1 shore		TA_2 sea	
	Number of stomata per 1mm²	Stoma area	Number of stomata per 1mm²	Stoma area
Tripolium vulgare	48 ±7	889.2 ±67.2	91 ±6	858.1 ±63.5
Triglochin maritima	74 ±15	728.8 ±84.1	110 ±23	571.2 ±70.4
Glaux maritima	78 ±21	983.1 ±96.2	73 ±16	1126.5 ±146.2
Plantago maritima	198 ±21	709.7 ±81.4	226 ±47	715.3 ±62.2

Comparison of species according to the functional activity of plants TA_1 and TA_2 at low tide showed that the rate of CO_2 absorption, calculated per unit of raw leaf surface biomass, is higher in *P. maritima* and *G. maritima*, and lower in *T. maritima* and *T. vulgare* (3 -4 times). *P. maritima* and *T. vulgare* have high values of stomatal conductance for gas flow, while at *T. maritima* this value is almost 3 times lower, *G. maritima* occupies an intermediate position closer to *P. maritima.* The decrease in stomatal conductance to the flow of gases in *T. maritima* resulted in low values of the transpiration rate and more efficient use of water by plants of this species (Table 3).

The carbon dioxide concentration in the intercellular spaces of *T. vulgare* and *T. maritima* was high and at the same level, which may indicate the absence of stomatal limitation of photosynthesis in these species. However, lower values of the intensity of photosynthesis in these species compared to *P. maritima* indicate the presence of other limiting factors. *G. maritima* showed average values of the internal carbon dioxide concentration, but in combination with a high intensity of photosynthesis and transpiration.

Table 3. *Physiological characteristics of dominant halophyte species under natural growing conditions (using the example of the coast of Kolezhma)*

Species	Photosynthesis μM CO_2 $m^{-2}s^{-1}$	Transpiration mM H_2O $м^{-2}с^{-1}$	Pn/E	Conductance, mM m^{-2}	Inner concentration CO_2, μM $m^{-2}с^{-1}$
Tripolium vulgare	11,5± 0,8	4,7± 0.2	2,4	280±10	298±14
Triglochin maritima	8,4± 1,2	2,8±0.2	3,0	80±10	207±15
Glaux maritima	38,7± 0,6	12,5±0,3	3,1	290±5	130±4
Plantago maritima	36,9±1,1	9,4±0,4	4,0	255±6	64±4

If we compare the data on the structure with the data on the functional activity of the leaf apparatus of the species studied, then we can trace some dependencies. The *P. maritima* plants, which in combination with the water-containing tissue and a large number of stomata, have both high photosynthesis and water metabolism can be classified as functionally more active and more adapted. In *T. vulgare*, the presence of aerenchyma and water-containing tissue in combination with a smaller number of stomata also provide a relatively higher, but lower than that of plantain, functional activity. And in *T. maritima*, a large percentage of aerenchyma reduces the proportion of photosynthetic tissue in the leaves, the absence of water-containing tissue leads to the need for more economical waste of water, low stomatal conductance, but high values of the internal concentration of CO_2. This combination provides lower values of both carbon dioxide and water exchanges. *G. maritima*, as the only representative of the group of crynohalophytes, has a high level of functional activity and an insignificant contribution of specialized tissues to the general structure of the plant, which makes it a highly specialized species, the distribution of which is limited in the taiga zone only to seaside ecotopes, unlike other species (Kravchenko, 2007).

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使用标准化实验室测试评估运动员的代谢状态和身体表现的等级
THE EVALUATION OF METABOLIC STATES GRADATION AND PHYSICAL PERFORMANCE OF ATHLETES USING STANDARDIZED LABORATORY TESTS

Tambovtseva Ritta Viktorovna
Doctor of Biol. Sciences, Professor, The Head of the Department of Biochemistry and Bioenergy of Sports named after N.I. Volkov Russian State University of Physical Education, Sport, Youth and Tourism, Moscow

注解。 在实验过程中，研究表明，在强烈的肌肉活动中，包含代谢过程的顺序直接取决于运动能力和持续时间的参数。 应该使用标准化的实验室测试来研究在进行剧烈工作时代谢过渡途径的生物能量特征。 通过评估运动和代谢状态的等级，可以确定所使用的运动负荷的最佳体积和强度的严格定量标准。

关键词：厌氧和有氧性能，功率，代谢，瞬态代谢状态，能量产生，标准化实验室测试，工作，耗氧率。

Annotation*. In the course of the experiment, it was shown that with intense muscular activity, the sequence of metabolic processes inclusion directly depends on the parameters of the exercise power and duration. Bioenergetic features of the metabolic transitional pathways when performing strenuous work should be studied using standardized laboratory tests. Assessing the gradations of exercise and metabolic states makes it possible to identify rigorous quantitative criteria for the optimal volume and intensity of the exercise load used.*

Keywords*: anaerobic and aerobic performance, power, metabolism, transient metabolic states, energy production, standardized laboratory tests, work, oxygen consumption rate.*

Introduction. Currently, it is quite relevant to study anaerobic metabolic processes and their features when performing work in conditions of limited oxygen supply to working muscles [1,2,3]. It is known that in the range of physical load performance there are significant changes in the anaerobic metabolism dynamics and ambiguous regulatory relationships occur in the aerobic and anaerobic energy supply [4,5,6]. The ratio of muscle tissue structural units and degree of oxidative and glycolytic muscle fibers recruitment have a significant impact on the dynamics

of aerobic and anaerobic metabolism. In this regard, the speed-strength characteristics of muscle tissue can be considered as specific markers of the bio-energetic capabilities of athletes of various qualifications and specializations. To give an accurate prediction of the metabolic shifts nature during intense muscle activity, it is necessary to study in detail the aerobic and anaerobic energy metabolism when performing of various duration and powercapacity exercises with simultaneous determination of the level of formation of speed-strength qualitie s of various muscle groups participating in one or another type of chosen exercise.

The metabolism at intense muscular activity changes very quickly. Identifying the dynamics of metabolic processes features during strenuous muscular activity is important for the scientific substantiation of rational strategy and tactics during the passage of distances in various sports.

The aim of this work was to study the various metabolic states and sports performance of athletes when working in anaerobic conditions.

Materials and research methods. The study was performed in the laboratory of muscle energy bioenergetics at the Department of Biochemistry and Bioenergy of Sport. Named after N.I. Volkov RSUPCSY&T (GTSOLIFK). The experiment involved highly skilled athletes, middle distance runners (n = 21) aged 18 to 23 years. The subjects performed exercises with a maximum duration of 15, 30, 60, 120, 180, 360 seconds. The exercises were performed on the "Monark" bicycle ergometer (Sweden). On the day of the experiment, athletes performed one exercise without warming up. To assess metabolic changes in the state of rest, during the work and during 30 minutes of recovery, the parameters of gas exchange, acid-base balance and the level of lactic acid in the blood were determined. Mathematical processing was carried out in the package Statgraf.

Research results and discussion. The results of the study showed that during intense muscle activity, significant changes occur in the range of anaerobic and aerobic metabolism. Energy costs when performing exercises of different duration and power range from 4 to 25% of the total energy consumption. Dependency analysis: "work - time limit" and "power - time limit" shows that the functions of the time limit for the exercise identify three sections of a straight line dependence that have different values of the coefficients "a" and "b". The constants of these quantities are quantitatively determined by the parameters of power and capacity of different sources of energy supply. When performing exercises in the zone of maximum power, the measurement parameters form a straight line that extends from the origin. There is no energy reserve source in this case, and the available reserves of high-energy phosphogenic compounds are constantly used during the exercise. When performing exercises lasting more than two minutes, the main source of energy is aerobic oxidation of carbohydrates. Critical power is about 370 watts. The capacity of such exercises consists of the total capacity of

glycolytic and alactate anaerobic processes and is 23 kJ. The dynamics of power processes, depending on the limiting long-term work, is approximated by the following power equation:

$$W(t) = W_0 \cdot t^{-p}.$$

W (t) - is the power with the limiting exercise time;
W_{o} - is the greatest power that develops in the exercise without fatigue;
t - is the exercise time;
p - is the stamina constant, which is the speed of power drop due to fatigue (Table 1).

Table 1 - *Analytical assessment of the dependence "work - limit time"*

Ergometric criteria	Time (seconds)	Result
Work in the zone of alactate anaerobic processes (a_1), kJ	0-10	6, 08
Work in the area of glycolytic anaerobic processes (a_2), kJ	10-45	16, 69
Total anaerobic work (a_3), kJ	45-150	22,79
$W_{ал}$ - alactate anaerobic power, Watt	0-10	980,7
$W_{гл}$ – glycolytic anaerobic power, Watt	10-45	510
$W_{кр}$ – critical aerobic power, Watt	45-150	369,5

The dynamics of the change of the limiting time when performing exercises of moderate power is constant with a low gradient of reduction, and oxygen consumption fully satisfies the body's energy demand. Extrapolated straight line crosses it in the zone of critical power and corresponds to the strengthening of aerobic metabolic processes. The increase in power during short-term intense exercise occurs due to anaerobic metabolism. However, from the point of view of anaerobic energy formation, these exercises are ineffective and are determined by the rapid development of fatigue and the rapid rate of decrease in power. The main reasons lie in the biochemical processes on which the development and change of the energy structure kinetics of any exercise and the establishment of a balance in the ratio of aerobic and anaerobic metabolism depend.

V.S. Farfel [5] identified four zones of metabolic relative power: maximum, submaximal, large and moderate in accordance with the different position of the segments on the logarithm curve “power - time limit”.

For our athletes tested, the maximum power segment was determined by a time limit of 10 seconds. In this range, the maximum anaerobic power was 980.7 Watts, and the fatigue coefficient was 0.075. Due to increasing fatigue, the fatigue coefficient in the submaximal power zone in the time interval from 10 to 150 seconds was 0.166, and in the high power range with a time interval from 150 to 600 seconds, the fatigue coefficient was 0.112.

The dynamics of oxygen consumption in exercises with different maximum duration revealed three consecutive phases: the increase in oxygen level associated with the lag period is the first 15-30 seconds, then a rapid growth of the function occurs, occurring from 30 to 45 seconds and the last segment is a slow increase oxygen consumption to stable values in the exercises for more than 1 minute. When switching to the slower component in these exercises, the level of oxygen consumption reaches 70-80% of the maximum V_{O2}. The level of carbon dioxide emissions, in contrast to the dynamics of oxygen consumption, is divided into only two phases.

This highlights the initial delay period - 30 seconds from the beginning of the exercises, and a very fast single-phase growth upon reaching a steady state in the next stage of the exercise. The peak values that occur at the end of the exercise do not practically differ in different exercises lasting longer than 1 minute. Differences arise in more powerful exercises with a time range of 31, 35, 38, 42 seconds for 1, 2, 3, 6-minute exercises. Accordingly, with a larger power of exercise will be bigger shifts in the CO_2 excretion.

The rate of oxygen consumption after performing the 15-second exercise increases immediately after the end of work and reaches 2.5 L/min, and then, after 1.5 minutes of rest, decreases rapidly, reaching 1 L / min. The oxygen consumption level returns to the original pre-working value for 20-30 minutes.

Table 2 presents the results on the dynamics of the O_2 consumption rate in the recovery period. Constants (K_1, K_2) and time ($t_{1/2}$) reach high values when performing 120-sec. exercise and become larger with the increasing of work duration. However, with an increase in the exercise duration, these figures are significantly reduced. In the recovery period, the values of the "half time" in the short-term exercises in the slow fraction of O_2 consumption have low values compared with the exercises of a long-term nature.

Table 2 - *Constants of the rate of oxygen consumption during the recovery period*

Exercise duration (s)	**Fast component**		**Slow component**	
15	K_1	$t_{1/2}$ sec	K_2	t ½ min
	2,31	18	0,16	4,35
30	1,99	21	0,29	2,50
60	1,39	30	0,11	6,26
120	1,07	39	0,07	9,76
180	1,18	36	0,08	9,01
360	1,26	33	0,09	7,50

The maximum accumulation of lactic acid concentration in the blood, which characterizes the increase in anaerobic metabolism in the tissues, is constantly increasing with an increase in exercise duration to almost 120 seconds. This indicator reaches greater values in exercises lasting 2 minutes, but with further growth of the limiting duration of exercise, the level of lactate in the blood decreases exponentially. At the same time, the total oxygen demand is associated with a linear dependence with the limiting operation time, when the values of the zero coefficient correspond to the largest value of the oxygen debt formed. The level of oxygen demand in exercises with different maximum duration will decrease with an increase in the limit time exponentially. With intense muscular activity, such changes in oxygen demand are directly related to those fundamental changes occurring in the range of anaerobic cellular metabolism. To determine the quantitative normalization of loads in exercises of different maximum duration, it is necessary to identify the dependences of transitional metabolic periods, reflecting the dynamics of relative power (MMR) and the ratio of O_2 request to the level of current consumption - the hypoxic index (Figure 1).

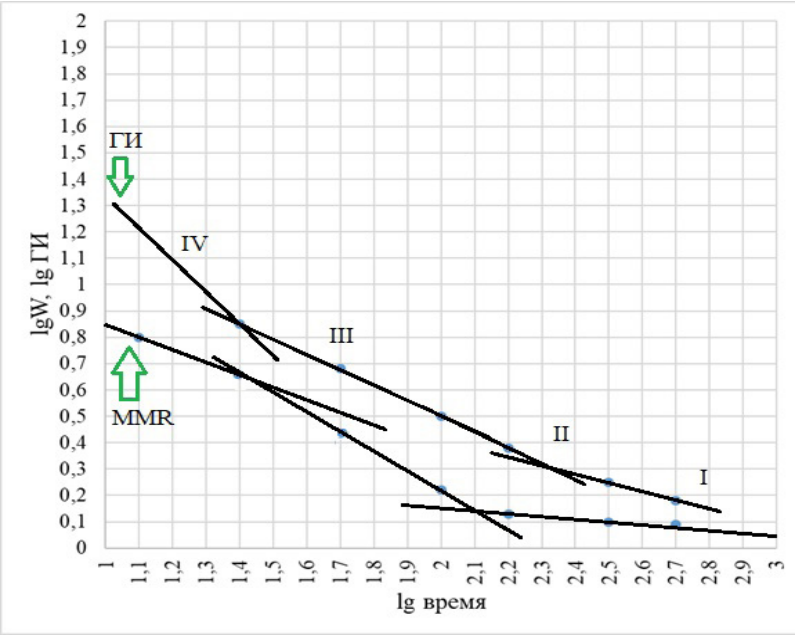

Figure 1 - *Dynamics of dependence of relative power parameters (MMR) and hypoxic index (HI) in exercises of various maximum duration*
The abscissa is the logarithm of time (lg время). The ordinate is the logarithm of relative power and hypoxic coefficient (lg W).

As shown in the graph, the dynamics of the relative power when performing exercises of maximum intensity with a limiting time of up to 20 seconds is determined by a slight decrease. This phenomenon is associated with the exhaustion of creatine phosphate anaerobic reserves in the working muscles and the development of protective inhibition in the motor centers of the central nervous system.

The highest rate of decrease in relative power, associated with increased anaerobic glycolysis, and a change in the homeostasis of acid-base balance in the working muscles and in the blood, is observed when performing exercises in the range of 20 to 150 seconds. With the intensification of aerobic processes when performing longer-term exercises that are in the «high power» zone of, the rate of decrease in relative power is significantly reduced. Figure 1 shows that when changing the hypoxic index, four segments with unequal angle of inclination with respect to the x-axis are clearly distinguished. Fracture points show a transition from one variant of the hypoxic state to another. These segments on the logarithmic curve can be attributed to several variants of different hypoxic states: latent hypoxia, which is associated with the implementation of moderate exercises with a maximum duration of 10 minutes or more; compensated hypoxia associated with exercise in the area of high power with a maximum duration of 2.5 to 10 minutes; severe hypoxia with increasing decompensation associated with performing exercises in the submaximal power zone from 20 to 150 seconds; decompensated hypoxia associated with exercise maximum power over time less than 20 seconds.

Conclusions:

1. Under conditions of intense muscular activity, depending on the metabolic and energy components, powerful changes in the metabolism of the whole organism can occur.

2. Artificially modified power and acceleration allow to achieve effects on metabolic transitional periods and to increase physical performance without harming healthy athletes.

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使用凝胶和“二级凝胶薄膜”细菌纤维素作为抗生素和免疫增强药物载体的前景
PROSPECTS FOR THE USE OF THE GELS AND THE "SECONDARY GEL FILMS" BACTERIAL CELLULOSE AS CARRIERS OF ANTIBIOTIC AND IMMUNE-BOOSTING DRUGS

Klenova Natalya Anatolyevna
Doctor of Biol. Sciences
Professor of Samara National Research University
named after S.P Korolev, Samara, Russian Federation

抽象。 该文章包含研究细菌纤维素凝胶和“二级”（凝胶制备）薄膜作为抗生素和免疫刺激制剂载体的用途的数据。 使用氯己定，克霉唑，芦荟和金盏花的醇提取物作为制剂，测试对象是大肠杆菌，S .. epidtrmidis培养物。 已经表明使用这些材料作为抗菌和抗真菌物质的载体的效率，因为它们使得有可能有效地混合并增加医疗用途所需的这些复合材料的性能的表现。 对于具有抗真菌作用的组合物，最好使用“二级”薄膜，对于具有抗菌作用的复合材料，凝胶和“二级”凝胶薄膜同样有效。

关键词：细菌纤维素，凝胶，抗菌和抗真菌特性/

Abstract. *The article contains data on the studying the use of bacterial cellulose gels and "secondary" (gel-prepared) films as carriers of antibiotic and immunostimulating preparations. Chlorhexidine, clotrimazole, alcohol extracts of aloe and calendula were used as preparations, the test objects were E.coli, S.. epidtrmidis cultures. The efficiency of using these materials as carriers for antibacterial and antifungal substances has been shown, since they make it possible to effectively mix and increase the manifestation of the properties of these composites necessary for medical use. For compositions with antifungal effect is better to use “secondary” films, for composites with an antibacterial effects, gels and “secondary” gel films are equally effective.*

Keywords: *bacterial cellulose, gels, antibacterial and antifungal properties/*

Bacterial cellulose belongs to the group of exopolysaccharides, the possibilities and prospects for the use of which in various fields are not yet sufficiently realized. Nevertheless, this material in the form of films has a number of unique properties: high hygroscopicity, mechanical strength, elasticity, low adhesive and allergenic properties [1]. Our research has shown that bacterial cellulose gels and also “secondary” gel films obtained from gels can be very promising for use in medicine [2].

For several years, we have studied the possibilities of using gels and "secondary" gel films as carriers of antibacterial, antifungal and immunostimulating preparations.

To obtain the gels, the strain *Gluconacetobacter sucrofermentans B-11267*, kindly presented to us by the Department of Biotechnology, Bioengineering and Biochemistry of the Mordovian National Research University named after O.N. Ogarev, was cultivated on the environment of Grande, 2009 [3]. Cultivation conditions: shaker, 5 days, mixing speed 200 sp. / min. Washing performed with 0.1 M NaOH, a solution of 0.5% acetic acid and distilled water until neutral.

The obtained gels were placed into 96% ethyl alcohol in a 1:1 ratio by volume. Studies have shown that in this state, the gels are stored at a temperature of 10-12 ° without bacterial contamination for 3-4 months. "Secondary" gel films were obtained by distributing gels over the surface of a polyethylene film and drying them in a crystallizer that was closed to bacteria.

As antibacterial compounds, 1% clotrimazole, 0.05% chlorhexidine, 100% dimethylsulfoxide (drugs) were used, added in a certain amounts when preparing composites. As immunostimulating agent, calendula or aloe alcoholic extracts were added to gels. The bacterial cellulose gel composite with extracts, chlorhexidine and dimethylsulfoxide (DMSO) contained 33% of the extract (either aloe or calendula), 16% of chlorhexidine and 3% of DMSO. When using clotrimazole, 0.2% of clotrimazole substance (by volume) was added to the gel, mixed in an incubator shaker (Environmental Shaker-Incubator ES-20/60) for 20 minutes, (mixing mode - 250 sp/min) and prepared a "secondary" gel-film.

The obtained composites of bacterial cellulose gels with an extracts, chlorhexidine and DMSO were formed to globular samples using tweezers and glass rods. Gels with addition of 52 percent of 96% ethanol and the “secondary gel films” prepared from them were used as controls. Sterilization of “secondary” gel films prototypes, 0.5 cm^2 in size, was performed by UV radiation for 30 minutes.

Bacterial cultures of *E.coli M-17 / pColap* and *Staphylococcus epidermidis NCTC8325-4* were used as test objects.

For planting, daily inoculants were prepared in the Czapek’s mineral medium with a population density of 0.15 to 0.44 optical density units. The optical density (OD) was estimated at λ=670 nm, thickness of the absorbing layer 0.5 cm.

To study the antifungal activity, as test microorganism the *Penicillum sp*. was used. The strain was isolated from the soil using the acidified Czapek’s medium, identified by cultural characteristics and microscopy data.

The antibacterial and antifungal effects were judged by the growth inhibition test around the samples after one-day or 2-3-day cultivation in Petri dishes on MPA at 30 °C.

When 10 µl of chlorhexidine is added to “secondary” gel films with aloe

extract for each sample, a significant antibacterial effect is observed, which results in growth restriction increase compared to control samples by about 4 times both in relation to *E. coli* and in relation to *Staphylococcus epidermidis*. The same effect was observed in case of Calendula extract using. However, the effect of growth restriction is most pronounced in relation to *Staphylococcus epidermidis*. The diameter of growth inhibition zones was higher by 30% than in *E. coli* ($p < 0.01$).

The use of bacterial cellulose (BC) gels showed that control gels containing only ethyl alcohol do not inhibit the growth of *E. coli*, but have a pronounced antibacterial activity against *Staphylococcus epidermidis.* Gels samples with the aloe extract addition, chlorhexidine and DMSO have more pronounced antibacterial action against *Staphylococcus epidermidis* than against *E.coli.*

Zones of growth restriction when used *Staphylococcus epidermidis* as a test object is approximately 2 times larger than when used as a test object of *E. coli* (Tab.).

Table 1. *Antibacterial activity of gels and "secondary" gel films containing plant extracts, chlorhexidine and dimethyl sulfoxide*

Test dosage forms	**Inhibition growth, mm**	
	Escherichia coli	***Staphylococcus epidermidis***
A). "Secondary" gel-film with ethyl alcohol (control); B).Gel with ethyl alcohol (control)	no no	no 14,3±2,04
A). "Secondary" gel film with Aloe extract; B). "Secondary" gel film with Calendula extract	5,00±0,13 5,00±0,13	5,00±0,13 5,00±0,13
A). "Secondary" gel film with Aloe extract + 10 µl chlorhexidine; B). "Secondary" gel-film with Calendula extract + 10 µl chlorhexidine	18,20±1,95* 18,70±2,13	20,50±1,75* 24,60±1,18*^
A). Gel with Aloe extract, chlorhexidine and DMSO; B). Gel with Calendula extract, chlorhexidine and DMSO	8,90±0,23* 11,00±0,87**	20,80±0,41*^ 23,80±1,17*^

*P<0,01 in relation to control;
**P<0,01 in relation to the gel with Aloe extract;
*^P<0,05 in relation to *Escherichia coli*.

Addition of Calendula, chlorhexidine and DMSO to the gels contained an antibacterial effect against *E. coli*, giving a growth inhibition of about 11 mm. But these gels exerted greater effectiveness on the growth of *Staphylococcus epidermidis*. The effect observed was higher than that of *E. coli* more than 2 times (Table).

These data are due to the fact that our chosen antibacterial drugs are more effective against gram-positive bacteria. The use of gels or "secondary" gel films is equally effective, the only difference is that the "secondary" gel films, due to the absence of ethyl alcohol, need additional sterilization before use.

For composites with an antifungal effect, it was more efficient to use “secondary” gel films, which is due to the fact that ethyl alcohol does not prevent the growth of fungi, and the presence of water in gels is unfavorable for the manifestation of antifungal properties.

"Secondary" gel films of bacterial cellulose containing 0.2% clotrimazole were characterized by manifestation of antifungal effect on *Penicillum sp*. growth on the 3rd day of cultivation on the Czapek’s medium.

The inhibition growth zones around the samples were 39.00 ± 0.30 mm, the zones of no growth were 11.96 ± 0.03 mm in the perfect absence of zones in the control samples.

Studies have shown that the use of gels and "secondary" gel films is effective in the preparation of complex composite materials for medical purposes. In this case, there is a proper mixing of the components, which is accompanied by the best manifestation of the properties of each of them. For the preparation of antifungal composites, it is more rational to use “secondary” gel films prepared from gels with preliminary mixing of the active compound with the gel. Antibacterial composites can be used in the form of gel balls without drying. In addition, as shown by our research, gels and films of bacterial cellulose undergo processes of degradation under the action of soil aerobic cellulose-destroying bacteria [2]. Keeping the primary (obtained by stationary cultivation of acetobacteria) films in Aloe, Calendula extracts with the addition of antibacterial and antifungal drugs immediately in the wet state is characterized by erosion of crops and does not give clear growth inhibition zones.

Drying of the films after incubation in active compounds requires sterilization, since without it, overgrowth of bacilli gives. Sterilization worsens the manifestation of antibiotic properties, the zones of no growth exceed control values by no more than 10-15%.

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Quasibinary削减Tm-AsS和As-TmS三重系统Tm-As-S

QUASIBINARY CUTS TM-ASS AND AS-TMS TRIPLE SYSTEM TM-AS-S

Ilyasly Teymur Mammad
Gahramanova Gunel Gadji
Gadzhaly Najafoglu
Ismailov Zakir Islam
Baku State University
Azerbaijan, Baku,

抽象。差热（DTA），X射线相（XRF）和微结构（MSA）分析方法，显微硬度和电物理性质的测量，研究了Tm-AsS和As-TmS系统中物理 - 化学相互作用的性质。

通过研究三种冷却模式中的初始组分的性质开始对系统合金的研究：1-2度/分钟，7-10度/分钟，410小时/分钟。玻璃形成区域随着冷却速率的增加，玻璃形成区域增加。在确定玻璃形成区域的边界后，我们研究了Tm-AsS玻璃的物理化学性质。热像图分析表明，对热像图的所有影响都是可逆的。在加热曲线上，主要获得两种吸热效应。 Tm-AsS系统中1075 K和575 K的影响与共晶水平有关。中间相TmAsS的熔点对应于1350K的温度。

微观结构分析表明，除TmAsS外，所有Tm-AsS和As-TmS截面合金都是双相的。Tm-AsS和TmS-As系合金的显微硬度对应于Tm，TmS，AsS和As以及TmAsS化合物，其为1940MPa。确定TmAsS化合物在Tm-AsS和As-TmS部分的交叉点处形成。根据X射线衍射的结果，计算了TmAsS化合物的晶格参数，表明它在菱形合成物中结晶，晶格参数a = 1.273nm，b = 0.875nm，c = 0.458nm。根据物理化学分析的结果，确定所研究的部分是Tm-As-S三元系统的准二元部分。根据物理化学分析的结果，构建了Tm-AsS，As-TmS截面的截面状态图，并且发现所研究的截面是Tm-As-S三元系统的准二元截面。

关键词：分析，截面，显微硬度，合金，温度，结晶

Abstract. *Methods of differential thermal (DTA), X-ray phase (XRF) and microstructural (MSA) analyzes, measurement of microhardness and electrophysical properties, studied the nature of the physico-chemical interaction in the Tm-AsS and As-TmS systems.*

The study of the system alloys was started by studying the properties of the initial components in three modes of cooling: 1-2 deg / min, 7-10 deg / min, 410 hail / min. Glass formation region with increasing cooling rate, glass formation region increases. After establishing the boundary of the glass formation region, we

studied the physicochemical properties of Tm-AsS glasses. The analysis of thermograms showed that all effects on thermograms are reversible. On the heating curves, mainly two endothermic effects were obtained. Effects at 1075 K and 575 K in the Tm-AsS system are related to eutectic horizontals. The melting point of the intermediate phase TmAsS corresponds to a temperature of 1350 K.

Microstructural analysis showed that all Tm-AsS and As-TmS section alloys are biphasic except for TmAsS. The microhardness of the Tm-AsS and TmS-As system alloys corresponds to Tm, TmS, AsS and As and to the TmAsS compound, which is 1940 MPa. It is established that the TmAsS compound is formed at the intersection point of the Tm-AsS and As-TmS sections. According to the results of X-ray diffraction, the lattice parameters of TmAsS compounds were calculated, which revealed that it crystallizes in a rhombic syngony with lattice parameters a = 1.273 nm, b = 0.875 nm, c = 0.458 nm. Based on the results of the physicochemical analysis, it was established that the sections studied are quasi-binary sections of the Tm-As-S ternary system. According to the results of the physicochemical analysis, a section state diagram of the Tm-AsS, As-TmS section was constructed, and it was found that the studied sections are quasi-binary sections of the Tm-As-S ternary system.

Keywords: *analysis, section, microhardness, alloy, temperature, crystallization*

Introduction

Interest in rare-earth (REE) elements and its compounds is caused by the possibility of using the compounds in various fields of technology, including the derivation of materials with a predetermined set of properties. Compounds of lanthanides are used as catalysts, HTSC ceramics of conductive materials, additives to various alloys to improve mechanical strength, heat resistance for special grades of glass used in atomic technology, for the manufacture of luminous compounds and fluorescent materials, radio and optoelectronics, as well as special probes to study the structure of solutions [1-3].

In literature, there are fragmentary data on the interaction in systems involving Tm, its chalcogenides with chalcogenides of the arsenic subgroup and the intermediate phases formed in them [4-8].

Purpose of the study

The aim of the present work is to study the nature of the physicochemical interaction in the Tm-As-S system using the Tm-AsS and As-TmS sections. The study of the electrophysical properties of compounds in a wide range of temperatures.

Material and methods of the research

To study these sections of Tm-AsS and As-TmS from the elements, TmS and AsS were synthesized using As arsenic of grade A-5 and Tm-A2, sulfur of high purity for synthesis. The synthesis mode was selected based on the physicochemical properties of the primary components and from the synthesis record.

The initial samples after evacuation of the ampule were placed in an oven and the oven was heated to 650-750 K for 8-10 hours, and then the temperatures were raised to 1200 K. At this temperature the ampules were kept for 5 hours and the ampule with the oven were slowly cooled to room temperature.

The alloys were homogenized by annealing for 650 hours depending on the concentration of the components in the alloys with TmS at a temperature of 750 K. And with As and Tm at a temperature of 555 and 775 K.

Methods of differential thermal (DTA), X-ray phase (XRF) and micro-structural (MSA) analyzes, measurement of microhardness and electrophysical properties, studied the nature of the physicochemical interaction in the Tm-AsS and As-TmS. In the study of the high-temperature part, the installation VDTA 987 was used. DTA was performed using the PDS-021 installation (a two-coordinate self-feeding potentiometer, MIM microscope - 7 and PMT-3 microhardness tester).

Research results and discussion

The equilibrium state of the alloys was controlled by the MSA and XRF methods. Alloys with high AsS content have yellow color and a high TmS content have grayish color. Analysis of thermograms showed that all effects on thermograms are reversible. On the heating curves, mainly two endothermic effects were obtained. Effects at 1075 K and 575 K in the Tm-AsS system belong to the eutectic horizontals. The melting point of the intermediate phase TmAsS corresponds to a temperature of 1350 K.

Tm - As_2S_3 cut. The study of the system alloys was started by studying the properties of the initial components. The cooling of the alloys was carried out in three modes: 1-2 deg / min, 7-10 deg / min, 410 deg / min. Glass formation area with the increasing cooling rate increases. After establishing the boundary of the glass formation region, we studied the physicochemical properties of Tm-AsS glasses, which are given in Tables 1, 2, 3

Table 1

Some physicochemical properties of the Tm-AsS cut glass (cooling rate v= 1-2 deg / min)

№	Alloy composition		Thermal effects of heating, T, K			Microhardness, Hμ/m² 10⁷	Density d, g/cm³	MSA results
	AsS	Tm	T_g,K	Tcr.	Tm.			
1	100	0	435	490	590	118	360	glass
2	99	1	440	495	585	120	355	glass
3	97	3	448	500	480	125	358	glass
4	95	5	450	510	585	133	365	glass
5	93	7	455	518	595	135	350	glass

Table 2

Some physicochemical properties of the Tm-AsS cut glass (cooling rate v = 7-10 deg / min)

№	Alloy composition		Thermal effects of heating, T, K			Density d, r/см^3	MSA results
	AsS	Tm	T_g ,K	Tcr.	Tm.		
1	100	0	430	-	580	3,75	One dark phase
2	99	1	436	470	575	3,81	One dark phase
3	97	3	450	475	568	3,85	One dark phase
4	93	7	465	485	545	3,94	One dark phase
5	90	10	468	497	535	3,98	One dark phase

Table 3

Some physicochemical properties of the Tm-AsS cut glass (cooling rate v = 450 deg / min)

№	Alloy composition		Thermal effects			Density d, g/cm^3	microhardness, Hμ kg/mm^2
	AsS	TmS	T_g ,K	Tcr.	Tm		
1	100	0	453	545	594	3,31	110
2	99	1	455	540	590	3,33	1150
3	97	3	458	553	565	3,36	1180
4	95	5	465	560	570	3,40	1185
5	93	7	467	565	575	3,43	1195
6	90	10	471	567	578	3,47	1205
7	88	12	477	570	580	3,53	Degr of cr.

Based on the results of the physicochemical analysis, it was established that the examined section is a quasi-binary section of the Tm-As-S ternary systems (Fig. 1.). After determining the glass formation area, the alloys were subjected to homogenizing annealing to bring it to equilibrium, the annealing temperature was 555K and the annealing time was 650 h. Some physicochemical properties of the alloys of the Tm-AsS system (after annealing) are listed in Table 4

Table 4

Some physicochemical properties of alloys of the Tm-AsS system (after annealing)

Composition mol%		Density d, g/cm^3	Microhardness, Hμ kg/mm^2	MSA results
Tm	**AsS**			
100	0	6,27	185	one phase
95	5	6,35	180	two phases
90	10	6,53	170	two phases
80	20	6,60	175	two phases
70	30	6,65	180	two phases
60	40	6,73	195	two phases
50	50	5,85	215	one phase
40	60	4,35	200	two phases
30	70	4,25	185	two phases
20	80	4,10	160	two phases
10	90	3,90	145	two phases
0	100	3,75	110	one phase

Based on the result of a physicochemical analysis, a Tm-AsS cut state diagram was constructed (Fig. 1)

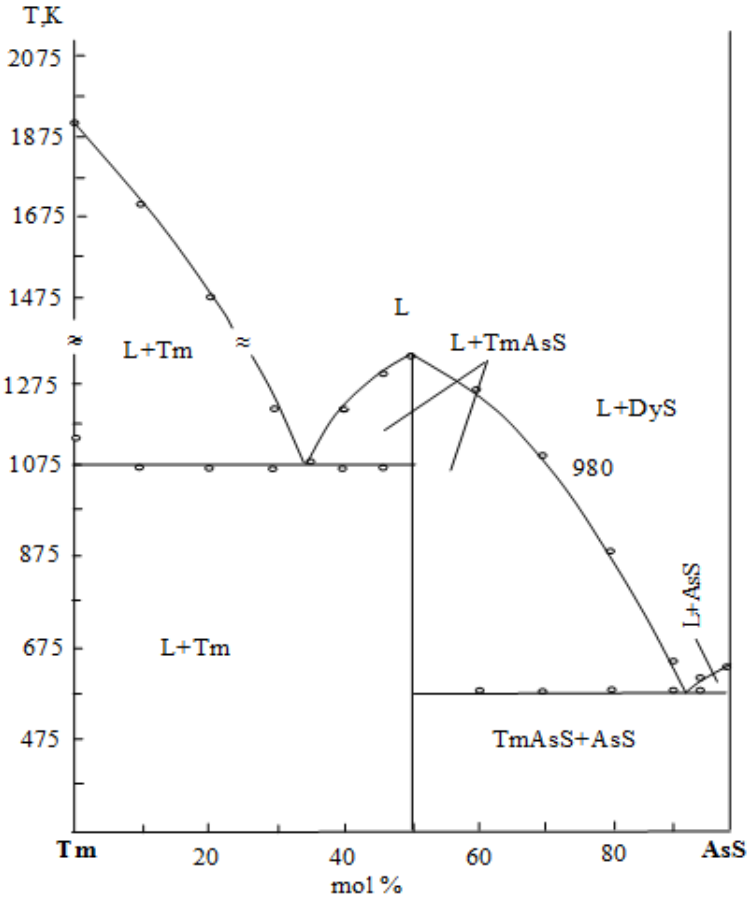

Figure 1. *Tm-AsS cut state diagram*

Equilibrium alloys were subjected to micro-structural analysis, while the etchant was a mixture of NaOH + CH_3CH_2OH at a 1:1 ratio.

As-TmS section Alloys of the ternary Tm-As-S system in the As-TmS section were investigated by the method of physicochemical analysis , the results of which are given in table 5.

Table 5

Some physicochemical properties of alloys of the As-TmS system

Alloy composition mol%		**Thermal effects of heating K**	**Microhardness, Hμ kg/mm²**	**Density d, g/cm³**	**MSA results**
As	TmS				
100	0	1085	185	6,25	one phase
90	10	975,875	185	6,30	two phases
85	15	900,875	188	6,35	two phases
80	20	875	195	6,38	two phases
75	25	975,875	203	6,45	two phases
70	30	875,1075	207	6,57	two phases
60	40	875,1215	210	6,85	two phases
50	50	1350	215	6,78	two phases
40	60	1075,1310	200	6,75	two phases
35	65	1075,1250	195	6,73	two phases
30	70	1075,1280	190	6,65	two phases
25	75	1075,1275	193	6,60	two phases
20	80	1075,1550	195	6,70	two phases
10	90	1075,~1975	210	6,75	two phases
5	95	1075, -	220	7,25	two phases
0	100	2000	285		one phase

According to the results of physicochemical analysis, a As-TmS cut state diagram was constructed and we found that the studied cut is a quasi-binary section of the Tm-As-S ternary system (Fig.2,).

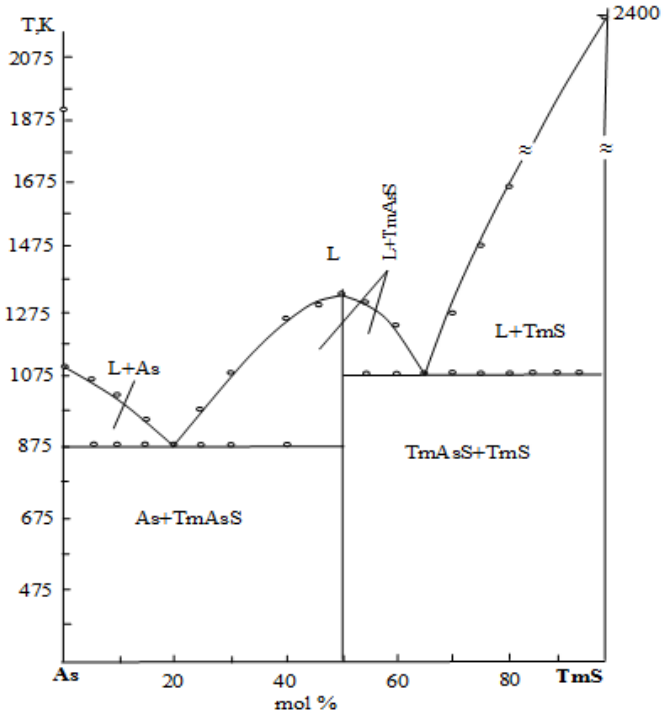

Figure 2. *As-TmS cut state diagram*

From the above it follows that all the alloys of the Tm-AsS and As-TmS cust are two-phase except for the 1: 1 composition, which corresponds to the composition of the TmAsS compound.

Microhardness in the Tm-AsS and As-TmS system alloys corresponds to the Tm, TmS, AsS and As phases and the TmAsS compound which is 1940 MPa (tab. 1.2)

The results of X-ray fluorescence analysis of the system alloys showed that in the Tm-AsS and As-TmS system with a 1: 1 ratio of components, the X-ray lines differ from the original components, which confirms the formation of new intermediate phases of the TmAsS composition.

According to the X-ray phase analysis results, the lattice parameters of TmAsS compounds were calculated by the principle of analogy. It was found that it crystallizes in a rhombic syngony with lattice parameters a = 1.273 nm, b = 0.875 nm, c = 0.458 nm.

It is established that the TmAsS compound is formed at the intersection point of the Tm-AsS and As-TmS sections. Based on the results of the physicochemical analysis, it was established that the Tm-AsS, As-TmS cuts studied are quasi-binary sections of the Tm-As-S ternary systems.

The systems detected compounds of the TmAsS composition melting congruently at 1350 K. On the basis of the initial components, the solubility rate is not found.

Conclusions or summary

1. According to the XRF results, the lattice parameters of the TmAsS compounds were calculated, which revealed that it crystallizes in the rhombic syngony with the lattice parameters a = 1.273 nm, b = 0.875 nm, c = 0.458 nm

2. TmAsS compounds are formed at the intersection of the Tm-AsS and As-TmS cuts. Based on the results of the physicochemical analysis, it was established that the cuts studied are quasi-binary sections of the Tm-As-S ternary systems.

3. It has been established that TmAsS compounds melt congruently at 1350 K.

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以欧亚河流为例的河水碳酸氢盐二元论
BICARBONATE DUALISM OF RIVER WATER ON THE EXAMPLE OF EURASIAN RIVERS

Eugene G. Abramov
Senior Researcher
Center for Strategic Planning and Management of Biomedical Health Risks, Moscow, Russia

摘要。 研究了欧亚大陆19条河流的河水化学成分。 建立了以两个碳酸氢根离子浓度值为特征的河水二元论的事实。 一些河流含有浓度为5 mg-EQ / dm3的碳酸氢根离子，另一部分河流含有浓度为3 mg-EQ / dm3的碳酸氢根离子。 该特征不依赖于许多外部因素，并且仍然是从河源到河口的河流的基本特征。

关键词：河水，碳酸氢根离子，二元论。

Summary. *The chemical composition of river water of 19 rivers of Eurasia is studied. The fact of dualism of river water characterized by two values of bicarbonate ions concentration only is established. Some rivers contain bicarbonate ions at a concentration of 5 mg-EQ /dm³, the other part of the rivers contains bicarbonate ions at a concentration of 3 mg-EQ/dm³. This feature does not depend on a number of external factors and remains as a basic characteristic of the river from source to estuary.*

Keywords: *river water, bicarbonate ions, dualism.*

Introduction

From the analysis of the literature data it follows that in the study of the chemical composition of river waters authors usually pay attention to the chemical pollution of river water and associate these changes with the anthropogenic factor, Panasin at al. (2007), Shulkin at al. (2009), Savichev at al. (2009), Shesterkin at al. (2010), Sorokovnikova at al. (2004), Romankevich (2013), Usmanova (2018), Horochevskaya (2015). The studies pay great attention to the presence of heavy metals in river water, Panasin at al. (2007), Shulkin at al. (2009), Savichev at al. (2009), Horochevskaya (2015). In this regard, it is possible to distinguish the work, Savichev at al. (2009), which noted the fact of a limited increase in the concentration of a number of metals in the case of wastewater discharge due to the low solubility of compounds of these metals with carbonates and humic acids. Indeed,

the values of the solubility product $[Me^{2+}] \times [CO_3^{2-}]$ for carbonates in a series of cations: Pb, Cd, Fe, Mn, Cu, Cr, Ca are: $PbCO_3 = 1.0 \times 10^{-13}$; $CdCO_3 = 5.2 \times 10^{-12}$; $FeCO_3 = 3.47 \times 10^{-11}$; $MnCO_3 = 1.8 \times 10^{-11}$; $CuCO_3 = 2.5 \times 10^{-10}$; $Cr(OH)_3 = 6.3 \times 10^{-21}$; $CaCO_3 = 4.8 \times 10^{-9}$ (1964. Chemist's reference book in 6 volumes, Nikolskiy, B. P., Grigorov, O. N., Pozin, M. E., Poray-Kochiz, B.A., Rabinovich, V. A., Rachinskiy, F. P., Romankov, P. G., Fridrichsberg, D. A., 3, 229 - 234, Chemistry, Moscow, Leningrad.). Thus, taking into account the kinetics of metal deposition, the author's conclusion can be described as weighted and objective, Savichev at al. (2009). Another common area of research on the chemical composition of river water is the consideration of a specific river in a particular region and assessment of the impact of a number of natural factors (storm water, floods, geological, mineralogical and landscape features of the region) on the content of those or other components in river water, Abduev (2010), Dolgonosov and Korchagin (2011), Chigova at al. (2013), Lutsenko at al. (2013), Reshetnyak

(2015). For example, the author carries out a comparative analysis of the mineral composition in the water of the rivers of Azerbaijan, using the terminology of "salt composition" and speaks of "seven salts" in relation to aqueous solutions of electrolytes, including strong electrolytes such as sodium chloride, magnesium chloride, sodium sulfate, magnesium sulfate, etc., Abduev (2010). As in this case, the author interprets the main provisions of the theory of electrolytic dissociation is not clear, but in general, the work reflects the trends in the study of water bodies in a particular region. In addition, the author provides data on the content of bicarbonate ion, which is extremely rare in various studies on the chemical composition of river water, since the content of this component by researchers working within the framework of traditional approaches and theoretical models, is rarely considered significant, Dolgonosov and Korchagin (2011).

The aim of the present work was to assess the content of bicarbonate ion in river water of a large number of river objects, regardless of the maximum possible number of factors, namely: the scale of the river (annual drain), the region of flow, the place of sampling (downstream), changes in salt composition as a result of anthropogenic factors, the time of year, etc. to testing the following hypothesis. Since the river is an open system, which is in contact with two other environments, namely, soil and air (and the air on the planet is unchanged, including the concentration of $CO_2 \sim 0.03\%$), it can be assumed that the content of bicarbonate ions in the river water is also basic and unchanged, the same for any river, which characterized by signs: the river must have a source, flow, and mouth.

Methods and materials

Ionic chromatography with select columns:

1. Column for cations analysis Shodex IC YS – 50 Japan; column number G3781001; determination cations: Li^+, Na^+, NH_4^+, K^+, Mg^{2+}, Zn^{2+}, Ca^{2+}, Sr^{2+}. De-

tection limit : 0.1 mg/l; Eluent: 4 mM Methanesulfonic acid, Flow rate: 1.0 ml/min, Detector: CD, Temperature: 40 ºC, Sample size: 50 µ l, Pressure: 4.4 M Pa

2. Column for anions analysis Shodex IC SI – 52 4E Japan; column number G1741031; determination anions: F^-, Cl^-, NO_2^-, NO_3^-, Br^-, PO_4^{3-}, SO_4^{2-}. Detection limit : 0.1 mg/l; Eluent: 3.6 mM Na_2CO_3, Flow rate: 0.8 ml/min, Detector: Suppressed CD, Temperature: 45 ºC, Sample size: 10 µ l, Pressure: 10.1 M Pa

Object of researches

Object of researches were Eurasia‘s rivers flowing in the Russian Federation and in Ukraine. These are rivers flowing in large cities (Moscow, Orenburg, Omsk, and Kiev); rivers flowing in small cities, such as Bryansk or Smolensk and these are rivers in countryside (village Romano near Lipetsk). The total number of rivers studied is 19. Chemical composition was studied into rivers with small average annual runoff < 50 km^3/year (Bereznya, Khimka, Lihoborka, Yauza, Dubna, Protva, Desna, Setun, Pahra). Chemical composition was studied into rivers with average annual runoff about ~ 50 – 400 km^3/year (Egorlyk, Klyazma, Desna, Moscow, Pregolya, and Ural). And finally chemical composition was studied into rivers with large average annual runoff > 400 km^3/year (Don, Dnieper, Volga, Irtysh). Samples of river water were taken in different places: upstream, middle and downstream. For most rivers, sampling was carried out at different times of the year without a strict fixation of specific place. It could be: source (Yauza, Desna, Don, and Dnieper), average current (Likhoborka, Pahra, Protva, Moscow, Klyazma, Dnieper, and Volga), down current or mouth (Setun, Yauza, Moscow, Dnieper, and Pregolya).

The chemical composition of the Don river water was studied for several years, water samples were taken in one place (Romanovo village) at different times of the year (winter, spring, summer, autumn) in order to control the constancy of the chemical composition of water for the main inorganic components.

The chemical composition of the Dnieper river water was studied in different places: in the upper reaches (Smolensk), the middle reaches (Kiev) and the lower reaches after the cascades of hydroelectric power stations and reservoirs (Khortytsya Island, reservoir Lenin's). The chemical composition of the Volga river water was studied in the upper (Kimry, Uglich).

Results and discussion

The results of studies of the chemical composition of river water are summarized in table 1.

Table 1

Content of bicarbonate ions and other inorganic components in river water of Eurasian

River names	Components														
	F^-	Cl^-	NO_2^-	Br^-	NO_3^-	PO_4^{3-}	SO_4^{2-}	HCO_3^-	Li^+	Na^+	NH_4^+	K^+	Mg^{2+}	Ca^{2+}	Sr^{2+}
Dnieper (Kiev)	0.16	111.6	-	0.057	26.7	-	93.3	290	-	44.9	0.19	4.8	33.4	108	0.4
Dnieper (Smolensk)	0.2	14.0	0.08	0.004	4.6	-	26.9	316	-	11.2	0.06	2.0	22	77	0.4
Results of researches Don river water (village Romanovo) for six years of observation															
Don (Romanovo) 03. 2013	0.40	13.8	0.05	0.04	10.1	-	78.7	311	0.009	8.2	-	2.6	27.8	90	3.4
Don (Romanovo) 08. 2015	0.40	13.6	0.05	0.04	10.0	-	76.5	300	0.007	7.8	-	1.8	27.2	87	3.0
Don (Romanovo) 01. 2017	0.37	13.9	0.05	0.038	10.0	-	98	319	0.010	8.2	-	1.6	29.0	99	3.1
Don (Romanovo) 06. 2017	0.36	12.6	-	-	3.6	-	85.6	299	0.010	8.2	-	2.1	25.3	90.7	2.8
Don (Romanovo) 12. 2017	0.37	13.4	-	-	4.6	-	80.5	305	0.008	8.0	-	2.0	27.4	90	3.0
Don (Romanovo) 06. 2018	0.39	14.8	-	0.04	6.5	-	75	311	0.007	9.5	-	2.0	24.8	93	2.3
Average content of bicarbonate ions in Don for six years of observation [HCO_3^-] = 307.5 mg/dm^{3}or 5.04 mg-EQ/dm^3															
Setun (Moscow)	0.6	64.5	<0.1	0.01	4.8	<0.5	52	302	0.005	32	0.2	6	23	88.5	2.5
Dubna (Moscow Province)	0.3	17.4	-	0.06	3.7	<0.5	33.3	315	0.015	10.3	-	2.1	22.3	81	0.4
Pahra (Moscow Province)	0.34	73.4	1.6		13.3	2.1	51	319	0.03	49	1.0	8.7	22	90	0.63
Desna (Moscow Province)	0.43	35	0.65		15.4	3.3	32	330	0.019	53	0.23	8.2	15.8	72	1.4
Bereznya (Moscow Province)	0.24	17	0.5		4.7	-	18	290	0.006	6.4	0.05	1.0	22	83	0.15
Protva (Obninsk)	0.22	14.7	0.5	0.029	4.1	-	12.5	314	0.005	8.7	0.20	2.3	20.3	76	0.3
Egorlyk (Salsky District)	0.34	169	-	0.36	0.36	-	745.7	293	-	240	-	2.2	89.5	143	1.5
Average content of bicarbonate ions [HCO_3^-] = 307. 6 mg/dm^{3}or 5.04 mg-EQ/dm^3															
Lihoborka (Moscow)	0.3	65	-	-	4.0	-	40	195	-	45	-	4.0	11	59	-
Dnieper (Khortytsya Island)	0.2	37.8	-	0.02	2.0	-	79.9	195	-	35.4	0.20	5.5	15.9	59	-
Yauza (Moscow)	0.07	109	0.1	0.03	3.0	-	42	198	0.016	47.4	0.29	2.5	16.0	77	0.16
Yauza (Moscow Province)	-	20	-	-	-	-	31	180	-	18.1	-	-	13.9	44	-
Moscow (Moscow)	0.16	13.0	0.15	0.006	1.7	-	21	191	0.007	15.0	0.06	2.6	11.3	46	0.2
Moscow (Kolomna)	0.4	59.1	1.7	-	32.9	-	49.8	198	-	43.4	-	8.8	15.1	63.2	1.0
Desna (Bryansk)	0.20	15.0	0.05	0.004	0.1	-	19	183	0.008	9.1	0.18	2.5	8.4	52	0.2
Klyazma (Vladimir)	0.30	27	-	0.020	0.6	-	29.2	187	-	18.4	0.3	4.7	13.2	48.5	0.2
Chimka (Moscow)	0.2	28.2	-	-	2.8	-	14.4	184	-	13.7	-	2.2	9.1	55	-
Volga (Kimry)	0.17	11.3	-	0.018	0.85	-	14.8	184	-	8.0	0.1	2.5	12.2	44	0.2
Volga (Uglich)	0.15	7.75	-	-	2.2	-	13.1	175	-	7.5	0.1	2.3	11.5	40.9	0.2
Ural (Orenburg)	0.35	99	-	0.058	0.44	-	100.6	196	-	66.3	3.3	3.8	24	59	0.05
Irtysh (Omsk)	0.2	20.0	-	0.038	0.03	-	27	179	0.020	19.8	-	1.15	11.8	44	0.7
Pregolya (Kaliningrad)	0.2	64.5	-	0.2	4.0	-	38	193	-	21.9	-	4.6	15.8	69.4	-
Average content of bicarbonate ions [HCO_3^-] = 188 mg/dm^3 or 3.09 mg-EQ/dm^3															

As follows from the analysis of the presented results, all 19 rivers were divided almost equally according to one criterion: the content of bicarbonate ions in river water. For one half of the rivers this content corresponds to the level of 3 mg-EQ / dm^3, for the other half of the rivers this content corresponds to the level of 5 mg-EQ/dm^3. The experimental error did not exceed 10%. Bicarbonate dualism in rivers does not depend on the geographical location of the river, belonging to the same water basin. Setun flows into Moscow, but the Setun water ~5 mg-EQ/ dm^3 of bicarbonate ions, and in the Moscow water ~3 mg-EQ/dm^3 of bicarbonate ions. Desna flows into Dnieper near Kiev, but the Desna water ~3 mg-EQ/dm^3 of bicarbonate ions, and in the Dnieper water ~5 mg-EQ/dm^3 of bicarbonate ions.

Bicarbonate dualism does not depend on the scale of the river, the time of year, the anthropogenic factor. The water of the Dnieper in Smolensk and Kiev contains ~5 mg-EQ/dm^3 of bicarbonate ions, while the chloride content was increased 8 times, sulfate content 4 times, and nitrate content 5 times. Finally, bicarbonate dualism does not depend on the chemical composition of the main inorganic components. The content of bicarbonate is constant throughout the river from source to mouth. In this regard, it deserves

special attention the "bicarbonate degeneration" of the Dnieper. Before the cascade of hydroelectric power stations and reservoirs (Smolensk, Kiev), the bicarbonate content in water corresponds to ~ 5 mg-EQ/dm^3, after the cascade, when the "nature of the river" changes dramatically (Khortytsya Island), the bicarbonate content is 3 mg-EQ/dm^3. In conclusion, it can be noted that rivers with bicarbonate content in water ~3 mg-EQ/dm^3 are characterized by the content of organic natural carbon (humic and fulvic acids) at ~5 mg/dm^3, for rivers with a concentration of 5 mg-EQ/dm^3, on the contrary, the content of organic carbon is less and corresponds to the level of ~3 mg/dm^3.

Conclusion

The study of the chemical composition of 19 rivers of Eurasia showed that they are divided into two groups according to the content of bicarbonate ions in water. For the first group, the concentration of bicarbonate ions is 5 mg-EQ/dm^3, for the second 3 mg-EQ/dm^3. This natural dualism does not depend from well-known factors. As a very general hypothesis, it can be assumed that such content is an equilibrium result of dynamic processes of interaction of river water with the atmosphere and soil, which globally on the planet is either acidic or alkaline.

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关于生物群的气候依赖性（以秋明地区为例）
ON THE CLIMATIC DEPENDENCE OF BIOTA (ON THE EXAMPLE OF THE TYUMEN REGION)

Konovalov Alexander Alexandrovich
Doctor of Engineering Sciences
Chief Research Officer of the Tyumen Scientific Center
Siberian Branch of the Russian Academy of Sciences
Full Professor of Tyumen Industrial University
Tyumen, Russia

注解。 研究了控制西西伯利亚（在秋明和鄂木斯克地区内）生物群结构组分分布的定量规律。 显示了它的气候依赖性。 北部（冷，湿）和南部（温暖，干燥）的植物群是有区别的。 它们之间的边界遵循干燥指数接近1的等值线。这里的热量和水分流量处于平衡状态，生物群的生活条件是最佳的。 找到了生物指数的纬向分布的量化。 为了分析和评估耐寒和耐热生物群的纬向分布，引入了分数热指数的概念，涉及不同的温度范围：0–5,5–10,10–15,15–0摄氏度。 提出了其近似评估的公式。

关键词：西西伯利亚，干热指数，生物群，结构，物种丰富度，生物多样性。

Annotation. *Quantitative laws governing the distribution of the structural components of biota in the territory of Western Siberia (within the Tyumen and Omsk regions) are studied. Its climatic dependence is shown. The northern (cold, wet) and southern (warm, dry) phytospheres are distinguished. The border between them follows the isoline of the dryness index close to 1. The heat and moisture flows here are in equilibrium and the living conditions of the biota are optimal. The quantifications of the zonal distribution of biotic indices are found. For the analysis and assessment of the zonal distribution of cold-resistant and heat-demanding biota, the concept of fractional thermal indices has been introduced, relating to different temperature ranges: 0-5, 5-10, 10-15, 15-0 °C. A formula for its approximate evaluation is proposed.*

Keywords: *Western Siberia, indices of dryness and heat, biota, structure, abundance of species, biodiversity.*

Introduction. The structure of biota, as known, is characterized by two parameters - abundance, which is understood as the total number of individuals or their mass, and diversity, expressed through different ratios between the number or mass (production) of different species - Shannon, Simpson, and others. It should

be stated that biotic diversity - the number of different species, genera, families, etc. actually determined only by direct counting (field methods). All the indices of diversity used [3] are calculated on the basis of the collected field material and are mainly of theoretical interest as a toolkit for identifying the general patterns of biosystem development. But none of the known indices of diversity reflects the influence of climate, which determines the heat and moisture supply of the soil and is the main factor in the segmentation of biota and its diversity. It allows, as shown below, to determine the structure of biota only from climate data.

Defining climatic indicators. The most important factors of biota functioning are the dryness index J = B / qU (here B is the annual radiation balance, kcal / cm^2; q = 0.6 kcal / cm^2 is the heat of evaporation; U is the annual precipitation, see) [1] reflecting the ratio between the heat and moisture entering the soil, and the heat index is the sum of positive air temperatures of $\sum_0$ (degree per day) that regulates the heat input. Analysis of weather station data shows that both parameters are interconnected — Fig.1.

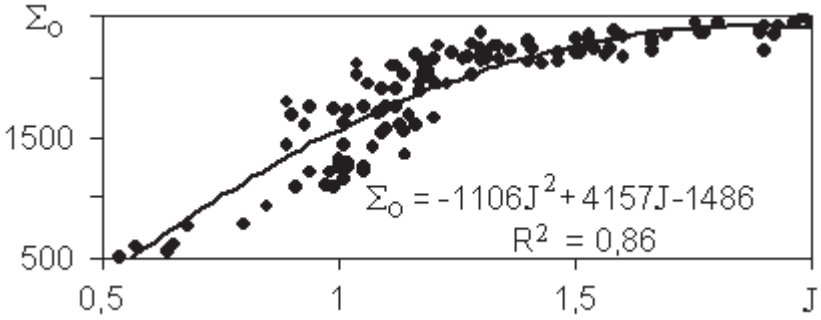

Fig.1. *The connection between indices of heat $\sum_0$ and dryness J (R^2 is the accuracy of the approximation of the graph).*

The conditions of heat and moisture exchange in the northern and southern phytospheres, characterized by the magnitude J (logarithmically), are antisymmetric. For example, the region of sustainable vegetation existence is limited in the north with isolines $J_n \approx 0.2 ... 0.33$ (northern tundra), in the south $J_s \approx 5 ... 3$ (southern semi-desert) [1], from where $J_n \approx 1 / J_s$ or $\ln J_n \approx \ln / (1 / J_s) \approx - \ln (J_s)$. Other indicators related to the cyclical nature of climate and expressed in the form of dependence on J, in particular, the annual total precipitation, group pollen spectra, phytoproductiveness [6], are approximately symmetrical. The curves of these dependences are dome-shaped, the peak of which falls on **J = 0.95 ... 1.2** (close to **J ≈1**). For example, Fig. 1 shows the dependence of the annual amount of precipitation U (cm) and phytoproductiveness (annual production) of the plant cover Pr (t / ha year) on J.

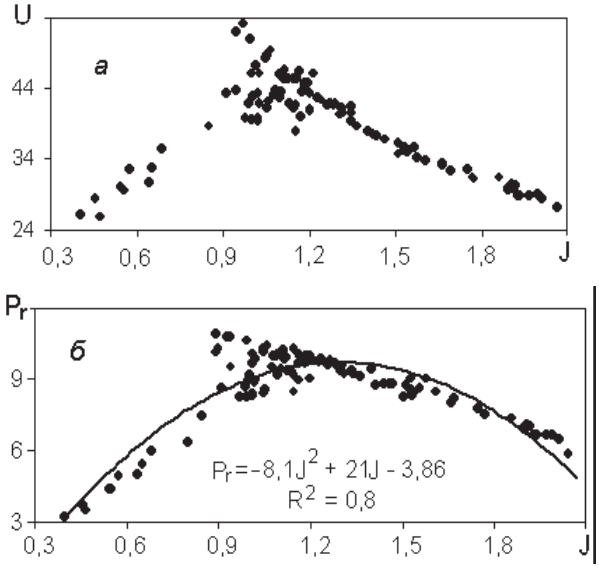

Fig.2 *The dependence of U (a) and Pr (б) on J*

Depending on the value of the J index, the phytosphere can be divided into the northern (cold, wet) and southern (warm, dry). The border between them passes, approximately, along the isoline *J≈1*, more precisely lies in the area *J≈0.95 ... 1.2*, where the heat and moisture are in equilibrium and the living conditions of the biota are optimal. In the northern phytosphere, the higher the $\sum_0$, the greater the number of geobotanical zones and sub-zones, starting with tundra, through the climatic conditions of which this place passes during the summer period and, accordingly, the more abundant and diverse its biota is. In the south - an increase of $\sum_0$ corresponds to a decrease in moisture intake, as a result of which biota degrades, its abundance and diversity decreases. $\sum_0$ is also responsible for the phase transitions of soil moisture. The frozen ground on the base of the summer thawing layer plays the role of a water seal providing a water reserve necessary to start and maintain the growing season of plants. Note that the optimum area of biota J≈0.95 ... 1.2 approximately coincides with the border of the multiyear and seasonal (thawing in the warm season) permafrost.

On the productivity of vegetation. The dependence of the annual production of the plant cover Pr on J and $\sum_0$ is established. The graph of the function Pr ($\sum_0$), as well as Pr (J), has a dome-shaped, symmetrical form - Fig.3. The maximum Pr ≈ 10… 11 t / (ha year) corresponds to $\sum_0$ ≈ 1750… 1800 degree-days. With further growth of $\sum_0$, Pr decreases. This means that the Pr ($\sum_0$) function indirectly takes into account the conditions of watering, since with an increase of $\sum_0$ the annual production of phytomass can decrease only due to the lack of moisture.

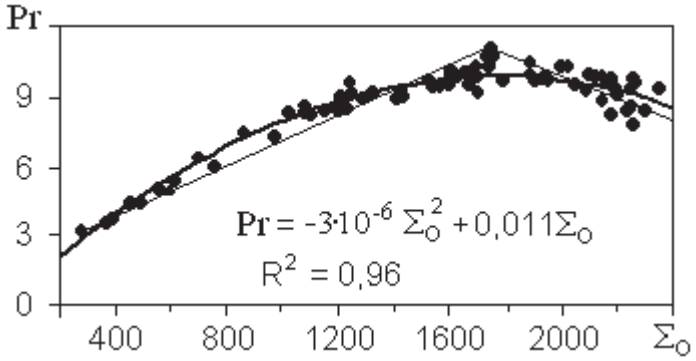

Fig. 3. *The dependence of Pr on ∑0 (according to the data of weather stations of the Tyumen region)*

The thin line in the graph on Fig. 3 shows a linear approximation of the dependence of Pr on $\sum_0$. In the northern phytosphere it has the form: $Pr = 0.006\sum_0$, in the south, where the distribution of Pr over $\sum_0$ is symmetrical: $Pr = 2100\text{-}0.006\sum_0$. The reliability of the linear approximation ($R^2 = 0.74$) is less than a quadratic, but also acceptable for approximate calculations.

In climate reference books, in addition to $\sum_0$, the values of the sums of temperatures above 5, 10, and 15 ° C ($\sum_5 \ldots \sum_{15}$) are given, which are related to $\sum_0$ — Fig.4.

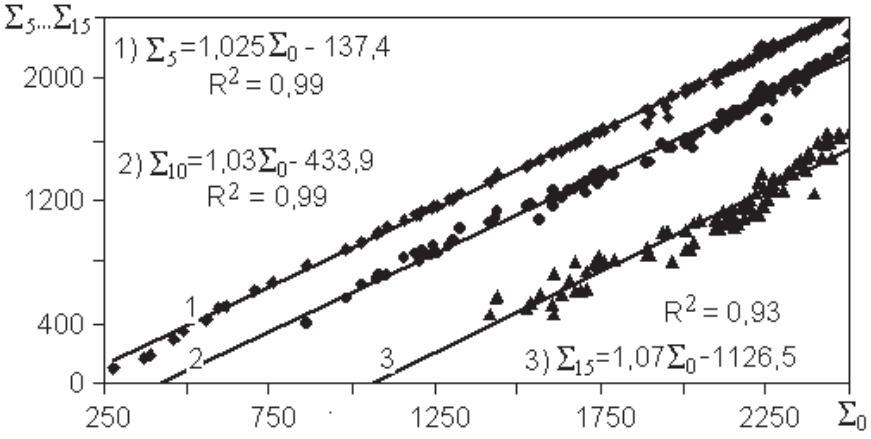

Fig. 4 *The dependence 1)∑ 5, 2) ∑10 and 3)∑ 15 on∑ 0 , degree-days.*

There are 4 temperature areas with different growing conditions 1) 0-5; 2) 5-10; 3) 10-15 and 4)> 15 ° C and the corresponding 4 groups of vegetation. The first and second groups include cold-resistant plants, and the third and fourth are heat-demanding. We distribute the heat index - $\sum_0$ into these groups. Take, for example, Tobolsk, where $\sum_0 = 2183$, $\sum_5 = 2093$, $\sum_{10} = 1793$, $\sum_{15} = 1191$. Subtracting $\sum_5$ 2093 from $\sum_0 = 2183$, we get the amount of conditional heat in the first area (0-5) - 90 (degrees per day); Similarly, we find the amount of heat in the second (5-10) and third (10-15) areas: $\sum_5 - \sum_{10} = 300$ and $\sum_{10} - \sum_{15} = 602$. For the fourth area (> 15) we have 2183 - (90 + 300 +602) = 1191. The part (n) of the value of $\sum_0$ on each of the 4 areas is: 90/2183 = 0.04; 299/2183 = 0.14; 0.28 and 0.54. Based on Fig. 3 (see the linear graph), we assume that the Pr value on all four areas is approximately proportional to n. Then:

$$Pr_{1\text{-}4} = Pr \cdot n_{1\text{-}4} \quad (1)$$

Similarly calculated $Pr_1 ... Pr_4$ distribution for 6 areas of the Tyumen and Omsk region, located in different natural zones, from tundra to steppe: 1) Tambey, 2) Salekhard, 3) Numto, 4) Surgut, 5) Tobolsk, 6) Omsk is presented in table 1.

Table 1

$Pr_1 ... Pr_4$ calculation

№	$\sum_0$	Pr	0-5	n	Pr_1	5-10	n	Pr_2	10-15	n	Pr_3	>15	n	Pr_4
1	493	4,7	149	0,3	1,4	344	0,7	3,3	-	-	-	-	-	-
2	1204	8,9	90	0,08	0,7	291	0,24	2,1	823	0,68	6,1	-	-	-
3	1414	9,6	85	0,06	0,58	274	0,19	1,8	597	0,42	4	458	0,32	3,1
4	1734	10,1	90	0,05	0,51	283	0,16	1,6	570	0,33	3,3	791	0,46	4,6
5	2183	9,25	90	0,04	0,37	299	0,14	1,3	602	0,28	2,6	1191	0,54	5
6	2445	8,96	69	0,03	0,27	261	0,11	1	631	0,26	2,3	1485	0,61	5,4

Table 1 shows that all plant products first increase towards the south, reaching a maximum at the latitude of Surgut, where J is close to 1. Then, with an increase in the dryness of the climate, decreases. Distributed products of the 1st, 2nd and 3rd temperature groups gradually decrease towards the south. The heat-demanding plants of the 4th group first appear approximately from the latitude of Numto (northern taiga), further to the south their mass increases.

Distribution and indexation of the abundance of species. Table 2 shows the distribution of biotic taxa, as well as average values of J over natural zones and sub-zones of the West Siberian Plain (according to [2, 4, 5]).

Table 2

The number of taxa of animals (birds + mammals) and vascular plants, as well as the average values of J in the sub-zones of WSP

№	Sub-zone	J	Animals (N_a)				Plants (N_p)			
			orders	families	genera	species	orders	families	genera	species
1	Northern tundra	0,44	7+5	20+9	46+15	73+18	17	17	35	57
2	Southern tundra	0,6	11+5	30+11	79+22	148+32	31	31	67	126
3	Forest tundra	0,75	15+5	39+12	107+27	194+42	28	28	58	99
4	Northern taiga	0,87	16+6	41+15	115+33	207+51	38	43	86	174
5	Middle taiga	0,96	18+6	48+17	136+38	257+59	46	50	147	247
6	Southern taiga	1,0	16+6	47+17	130+38	246+60	57	73	203	380
7	Sub-taiga	1,1	18+6	54+18	141+41	271+67	*57*	*74*	260	493
8	Northern forest-steppe	1,3	19+6	50+19	139+43	259+63	55	64	*267*	*540*
9	Southern forest-steppe	1,5	18+6	48+18	135+44	252+67	46	54	226	449
10	Steppe	1,9	19+6	45+16	115+40	208+58	33	36	131	215

Note: 1) Taxa (zoolog.) and orders (bot.) are identical in content.

From Table 2 it can be seen that the number of both faunal (N_a) and floristic (N_p) taxa of any rank follows the same regularities as Pr: with increasing J, and hence $\sum_0$ (in Fig. 1), the value of N first increases , reaching a maximum in the transitional zone of taiga to the forest-steppe, where the dryness index J is close to 1 and then decreases. Therefore, the values of distributed thermal indices $n_{1\text{-}4}$ are calculated in the same way, as described above, for Pr and for N, and the values of $N_{1\text{-}4}$ are determined by formula (1) when N is inserted into it (number of species, genera, families ...) instead of Pr.

Table 3 presents the results of calculations for the proposed method of group indices of heat n_1- n_4, as well as the number of plant species $N_{p.1}$- $N_{p.4}$ and animals $N_{a.1}$- $N_{a.4}$ in the zones and sub-zones of the WSP. Table 3 confirms the cyclical nature of the zonal course of both structural parameters of the biota — the annual production of Pr and the abundance of species N, of both N_p plants and N_a animals. The peak (maximum) of Pr and N is observed on the border of the taiga and forest-steppe, approximately coinciding with the southern border of permafrost and characterized by an approximate equilibrium between heat and moisture (J≈1). The distribution of $Pr_{1\text{-}4}$ и $N_{1\text{-}4}$ differentiated by cold resistance depends on the group (fractional) heat indices $n_{1\text{-}4}$, which significantly violate (diversify) this general order. The structural indicators of the cold-resistant biota of the 1st group,

after n_1 , continuously decrease from north to south, up to 10 or more times in the steppe, compared with the northern tundra. The biota of the 2nd and 3rd groups (temperate climate) increases slightly from the northern to the southern tundra, and then also decreases to the steppe zone. The heat-demanding biota of the 4th group first appears in the northern taiga, increasing to the south, and only in the steppe its species composition decreases. As expected, the category of rare species is represented in the northern phytosphere by heat-demanding plants, and in the southern by cold-resistant ones.

Table 3

The dryness index J and heat $\sum_0$, degree-days; the number of animal species (birds and mammals) N_a, $N_{a.1}$ ... $N_{a.4}$ and vascular plants N_p, $N_{p.1}$ ... $N_{p.4}$ in different (I) WSP sub-zones: 1) northern tundra, 2) southern tundra, 3) forest-tundra , 4) northern taiga, 5) middle taiga, 6) southern taiga, 7) sub-taiga, 8) northern forest-steppe, 9) southern forest-steppe, 10) steppe, and the corresponding values of $n_{1\text{-}4}$, and $N_{1\text{-}4}$

i	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
J	**0,44**	**0,6**	**0,75**	**0,87**	**0,96**	**1**	**1,1**	**1,3**	**1,5**	**1,9**
$\sum_0$	**129**	**610**	**1010**	**1293**	**1485**	**1565**	**1832**	**2049**	**2261**	**2420**
$\sum_1$	101	***122***	112	105	100	98	92	85	81	77
$\sum_2$	28	***294***	292	290	289	289	287	286	285	284
$\sum_3$	0	194	606	***641***	634	630	619	611	602	597
$\sum_4$	0	0	0	258	463	548	834	1066	1293	***1463***
n_1	***0,83***	02	0,11	0,08	0,07	0,06	0,05	0,04	0,036	0,032
n_2	0,17	***0,48***	0,29	0,22	0,19	0,18	0,16	0,14	0,13	0,12
n_3	0	0,32	***0,6***	0,5	0,43	0,4	0,33	0,3	0,26	0,25
n_4	0	0	0	0,2	0,31	0,36	0,46	0,52	0,57	***0,6***
Pr	1,69	5,59	8,05	9,21	9,72	9,87	***10,1***	9,94	9,51	9,1
Pr_1	1,04	***1,12***	0,89	0,74	0,68	0,59	0,51	0,4	0,34	0,29
Pr_2	0,29	***2,68***	2,33	2,03	1,85	1,78	1,62	1,39	1,24	1,09
Pr_3	0	1,79	***4,83***	4,6	4,2	3,98	3,43	2,96	2,56	2,28
Pr_4	0	0	0	1,89	3	3,48	4,64	5,2	5,43	***5,44***
$\mathbf{N_p}$	57	126	100	174	247	380	493	***540***	449	215
$N_{p.1}$	***47***	25	11	14	17	23	25	22	16	7
$N_{p.2}$	10	***60***	29	38	47	68	***79***	76	59	26
$N_{p.3}$	0	40	59	87	106	152	***163***	162	117	54
$N_{p.4}$	0	0	0	35	77	137	227	***281***	256	129
$\mathbf{N_a}$	91	180	236	258	317	306	***338***	322	319	266
$N_{a.1}$	***76***	36	26	21	23	18	17	13	12	9
$N_{a.2}$	15	***86***	68	57	60	55	54	45	42	32

i	1	2	3	4	5	6	7	8	9	10
J	0,44	0,6	0,75	0,87	0,96	1	1,1	1,3	1,5	1,9
$N_{a.3}$	0	58	***142***	129	136	122	112	97	83	67
$N_{a.4}$	0	0	0	52	98	111	155	167	***182***	160
$N_{п}$	73	148	194	207	257	246	***271***	259	252	108
$N_{п.1}$	***61***	30	21	17	18	15	14	10	9	3
$N_{п.2}$	12	***71***	56	46	49	44	43	36	33	13
$N_{п..3}$	0	47	***116***	104	111	98	89	78	66	27
$N_{п.4}$	0	0	0	41	80	89	125	135	***144***	65

In general, the obtained results demonstrate the interdependence of the existence of plants and animals, their general dependence on climate, as well as the possibility of assessing the diversity of biota by heat indices, differentiated by cold resistance.

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冻土的强度和变形特征
STRENGTH AND DEFORMATION CHARACTERISTICS OF FROZEN SOIL

Konovalov Alexander Alexandrovich
Doctor of Engineering Sciences
Chief Research Officer of the Tyumen Scientific Center
Siberian Branch of the Russian Academy of Sciences
Full Professor of Tyumen Industrial University
Tyumen, Russia

注解。 分析了负荷下冻土的性能。 结果表明，在稳定蠕变阶段，变形过程在能量上与熔化相对应。 考虑到这一点以及冻土强度的动力学概念，已经获得了一个涉及耐久性，变形，载荷和温度的配方。

关键词：强度，变形，耐久性，蠕变，破坏

Annotation. *The performance of frozen soils under load is analyzed. It is shown that at the stage of steady creep, the process of deformation energetically corresponds to melting. With this in mind and the kinetic concept of strength for frozen soil, a formula has been obtained that relates durability, deformation, load and temperature.*

Key words: *Strength, deformation, durability, creep, destruction*

On the kinetic concept of strength. In solid state physics, a kinetic (thermofluctuation) concept of strength has been developed, the essence of which is contained in the formula for durability $t_{дл}$ [7]:

$$t_{дл}=t_o \exp[(U_o - gP)/RT], \quad (1)$$

where $U_o \approx Q_c$ - activation energy of destruction; Q_c - latent heat of sublimation; $t_o \approx 10^{-13}$ sec - the period of thermal oscillations of atoms; RT is the average energy of atomic vibrations; T is the temperature (K); P - pressure (strength); R is the universal gas constant; g is a coefficient that has the meaning of the volume of an atom at the time of sublimation.

Formula (1) is based on the idea of the local nature of the destruction of interatomic bonds, in terms of microcracks and other structural defects that serve as stress concentrators. It is obtained as a result of the generalization of numerous tensile tests of various materials, including composite and heterogeneous. It should be noted that it can also be derived analytically, based on energy - entropy

considerations [4]. From the formula (1) it follows that the durability is the final value, at P = 0 it reaches its maximum, equal to $t_o \exp(U_o/RT)$. I.e. the body is destroyed also in the absence of external pressure, under the action of time, which is the same active force of destruction as pressure and temperature.

In [4, 5, 8], the limitation of formula (1) is shown, its applicability mainly for materials with high melting points and at high pressures. It is hypothesized that there are two mechanisms (types) for the destruction of a solid: near the melting point, brittle ("sublimation"), which implies the breaking of interatomic bonds ($U_o \gg Q_c$) and away from it, plastic (" smelting "), which implies dilution ($U_o \gg Q_{пл}$). Frozen soils are destroyed mainly according to the second type.

This article develops theoretical concepts of permafrost studies in terms of the staging of soil moisture crystallization, the connections of the strength and durability of frozen soils with phase transition temperatures, with global factors and time. Much attention has been paid to an insufficiently studied phenomenon - the supercooling of the freezing soil, during which, under certain conditions, the entire temperature spectrum of its future frozen state is recorded. This opens up great opportunities for early prediction of the strain state of frozen soil and cost savings for the production of expensive field tests of frozen soils.

Stages of crystallization. The main stages of soil moisture crystallization are shown in Fig.1.

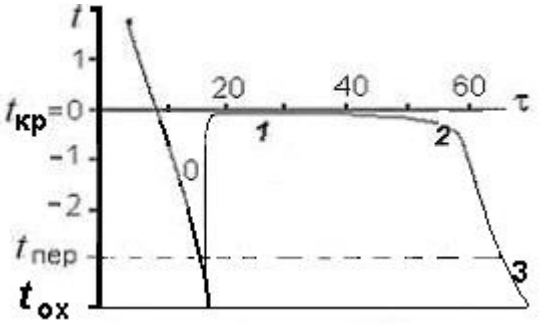

Fig.1. *Stages of liquid transition to the solid phase (0 – supercooling; 1, 2 — crystallization of free (1) and bound (2) water; 3 — cooling of frozen soil; τ — current time, min; t — current temperature, ° C; $t_{кр}$ — crystallization temperature; $t_{пер}$ - supercooling temperature; t_{ox} - cooler temperature (temperature in the permafrost chamber)*

The formation of the structure of ice starts when its temperature drops below + 4 ° C, when the density of water begins to slowly decrease, rushing to the density of ice. Bulk crystallization of water in time is preceded by its supercooling (metastable state) below the crystallization temperature $t_{кр}$ to the value of $t_{пер}$ (hidden,

zero stage in Fig. 1). Supercooling creates a temperature difference $t_{кр}$ - $t_{пер}$, which is necessary for obtaining the energy of formation of the bulk crystallization front (interface of phases).

After reaching $t_{пер}$ the temperature of the soil rises abruptly to $t_{кр}$, and the first ice crystals, centers of the subsequent bulk (clear) crystallization, including two stages (1 and 2 in Fig. 1), appear "into the light". On the first one, at a constant temperature $t_{кр}$, free water freezes, on the second - loosely bound water. The temperature of the soil before the crystallization of its moisture (when $t > t_{кр}$) depends on the temperature of the coolant $t_{ох}$ and its thermo-physical properties, according to the Fourier thermal conductivity law. With its start, this dependence is blocked by the latent heat of phase transitions $Q_ф$, when the heat capacity of the moist soil becomes an effective value [6]:

$$C_{эф} = C_у \cdot \rho_{ск} + (dW_н / dt) \cdot Q_ф \rho_{ск}, \quad (2)$$

where $C_у$, kJ / kg degree - specific heat capacity of the freezing soil; $Q_ф$ = 334 kJ / kg is the latent heat of crystallization of soil moisture; $W_н$ - moisture due to unfrozen water; $\rho_{ск}$- density of the dry soil unit.

The second component in (2) is hundreds of times larger than the first. Under these conditions, the crystallization front becomes a screen ("zero curtain"), protecting the freezing soil from external cooling and ensuring the constancy of $t_{кр}$ at the 1st stage. At the 2nd stage, water freezes in a certain range of temperatures. Here, each $t_{кр}$ corresponds to a certain, gradually decreasing amount of unfrozen water and, accordingly, increasing deformation. At the end of the stage, at a sufficiently low temperature of the cooler $t_{ох}$, a hard-frozen state is established, characterized by a temperature $t_{тм} \approx t_{пер} \geq t_{ох}$, at which practically all bound water freezes.

From Fig. 1 it follows that, in general, with each temperature, when the thawed soil is cooled (on the left curve), it is possible to compare the temperature of the frozen soil (on the right curve) equal to it, which determines its strain state, including strength and other physical and mechanical properties. That is, during the supercooling of thawed soil, all temperatures are consistently demonstrated, which are then repeated at the 2-stage crystallization. In the reverse process, the transition of the solid phase to a liquid, metastable state is not realized. It is not necessary because there is unfrozen water in frozen soil at almost any temperature, and the phase interface is always present.

The lower the $t_{пер}$, the shorter the formation time of the crystallization front, or, which is the same, the smaller the supercooling period $t_{пер}$. At sufficiently low $t_{ох}$, the value of $t_{пер}$ becomes less than the resolution of the measuring instruments and the entire supercooling section is not recorded by observations because of its smallness. For an example the table. 1 shows the results of experiments to determine $t_{кр}$ and $t_{пер}$ in peated clay soils with different $t_{ох}$ [5, 8] From tab. 1 we can see that $t_{пер}$ is always higher than $t_{ох}$, and with decreasing $t_{ох}$, the supercooling area decreases and at $t_{ох}$ around minus 6 ... 8 ° C goes beyond the limits of "visibility" of the devices.

Table 1. *Connection of t_{ox}, $t_{пер}$ and $t_{кр}$ in peat clay soils*

Experiment №	1	2	3	4	5	6
t_{ox}	-3.2	-5.8	-6.4	-8	-9.8	-17.7
$t_{пер}$	-2.4	-2.5	-	-	-	-
$t_{кр}$	-0.1	-0.1	-0.11	-0.12	-0.12	-0.27

Detailed studies of the dependence of $t_{пер}$ on $\tau_{пер}$ were performed by S.E. Grechishchev et al. [2]. Approximation of this dependence gives [4]:

$$t_{пер} / t_{min} = (\tau_{пер} / \tau_{min})^{g} \quad (3)$$

where t_{min} and τ_{min} - the minimum temperature and period of supercooling in the experiment, $g \approx 0.09$ is the relative change in the volume of water during freezing.

With the help of (3), it is possible to establish the minimum cooling temperature t_{ox}, at which the value of $t_{пер}$ is still observed. Let us accept the conditions of one of the experiments [2]: loam with moisture of 26, 2%, $t_{кр}$ = -0.4 ... - 0.5 ° C, g » 0,1; t_{min} = -3,3 °C and τ_{min} = 30 s. According to the calculation with the formula (3): at $t_{пер}$ = -4,6°, the value of $\tau_{пер}$ = 1 s, at-5 °, it is equal to 0.43 s, and at -8 °, it is just 0.004 s. It is clear that in this case, $t_{пер}$ is fixed at t_{ox} not lower than -5° C . If t_{ox} is lower than the temperature of the solid-permeable state of the soil $t_{тм}$ (in loams tтм ≈ -6 ... -8°C), supercooling is not observed, the first crystallization stage begins.

S.E. Grechishchev accepts that $t_{пер} = t_{ox}$. Although this equation is not observed in experiments, this assertion can be accepted if we assume an instantaneous change in temperature from $t_{пер}$ to t_{ox} and back, as shown in Figure 1.

With an increase in $t_{пер}$, the duration of supercooling $t_{пер}$ increases. As the temperature of the cooler approaches $t_{кр}$, the value of $t_{пер}$ tends to an infinitely large value.

The magnitude of supercooling — its temperature and duration — can be reduced and even nullified by shaking the sample, increasing the external pressure, lowering the temperature in the chamber, using various crystallization inocula.

The value of g in (3) is close to the relative crystallization strain g » $j_{кр}$» 0,091, and the maximum supercooling (instantaneous, with the duration of supercooling equal to the period of atomic oscillations: $t_{пер} = t_{min} = t_{o}$»$10^{-13}$ sec) when substituted into the formula (3) experimental data are obtained equal to minus 22-24°C. This is close to the minimum temperature at which ordinary water may still exist (not freeze) [9]. i.e. the extremes of the temperature of supercooling and crystallization are the same: about 0 and -22°C.

The supercooling temperature, like the crystallization temperature, depends on the pressure. But if the crystallization temperature decreases with increasing pressure, then, as experimentally established [4], the supercooling temperature, on the contrary, increases. This is evident from the figure 2 shown for example: at P = 0.1 MPa, $t_{пер}$ = -3.1 ° C; at P = 5.7 MPa, $t_{пер}$ = -1.4 ° C [4].

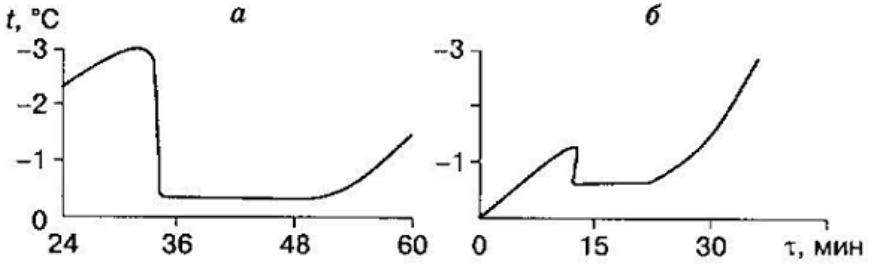

Fig.2. The temperature change of the freezing loam at P = 0.1 MPa (a) and P = 5.7 MPa (б).

Phase equilibrium of soil moisture. Pressure, temperature and volumetric deformation characterizing the phase transformations of soil moisture are the main parameters of the state of frozen soils. The relationship between them in the *limiting* equilibrium state is governed by the Clapeyron-Clausius law, which we write in the following form [4, 6]:

$$dT/T=dP\,(V_{тв}-V_{ж})/Q_{ф,} \quad (7)$$

where T (K) is the temperature in Kelvins; T_o = 273 (K) is the crystallization temperature at atmospheric pressure; P - external pressure, kg / cm2; $V_{тв}$ и $V_{ж}$ - the specific volume of the solid and liquid phases; $Q_ф$ is the latent heat of ice-water phase transitions, kJ / kg.

Integrating this equation gives:

$$\ln(T_o/T)=P(V_{тв}-V_{ж})/Q_{ф,} \quad (8)$$

With T/T_o» 0.9 ... 1, which is typical for frozen soils existing in the temperature range 0 ... -22°C (273 ... 251K), replacement is possible

$$\ln(T/T_o) \approx (T/T_o)-1=-t/T_o \quad (9)$$

Then the equation of phase equilibrium is linearized:

$$t_ф = t_{кр}=P(V_{тв}-V_{ж})T_o/Q_ф=Pj_{кр}T_o/L_{кр}=Pb, \quad (10)$$

where $t_ф$ =|T-T_o| - freezing point of water in °C with a plus sign; $j_{кр}=(V_{тв}-V_{ж})/V_{ж}$ = 0.091 is the relative crystallization strain; $L_{кр}=Q_ф/V_{ж}$ - volumetric heat of crystallization, kJ / m^3; $b=(V_{тв}-V_{ж})T_o/Q_ф$, °C// MPa.

The coefficient b depends little on temperature, rising as it decreases, in different soils from about 0.08 to 0.14 °C/ MPa; on average, b » 0.1 °C / MPa. [4, 6].

When describing melting, instead of $j_{кр}$ and $L_{кр}$, relative deformation and volumetric heat of melting $j_{пл}=(V_{тв}-V_{ж})/V_{тв}$ = 0.083 and $L_{пл}=Q_ф/V_{тв.}$, $L_{кр}<L_{пл}$, a $j_{кр}>j_{пл}$ are substituted into (10) by about 9%.. This difference is often neglected. From formula (10), at a known temperature, the pressure of phase transformations (pore

pressure) is determined: $P_ф$=t/b, positive during crystallization of water, resulting from the impossibility of free expansion, and negative during ice melting, resulting from the free release of pore volume. The index "ф" for t and P is set when they are functions of, respectively, P and t.

Unlike most other substances, water during freezing increases in volume, and the temperature (in the range of 0 ÷ - 22°C) and the pressure of phase equilibrium are not in direct, but in inverse connection. At about t = –22 °C and P ≈ 220 MPa [4, 9], the sign of the dependence of $t_ф$ on P changes to the opposite: the value of $t_ф$ begins to increase. At t <–22 °C ordinary water, and at P> 220 MPa, ordinary ice (ice I) does not exist (Fig. 3).

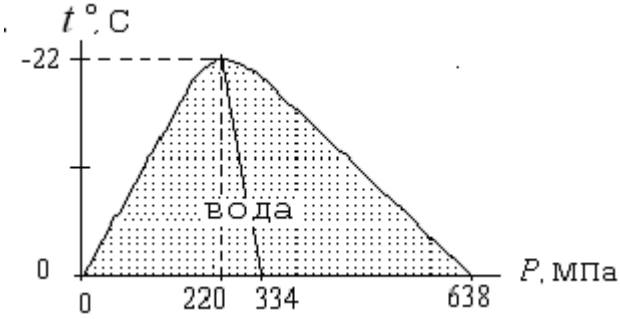

Fig. 3. *Area of existence of ordinary water at t <0 °C*

The temperature and pressure at this limit, by analogy with supersaturated solutions of alloys are called eutectic (from Greek - fusible): $t_{эв}$ ≈ –22 °C , $P_{эв}$ ≈ 220 MPa, since water at these indicators is in equilibrium with two solid phases - ice 1 and ice 3 [9], i.e. falls under the definition of eutectic. The analysis of the actual material also showed that the spatial, mechanical, thermal and temporal parameters characterizing the boundaries of the existence of a solid phase of water are approximately similar:

$$1-(V_ж/V_{тв})=1-(T_{эв}/T_o)=Q_{пл}/Q_c=1-(P_{эв.пл}/P_{эв.кр}) \approx j_{пл} \approx 0{,}083=1/12, \quad (11)$$

$$(V_{тв}/V_ж)-1=(T_o/T_{эв})-1=(Q_c/Q_и)-1=(P_{эв.кр}/P_{эв.пл})-1 \approx j_{кр} \approx 0{,}091=1/11, \quad 12)$$

where $Q_и$ and Q_c - latent heat of evaporation of water and ice sublimation (at t = -22°C Q_c = 2830 kJ / kg, $Q_и = Q_c – Q_{пл}$ = 2830 –235 = 2595 kJ / kg); $P_{эв.пл}$ »216 MPa and $P_{эв.кр}$ = 235 MPa - eutectic melting and crystallization pressures (power equivalents $L_{пл}$ and $L_{кр}$ at t = $t_{эв}$ = -22°C).

From equations (11) - (12), the linearity of the distribution of t, P and j between their extreme values and an approximate analogy of the sum-total of these equations to gas laws follows.

The similarity criteria in the equations are equal to the relative deformations of ice melting and water crystallization, and their reciprocal values coincide with the number of months in the earth and lunar annual cycles, which apparently indicates a relationship between the water-ice phase transitions and planetary factors.

Durability and long-term strength of frozen soil. Let us assume that changes in durability and the work of destruction (melting) of frozen soil, related to their maxima, are proportional to:

$$\Delta P V_{тв}/[P_m(V_{тв}-V'_ж)] = \Delta P\, j_{пл} = \Delta\tau/\tau\,, \qquad (13)$$

where $V'_ж$ - increasing content of unfrozen water in thawing soil.

Replacing $\Delta\tau$ and ΔP with differentials, we rewrite (13) in integral form [4], after integrating and simple transformation of which, we get:

$$(t_э/t_д)^{jпл} = (P/P_m) = Pb/t_ф\,, \qquad (14)$$

where P is the pressure on the frozen body; P_m - the maximum pressure that this body can withstand without breaking down during elementary time, determined from equation (10); te $t_э$ is the minimum (elementary) time interval adopted in this experiment (of the order of minutes [1] with the lower limit $t_э \approx 10^{-13}$ s — the period of thermal vibrations of an atom); td $t_д$ - durability (time to destruction); $j_{пл}$ - deformation, increasing in the process of melting ice to its maximum.

In (14) there is a deformation of the steady-state creep $j_{пл}$, varying from a certain minimum to a limit value at which complete destruction occurs (thawing of soil ice) - $j_{пл} = j_{пр} = 0.083$. In frozen soils of different composition, $j_{пр}$ may be slightly more - 0.09 ... 0.14 [1].

The analysis showed good convergence of the results of calculations by the formula (14) with actual data [4, 5, 8]. For example, Table 2 gives the relative strength of sandy loam P/P_m at t = -10 ° C, with different durability (t, min), obtained with various types of tests experimentally [1], and calculated by the formula (14) at $j_{пл} = 0.11$ and $t_э = 1$min.

Table 2. *Dependence of P/Pm on t (min) under: 1) compression, 2) tension, 3) shear, 4) calculation by the formula (14)*

t	1) P/P_m	2) P/P_m	3) P/P_m	4) P/P_m
1	1	1	1	1
10	0.84	0.79	0.78	0.78
60	0.65	0.61	0.61	0.63
180	0.56	0.55	0.54	0.56
480	0.5	0.5	0.5	0.51
720	0.49	0.48	0.47	0.48

We can note that pressure, temperature, volumetric deformation and time enter into equation (14) equally, which implies their equivalence and interchangeability. Each of them can serve as a function, and the rest act as arguments. It was shown above that any temperature of supercooling of soil moisture corresponds to the temperature of its future crystallization. I.e. the strength and deformation properties of the frozen soil can be approximately determined even when it is in the thawed state, substituting $t_{ф} \approx t_{пер}$ into (14).

Conclusion. Formula (14) is a complete description of the process of deformation and destruction of plastic frozen soil. It differs from the well-known, firstly, by compliance with the kinetic concept of solid strength, naturally arising from the classical molecular kinetic theory, and secondly, by linking strength with phase equilibrium and deformation.

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用植物激素处理水果和浆果作物，作为减少由于缺乏授粉而造成的作物损失的一个因素

TREATMENTS OF FRUIT AND BERRY CROPS WITH PHYTOHORMONES, AS A FACTOR OF REDUCING CROP LOSSES FROM THE LACK OF POLLINATION

Boitsenyuk Leonid Iosivovich
Doctor of Agricultural Sciences , Full Professor, Head of the Department
Zhelonkina Elena Eduardovna
Candidate of Geographic Sciences, Associate Professor
Pafnutova Elena Gennadievna
Head of the Department
State University of Land Use

注解。 本文讨论了减少植物激素合成类似物缺乏授粉的事实的能力，这种特性因环境和气候条件的变化而特别相关。 进行的研究为开发提高作物产量的方法创造了先决条件。

关键词：生态，气候条件，花粉，花粉管，花蜜，授粉，植物激素，产量，昆虫，赤霉素。

Annotation. *This article discusses the capabilities of the fact reducing the lack of pollination by synthetic analogues of phytohormones, which is particularly relevant due to changes in environmental and climatic conditions. The conducted study creates the prerequisites for the development of approaches to increase crop yields.*

Key words: *Ecological, climatic conditions, pollen, pollen tubes, nectar, pollination, phytohormones, yield, insects, gibberellins.*

The evolution of flowering plants and pollinating insects proceeded in parallel, since they both could not develop without each other. As a consequence, the yield of entomophilous plants depends on the quality of pollination, which in its turn depends on weather and climatic conditions.

Nowadays, due to the complication of the ecological situation, changes in climatic conditions, yield losses become significant and the factor of the lack of pollination is coming to one of the first places in importance [5]. Thus, in unfavorable

years, losses from the lack of pollination led to 80% dieback of the sets of melons, cucumbers and watermelons, as well as to 100% dieback of the sets of pumpkins. Conversely, with enough red clover pollination, the yield increase was 50-80%, for sunflowers 20-40%, for stone fruits up to 80%. Yield losses of the same level were observed in years with adverse conditions for the flying of bees.

It has long been established that a single visit of a bee to a flower is not enough to set the fruit. For setting seeds a sunflower requires at least 6 visits to a flower, watermelon-18, cherry-20, melon-24. With a further increase in the frequency of visits by bees for these plants, like for buckwheat, there was no increase in the percentage of setting, but there was an increase in mass and an improvement in seed germination. So, for setting seeds of buckwheat, a double visit to a flower is required, with an increase in the number of visits, the weight, the completion of the seed, the germination energy and the germination of seeds rises as well [3, 6].

Pollen on the style for the vast majority of plants is a necessary factor prior to the formation of fruits. The development of ovule occurs simultaneously with the development of other parts of the flower. In some plants, the set ceases to grow while or before the flower opens; in others, the growth of the set continues until fertilization, in both cases further growth of the set occurs when the pollination is successful. If, for any reason, pollination does not occur, the growth and development of the fruit ceases. Failure in pollination leads to dropping unfertilized flowers from plants, which indirectly affects the formation of a separating layer in the floral stem. After successful pollination, on the contrary, the rapid growth and development of the set begins.

Right after the ingress of pollen, and even after the start of germination and the introduction of pollen tubes into the tissue of the column, the nature of the metabolism of the column changes sharply. The appearance of stamens and petals is considered to be an outward sign of successful pollination. The very process of pollination, regardless of whether it is followed by fertilization, is sufficient to activate the growth of the set and other parts of the future fruit [4]. This is evidenced by the fact that in many fleshy fruits the set begins to develop before sufficient time for fertilization passes . Moreover, even strange pollen taken from unrelated plants, and therefore unsuitable for fertilization, can cause a noticeable stimulation of set growth.

This assumption indicates that this fact is due to the content in the pollen of a certain mentor responsible for the development of the set, that could be the physiologically active substances in the pollen. This assumption was confirmed in the experiments, when pure auxin-type phytohormones were used as the reproductive mentor. The experiments performed on winter rye were successful: with the inbreeding of rye, in the presence of these substances, there was a 10 times increase in the setting of grains. The weight of seeds increased significantly in the experimental pollen variants [1, 2].

It should be noted that we were very lucky to conduct experiments in almost perfect conditions. At the end of April and the beginning of May (until 07.05), average daily temperatures above 10 ° C were noted, and from May 8 to May 17 a cold snap occurred with an average daily temperature below 10 ° C. Low temperatures and precipitation significantly reduced the flight activity of entomophilous insects.

To stimulate fruit setting and reducing the negative effect of the lack of pollination by bees, we have processed synthetic analogues of phytohormones to plant flowers that are in the budding phase of the onset of flowering.

In the experiments we took into account the percentage of set fruits and their average mass.

The beginning of cherry flowering occurred on 03.05 with almost perfect weather conditions - a little cloudy weather with an average daily temperature of 12 ° C (+7 at night and + 17 in the afternoon). Accordingly, the amount of nectar and the sugar content was optimal. Thus, the attendance of flowers by bees was at a fairly high level, but unfortunately, after three days a cold cyclone with rainy weather came and insects stopped visiting flowers. What ultimately affected the yield (table 1).

Table 1

Effect of phytohormone treatments on the setting and mass of cherries

Variant	Set, %	Average seed mass, g
Control	3.7	204
GA_3 $1{,}4\times10^{-4}$ M	12.4	3,12
IAA $2{,}8\times10^{-4}$M	10.7*	3,05

In 2017, the beginning of the gooseberry bloom began in the north of the Moscow region on May 12 and lasted until May 24. In the period from 07.05 to 13.05 there were low night temperatures from -1 to +4 degrees Celsius, fairly low daytime temperatures from +3 to + 11° C and all this with the cloudy rainy weather. It could not but affect the nature of the bees visiting the flowers. In the first days, there was a lack of attendance by bees and a slight interest of bumblebees (table 2).

Table 2

Effect of phytohormone treatments on the setting and weight of gooseberry berries

Variant	Set, %	Average seed mass, g
Control	34.7	2.64
GA_3 $1{,}4\times10^{-4}$ M	47.6	3,87
IAA $2{,}8\times10^{-4}$M	43.5	3,45

The beginning of flowering of apple trees began in the first half of May (May 16), when rainy and cold days were noted with an average daily temperature below 10 ° C (Table 3). Since apple trees are more demanding on heat than cherries

and gooseberries, which is reflected in later flowering periods, at temperatures below 10 ° C, physiological processes are extremely slow. It reflected in the secretion of nectar. In the first half of the flowering period there was almost no nectar secretion. With the increase of average daily temperatures above 10 ° C, nectar began to secrete. Due to the wet weather and large reserves of moisture in the soil, the flowers secreted a significant amount of nectar. However, the rainy and windy weather did not favor the active visiting of flowers by bees. The main pollinators were bumblebees, which are able to work under more unfavorable conditions.

Table 3

The effect of phytohormones treatments on the setting and weight of apple fruits

Variant	Set, %	Average seed mass, g
Control	13.9	112
GA_3 $1,4\times10^{-4}$ M	19.4	147
IAA $2,8\times10^{-4}$M	17.1	153

In our experiments, gibberellins were most conducive to fruit setting and increase in their mass. Synthetic analogs of auxin also contributed to the growth of these indicators, but to a lesser extent than gibberellins. This can be explained by the fact that we could not find the most active drug concentrations.

All the above mentioned facts create prerequisites for the development of methods for increasing the yield of plants, which becomes especially relevant when the climatic conditions change, the entomofauna is reduced, and, consequently, the potential yield is reduced from the lack of pollination.

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需要在现代条件下整合管理系统
THE NEED TO INTEGRATE MANAGEMENT SYSTEMS IN MODERN CONDITIONS

Vayskrobova Evgenyia Sergeevna
Candidate of Engineering Sciences, Associate Professor
Magnitogorsk State Technical University named after G.I. Nosov
Baryshnikova Nadezhda Ivanovna
Candidate of Biological Sciences, Department Chair
Magnitogorsk State Technical University named after G.I. Nosov

注解。 本文介绍了在俄罗斯联邦企业中引入现代管理系统的必要性及其描述。 考虑了综合管理系统，其基础的目标和选择以及其优势等概念。 介绍了作者为企业形成集成系统而开发的一种方法，在此基础上，展示了肉类加工企业综合管理系统的详细开发及其测试结果。

关键词：管理，集成，集成管理系统，模型，集成质量和安全管理系统。

Annotation. *The article presents the need for the introduction of modern management systems in enterprises of the Russian Federation and its description. Such concept as integrated management systems, goals and options for its foundation as well as its advantages are considered. A method developed by the authors for the formation of integrated systems in enterprises is described, on the basis of which a detailed development of an integrated management system for a meat processing enterprise is shown with the results of its testing.*

Keywords: *management, integration, integrated management systems, model, integrated quality and safety management system.*

The active development of international standardization and the formation of the Eurasian Economic Union have led to a tightening of legislative and regulatory requirements for products and services by the Government of the Russian Federation through the use and application of world standards that dictate new high-level requirements and are constantly being improved based on global trends and best practices.

As a result, domestic enterprises need to form its development strategy in order to survive in the markets and maintain its competitiveness in modern conditions so that it could focus on improving the quality and safety of the products and services provided, which can only be done through the use of modern concepts, methods

and approaches. As a result, the interest of Russian enterprises in the need of introducing world standards is rapidly increasing every year, as evidenced by the steady increase in the number of certificates of conformity [8].

At the moment there are many models for the development, implementation and improvement of the management system in enterprises. The activity of any enterprise must comply with the requirements of general-purpose standards governing universal general requirements (ISO 9000, ISO 14000, OHSAS 18000, ISO 26000, ISO 27000, ISO 31000 and others), as well as industry standards that take into account the specific features of a particular industry (ISO 22000, IATF 16949, AS 9100, ISO 13485, TL 9000, IWA, IEC 60300, ISO / TU 29001 and others).

The principles of general management, which can be applied to any enterprise regardless of the industry, are formulated in the basic standards of the ISO 9000 series, which allowed the introduction of other standards for management systems and largely predetermined the methodology for its construction. The universal general requirements of the ISO 9000 series do not take into account, and cannot take into account the requirements that enterprises engaged in a particular type of activity must fulfill. These features of ISO standards lead to the fact that enterprises are forced to introduce other standards for management systems that will take into account the specifics of its industry [6,7].

To solve this problem and for the further sustainable development of enterprises, to optimize their management process, to reduce the costs of eliminating the consequences of making inefficient management decisions, it is necessary to integrate separated measures into a single system of constantly implemented actions at all stages of the product life cycle. Almost all industrialized countries have entered a new stage of ensuring the sustainable development of an enterprise, characterized by the creation of integrated management systems.

In this regard, enterprises need common methods, models, approaches, technologies that will allow them to implement and improve the effectiveness and efficiency of integrated management systems. Development of guidelines for the formation and implementation of such systems is still a pressing issue.

According to M.Z. Sweetkin, an integrated management system, is a part of the general management system of an enterprise that meets the requirements of two or more international standards for management systems and functions as a whole [3].

The purpose of forming an integrated management system is joint optimal risk management, which allows reducing the material and organizational resources required by an enterprise [2]. The practical formation of an integrated management system is carried out in three ways:

- the creation of parallel models, when systems exist independently of each other with the development of cross-documents;

- creation of additive models, when other systems are sequentially added to the base system. Integration is mainly carried out at the system documentation level;

- the creation of fully integrated models, when all systems are combined into a new whole.

The organizational and methodological foundation for integrated management systems are the ISO 9000 standards, as they are the basic and universal standards for general use. Thus, integration consists in combining the requirements of ISO 9001 and various industry standards for management systems, depending on the industry. Industry standards for management systems are designed to fully comply with the structure of ISO 9000 standards, which facilitates its integration [2].

Today, large industrial enterprises increasingly introduce integrated management systems based on ISO 9001 + ISO 14001 + OHSAS 18001. For food enterprises, it is advisable to create integrated management systems based on ISO 9001 + ISO 22000. There are other combinations of standards that depend on the objectives of the enterprise and its industry.

For the formation of integrated management systems in enterprises, we have developed a methodology that consists of the following steps:

1. To conduct a comparative analysis of the requirements of integrated standards in order to establish areas of integration of these systems using an expert method.

2. To develop elements of an integrated system, i.e. clearly identify areas for integrating standards. This stage is performed using the principle of combination — for the purpose of integration, the requirements of clauses of one standard are supplemented with the corresponding requirements of another standard, and those requirements that are specific to these standards are fully incorporated into the elements of the integrated system.

3.To develop integrated system processes. Initially, it is necessary to determine the composition of the basic processes, to further determine the supporting and management processes, to describe and to structure it.

4.To develop a process model of an integrated system that implements a cycle of continuous improvement and allows you to establish the connections of processes.

5. Develop a responsibility matrix in the framework of an integrated system, in which the role of personnel is determined by the system processes.

6.To develop the composition and structure of the documentation of the integrated system [1].

On the basis of the proposed methodology for the formation of integrated systems, we carried out the integration of systems at the meat processing plant in Saransk.

For enterprises of the food industry, the HACCP system is mandatory for

the application of the industry system in accordance with the TR CU 021/2011 "On food safety". Currently, the HACCP system is represented by two standards: GOST R 51705.1 and GOST R ISO 22000. In this connection, we decided to integrate the two systems — the quality management system (QMS) in accordance with the requirements of ISO 9001 and the food safety management system (FSMS) in accordance with ISO 22000. This system was commonly referred to as the Integrated Quality and Safety Management System (IQSMS).

At the initial stage, a comparative analysis of the requirements of the standards to be combined was carried out for the development of IQSMS in order to establish areas of combining QMS in accordance with GOST R ISO 9001 and FSMS in accordance with GOST R ISO 22000. Analysis of the structure of the standards allowed to establish its proximity and compatibility. Later, in order to identify similar elements and differences in the requirements of these standards, a detailed review of the degree of compliance of ISO 9001 and ISO 22000 was carried out. To determine the degree of compliance with the requirements of these standards, an expert method was used to determine the compliance of each item of the normative documents under consideration. As a result, the conformity of each clause of ISO 22000 to clause of ISO 9001 was determined. For this, a qualified group consisting of seven people was formed. This group included specialists from the certification bodies of Magnitogorsk, Chelyabinsk and Moscow, specialists from the food industry enterprises of Saransk and Magnitogorsk, as well as representatives from universities of Magnitogorsk, Chelyabinsk and Moscow. Each member of a qualified group gave their own marks on a scale of 0.1 to 1.0. The highest score was set for completely similar and closest points of standards. The final assessment of compliance was obtained as a result of the collecting and processing data submitted by all members of the group. To determine the degree of consistency of estimates by the group members, it was necessary to determine the coefficient of variation, which was 4-22%, which means that the variability is insignificant, and the information is homogeneous. For a visual representation of the similarities and differences in these standards, circular diagrams were constructed, from which you can see that they are compatible and on its basis it is possible to build an IQSMS [1,2].

For the development of IQSMS, we analyzed the technological (life) cycle of the company's products. In identifying and describing this cycle, IDEF0 notation was used. As a result, we established the factors that shape the quality and safety of products and a number of factors influencing the effective functioning of the system at the meat processing plant. Based on the analysis, it was determined that the basis for ensuring the quality and safety of products consists of 8 processes: market research and contracting, production planning and management, product design and development, raw product and materials procurement, manufacturing, equipment management, process and product monitoring, sales of finished products.

Further, the risks of biological, chemical and physical origin that are characteristic for the production of meat products, as well as the procedures for its control, were identified and characterized. An expert assessment of the identified risks was carried out in terms of the severity of the consequences and the possibility of its realization, on the basis of which unacceptable risks were identified. Based on the systematization of hazards and identified unacceptable risks using the "decision tree" method, critical control points (CCP) have been established. For each CCP, critical limits are assigned, as well as procedures for its control, corrective actions, verification procedures and record forms, which were presented in the form of an FSMS plan. Thus, the principles of the HACCP system were applied and developed. To prevent and eliminate the identified hazards, programs of mandatory preliminary measures have been developed.

At the next stage of research on the basis of ISO 9001 and ISO 22000 standards, an IQSMS model was formed. This model is based on a process approach to ensure the necessary parameters of quality and safety of products.

The initial stage of the formation of the IQSMS model involves the establishment of its elements. For the development of the elements, areas for combining the above standards have been identified, which turned out to be ten.

Further, on the basis of the identified IQSMS elements , the structure of the processes was identified, on the basis of which the IQSMS model was developed, implementing a continuous improvement cycle. On the basis of the created process IQSMS model, the structuring of processes using the IDEF0 notation was performed. As a result, the model connects managerial, supporting and basic processes that are linked together in flow-diagrams and indicates the interaction of these processes. The model indicates the direction of resource flows and documentation and reflects the dependence of the functioning of each process from each other. To determine the owners of the processes, a responsibility matrix was further developed, which defines the role of the company's management in ensuring systematic monitoring and analysis of IQSMS.

The requirements for the structure and composition of documentation were also analyzed, on the basis of which a typical unified structure of IQSMS documentation was developed and its composition was determined. Documentation allows linking the processes we identified between their participants, getting rid of disunity and internal conflicts, as well as monitoring its effectiveness [1,5].

In order to evaluate the effectiveness, conformity and probability for improving the proposed model, a methodology has been developed for evaluating its effectiveness. The method involves scoring 8 criteria: leadership, policies and goals, staff interaction, resource provision, process management, satisfaction of internal customers (for IQSMS — satisfaction of external customers), satisfaction of internal consumers with work, effectiveness and efficiency of processes, impact of the enterprise on society (estimated only for IQSMS). Within the framework of this methodology, a efficiency scoring algorithm has been proposed, the basis

of which was the self-assessment of the functioning of process owners. For each identified process in the units, a questionnaire is filled in according to 8 criteria. Each block (criteria) of the questionnaire contains 5 questions for which there are 5 possible answers, and for each answer in the questionnaire the appropriate coefficient is assigned [4].

Approbation of the developed and improved methodology at the meat processing plant in the city of Saransk showed that it has practical significance. On the basis of the developed ISUK model, we carried out an improvement of the additive model in the enterprise, which allowed us to create a fully integrated system:

- a part of basic, supporting and management processes was reworked, as a result, a new organizational structure of the enterprise, a responsibility matrix, a process interaction matrix, new process management structures that show their sequence and interaction with reference to the structural divisions of the enterprise, as well as input and output process data were developed;
- a quality and safety guidelines have been developed and implemented;
- the enterprise documentation was updated;
- a new structure for the designation of documentation in accordance with the fundamental requirements of external documentation was proposed.

The conducted activities have shown that the implemented IQSMS system harmoniously combines the requirements of the QMS and the FSMS developed at the enterprise and is effective. The following benefits from system implementation are established:

- the ability to carry out joint and precise quality and safety management of products, as well as to comply with legal and consumer requirements;
- due to a clear delineation of personnel responsibilities management of the system as a whole improved;
- due to streamlined information flows, it was possible to respond promptly to inconsistencies;
- due to the integration of systems, the number of documentation was reduced by 16%;
- due to accurate system management and streamlined information flows, it was possible to reduce the proportion of inconsistencies to 0%;
- due to clear safety management and the introduction of mandatory measures, the sanitary and hygienic condition of the premises improved by 11.3%;
- due to effective preventive and corrective actions, the number of complaints from consumers decreased by 91% [1].

Thus, by introducing integrated management systems the company receives a number of advantages: the activity of the enterprise is optimized; more accurate traceability and transparency of the enterprise; reduced material resources and product inconsistencies; the quality and safety of products and services provided will increase, and as a result, the competitiveness of products and the enterprise as a whole increases.

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使用直立螺旋输送机处理颗粒材料的数学描述

THE MATHEMATICAL DESCRIPTION OF GRANULAR MATERIAL HANDLING WITH AN UPRIGHT SCREW CONVEYER

Evstratov Vladimir Aleksandrovich,
Suxarnikova Valentina Aleksandrovna
Shakhty department of the South – Russian statement technical University (Novotchercassk polytechnic Institute)

注解。我们使用直立式螺旋输送机推导出一套用于松散物料流动处理的方程式，同时考虑了物料流动的物理机械特性和几何特征。这组方程能够探索输送机的结构和条件参数对输送机功能效率的影响。

我们开发了一种确定处理材料流动几何特征的方法：材料流动自由表面配置，无流动表面和螺旋叶片交叉点的坐标，材料元件扇区的体积及其与质心的坐标考虑处理材料内部摩擦系数。

使用所得到的结果实际上能够大大增加直立式螺旋输送机的操作特性。

关键词：材料流动的几何特征，松散介质，驱动力，运动阻力，执行装置，接触面，颗粒材料。

Annotation. *We derived a set of equations for loose material flow handling with an upright screw conveyer with taking into consideration physical-mechanical properties and geometrical characteristics of the material flow. This set of equations enables exploring the influence of structural and conditional parameters of the conveyer on functioning efficiency of the conveyer.*

We developed a method of determination of handling material flow geometrical characteristics: material flow free surface configuration, the coordinate for the intersection point of the flow free surface and the screw blade, volume of material element sector and its coordinate for the centre of mass with taking into consideration handling material internal friction coefficient.

Using the derived results practically enables great increasing of upright screw conveyers operation characteristics.

Keywords: *geometrical characteristics of the material flow, loose medium, driving force, motion resistance force, executive devices, contact surface, granular material.*

At the present time there is no accurate mathematical description of the process of loose material flow upright screw conveying. The most of investigations are based on the estimated scheme which substitutes the flow conveying with the conveying of a particle leaning against the screw blade and pushed to the tube. The particle's moving for an upright screw conveyer in stationary condition can be described by following differential equations:

;

$$\left.\begin{aligned} N_s\cos\alpha_R - f_s N_s\sin\alpha_R - f_t N_t\cos\beta - mg = 0; \\ f_t N_t\sin\beta - f_s N_s\cos\alpha_R - N_s\sin\alpha_R = 0; \\ -N_s + mR\omega_0{}^2\left[\frac{\sin\alpha_R\sin\beta}{\cos(\beta-\alpha_R)}\right]^2 = 0; \end{aligned}\right\} \quad (1)$$

where f_s = friction coefficient of material against the screw blade;

f_t = friction coefficient against the tube;

m = mass of the material particle;

N_s = normal reaction of the screw blade;

R = normal reaction of the tube;

R = screw blade radius;

$\alpha_{\mathrm{R}} = arctg\,\frac{t}{2\pi\mathrm{R}}$ = the helix angle on outer radius;

$t = 2\pi R tg\alpha_R$ = lead of the screw;

β = the angle contained by absolute velocity vector v of the material particle and the screw axis;

ω_0 = screw angular velocity;

$g = 9{,}81 м/с^2$ = free fall acceleration.

The equation for determination of angle β :

$$\frac{R\omega_0^2 f_t}{g}\left[\frac{\sin\alpha_R \sin\beta}{\cos(\beta-\alpha_R)}\right]^2 - \frac{f_s + tg\alpha_R}{\sin\beta(1-f_s tg\alpha_R)-\cos\beta(f_s+tg\alpha_R)} = 0 \quad . \quad (2)$$

Analysis of amount results of handling process taken from solution of the relation (2) with using a computer shows that functioning efficiency of upright screw conveyers is considerably influenced by geometrical and kinematical parameters of the conveyer tools (the radius and the helix angle of the screw blade and rotational speed of the shaft). Indeed, material flow moving will be simulate with a particle moving, but the amount will be differ (2).

The equilibrium of material volume element engaging sector of a blade with the central angle $d\varphi$ is plotted in Fig. 1. In order to proceed from particle moving it's necessary to ascertain flow cross section shape. If consider moving granular material flow as moving liquid flow, as the pressure is the free surface, the flow free surface equation is the following:

$$z = z_0 + \frac{\omega^2 x^2}{2g} \quad \text{or} \quad z = ax^2 + b\,, \quad (3)$$

where ω = material angular velocity.

To determinate coordinates for the intersection point of the flow free surface and the screw blade r it's necessary to study particle equilibrium at this point. Suppose, the particle is on flow free surface, leans against the screw blade at the distance r from the axis, pushed to material flow and gyrating by concentric rotational speed ω_0.

There are equations of particle moving:

$$\left.\begin{aligned} N_s\cos\alpha_r + f_s N_s \sin\alpha_r + f_t N_t \sin\alpha_r - mg = 0;\\ f_m N_m \cos\alpha_r + f_s N_s \cos\alpha_r - N_s \sin\alpha_r = 0;\\ -N_m + mr\omega_0^2 = 0, \end{aligned}\right\}$$

where f_m = internal friction coefficient of the material;

N_m = normal reaction of flowing material;

$\alpha_r = arctg(\frac{R}{r} tg\alpha_R)$ - the helix angle at the distance r from the axis.

Solving this set of equations and relation (3) simultaneously yields the following relation for coordinate of the intersection point of flow free surface and the screw blade:

$$f_m \omega_0^2 r^2 - f_s(f_m R\omega_0^2 tg\alpha_R + g)r - gRtg\alpha_R = 0 . \quad (4)$$

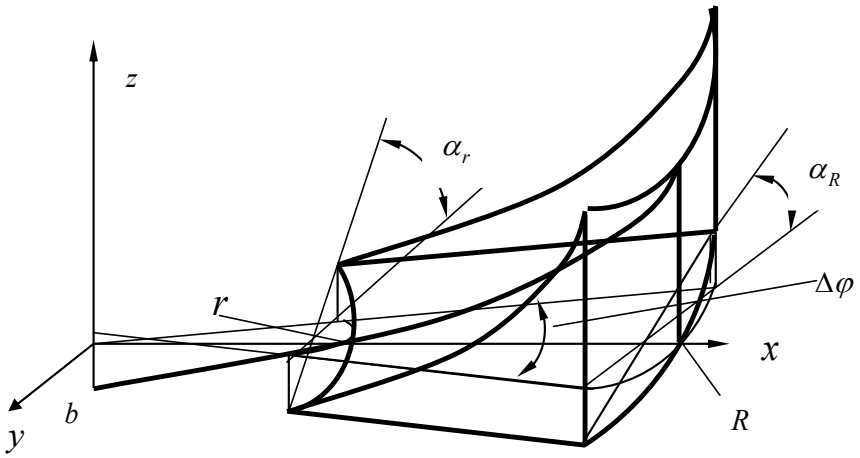

Fig. 1. *The equilibrium of material volume engaging sector of a blade*

As the helix angle changes from the axis to periphery, in order to describe material flow moving it's necessary to substitute in relation (1):

$$N_s \sin\alpha_\rho = P_s S_v ; \quad N_s \cos\alpha_\rho = P_s S_h . \quad (5)$$

Taking into account (5) the set of equations (1) yields:

$$\begin{gathered} P_s S_h - f_s P_s S_v - f_t P_t S_t \cos\beta - \gamma V = 0; \\ f_t P_t S_t \sin\beta - f_s P_s S_h - P_s S_v = 0; \\ - P_t S_t + \frac{\gamma}{g} V \rho_c \omega_0^2 \left(\frac{\sin\alpha_R \sin\beta}{\cos(\beta - \alpha_R)} \right)^2 = 0, \end{gathered} \quad (6)$$

where P_s - pressure of the material volume engaging sector of the blade with the central angle $d\varphi$ on the screw blade;

P_t - pressure which the material volume brings to the tube;

S_c - contact area of the material volume element and the tube inside;

S_h - horizontal projection of the sector of the blade with the central angle;

S_v - vertical projection of the sector of the blade with the central angle $d\varphi$;

V - material volume engaging the sector of the blade $d\varphi$;

γ - the distance from the screw axis to the material volume element centre of mass;

γ - bulk weight of the material.

Horizontal projection area of the sector of the blade $d\varphi$ between the limits r and R (Fig. 2)

$$S_h = \int_r^R x \Delta\varphi dx = \frac{R^2 - r^2}{2} \Delta\varphi. \quad (7)$$

Vertical projection area of the sector of the blade $d\varphi$:

$$S_v = \int_r^R xtg\alpha_x \Delta\varphi dx.$$

As $xtg\alpha_x = t = const$, so that

$$S_v = \int_r^R t \Delta\varphi dx = t(R - r)\Delta\varphi = R(R - r)tg\alpha_R \Delta\varphi \quad (8)$$

Material volume engaging the sector of the blade $d\varphi$ (Fig. 1) is equal to material volume which is a part of body of revolution formed by plane xOy, cylinder surface formed by rotation (around axis *z*) of vertical elements passing through points of plane xOy of plot $y^2+x^2=R^2$ and curve surface formed as plot $z=f(x)$ or $z=a(x^2+y^2)+b$ rotates around axis z. The equation for the material volume can be determinated by relation (3)

$$V=\int\limits_S\int f(\rho)d\rho d\theta=\int\limits_0^{\Delta\varphi}d\theta\int\limits_r^R f(\rho)\rho d\rho=\left[(R^2+r^2)a+2b\right]\frac{R^2-r^2}{4}\Delta\varphi$$

, (9)

where $\rho=\sqrt{x^2+y^2}$, $x=\rho\cos\theta$, $y=\rho\sin\theta$.

Coordinate for the centre of mass of material element, taking into account (9), can be determinated by relation:

$$\rho_c=\frac{\int\limits_V xdv}{V}=\frac{\int\limits_0^{\Delta\varphi}\int\limits_r^R f(\rho)\rho^2\cos\theta d\rho d\theta}{\int\limits_0^{\Delta\varphi}\int\limits_r^R f(\rho)\rho d\rho d\theta}=\frac{\sin\Delta\varphi\int\limits_r^R(a\rho^2+b)\rho^2 d\rho}{\Delta\varphi\int\limits_r^R(a\rho^2+b)\rho d\rho}$$

$\Delta\varphi$ is infinitesimal so that $\frac{\sin\Delta\varphi}{\Delta\varphi}\approx 1$, so that after integrating

$$\rho_c=\frac{\frac{a}{5}\left(R^5-r^5\right)+\frac{b}{3}\left(R^3-r^3\right)}{\frac{R^2-r^2}{4}\left[a\left(R^2+r^2\right)+2b\right]}. \qquad (10)$$

Introducing relations (7-10) in set of equations (6) yields the following relation for angle β

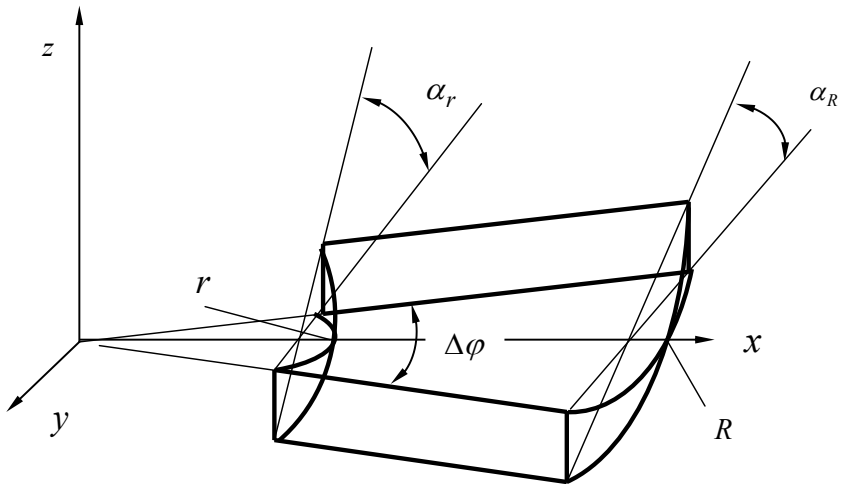

Fig. 2. *The sector of the blade and its horizontal and vertical projections*

$$\frac{f_t \rho_c \omega_0^2}{g}\left[\frac{\sin\alpha_R \sin\beta}{\cos(\beta-\alpha_R)}\right]^2 - \frac{f_s S_h + S_v}{(S_h - f_s S_v)\sin\beta - (S_v + f_s S_h)\cos\beta} = 0 \quad (11)$$

Fig. 3 plots the variation of angle β for α_R particle and for material flow in an upright screw conveyer vs. helix angle for different angle velocities of the screw, taken from the relation (2) and (11). Material friction coefficients against the screw and cylinder are $f_t = f_s = 0{,}5$. The radius of the blade $R = 0{,}5m$.

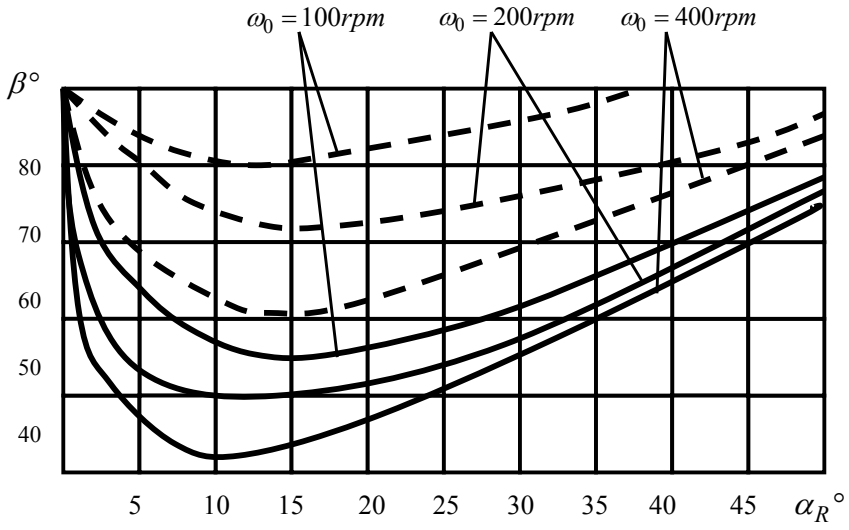

Fig. 3 *The variation of angle* β *for a particle and for material flow in an upright screw conveyer vs. helix angle for different angle velocities of the screw: _____- a particle, _ _ _ _ _ - material flow*

As the graph shows every curve has its own extremum. It means that there is some rational value for helix angle in some rational value for helix angle in every case when absolute velocity vector V deviation from the axis will be the least.

Therefore the value of angle β for a particle and for material flow are considerably different.

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UDC 631.354

大豆种子脱粒，机械损伤及分离过程的研究两相脱粒机组脱粒机长度的研究

RESEARCH OF THE PROCESS OF THRESHOLD, MECHANICAL DAMAGE AND SEPARATION OF SOI SEEDS BY THE LONG OF THE HAMMER OF THE TWO-PHASE THRESHOLD COMBINE

Prisyazhnaya Irina Mikhailovna
Candidate of Engineering Sciences
Associate Professor of the Department of "Design"
Faculty of Design and Technology Amur State University
Blagoveshchensk, Russian Federation
Prisyazhnaya Serafima Pavlovna
Doctor of Engineering Sciences
Professor of the Department of "Energy"
Faculty of Energy Amur State University
Blagoveshchensk, Russian Federation

注解。 由于种植面积的扩大，阿穆尔州大豆产量的增加已经耗尽其潜力，因此有必要确定和引进创新技术，以生产高质量和更高产的种子。 已经确定大豆具有种子的生物多样性。 其形成较早开始的种子具有增加的生长能量，发芽，生产力，更高的绝对重量。 已经开发了用于分离和收集这些种子的技术（申请号2011010674，日期为12.03.2018），简单，低劳动力并且需要现代化联合收割机用于收获种子地块，这是由于显着的损害和播种的种子质量差。 该地区（平均播种次数高达20%的种子）。

关键词：大豆，收获，结合，优质种子，发芽，生产力，产量。

Annotation. *The increase in soybean production in the Amur Region due to the expansion of acreage has exhausted its potential, therefore it is necessary to identify and introduce innovative technologies for producing high-quality and more productive seeds. It has been established that soybean has a biological diversity of seeds. Seeds, the formation of which begins earlier, have increased growth energy, germination, productivity, higher absolute weight. The technology for isolating and collecting these seeds has been developed (Application No. 2011010674 dated 12.03.2018), is simple, low-labor and requires modernization of the combine for*

harvesting seed plots, due to significant damage and poor quality of seeds sown in the region (on average up to 20% of substandard seeds are sown).

Keywords: *soy, harvest, combine, high-quality seeds, germination, productivity, yield.*

In the study of the process of soybean threshing in a two-drums threshing-separating device of the beating type, the soybean crops represented the following characteristic (Table 1).

As a result of the conducted research, it was established that the soybean seeds are most intensively threshed and separated at the outset of the threshing - separating device of the two-phase threshing combine. So, for example, in the zone of the first threshing drum, up to 88.5% of whole seeds and up to 65.1% of crushed soybean seeds are separated when fed to the thresher 1.76 kg/s (Table 1). With an increase in the supply, the soybean seed separation is redistributed to the other working parts of the threshing group and the straw walkers. Thus, with an increase in the supply to 4.9 kg / s, the separation of soybean seeds decreases by 17.7% through the first concave, but this increases the separation of seeds from 16.0 to 28.5% through the concave of the second drum and the yield of seeds to the straw walker from 0,6 to 2.8%.

Table 1.

Characteristics of the soy plot

№ o/n	Names of factors	Ground 1	Ground 2
1	Harvest grain standing, cwt/ha The density of the standing of the stems on soy pieces	19,7	21,9
2	The density of the stem standing on soy, pieces per $1m^2$	51	52,6
3	Number of weeds, pieces per $1m^2$	37,4	16,4
4	The average height of soybean stalks, cm	86,9	77,4
5	The average height of weed stalks, cm	113,2	70,8
6	Culture dockage: (the number of weeds of the total number of soybean plants and weeds,%) (Weight of weeds of the total weight of plants standing,%	42,3 38,2	23,8 10,1
7	The ratio of grain weight to straw weight	1:2,58	1:1,41
8	Moisture,% of seeds / straw impurities	10,3/18,8	9,4/15,7
9	Weight of 1000 seeds, g.	148,4	149,8

With increasing load on the thresher, separation of straw impurities increases by 2-3% in the first and second zones. The distribution of straw impurities in the zones shows that its main part (63.6-72.2% of the evaporated through the threshing-straw walker group) falls on the 3rd-5th zone, i.e. on intermediate beater, second drum and straw walker.

As studies have shown (Table 1), as the mass moves in the threshing device, the grain concentration in the pile that has passed through the threshing — separation group decreases. For example, in the first and second zones, 70.4-81.6% is occupied by grain, and only 18.4-29.6% is accounted for by mineral impurities (soil, straw, chaff, and unmilled beans). Moreover, with an increase in the feed to the thresher from 1.76 to 4.9 kg/s, the seed content of the main crop decreases from 81.6 to 78.3 in the first zone and from 74.4 to 70.4% in the second zone (the zone of the first threshing drum). With the change in the feed to the thresher, the components of the pile are redistributed both by zones and in the zone itself. For example, when increasing the load on the thresher from 1.76 to 4.9 kg/s, the seed concentration in the pile coming from the second drum and with the straw walker key (4th and 5th zones) increases, respectively, from 13.0 up to 36.4% and 2.3 to 20.6%

Compositional analysis of the pile shows that with an increase from 1.76 to 4.9 kg/s feed to the thresher decreases from 3.5-4.0 to 2.2-2.7% of the crushed seeds in the first and second zones. The predominant type of damage to soybean seeds are broken seeds across. Depending on the allocation zone, this type of damage is 57.1-66.4%.

The predominant species in straw impurities are chaff and bean flaps. They occupy, respectively, 7.3-12.1 and 2.6-11.8% in the first two zones. In the 4th and 5th zones, its content reaches, respectively, 60.6 and 30.7%.

The study of the distribution of straw impurities in the zones shows that the main part (63.6-72.2% of the evaporated through the threshing-straw walker group) falls on the 3rd-5th zone, i.e. on intermediate beater, second drum and straw walker.

The peripheral speed of the drum rasp also has a significant effect on the change in the state of the soybean heap in the threshing and separating device of a two-phase threshing process. For example, studies of the threshing process and the separation of soybean seeds along the length of the thresher, conducted on the soybean plot with a contamination of 10.1% (ground 2) with constant feed to the thresher (q_n = 4.9 kg/s), showed that with the circumferential speed ratio of the rasps of the first and second drums V_1/V_2 = 13.24 / 17.56 m/s in the area of the first deck, 70.8% of the seeds are separated. In the zone of the intermediate beater and the deck of the second drum, 12.7 and 13.7%, respectively, is separated (Table 2.1.1). With a decrease in the peripheral speed of the scourges of the first drum and its relation to the peripheral speed of the second drum V_1/V_2 = 8.63 / 17.56 m/s, the separation of soybean seeds in the zone of the first deck is only 53.6%. The number of seeds allocated in the zone of the intermediate beater and the deck of the second drum increases, respectively, to 18.9 and 19.9% (Fig. 1.).

This is due to the fact that with a decrease in the peripheral speed of the rasps

of the first drum, the intensity of threshing of seeds at the first stripe of the first concave deck and along its length decreases. This is evidenced by the decrease from 0.916 to 0.693 of the coefficient A_1, which takes into account the threshing at the first deck and from 2.7 to 1.668 of the coefficient μ_{01}, which characterizes the intensity of threshing along the length of the deck (Table 1). This reduces the amount of available (milled grain in this zone, and the content of unmilled grain at the gathering from the first drum (at the end of section L_1) increases from 7.1 to 17.2 (curves 1, 2, and 3 in Fig. 1.) With the further movement of soybean mass in the threshing and separating device, the threshing of grain occurs at the first bar of the deck of the second drum and along its length. Moreover, when the circumferential speed of the rasps of the first drum decreases from 13.24 to 8.63 m / s the grain threshing intensity rises. It is characterized by the rise from 0.767 to 1.41, by the A_3 coefficient with the rise from 3.186 to 3.295 and $\mu_{,03}$, respectively, threshing at the first bar of the deck of the second drum and along its length. The threshing curves of grain (2,3) in L_3 section go more steeply than curve (1). The content of non-threshed grain in the gathering from the second drum increases with 0.43 to 0.51%.

Based on the data obtained, the dependences clearly show (Fig. 1.) that in a two-phase threshing of soybeans, the seeds threshed in the L_1 area with a threshing-separating device are not completely separated through the straw grating and the deck of the first drum. At the studied feed and modes from 22.1 to 29.2% of available grain goes to the intermediate beater grid. However, here it still does not have time to be drained and from 9.1 to 10.3% of the threshed (available) grain (zone Y) goes to the second drum, operating in “hard” mode.

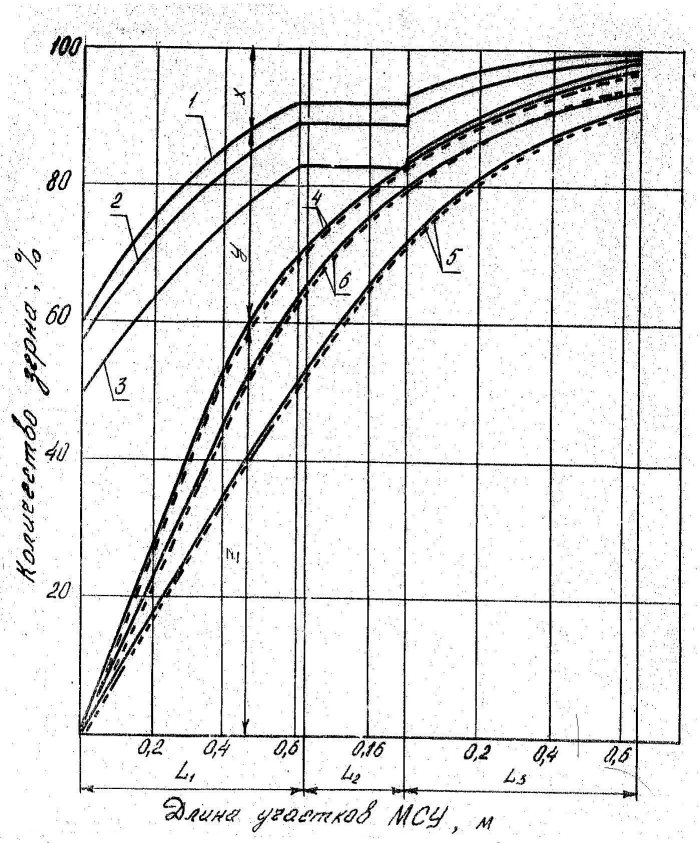

Fig. 1. *The influence of the ratio of the peripheral speeds of the drum whips on the change in the ratio of soybean heap in the threshing and separating device of two-phase threshing. 1, 2,3- threshing grain along the length of the thresher (1-X); 4,5,6- grain separation along the thresher. ---------- experimental; _____-theoretical*

$$1,4-\frac{V_1}{V_2}=\frac{13,24}{17,56}\,м/с;\quad 2,6-\frac{V_1}{V_2}=\frac{10,94}{17,56}\,м/с;\quad 3,5-\frac{V_1}{V_2}=\frac{8,63}{17,56}\,м/с.$$

This phenomenon leads to additional damage to the seeds. In order to exclude this phenomenon, the first concave should have an extended separation zone, especially behind the first bar of the deck and a reduced zone of threshing of seeds

along its length. This will increase the intensity of separation of soybean seeds threshed at the first bar of the deck and eliminate them from additional mechanical damage.

As a result of the research, the analytical dependences of the threshing and separation coefficients on the total separation of soybean grain along the length of the threshing and separating device of a two-phase threshing (Fig. 2) were established and the following empirical equations were determined:

$$\begin{aligned} A_1 &= 1,979 Z_{L_1} + 0,0124 \\ \mu_{01} &= 5,8136 Z_{L_1} - 1,516 \\ \mu_1 &= 4,0698 Z_{L_1} - 0,0514 \end{aligned} \quad (1)$$

$$\begin{aligned} A_3 &= -13,5582 Z_{L_3} + 13,9676 \\ \mu_{03} &= -2,2703 Z_{L_3} + 5,3927 \\ \mu_3 &= 24,3675 Z_{L_3} - 20,435 \\ \mu_2 &= -6,8205 Z_{L_2} + 8,8401 \end{aligned} \quad (2)$$

The theoretical dependences of the processes of separation of soybean seeds along the length of a threshing and separating device of a two-phase threshing, obtained taking into account certain coefficients, are in good agreement with the experimental ones. The relative error in this case does not exceed 0.11-0.41%.

In the case of a two-phase soybean threshing, the volume weight of the small heap allocated along the length of the threshing and separating device and the load on the shaker board change. For example, depending on the ground of the crop being harvested, 51–64% of the total load falls on the first and second zones. The bulk density of the pile here is 368-408 g/dm^3 (Fig. 3). As the heap moves along the length of the shaker board, its bulk density and unit load decrease. The fifth zone (breaker and straw walker) accounts for only 4.8–9.4% of the total pile load with the bulk density of 52.9-83.7 g/dm^3.

The change in the load along the length of the shaker plate, shown in Fig. 3, shows that the intensity of its growth occurs on a parabolic dependence, and, moreover, the intensity of the growth of the specific load on a less littered background is higher. This phenomenon is due to the fact that on a less littered ground (10.1% weeds) of the combine harvester, due to the field unevenness, a greater amount of mineral impurities (soil) falls, which, passing through the threshing and separating device, scatters fully, creating super load for filtration and contaminating the pile with a hardly separated component. Receipt of soil for a large filtration falls on the 1st and 2nd zones - 65 and 29% and to a lesser extent on the 3rd and 4th zones, 2.81 and 2.0% respectively and only 0.15 % on the 5th zone.

Studies have shown that, depending on the ground of the crop being harvested,

the load is distributed on the working parts of the two-phase threshing combine when harvesting soybeans. So, for example, with an increase in the working speed of the combine from 1.1 to 2.45 m/s, the feed to the thresher increases from 1.76 to 4.9 kg/s (Fig. 4) against the ground with a contamination of 10.1% (ground 2) and from 2.8 to 5.19 kg/s in the ground with a contamination of 38.2% (ground 1).

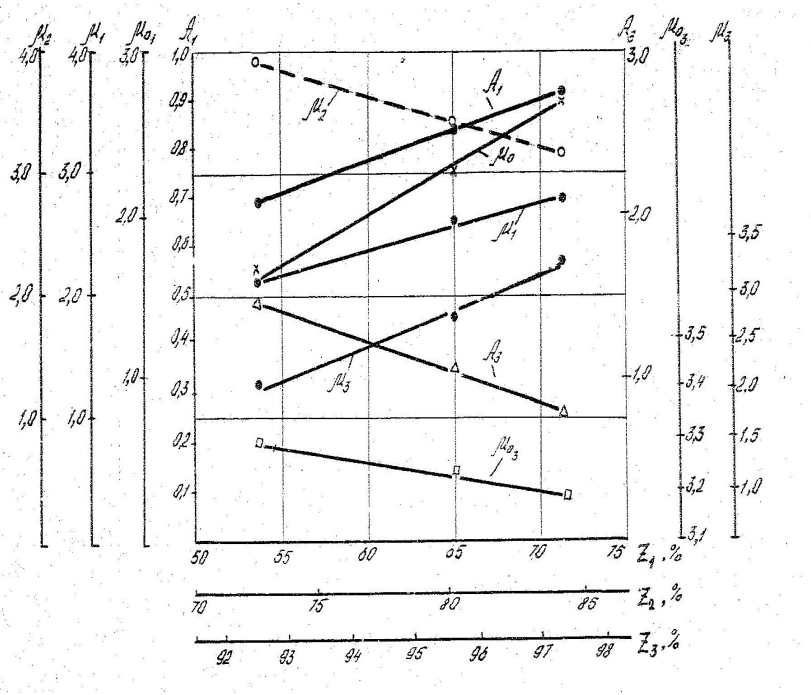

Fig. 2. *The dependence of the coefficients A_1, μ_{01}, μ_1, μ_2, A_3, μ_{03} and μ_3 on the amount of the total grain separation in different parts of the threshing and separating device of a two-phase soybean threshing*

However, a more intensive growth due to the high straw content occurs on the ground 1. The load on the thresher here, at the same working speed of the combine, is 0.2-2.1.1 kg / s higher.

Analysis of data on the load on combine filtration shows that as the working speed of the combine changes, the load on the filtration increases proportionally to it. At a working speed of 1.11 m/s, it is 0.15 kg/dm.s., and at 2.45 m/s - 0.38 kg/dm.s. (ground 1). A similar dependence was obtained against the second ground (Fig. 4). However, it should be noted that due to the greater intake of mineral impurities in the soil, the load on filtration on a less contaminated ground (ground 1) is 0.02 kg/dm.s. higher.

Table 2.

Characteristics of soybean seeds, allocated along the length of the threshing and separating device of SKD-5 combine

Zones	Milled seeds, %	Micro-damaged seeds %	Total mechanically damaged seeds, %	Weight of 1000 seeds, g
1	2,1	7,5	9,6	153,4
2	2,6	5,4	8,0	151,0
3	5,3	12,6	17,9	148,2
4	27,6	9,4	37,0	146,9
5	24,3	14,0	38,3	141,3

Analysis of the quality of seeds allocated along the length of the threshing and separating device of the SKD-5 combine shows (Table 2) that as the threshed mass progresses in the thresher, the number of seeds with mechanical damage increases, and the weight of 1000 seeds decreases.

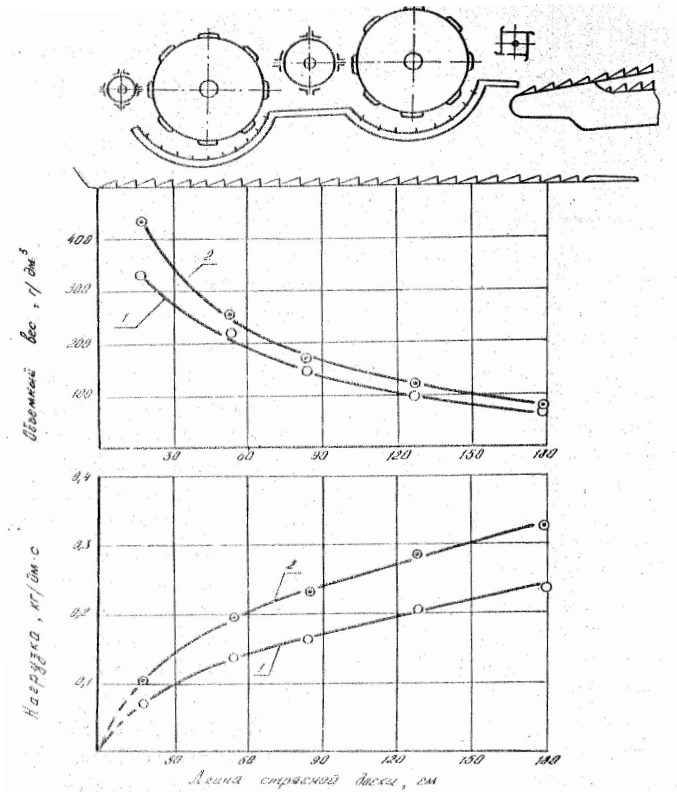

Fig. 3. *The change in the bulk weight of the pile and the load along the length of the stacking board of the SKD-5 combine when soybeans are harvested*
1 - contamination 38.2%; q_n = 4.4 kg/s.
2- contamination 10.1% ; q_n = 4.33 kg/s.

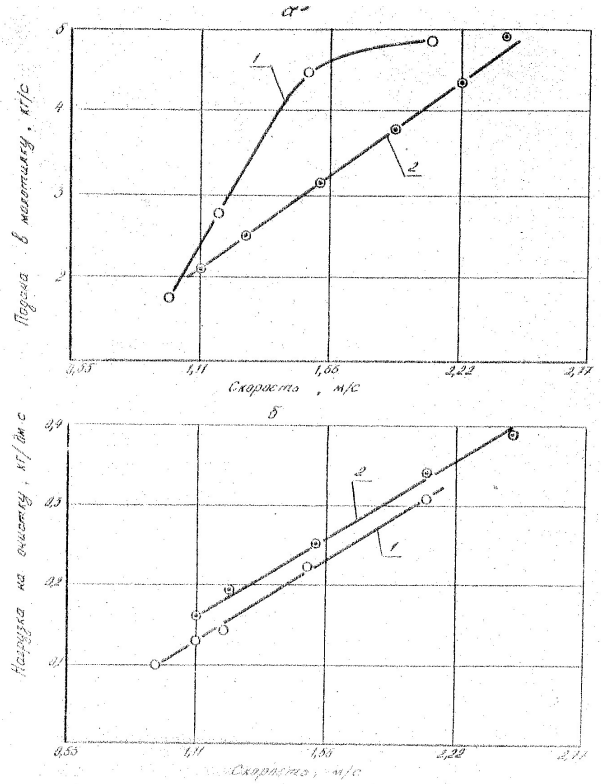

Fig. 4. *The change in the load on the working parts of the SKD-5 combine when harvesting soybeans*

1 - contamination 38.2%;

2 - contamination 10.1%.

As a result of the research, it was established that the number of crushed seeds in the zone of the first drum is 2.1-2.6%, and that of micro-damaged ones is 5.4-7.5% in the zone of the second drum, respectively -27.6% and 9.4% the weight of 1000 seeds, threshed and selected in the zone of the first drum is 4.1-6.5 g higher than the weight of seeds selected in the zone of the second drum.

On the basis of the obtained data in the study of the process of threshing and separating of soybean seeds along the length of the threshing and separating device we stated, that:

1. In case of a two-phase threshing, the soybean seeds are most intensively threshed and separated in the zone of the first threshing machine of the combine of two phase threshing. Here, depending on the technological adjustments and

the feed to the threshing machine, 70.3-81.6% of the most full-bodied and less damaged seeds are separated. At the same time, the number of crushed and micro-damaged seeds does not exceed 2.6 and 7.5%, respectively, and the weight of 1000 seeds is 4.1-6.5 g higher than the weight of seeds, separated by the second threshing machine.

2. The advantages created by the two-phase threshing can be realized most fully, with separate gathering of the most full-bodied and less damaged soybean seeds threshed and separated, in the zone of the first threshing machine of the two-phase threshing combine.

3. In order to preserve the quality and biological usefulness of soybean seeds threshed at the outset of the threshing and separating device of a two-phase thresh-ing, the first concave should have an intensive separation zone, especially behind the first deck bar.

4. To further preserve the quality of seeds isolated in the zone of the first threshing machine, it is necessary to collect threshed seeds in a separate bunker or in a soft container. For transporting them to a separate bunker in a combine, use a belt - screw conveyor with a brush frame of the edges of the belt and a spiral edge of a horizontal screw (Application for an alleged Patent for a utility model)

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关于计算控制机器零件尺寸的简化设计头部精度
ON CALCULATING THE ACCURACY OF THE HEAD OF SIMPLIFIED DESIGN FOR CONTROLLING THE DIMENSIONS OF MACHINE PARTS

Liberman Yakov Lvovich
Mahiyanova Alisa Nailyevna
Institute of New Materials and Technologies
Department of Machine Building
Ural Federal University
Yekaterinburg, Russia

抽象。 该研究的重点是提高可靠性的问题，从而提高了公差尺寸控制头的耐用性和精度。 本文介绍了控制头的计量方案，当传感器位于“电路”上时，它提供了控制零件端部位置直径的能力。 由于传感器具有一些触发误差，因此计量方案的使用伴随着测量误差的出现。 测量误差的值由传感器尺寸的比率确定。 为了合理使用提供的头部，有必要分析其运动精度。 结果，获得了头部精度与探针长度的关系。

关键词：控制头； 传感器，机床。

Abstract. *The research was focused on the problem of increasing the reliability and, as a result, increasing the durability and accuracy of the head for tolerance dimension control. The article presents the metrological scheme of the control head, which provides the ability to control the diameters in the position of the ends of the parts when the sensors are on the "circuit". Since the sensor has some error of triggering, the use of the metrological scheme is accompanied by the appearance of measurement errors. The value of measurement errors is determined by the ratio of the sensor dimensions. For rational use of the offered head it was necessary to analyze its kinematic accuracy. As a result, relation of the accuracy of the head to the probe lengths were obtained.*

Keywords: *control heads; sensor, machines tools.*

I. INTRODUCTION

As it is known, in the process of production of machine parts, there is a need to control their dimensions, for which purpose special control heads are used, installed on CNC metal cutting machines tools or coordinate-measuring machines [1, 2]. Such heads practically always work on the same principle described, for example, in [3,4,5], but have very diverse designs [6,7,8,9]. Nevertheless, all those

designs are quite complex and not always reliable enough. To address that issue, we have offered in work [10] a simplified design of the control head – its metrological scheme is shown in fig. 1. For rational use of the offered head it was necessary to analyze its kinematic accuracy, which is described below.

II. SOLUTION OF THE RESEARCH TASKS

To perform the analysis, plate 1 with probe 2 were considered to be in two extreme positions, according to the scheme shown in fig. 2, where δ – is error of triggering of the sensor, ΔX and ΔY – are corresponding errors of positioning of the probe end in the X and Y directions, and the remaining symbols are clear from the figure.

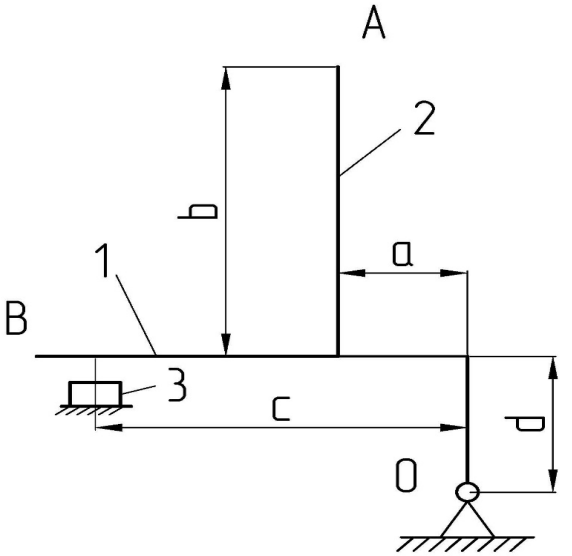

Fig. 1. *The metrological scheme of the head (1 - rotary g-shaped plate, 2 - measuring probe, 3 - non-contact (oscillator) sensor.*

As can be seen from fig. 2, namely, from the triangle B_1OC_1:

$$\overset{\frown}{B_1OC_1} = \operatorname{arctg}\frac{|B_1C_1|}{|C_1O|} = \operatorname{arctg}\frac{d+\delta}{c}.$$

Similarly, from the triangle B_2C_2O:

$$\overset{\frown}{B_2OC_2} = \arcsin\frac{|B_2C_2|}{|B2|} = \arcsin\frac{d}{\sqrt{c^2+d^2}}.$$

From this

$$\gamma = \operatorname{arctg}\frac{d+\delta}{c} - \arcsin\frac{d}{\sqrt{c^2+d^2}} \quad (1)$$

The segment A_2A_1 will be considered as a chord of the circle with radius $OA_1 = OA_2$. Drawing OE - the middle perpendicular to this chord – we will get

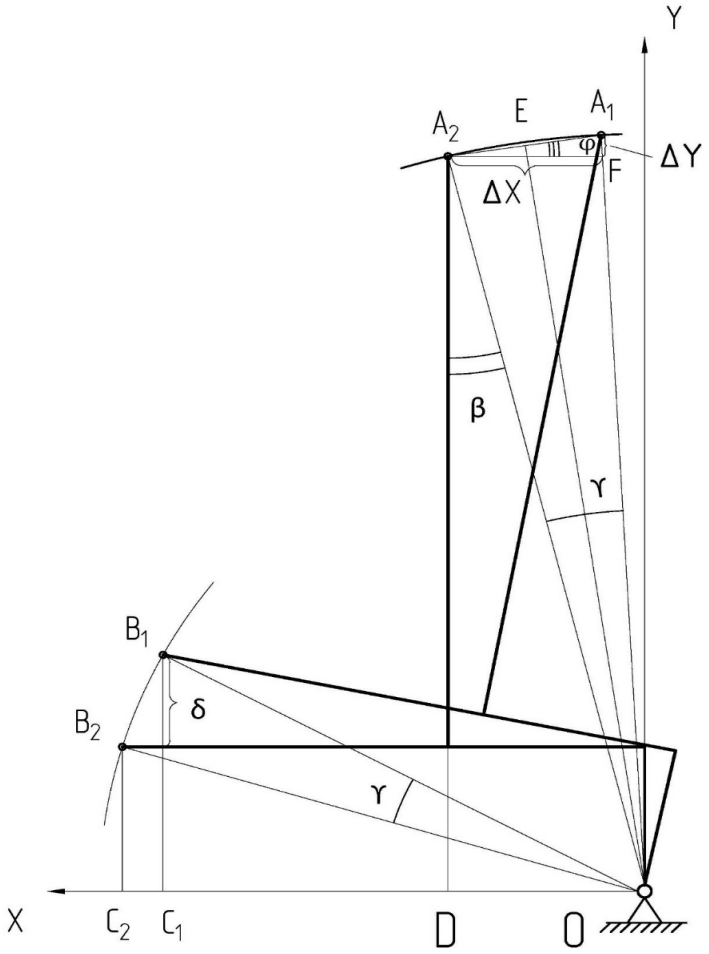

Fig. 2. *The scheme to calculate the accuracy of the head*

$$|A_2A_1| = |A_2E| + |A_1E| = 2|A_2E| = 2\sin\frac{\gamma}{2}\cdot\sqrt{a^2 + (b+d)^2} \qquad (2)$$

From the triangle OEA_2

$$OA_2E = 90° - \frac{\gamma}{2},$$

and from the triangle DA_2O

$$\widehat{DA_2O} = \operatorname{arctg}\frac{|DO|}{|A_2D|} = \operatorname{arctg}\frac{a}{b+d} = \beta.$$

But in that case

$$\beta - \frac{\gamma}{2} = \varphi. \qquad (3)$$

Knowing φ, from the triangle A_2A_1F we will find

$$\Delta Y = |A_1F| = |A_1A_2|\cdot\sin\varphi, \qquad (4)$$

$$\Delta X = |A_2F| = |A_1A_2|\cdot\cos\varphi. \qquad (5)$$

Substituting (2) and (3) in (4), we will get

$$\Delta Y = 2\cdot\sin\frac{\gamma}{2}\cdot\sqrt{a^2 + (b+d)^2}\cdot\sin\left(\beta - \frac{\gamma}{2}\right) =$$

$$= \sqrt{a^2 + (b+d)^2}\left[\sin\gamma\cdot\sin\beta - 2\sin\frac{\gamma}{2}\cos\beta\right], \qquad (6)$$

where in general

$$\sin\frac{\gamma}{2} = \pm\sqrt{\frac{1-\cos\gamma}{2}},$$

As and in our case, only the sign " + " makes sense, since the angle γ lies in the first quadrant. After transformations (6) we will have

$$\Delta Y = \sqrt{a^2 + (b+d)^2}\left[\sin\gamma\cos\beta - (1-\cos\gamma)\cdot\cos\beta\right]. \qquad (7)$$

Similarly, substituting (2) and (3) in (5), we will obtain

$$\Delta X = \sqrt{a^2 + (b+d)^2}\left[\sin\gamma\cos\beta - (1-\cos\gamma)\cdot\sin\beta\right]. \qquad (8)$$

Using (1), we define

$$\sin\gamma = \sin\left(\operatorname{arctg}\frac{d+\delta}{c} - \arcsin\frac{d}{\sqrt{c^2+d^2}}\right) = \sin\left(\operatorname{arctg}\frac{d+\delta}{c}\right)\times\cos\left(\arcsin\frac{d}{\sqrt{c^2+d^2}}\right) -$$

$$-\sin\left(\arcsin\frac{d}{\sqrt{c^2+d^2}}\right)\times\cos\left(\operatorname{arctg}\frac{d+\delta}{c}\right)$$

and, applying to (7) and (8) known rules of interrelation of trigonometrical functions [11], we will get:

$$\sin\alpha = \frac{\operatorname{tg}\alpha}{\sqrt{1+\operatorname{tg}^2\alpha}}, \qquad \cos\alpha = \sqrt{1-\sin^2\alpha} = \frac{1}{\sqrt{1+\operatorname{tg}^2\alpha}}$$

In view of the above, and after further transformations, we will have

$$\Delta Y = \sqrt{a^2+(b+d)^2}\left[\frac{c\cdot\delta}{\sqrt{c^2+(d+\delta)^2}\cdot\sqrt{c^2+d^2}}\sin\beta - \right.$$

$$\left. -\left(1-\sqrt{\frac{c^2\cdot\delta^2}{\left(c^2+(d+\delta)^2\right)\cdot\left(c^2+d^2\right)}}\right)\cos\beta\right], \tag{9}$$

$$\Delta X = \sqrt{a^2+(b+d)^2}\left[\frac{c\cdot\delta}{\sqrt{c^2+(\delta^2+d^2)^2}\cdot\sqrt{c^2+d^2}}\cos\beta + \right.$$

$$\left. +\left(1-\sqrt{\frac{c^2\cdot\delta^2}{\left(c^2+(d+\delta)^2\cdot(c^2+d^2)\right)}}\right)\sin\beta\right] \tag{10}$$

As experiments have shown, the error of triggering of the sensor lies in the range from 3 to 4.2 μm [12]. Other values (dimensions a, b, c, d) are disproportionately larger than δ. Taking this into account, it is fair to assume that

$$\frac{c^2\cdot\delta^2}{\left(c^2+(d+\delta)^2\right)\cdot\left(c^2+d^2\right)} \to 0, \ (d+\delta)^2 \to d^2.$$

It gives the opportunity to obtain expressions from (9) and (10)

$$\Delta Y \cong \frac{c\delta\sin\beta\sqrt{a^2+(b+d)^2}}{c^2+d^2}, \tag{11}$$

$$\Delta X \cong \frac{c\delta\cos\beta\sqrt{a^2+(b+d)^2}}{c^2+d^2}, \tag{12}$$

allowing to make the required analysis with the reliability sufficient for engineering practice.

Assume, for example, a = 20 mm, c = 30 mm, d = 10 mm, δ = 0.003 mm. Then

$$\sin\beta = \frac{\Delta Y \cdot \left(30^2 + 10^2\right)}{30 \cdot 0{,}003 \cdot \sqrt{20^2 + \left(b+10\right)^2}}$$

$$\cos\beta = \frac{\Delta X \cdot \left(30^2 + 10^2\right)}{30 \cdot 0{,}003 \cdot \sqrt{20^2 + \left(b+10\right)^2}},$$

$$\Delta Y = 9 \cdot 10^{-5} \cdot \sin\beta \sqrt{400 + \left(b+10\right)^2},$$

$$\Delta X = 9 \cdot 10^{-5} \cdot \cos\beta \sqrt{400 + \left(b+10\right)^2}.$$

The accuracy of the head varies in relation to the probe lengths as shown in the table below.

Table 1. *Relation of the accuracy of the head to the probe lengths*

b, mm	ΔY, mm	ΔX, mm
10	0,00179	0,0018
20	0,00180	0,00269
30	0,00179	0,0036
40	0,00180	0,00450
50	0,00179	0,0054
60	0,00179	0,00809
70	0,00180	0,00780
80	0,00179	0,00809
90	0,00180	0,00899
100	0,00179	0,00989

CONCLUSION

Considering the data given in it, it is easy to conclude that the offered control head can be used quite successfully when the length of a measuring probe is chosen correctly. The obtained accuracy of the head is quite acceptable to control the positions of end faces on the coordinate X and their diameter values on the coordinate Y.

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以风险为导向的方法确保磁悬浮GPU的安全运行
RISK-ORIENTED APPROACH TO ENSURING SAFE OPERATION OF GPU WITH MAGNETIC SUSPENSION

Belova Svetlana Alexandrovna
Naumova Anna Yaroslavna
Students of the St. Petersburg Mining University

摘要。在压缩机站的石油和天然气分支以及惯常的燃气轮机气体抽油机（GPU）中，带有离心式增压器的GPU（包括主动磁轴承（AMB））相遇。该主动磁悬浮系统不仅成功地应用于电驱动气体分配单元的一部分，而且还成功地应用于作为主气体管道和增压压缩机站的物体上的气体分配单元的一部分的离心压缩机。由于其应用程序的分布，存在这种类型的GPU安全稳定工作的问题。在提交的文章中，分配了具有磁悬浮的气体分配单元可能引起的紧急情况的主要原因。并且还对这些事故的概率进行了分析，得出了该GPU在压缩机站的安全运行的结论。所提供的文章今天非常相关，因为带有离心式增压器的GPU在开启主动磁轴承之前在其他类型的抽气装置之前具有许多优点，并且是天然气运输领域的透视方向。

关键词：抽气机组，风险 – 聚焦方式，主动磁力轴承，离心式增压器，传感器，事故，转子。

Summary. *In oil and gas branch along with habitual gas-turbine gas-pumping units (GPU) at compressor stations, GPU with centrifugal superchargers including the active magnetic bearings (AMB) meet. The system of active magnetic suspensions is successfully applied not only as a part of electrodriving gas-distributing units, but also on centrifugal compressors as a part of gas-distributing units on objects of the main gas pipelines and at booster compressor stations. Due to the distribution of their application, there is a question of safe and stable work of this type of GPU. In the submitted article the main reasons for emergencies which can arise with the gas-distributing unit with a magnetic suspension are allocated. And also the analysis of the probability of these accidents is carried out and the conclusion is drawn on the safe operation of this GPU at compressor stations. The provided article is very relevant today as GPU with centrifugal superchargers which are turning on active magnetic bearings have a number of advantages before other types of gas-pumping units and are the perspective direction in the field of transportation of natural gas.*

Keywords: *the gas-pumping unit, risk – the focused approach, active magnetic bearings, centrifugal superchargers, sensors, accident, a rotor.*

Work of AMB is based on the principle of an active magnetic suspension of a ferromagnetic body. At the same time stabilization of a rotor is carried out by forces of a magnetic attraction, proceeding from electromagnets. [2]

The active magnetic bearing consists of two main parts: electronic control system and the bearing (Figure 1).

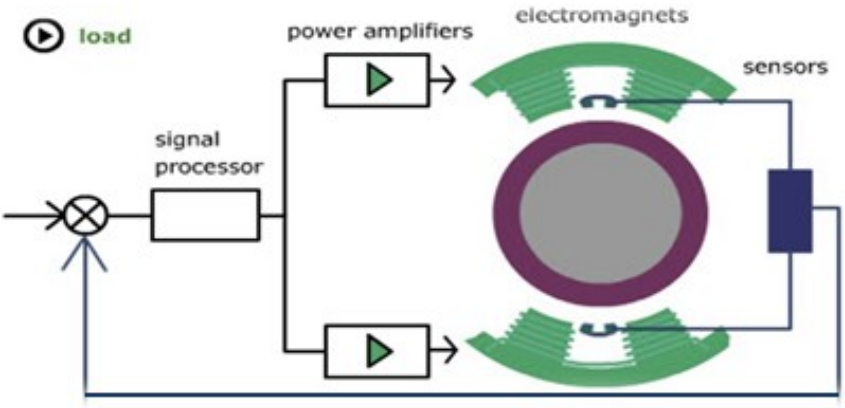

Figure 1 – *Scheme of the principle of operation of the active magnetic bearing*

The signal arriving from the generator passes through power amplifiers, thereby having increased the value. Then it gets on electromagnets which, in turn, and create the electromagnetic field providing stabilization of a rotor.

Active magnetic bearings have the following main advantages when using them in gas-distributing units:

1) Lack of mechanical friction that reduces power losses of the equipment;

2) Refusal of the system of oil supply, owing to what, an exception of a possibility of pollution of process gas lubricant or oil;

3) Increase in reliability and service life of bearings.

The risk – oriented approach consists in identification, the analysis and forecasting of risks of industrial accidents. For this purpose, first of all, estimate risk and possible scales of consequences of accidents on hazardous production facilities. Then undertake necessary organizational and technical measures of prevention of accidents, prevention of emergence of threats and an increase in efficiency of ensuring industrial safety on hazardous production facility. [4]

The wide circulation of gas-distributing units with an active magnetic suspension at compressor stations puts before the companies which are engaged in the transportation of natural gas, questions of profitability and safety of acquisition and use of data of GPU.

Having analyzed technical characteristics and the description of work of GPU with a magnetic suspension, the following main types of malfunctions and accidents to which they are subject were allocated:

engine rotor stop, owing to high loadings which lead to heating and demagnetization of the leading magnet;

emergency stop of the unit, owing to periodic increases in amplitude of vibrations of a rotor, due to insufficient stability of the rotor-AMB system;

formation of congestion of excess electric charge on a rotor shaft as a magnetic field can create the induction leading to heating of the mechanism and also to a congestion of excess electric charge on a rotor shaft;

rotor misbalanced which reasons not only the wrong calculation the centre of mass of a rotor but also unevenness of magnetization of magnets can be. Even at weak changes, at a set of turns, the mobile system can enter a resonance with own fluctuations of a magnetic system. The rotor can be shaken and pull out an anchor.

Having estimated statistics of emergency cases of stops of GPU for 3 years (from 2013 to 2016) and has drawn an analogy to technical features of active magnetic bearings, the following distribution of probabilities of each of above-mentioned accidents and malfunctions (Figure 2) was defined. [1]

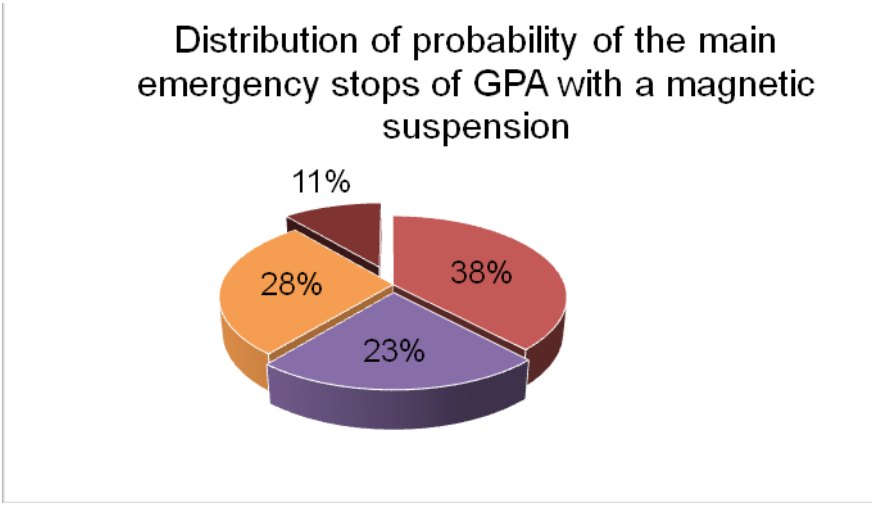

Figure 2 - *Distribution of probability of the main emergency stops of GPU with a magnetic suspension*

Consequences of such emergency stops lead to long capital repairs of gas-distributing units with a magnetic suspension. And in order to avoid these accidents, it is necessary for prevention that centrifugal superchargers were equipped: [7]

- temperature sensors;
- safety bearings which will be able to cope with "falling" of a rotor;
- inductive sensors of radial and axial movement;
- sensors of speed of rotation of a rotor;
- vibration sensors;
- sensors of magnetic field.

The offered sensors in the course of operation of active magnetic bearings send a signal to an electronic control system which, in turn, reads out data of the sensor. On the available data, the operator can control a condition of the AMB system as a part of gas-distributing units, thereby, ensuring them trouble-free operation.

The card of risks presents itself the evident image of the identified risks in the form of points on the coordinate plane. On an axis of OY the probability of realization of risk (in %), and on OX axis – damage from realization is postponed.

In this case, all allocated types of risks lead to failure of all bearing, so that the damage from realization of the given risks is approximately identical.

In this regard, the card of risks depending on their probability (Figure 3) is under construction.

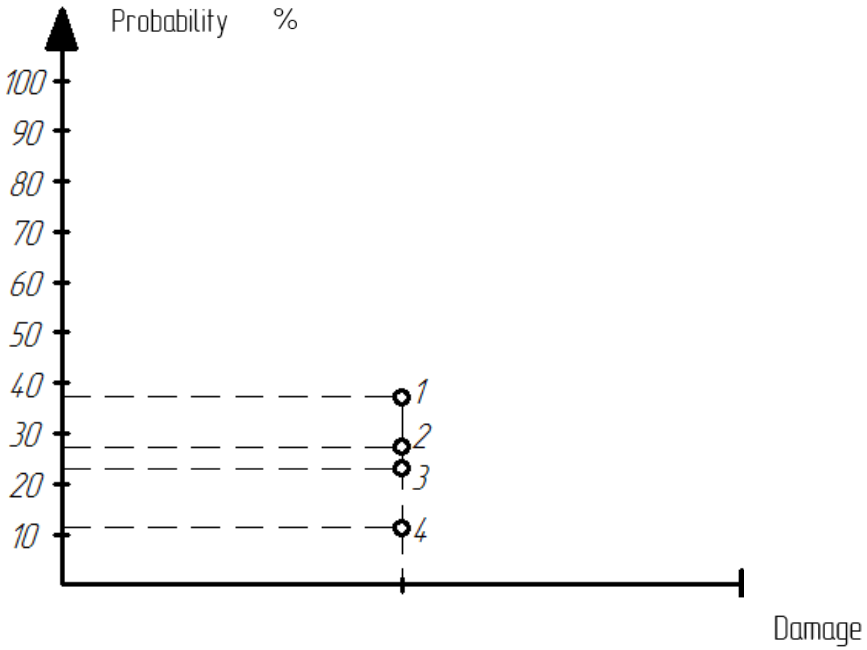

Figure 3 – *The schematically image of the card of risks (1 – vibration of a rotor, 2 – a misbalanced, 3 - heating of a magnet, 4 – excess electric charge)*

There is also another type of evident representation of risks - it is a risk matrix.

The matrix represents the table where on columns damage sizes from realization of risks are located and in the lines – probabilities of their realization.

By policy in the relation of a risk management it is defined that the risk in the probability from 0 to 5% is extremely improbable, from 5 to 10% - improbable, from 10 to 40% - possible, from 40 to 70% - very probable, from 70 to 100% - almost reliable. [4]

Having analyzed the provided data, the following risk matrix (Figure 4) was constructed.

	Damage from realization of risk				
Quality standard of probability	Insignificant	Small	Middle	High	Extremely high
Almost authentically					
Very possibly					
Possible					
Be improbable					
Extremely improbable					

Figure 4 – *A matrix of risk levels (green – a zone of low risk, yellow – a zone of moderate risk, red – a zone of high risk)*

In respect of quality standard of probability, the allocated types of risks belong to the category possible, and on damage from realization – to high damage as lead to full failure of the bearing, and, therefore, and in general the gas-distributing unit. From a matrix it is visible that risks belong to a zone of high risk.

Having defined a risk zone, pass to assessment of the frequency of conducting inspections of AMP. At the same time, the concept "frequency factor" is entered.

There is an approximate ratio of risk level, a factor of frequency and the recommended frequency of inspections (Table 1). [4]

Table 1 – *Results of assessment of frequency of carrying out engineering certifications*

Risk level	Frequency factor	Frequency of inspections (month)
High risk	0,1	24
Moderate risk	0,2	48
Low risk	0,4	96

As all risks presented in this work belongs in a varying degree to the high level of risks, the factor of frequency makes 0.1, and the recommended frequency of inspections – 24 months, i.e. time in 2 years.

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