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WELFARE OF INDIVIDUALS UNDER THE CHANGING ECONOMIC SECURITY OF THE REGION

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Abstract. The article discusses the well-being of the individual in the crisis and post-crisis years on the example of a large industrial region. The Sverdlovsk region was chosen as the object of study, which is characterized by both industrial and innovative development, high intellectual potential, and significant influence on the development of other subjects that are part of the Ural Federal District. An analysis was made for the period from 2005-2020 with an emphasis on 2008-2010 (financial and economic crisis) and 2018-2020 (the beginning of the COVID-19 pandemic). Associated threats are assessed through the impact on the individual's well-being index of the most significant indicators of economic security. The author's methods of express diagnostics are proposed in order to quickly assess the ongoing changes in socio-economic development. To take into account the delayed impact of macroeconomic factors, standard regression methods are combined with lag models.

Keywords: well-being of the individual in the territory of residence, economic security, express diagnostics, correction factors, levels of crisis

Introduction

The time period considered by the authors of the article covers a whole range of events, accompanied by various factors influencing the economy

of the territory: it is the financial and economic crisis in the period 2008-2010, a rather active recovery in the next two years, a period of stagnation with insignificant growth rates, a new sharp crisis in the economy, caused by the COVID-19 pandemic, and finally, the military operation in Ukraine and the hurricane of economic sanctions. These cataclysms are viewed through the prism of changes in the well-being of the individual in the territory of residence. The used methodology for diagnosing economic security serves as a determinant of the stability of the regional economic system and allows us to see the latent nature in the behavior of personal well-being.

Personal well-being refers to the totality of factors that enable individuals to participate rationally and productively in economic activity. The welfare of the individual in the territory consists of material well-being, security of the individual, favorable conditions for education and professional development.

Significance acquires the ability not only to state some dynamics of changes in indicators, but also to take into account the change in their vectors and resistance to regression. The area of interaction of indicators in the context of the transition from one type of crisis to another makes it possible to judge the nature of not only the general, but also the latent behavior of the region's economy.

Materials and methods

In order to quantify the well-being of an individual, the technique described in [1] was used. The index of well-being of the individual in the territory of residence (hereinafter referred to as IWBI) introduced in it is a synthetic value that combines 94 indicators measured with a sampling frequency of one year. The territory of residence in the methodology means a separate subject of the Russian Federation.

To obtain an approximate estimate of IWBI, a methodology for estimating IWBI values based on a reduced set of 6 indicators was developed. The indicators included in this set are called the *main ones*. Since the original IWBI calculation algorithm establishes linear relationships between the values of individual indicators and the final value of the index, approximation algorithms use models based on linear regression.

In order to take into account the impact of threats and crisis situations on IWBI, the method of diagnosing the economic security of the region, described in [2], is used. It allows you to identify the ability of the economy of the territory to sustainable development and ensure an acceptable quality of life (table 1).

Table 1.

Indicators characterizing the socio-economic state of the region

Indicator	Criteria
Personal well-being index in the territory of residence	<ul style="list-style-type: none"> • Natural increase rate • Ratio of budget spending on education to gross regional product (GRP) • The volume of arrears on mortgage housing loans • Ratio of budget spending on health care to GRP • General unemployment rate • Share of population with incomes below the subsistence level
Economic security index	<ul style="list-style-type: none"> • The degree of depreciation of fixed production assets • The ratio of exports of the territory's products to GRP • Consumer price index • The ratio of the average per capita cash income to the subsistence minimum • General unemployment rate • Life expectancy at birth • The degree of per capita satisfaction of the need for the main types of agricultural products in accordance with medical nutritional standards <ul style="list-style-type: none"> • Specific emissions of harmful substances into the atmosphere from stationary sources of pollution

Compiled by the authors. The name criteria meets the requirements of the Federal State Statistics Service

However, the dynamics of IWBI change cannot be described solely on the basis of relationships between safety criteria and welfare criteria. One of the parameters characterizing the dynamics of changes in welfare criteria is the ability to resist sharp negative changes, which can either be the consequences of socio-economic crises or their causes. Criterion, which has fallen into the crisis zone and quickly (within 2–3 years) returned to normal or pre-crisis values, can be considered quite elastic. On the contrary, a criterion that is not able to return to the pre-crisis-normal zone in a timely manner after a crisis peak, or does it extremely slowly, can be considered fragile and unable to resist the influence of negative factors. At the same time, for the purposes of modeling, we have the right to neglect the reverse influence of individual well-being criteria on economic security, since in the short term they are not key factors in economic growth [3]. In our analysis, we pay special attention to the 2008–2010 and 2018–2020 retrospective period, since the speed and dynamics of recovery after the global financial crisis is considered by some researchers to be a reliable

predictor of the overall dynamics of the post-crisis recovery. This is especially true for the period of emergence and the expected plateau in the development of the COVID-19 pandemic [4].

The field of values for each criterion was divided into 7 crisis zones that characterize the dynamics of changes in each criterion, where H - a relatively normal situation, PK1 - the initial stage, PK2 - a developing stage, PK3 - a critical stage that threatens to move into a crisis zone, K1 - unstable stage, K2 - threatening stage, K3 - emergency stage (table 2).

Table 2.
Crisis zones with intervals of normalized values

Crisis zone	Value range
H	$(-\infty; 0,0)$
PK1	$[0,0; 0,333)$
PK2	$[0,333; 0,666)$
PK3	$[0,666; 1]$
K1	$(1; 1,4]$
K2	$(1,4; 1,8]$
K3	$(1,8; +\infty]$

Source: methodical work [1]

For a correct approximation of IWBI, it is necessary to take into account both its previous dynamics and the lag effect of economic security criteria. Thus, neither standard linear regression models (due to the lack of the ability to represent the lag) nor the ARIMA family of models (due to the lack of the ability to represent the influence of independent variables) are suitable for modeling purposes [5; 6]. Based on these considerations, the ARMAX model (autoregressive moving average with exogenous terms) was chosen, which extends the ARMA model with an additional set of independent variables - the main criteria for economic security - with linear coefficients:

$$I'_t = (\alpha_1 I_{t-1} + \alpha_2 I_{t-2}) + (\beta_1 s_1 + \beta_2 s_2 + \dots + \beta_8 s_8) + \mu, \quad (1)$$

where: I'_t – the approximate value of the individual's well-being index, I_{t-1} , I_{t-2} – the IWBI values for the previous two years, $\alpha_{1,2}$ – ARMA autoregression coefficients, $s_{1,\dots,8}$ – economic security criteria, μ – random noise.

The optimal values of lag biases for economic security criteria were chosen by enumerating all possible values from 0 to 3 years for each cri-

terion and then evaluating the effectiveness of the model with the selected bias values. The efficiency of the model was evaluated by the magnitude of random noise and by its resistance to overfitting criteria: the model was considered ineffective if, when one criterion was excluded from the equation, the regression coefficients increased or decreased by an order of magnitude, and also if they changed sign. The maximum likelihood method was used to estimate the autoregressive coefficients α_1 and α_2 .

Results

The model shows the highest efficiency for the following values of lag biases and regression coefficients (table 3).

Table 3.
Parameters of the ARMAX model

Criterion	Lag offset (in years)	Regression coefficient
The degree of depreciation of fixed production assets	0	0,056
The ratio of exports of the territory's products to GRP	3	0,256
Consumer price index	2	0,227
The ratio of the average per capita cash income to the subsistence minimum	1	0,281
General unemployment rate	1	0,327
Life expectancy at birth	2	0,335
Specific emissions of harmful substances into the atmosphere from stationary sources of pollution	3	0,01

Source: authors' calculations

Of the main criteria of economic security, IWBI is least affected by specific emissions into the atmosphere from stationary sources of pollution (presumably due to the long horizon of the influence of environmental factors on the life of the population) and the degree of depreciation of fixed production assets (due to the inertia of this criterion). The biggest influence is the overall unemployment rate and life expectancy at birth.

Table 4 shows the values of adjustments to the personal well-being index under the influence of economic security factors. The largest relative adjustments occur in 2016 (the first significant reactions to the sanctions in 2014) and 2020 (the start of the COVID-19 pandemic).

Discussion

The authors of the article for the first time proposed taking into account the impact on the well-being of the individual in the territory of residence of the main criteria for the macroeconomic security of the region, taking into account lag effects and autoregression.

The developed methodology allows modeling the interaction of socio-economic criteria and macro-criteria of economic security for a single Russian region. In turn, this makes it possible to identify crisis points in the dynamics of the economic development of the region, provided that there is a sufficiently large retrospective interval for model calibration.

Basically, the pessimistic nature of the model adjustments allows us to say that a straightforward analysis of the statistical criteria of the region does not give a complete picture of the trajectory of its development and may present an overly rosy picture to the researcher.

Conclusion

A methodical apparatus for establishing statistical relationships between the individual's well-being index and the criteria for the economic security of the region has been developed.

The results of the study can be applied in the analysis of the socio-economic state of the regions, the identification of slow-acting economic relations and autoregressive dependencies.

Table 4.

Adjustment of the values of the personal well-being index

	2008	2009	2010	2014	2015	2016	2018	2019	2020
Personal well-being index (initial value)	1,123 K1	1,211 K1	1,013 K1	0,913 PK3	0,997 PK3	0,836 PK3	0,859 PK3	0,911 PK3	1,044 K1
Personal well-being index (approximated estimate)	1,353 K1	1,489 K2	1,287 K1	1,113 K1	1,218 K1	1,212 K1	1,146 K1	1,188 K1	1,494 K2
Percentage of change due to adjustment	20,4%	23,0%	27,1%	21,9%	22,2%	45,0%	33,4%	30,4%	43,1%

Source: authors' calculations

Acknowledgements

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**CORPORATE MANAGEMENT AND THE EVOLUTION OF
MARKETING CONCEPTS OF THE FUTURE, AS THE FORMATION OF
THE DIGITAL INFRASTRUCTURE OF GLOBAL MARKETS**

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Abstract. In the article, the authors propose to consider the existing approaches to business processes and their ultimate transformation in the evolutionary digitalization of the behavioral economy markets by Daniel Kahneman, guaranteeing not only unbridled consumption, but also a gradual return to rational models of classical economics, giving a link both to the Maslow pyramid, and to the emerging direct dependencies on a set of personal properties for the needs of each participant in the market of the future due to AI systems and growing statistics of big data bases that clarify forecasts of consumption and distribution by manufacturers for each potential customer from existing focus groups in the market. At the same time, the elements of creativity and participation make the union of the buyer and the seller more logical and positively emotionally colored, giving a creative start and more complete satisfaction of needs and requirements on both sides, choosing the place of their interaction and involvement in the ecosystems and metauniverses of the future.

Keywords: ecosystem, metaverse, artificial intelligence (AI), BIG DATA, Industry 4.0, Daniel Kahneman, Pieter Drucker, Philip Kotler, Abraham Maslow, digital transformation.

The existing world order continues to be supported by the mechanisms of digital transformation of the global industries of Industry 4.0. [1], which determine the further infrastructure of the economy of corporations and banksters, reflecting the changing ways of analyzing trends in the MEO and MRI, providing ideas for more and more efficient management of business processes in the polarizing reality of a market-planned world economy.

In particular, the post-COVID strategies of the corporate sector have been diversified through the use of online and offline division of those labor resources that are allowed not only to create the appropriate links in the final production and complete translogistics chains, but are also responsible for the increasing intensification and use of competencies and the incorporation of unique knowledge passing to the level of insourcing by TNCs themselves at the meso-, macro- and mega-levels. The effectiveness of such approaches is increasingly based on indicators of medium-term and long-term planning that provide feedback on target designation and its adaptability to changing priorities of digital transformation: both the business itself and the marketplaces for interaction between buyers of 5 generations that determine the marketing strategy for engagement from baby boomers to alpha generation [2]. More and more we can talk about the symbiosis of the real and virtual worlds, giving and shaping the taste preferences of mental reactions, responding to irritations and challenges of the market environment and creating that cumulative part of ecosystem management, which leads to new ways of expressing consumer interests: growing metauniverses begin to compete for the preferences of the network access for every buyer seeking to abstract from the realities of reality and protect their uniqueness in the virtual worlds of the future. At the same time, the behavioral economics of Daniel Kahneman allows the market, everyone, to be everything and no one, a creator and a slave, a hero and a victim, a digital copy of spyware and bot chats that pull out of the inflamed consciousness of a person those desires that irrationally make him defenseless against the commodity relations of the coming urban society [3]. Maslow's pyramid itself ceases to connect with real needs and in the background determines the quality of purchases made according to the principles of creative shocks, formed by an increasingly creative society of total consumption, and the information accompanying these processes. It doesn't matter that the market ceases to be a place of realizable satisfaction of needs in the process of saturating effective demand in a realizable social contract between a producer and a buyer, but becomes a platform, marketplace, chip or virtual point-node of the algorithm for pushing a bright,

eye-pleasing participant in the process, commodity circulation into the area based on mental shocks and endorphin chains of saturation of the receptor cocktail of impressions, from the standpoint of non-stop shopping, not only devoid of rational meaning, but also giving joyful euphoria of untimely involvement in the processes of saturation and maintaining the pleasure of the participants themselves. This is a vampiric hunger that can be partially drowned out by the action of the hoarding of the consumer society, but does not give any reasonable explanation about the meaning of the actions taken in the area of acquisition from real essential goods to luxury goods and the snob effect, bordering on the clinical unbridled appetites of people deprived of the digestive system and expected taste preferences. Therefore, the greater the consumption, the greater the itching, as well as the growing state of hunger that accompanies it, overwhelming both the fears and the pain of loneliness in the network, and the grayness of anonymous participation in sales and purchases, without the right to fame and hype among their own kind. The humanity goes out, and the animalistic makes it more unstoppable, aggressively inaccessible, capable of an act, sometimes bearing a senseless, but fetishistic character [4]. And, as a result of such aberrations, deviant behavior enhances the feeling of vital involvement in those processes that are modeled outside, but which guarantee uncontrollable joy, an endorphin cocktail of emotions that gives a state of happiness and unity with the magic of the market infrastructure, its gamification and the Internet of things.

The marketing strategies of the corporate sector determine the crisis transformations not only in the share of markets or focus groups of different customer strata, but also take into account the peculiarities of their age preferences, gender motivations, social orientation, effective demand and the behavioral nuances of seasonal reactions to various promotions, "black fridays", outlet stores. vacations and dumping indulgences during periods of reformatting groups of actors responsible for the real sectors of sales of goods and services, providing the required sets of "happiness" and "pleasure" [5], their after-sales support and in-house services. This means that the volatility and adequacy of the applied mathematical models for each market participant in the digital transformation of global trade is not only targeted and cumulative in the analysis of the BIG DATA algorithms used by artificial intelligence (AI) systems [6], reflecting the statistically accurate place of each in the production processes and consumption, but also giving prognostic estimates of probabilities in scenarios of redistribution of existing market bubbles or linear/discrete distribution of goods and services between all actors of market interaction. And here, it is extremely important

to understand the timing of the use of each model in a dynamic system of market relations, to take into account the dynamism and vector nature of external shocks, as well as the internal readiness for changes in the growing polarization of the world community towards the rich and super-rich, on the one hand, and marginalized losers, on the other.

Therefore, managers in marketing and planning within global TNCs today are integratively obliged to solve professional problems: the maximum efficiency of capital turnover in those sectors that can innovatively or uniquely collect the entire market for themselves on the principles of monopoly or oligopoly, predict sales peaks, according to the schemes of Peter Drucker and Philip Kotler, who justify sequestering the very structures and forms of ownership of transforming companies to the states of optimal efficiency and quantitative solvency [7]. This means that the rate of output, the return on working capital and the growth of costs in the process of creating the most added value should be put at the forefront, but during periods of crisis states of the required strategic management, change the length of business process chains, change missions and the form of decision-making between managers, shareholders and stakeholders, in the direction of minimizing risks and maximizing the unique effects of indirect actions in search of equilibrium states and stability for a product and a service in a certain time interval, a falling or growing trend in market conditions. Therefore, managers of global markets of the future, with the help of AI systems and access to databases of existing consumption and production algorithms for each sector of generating assets, must demonstrate the competencies of diagnosticians, analysts and retailers, including elements of total network marketing and manipulation of digital copies of the preferences of arrays of their potential buyers. And this means that the purchase histories accumulated by such customers begin to lay down the algorithms of their future preferences in the networks of the matrix service of TNCs within the initially set parameters of the mathematical expectation, which reflects the dispersion of the distribution of existing and formed focus groups according to the evolving product of targeted demand and the uniqueness of the formed preferences following the dynamics of market sales and anticipation of various niches of expectation of the best price for the proposed purchase. And here the spectrum of seduction of a solvent and complexly oriented client is extremely motivated by his bioalgorithms, the existing features of personal and gender clarification of emerging desires, irrational shocks of overcoming stress through adjustment and hedging of fears, pain, desire for love and tenderness. Surrogate analogues of truly great feelings should fluctuate around those goods and complex decision-mak-

ing in terms of pricing and willingness to act - buy or rent (leasing, network ownership, delegated access through entering one or another focus group according to preferences for any property of the product, promoted time-sharing of complicity, etc.), to form a culture of consumption and the return of customers from the world of unbridled consumption of everything and everything to the aesthetics of proportionality and critical necessity on the principles of minimalism and rational understanding of their actions. This will save not only the nerves and health of potential buyers, but also correlate corporate strategies within the TNCs themselves, who predict resource shortages in advance and prepare their clients to personify the pleasure of the purchased goods, due to their individual predisposition to the personal interests of each focus group participant and cumulative the multiplier effect of creative involvement of polishing each serial product to the level of creative individuality of the creative industry of the urban markets of the future.

And it is this digital basis of the ongoing transformation of global zones of exchange of goods and services between sellers and buyers that will formulate the postulates of the coming behavioral economy 2.0 [8], which takes into account the wishes of everyone and everyone through an evolving culture of clearly motivated consumption and rationalization of purchase requests, returning to the ideology of Maslow's necessary pyramid and internal creative service to the virtual and earthly market, dissolving dependence on shocks and needs and routinely serving the entire spectrum of irrationally arising needs, a person exhausted by shocks in a crisis and frustrated state [9]. And this market medicine will be able to find the bottom of the salvation of the psyche of such an uncivilized wild consumer, that is not ready to be subjected to material dependence on the market, demanding a holiday of the spiritual beginning of the soul, but able to empathize and create within the framework of personal interest [10] in its acceptance by the market structures of the future through guaranteed access to a set of individual goods and services, the metauniverse chosen by him from a producer who understood and pitied him [11].

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INNOVATIVE ACTIVITY OF RUSSIAN ENTERPRISES: THEIR VALIDITY IN MODERN ECONOMIC CONDITIONS

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Abstract. Modern economic conditions for the functioning of national economic systems are characterized by significant sanctions pressure from foreign countries. Restrictive measures formed by foreign countries include limiting the export of technological systems, limiting the use of information systems, limiting the import of final products of domestic economic entities. The object of the study is the national sector of investment and innovation. The subject of the study is Russian innovative enterprises in modern economic conditions, which are characterized by significant restrictive export measures at the international level. The aim of the study is to assess the prospects of domestic innovative enterprises in modern economic conditions. The result of the study is a quantitative assessment of the prospects for the functioning of Russian innovative enterprises in the context of technical and technological resource limitations caused by restrictive measures for the export of final products and the import of technological and technical resources from foreign countries.

Keywords: sanctions, high technologies, innovative activity, innovative activity, efficiency, approximation

Modern economic conditions for the functioning of national economic systems are characterized by significant sanctions pressure from foreign countries. Restrictive measures formed by foreign countries include limiting the export of technological systems, limiting the use of information systems, limiting the import of final products of domestic economic entities.

The purpose of the study is to assess the prospects of domestic innovative enterprises in modern economic conditions. The result of the study is a quantitative assessment of the prospects for the functioning of Russian innovative enterprises in the context of technical and technological resource limitations caused by restrictive measures for the export of

final products and the import of technological and technical resources from foreign countries.

The object of the study is the national sector of investment and innovation.

The subject of the study is Russian innovative enterprises in modern economic conditions, which are characterized by significant restrictive export measures at the international level.

Main part

To achieve the goals of the study, we will use a scenario approach that provides for three scenarios for the development of the situation: positive, neutral, and negative.

The positive scenario provides for the preservation of the same growth rates that existed before the moment of sanctions pressure from foreign countries, it is obvious that it is unlikely. The low probability of such a scenario being realized is explained by additional negative factors of pressure on national economic entities caused by the global covid-19 pandemic.

The neutral scenario provides for a decrease in the growth rate of indicators, which implies stagnation in the development of innovative enterprises and final performance indicators with a certain decrease (decrease interval), which does not imply a "critical" change in technical and technological systems.

The negative scenario assumes a significant drop in the final performance indicators of domestic innovative enterprises, suggesting a decrease over the years by more than 10 percent of the average growth rate of indicators.

The initial data for the development of the scenario approach will be taken according to the "Initial data for assessing the factors determining innovation activity in Russia" [1, p.18].

Table 1.
Initial data for developing scenarios for the development of Russian innovative enterprises

Indicator/year	Abbr.	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Level of innovation activity	Lia	9.5	10.4	10.3	10.1	9.9	9.3	8.4	14.6	12.8	9.1	10.8	10.5
The share of organizations engaged in innovative activity	Sio	7.9	8.9	9.1	8.9	8.8	8.3	7.3	20.8	19.8	21.6	23	23.1
The share of innovative goods in the total volume of the gross national product	Sig	4.8	6.3	8.0	9.2	8.7	8.4	8.5	7.2	6.5	5.3	5.7	7.2
The share of costs for the implementation of innovative activities	Sic	1.6	2.2	2.5	2.9	2.9	2.6	2.5	2.4	2.1	2.1	2.3	2.4

Consider the initial data from table 1 for three scenarios – table 2.

Table 2.
Summary of indicator values for the current year and two subsequent years under different scenarios

Indicator/year	Abbr.	neutral	positive	negative
Level of innovation activity	Lia	10.47	10.8	9.2
The share of organizations engaged in innovative activity	Sio	21	23.13	13.13
The share of innovative goods in the total volume of the gross national product	Sig	7.15	7	6.1
The share of costs for the implementation of innovative activities	Sic	2.37	2.2	3

When forming scenarios, we proceed from the fact that the assessment of prospects can be carried out on the basis of retrospective data using approximation curves. Approximation will be carried out using polynomial curves with a high confidence factor. Thus, we will obtain a fairly reliable assessment of the prospects in a graphical interpretation, which will allow us to conduct a heuristic assessment and draw a conclusion about the development prospects of Russian innovative enterprises.

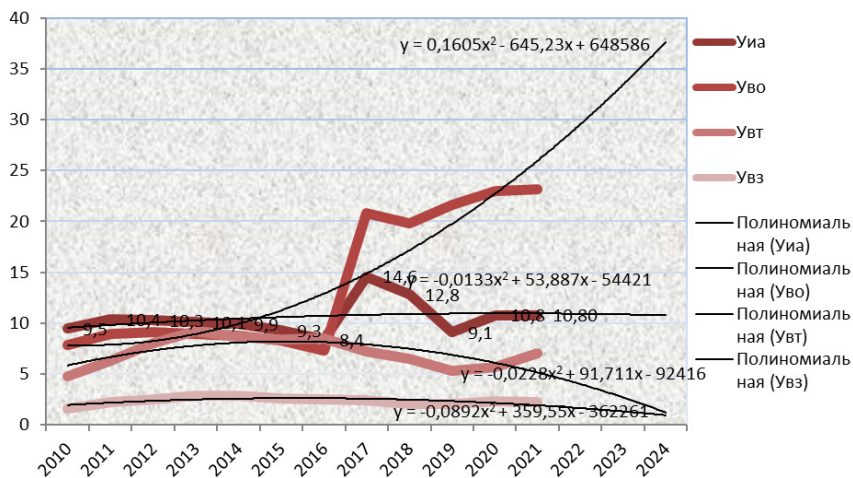


Figure 1. Positive scenario in assessing the prospects of Russian innovative enterprises

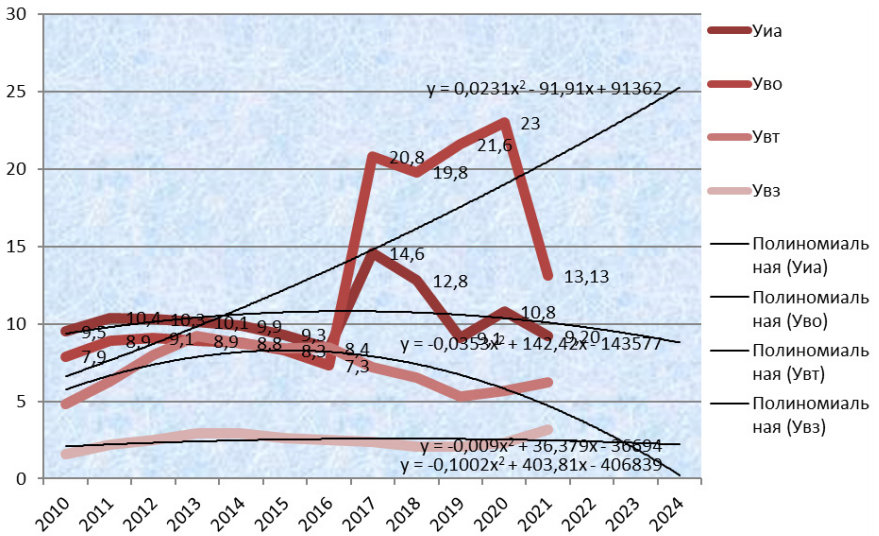


Figure 2. Negative scenario when assessing the prospects of Russian innovative enterprises

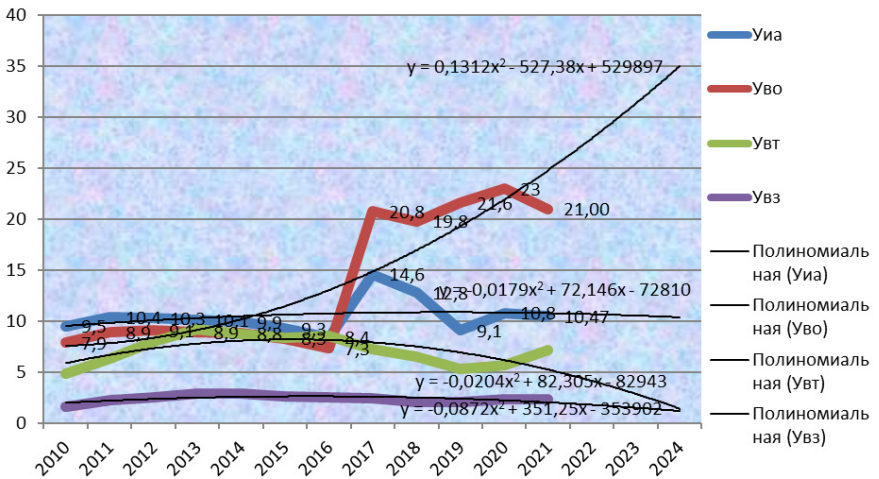


Figure 3. Neutral scenario when assessing the prospects of Russian innovative enterprises

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As we can see, in all scenarios, there is a decrease in the level of investment activity (L_{ia}), but at the same time, due to the "high base" effect, there is an increase in the proportion of organizations (S_{io}) that show innovative activity. That is, in the aggregate, investment activity will decrease, but in order to level out negative factors, the number of organizations with an innovative sign of management will grow. Which is quite logical and justifies the current economic paradigm: since the export of high technologies is limited, national companies will increase their share of presence in this sector of the economy. Let's consider how the reliability and pair correlation between the indicators of innovative activity will change in the current economic situation, figure 4.

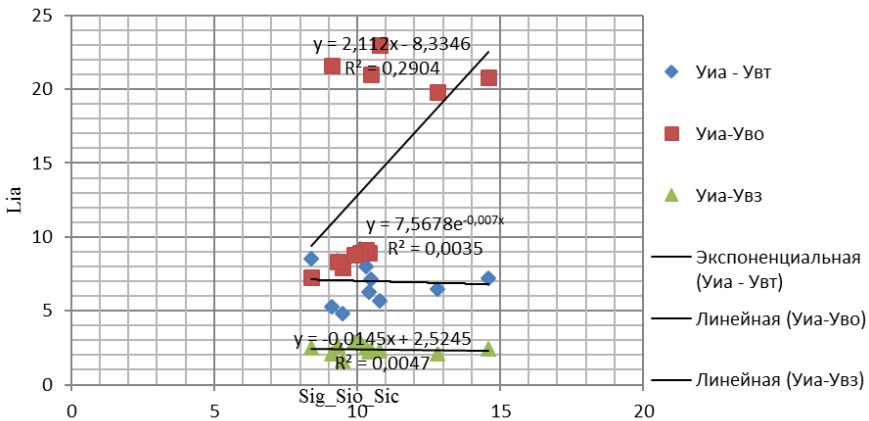


Figure 4. Correlation field and reliability coefficient between the level of innovative activity and other indicators (neutral scenario)

As we can see for all groups of indicators, the reliability of the result and the correlation of relationships are extremely weak and insignificant, which indicates a high factor of uncertainty in the macro and micro economic environments.

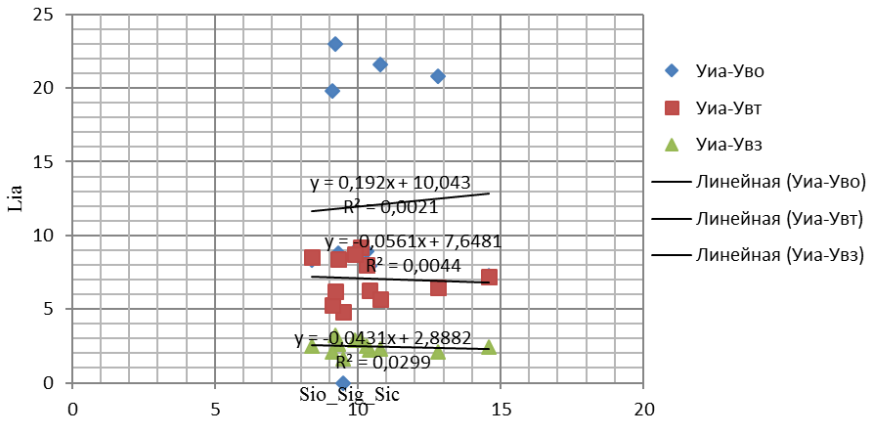


Figure 5. Correlation field and reliability coefficient between the level of innovative activity and other indicators (negative scenario)

We can observe an absolutely identical situation with the reliability of data and an extremely weak pairwise correlation of data series in the case of a negative scenario. In general, this indicates a weak predictability of the quantitative values of the prospective period.

Conclusion

In general, according to the results of the study, a neutral scenario looks more justified, in which the indicators of innovative activity will stagnate. In addition to the intensification of the import substitution policy in recent years, Russian innovative enterprises have shown a significant increase in all aggregate indicators of innovative activity. Also, to a large extent, in the absence of triggers for the decline in performance indicators, it is explained by the presence of economic inertia: "... consisting in maintaining its previous state for a certain period of time, when various forces act on the system, including those caused by contradictions between social obligations and economic interests, while economic growth is not a "natural" state of the economic system" [2, p. 100]. Given the relative stability that the high-tech sector of the domestic economy has accumulated in recent years, the neutral scenario (stagnation) of the innovative activity of Russian enterprises looks more justified.

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**DIGITAL PLATFORMS: ESSENCE, CLASSIFICATION,
OPPORTUNITIES AND PROBLEMS**

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Abstract. The focus of the study is a new format for the existence of a business and the implementation of interaction with partners and competitors - digital platforms operating on the basis of information and communication (digital) technologies. Based on the results of the analysis of a number of scientific articles, the essence of this concept is described, a classification of digital platforms is developed according to a number of basic criteria that a researcher encounters when studying fundamental concepts related to the functioning of platforms. As part of the SWOT-analysis carried out by the authors, the opportunities provided by digital platforms were identified, and some problems arising in their application were noted.

Keywords: information technology, digital firms, digital platforms, properties of digital platforms, classification, network effects, SWOT-analysis.

Introduction

The era of the Internet is just over 40 years old. The countdown is, according to Bill Gates, since 1981 - the year the first IBM PC appeared. The rapid development of the Internet during this period and the use of *digital information technology (IT)* has changed the very type of business and its conduct, providing it with unlimited potential for its development in almost any area. Indeed, with the development of *digital technologies*¹, the Internet has become not just a tool, but a way for companies to communicate with their consumers and a new business environment.

¹*Digital technologies* include artificial intelligence, big data processing (Big Data), Internet of Things (IoT), cloud computing and distributed registry (blockchain), etc.

The concept of "*digital platform*" (*DP*), closely related to the process of digitalization of the economy around the world through the widespread use of digital technologies by firms, which contributed to the formation of a new understanding of time and space, the active introduction of innovations, the creation of new markets and distribution channels, as well as new forms of commerce and marketing. The world economy has entered a new era, called the information economy, virtual or *digital economy*.

This prompts researchers to turn to the study of new phenomena of this economy, which include the concept of "digital platform". But the relevance of the research topic is also due to the fact that in the scientific literature there is no *systematic* view of the essence of digital platforms, there is not even a classification of the DP, which is primarily due to the complex nature of this fairly new economic phenomenon, which is of interest to both theorists and for practitioners.

In view of this, the authors set themselves *the goal* of showing the connection between the basic concepts of the new economic theory and the DP conception under study, developing a consolidated classification of digital platforms based on a number of features that can be identified when studying these concepts, and exploring this concept in a multifaceted way, choosing SWOT analysis as an instrument of such research. Thus, the object of research is digital platforms, and the subject is their essence, typology and properties, possibilities and problems of their application. The study used general scientific and special methods and, above all, systemic analysis.

1. What is a "digital platform"?

Many works are devoted to the study of this concept, primarily by foreign authors who covered it from different angles. Thus, McIntyre and Srinivasan [8, p. 141–160] associated the emergence of digital platforms with the development and improvement of the network format of doing business, Birkinshaw [3, p. 185–214] justified the emergence of the DP by technological changes (the advent of IT) that affect the nature of corporations. Parker (et al.) [10] described the global economic impact of DP use, and Rahman [11, p. 177–204] assessed the impact of using the platform business model on capitalism in the 21st century as a whole. Finally, Zhu [15, p. 23–28] paid attention to the relations between platform actors (who are all interested in the success of the company, and their needs are united and implemented by the platform), in particular, owners and complementators²

²*Complementators* are the developers of the core and peripheral elements of the DP [10].

With the development of the digital economy, the concept of "*digital firm*" appeared, which, according to Birkinshaw [3, p. 185–214], broadly covers various types of firms, from traditional firms *selling* digital products and digital service providers, to firms *using* digital platforms (Apple, Amazon) and *purely platform firms* (Uber, Meta - formerly Facebook, Yandex). This description defines three types of platform business models that differ in different degrees of their digitalization or virtualization. At the same time, a digital platform (DP) is understood as a technological interface that mediates transactions between two or more parties, participants in business relations [3, p. 185–214; 11, p. 177–204].

Digital platforms are a key tool for the *digital transformation* of traditional industries and markets. **Digital transformation**, meaning the revolutionary change of business models based on the use of DP, is a concept that is different from *digitalization* (i.e. digital automation), as it provides a transition to the format of *ecosystems*, leading to a radical increase in market share and competitiveness of companies.

An **ecosystem** is understood as a community of interacting firms and individuals that jointly develop in the direction set by one or more central companies [8, 141–160]. That is, they evolve together. In other words, an *ecosystem* is an aggregated digital system that connects economic entities through IT in a digital economy.

Digital platforms provide the creation of mechanisms for cooperation between ecosystem participants and allow them *to self-develop* based on generalized knowledge and pooled resources if necessary. Functioning within the framework of the DP allows generating a *synergic effect* due to the creation of such joint assets by participants in the business ecosystem that none of them could create on their own, acting outside the system, functioning alone [2].

By building a business ecosystem, firms can gain *competitive advantages*, such as *lower transaction costs* for DP participants, as well as an improved environment for successful technology and resource development and innovation. The reasons for the success of ecosystems in the implementation of DPs and possible problems arising from this can be reflected in the framework of the SWOT analysis (see further paragraph 4).

2. Concepts underlying the functioning of the platforms

First of all, we should refer to *the concept of "digital platform"*. In numerous Russian and foreign sources, very close attention is paid to the study of this concept [3, p. 185–214; 5, p. 16-34; 7, p. 22-36; 11, p. 177–204]. This is both a way for companies to communicate with their consumers,

and a new business environment, and a technological interface that mediates transactions between two or more parties, participants in business relations. It is also an Internet infrastructure that is used to ensure the interaction of sellers and buyers, and globally it is a key tool for the digital transformation of traditional industries and markets [9, p. 617–632; 10]. The plurality of views regarding the concept of "digital platform" encourages researchers to continue to study this concept, using *systemic* views, which alone can create a holistic theory and science of the DP.

The concept of "multi-sided platforms" (MSP) is associated with a more complex type of DP [6, p. 92-101; 12, p. 248–280; 14, p. 1642–1672]. MSP includes two or more groups of clients that depend on each other, and their structure is aimed at creating value by reducing the cost of searching, transactions and promoting a product/service, that is, due to multiple *indirect network effects* between several participants in the DP [9, p. 617-632]. Various actors (participants) of the platform³ are held together through formal contracts and/or mutual dependence [6, p. 92-101; 12, p. 248-280]. They provide the functioning of the digital infrastructure and create *an ecosystem* that connects several markets.

Platforms like MSP allow the creation of *new, higher quality services and new markets* that destroy old and less productive ones in accordance with *the concept of "destructive design"* [14, p. 642-1672].

The concept of "network effects" is very important in understanding why some DP-based firms thrive while others get themselves into quite difficult positions in the market. In addition to *the direct network effect (NE)* associated with the direct dependence of the value of a digital product on the number of users of this product [8, p. 141–160], *indirect NEs* are also singled out, when an increase in the use of a certain product/service creates a higher cost of *complementary goods*, which leads to *the added value* of the original product. They act as economies of scale, leading to the achievement of a *"critical mass" of users* (network size limit), when the exponential growth of the platform begins, which pulls the entire market over itself, reflecting *the concept of "winner takes all"* [15, p. 23–28].

In addition to NE as a sign of dominance, there are *several other factors* that affect the position of the platform owner in the market, which depend on its strategic decisions regarding [16]:

- *platform architecture* (method of value creation, revenue streams using the *"no-intermediary" principle*);

³In theory, there are four main types of platform actors (DP parties) interested in its success, whose needs are united by the platform: *platform owners, managers* (providers), *complementators* (developers of the core and peripheral elements of the DP); and *independent users* (consumers, suppliers, etc.) [10].

- *the size of the network* (with the resulting need to solve the dilemma "size versus quality")⁴;
- *the degree of differentiation of the DP* (which requires an examination of the question of *the exclusivity of the products* produced and the size of all sides of the network).

3. Selection of classification criteria and construction of a consolidated classification of digital platforms

The review of sources carried out in paragraph 1, in which the properties of the DP were studied, makes it possible to single out a certain set of criteria, each of which can identify several types of DP. The first and rather obvious one is the criterion related to the DP function⁵. The rest are presented in a separate (second) column of the following table:

Table.
Author's classification of digital platforms

No.	Criteria	Types of digital platforms
1	<i>In scale</i>	- <i>global</i> - <i>national</i> ; - <i>regional</i>
2	<i>By the type of business- model used</i>	- <i>centralized models</i> (for example, Yandex.Realty, Yandex.Video and Yandex.Market); - <i>decentralized</i> (Yandex.Browser and Yandex.Money); - <i>hybrid</i> (Uber, Yandex.Taxi)
3	<i>By degree of digitalization of platform business models</i>	- <i>traditional</i> - firms selling digital products and digital service providers; - <i>using digital platforms</i> (Apple, Amazon); - <i>platform firms</i> (Uber, Meta - former Facebook, Yandex) [3, p. 185–214]
4	<i>By type of architecture</i>	- <i>multi-level</i> ; - <i>modular</i> ; - " <i>nuclear</i> " - with permanent components; - <i>peripheral</i> - with variable components

⁴The strategic dilemma of size versus quality raises the question of whether to grow quickly to reach critical mass or limit growth by improving the quality of interactions on the platform, i.e. curate (monitor) content. This dilemma does not depend on platform architecture, but on strategic decisions about functionality.

⁵Digital platforms are very diverse in terms of functionality. These are social networks, instant messengers, sharing platforms, search engines, payment systems, e-commerce platforms, finance, tourism, employment, education, passenger transportation, etc.

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5	By the number of parties- actors	- <i>two-sided platforms</i> [6, p. 92-101]; - <i>multilateral DP</i> [14, p. 1642–1672]
6	By level of development	- <i>internal</i> - DPs operate within individual companies, various value chains, - <i>external</i> (industry), which are formed on the basis of the leader platform; - <i>industry ecosystems</i> (are more competitive through the use of network effects and greater openness to innovation)
7	By type of network effect (NE)	- <i>positive</i> , - increases switching costs and ties (locks) users to the platform; - <i>negative</i> , - associated with network congestion, quality degradation due to a large number of users; - <i>cross</i> , - describes the dependence of utility on the size of the second side of the network (a <i>positive cross NE</i> “locks” users on the platform, this is a sign of a dominant platform)
8	By size (coverage) of the DP network	Platform networks can function at <i>micro-, macro-, meso-, and global levels</i>
9	By type of pricing policy	- <i>a free model</i> (for example, the Yandex.Market DP offers free services, and monetization is carried out through advertising content); - <i>shareware</i> (for example, Yandex.Music offers free services in the basic version, only advanced functionality is paid); - <i>paid services</i>
10	By degree of differentiation	<i>Degree of DP differentiation</i> - determined by the presence or absence of "multihoming" (or the threat of platform conversion)

Source: authors' development.

In any systemic study, it is important to accurately identify the object of study in terms of highlighting its variable properties, which, of course, will help the analysts with the classification of digital platforms proposed by the authors.

4. Benefits of digital platforms and challenges associated with their use

The study of a number of theoretical [3 - 11] and empirical [13] materials related to the use of digital platforms in business allowed the authors to conduct a SWOT analysis of the use of the DP by companies. Its results are shown in the figure.

SWOT analysis of the use of digital platforms

<p>DP strengths (S):</p> <ul style="list-style-type: none"> → Direct distribution channels due to the elimination of intermediaries → Reduced transaction and marketing costs → Increasing market share and volume → Increasing the transparency of operations and transactions → Improving the quality of life of the population 	<p>Weaknesses of the DP (W):</p> <ul style="list-style-type: none"> → The need to restructure corporate processes → The temptation to enter the markets mastered by complementators, which leads to the complication of relations with them [15, p. 23–28] → Violation of confidentiality of personal data of the users
<p>Opportunities (O):</p> <ul style="list-style-type: none"> → Capturing new markets → Obtaining information about consumer preferences → Stimulation of market development and innovation → Stimulation of export growth → Changing the structure of the economy, increasing the productivity of traditional industries 	<p>Threats (T):</p> <ul style="list-style-type: none"> → Loss of control over distribution channels → Emergence of new competitors, incl. foreign → Monopolization of digital infrastructure by a major player → Introduction of tools to control the actions of owners of digital platforms by the state

Figure.

Source: authors' development.

Analyzing the matrix, one cannot fail to note the problems that arise when using the DP and are related to the management of economic processes by the state. These include: the lack of effective regulatory tools adequate to the new reality, the unsuitability of antimonopoly legislation for the conditions of the digital economy. The underdevelopment of national and international legislation in the field of protection (preservation of confidentiality) of users' personal data, which are often collected and used by platform owners without notifying customers, should also be noted.

The results of the SWOT analysis conducted by the authors will be useful when designing a development strategy for companies using the DP format.

Conclusion

Currently, digital platforms and the platform ecosystems they form are becoming drivers of economic growth, innovation and competition. The average annual growth rates of the ecosystems of the largest DPs are

impressive. They exceed in their effectiveness the network and integration forms of doing business, using their effects in their work⁶.

The coronavirus pandemic has exacerbated this trend. The forced transition to a remote work format in various business areas has not only significantly increased the degree of use of digital technologies, but also allowed companies to see a number of advantages in this. An example of the successful use of the DP as a new organizational and economic form of doing business in the Russian market of search engines is Yandex (with a market share of 41.9%), whose competitor is only the American search engine Google (its Russian subsidiary has a share of 53.5%). Thus, since the end of 2019, there has been oligopolistic competition between two platform leaders [5, p. 16-34].

In modern conditions, the success of a company largely depends on *the type of platform*, therefore, *the classification of digital platforms* proposed by the authors according to a number of criteria solves the issue of DP identification and provides broad information about its properties. Correct identification of the platform created by the business will allow answering the question: how achievable is the success of such a company in the face of new competition - the competition of business models and platforms? The SWOT analysis carried out by the authors allows not only to reflect the properties of digital platforms, their capabilities and strengths, but also to warn actors and the regulator represented by the state from possible problems associated with the use of the DP.

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⁶The *network effect* occurs when the value of one product for one user depends on the number of users of this product [4, p. 317-326], and *the effect of intercompany relations*, which is a synergic effect resulting from the integration of companies [1].

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HOW DOES CIVIL SOCIETY PLAY ROLE IN PROTECTING HUMAN RIGHTS?

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Annotation. The article is devoted to the implementation and protection of human rights with the help of civil society institutions. The article defines the forms of manifestation of human rights in relation to civil society. The article also substantiates that the relevant institutions form the basis for the realization of human rights, including through the legitimate activities of individuals.

Keywords: human rights, civil society, civil society institutions, implementation and protection of human rights, legal activity.

Human rights are the value basis of the activities of individuals or their associations. Based on the existence of rights, institutions of civil society can be created and function, which simultaneously act as a sphere for the implementation of human rights and the coinciding interests of individuals.

Civil society is a concept that refers to a system of independent and state-independent public institutions and relations that provide conditions for the realization of private interests and needs of individuals and collectives, for the functioning of social and spiritual spheres, their reproduction and transmission from generation to generation. In civil society, the rights and freedoms of citizens are the most important social and political-legal institution that determines its development. Human rights in civil society are inseparable from social relations. They ensure the normative consolidation of the conditions of human life, objectively necessary for the normal functioning of society and the state. Human rights establish a degree of freedom, which, on the one hand, ensures the realization of subjective interests, and on the other hand - does not violate the possibilities of others.

The concept of civil society is most often used in two meanings. Firstly, it is understood as a set of non-political relations. In the second sense, it is a society of free and independent individuals who assume responsibility

and the obligation to obey laws, the execution of which is fairly controlled by the state. The concept of civil society is inextricably linked with the concept of democracy, since the former is a free space, within which the state should act as a sovereign regulator, but a democratic state, for the existence of which civil society creates the necessary conditions.

Consequently, the core of civil society is the social institutions that determine the freedom of the individual - just as a democratic state is the core of a democratic political system.

The idea of creating a legal state and the problem of civil society are at the center of modern legal thinking, their relevance and significance at the present time can hardly be overestimated. It is the rule of law that is capable of reliably protecting human rights, ensuring the subordination of the supreme power to the people, and effectively regulating social relations.

How does civil society play an important role in protecting human rights?

Progress on human rights requires the creation of an environment conducive to their respect. These conditions create norms that take on cognitive, instrumental and moral dimensions that arise from continuous dialogue that touches different points of view and constantly re-creates these norms as dynamic and universal principles. If someone strives for justice, it is impossible to skip this process, because the dialogue itself is an integral part of justice. Realization of rights is a process that cannot be accomplished solely by incorporating rights into national and international legal frameworks.

Civil society is a key player in creating the conditions for the realization of human rights. It promotes a discourse on human rights that reaffirms legal norms, in particular through the inclusion of devalued and invisible groups. The forms of this discourse are also varied and give rise to different strategies and means by which the logic of human rights can be realized in society. This brief discussion of the role of civil society leaves, however, an obvious question: if civil society is a powerful and important player in the realization of human rights, what prevents it from being effective? This article is planned to answer the question - what are the factors that prevent civil society from achieving a stronger impact in the field of human rights?

One of the fundamental principles of the rule of law is the real provision of individual rights and freedoms. Human rights are the quintessence of the rule of law, the most important factor in the development of society as a whole. Human rights are the value basis of the activities of individuals or their associations. On the basis of the existence of rights, institutions of civil society can be created and function, which simultaneously act as a sphere for the implementation of human rights and the coinciding interests of individuals.

Based on the provisions of the Constitutions of all democratic countries of the world, a person, his rights and freedoms are the highest value. Thus, fundamental human rights and freedoms are inalienable and belong to every person from birth; they are also directly applicable and establish the meaning, essence and application of laws, the work of legislative and executive authorities, local self-government and are guaranteed by justice. The central role of human rights and their protection is equally confirmed, for example, by the Convention for the Protection of Human Rights and Fundamental Freedoms (Rome, November 4, 1950), the European Convention for the Prevention of Torture and Inhuman or Degrading Treatment or Punishment (Strasbourg, November 26, 1987) and other international legal acts. The Vienna Declaration and Program of Action, generally established in 1993 by the Second International (World) Conference on Human Rights, noted: "All human rights are universal, indivisible, interdependent and interrelated. The international community must treat human rights globally, on a fair and equal basis, with the same approach and attention. While the importance of national and regional specificities and various historical, cultural and religious characteristics must be borne in mind, States, regardless of political, economic and cultural systems, have a duty to promote and protect all human rights and fundamental freedoms." This conceptual doctrine has become a kind of prescription for bringing national legislation into line with the norms of international law. For any country, the well-established task is of a protective nature, which is based on the priority of universal values.

Human rights are the basis for the formation and functioning of some civil society institutions.

For example, the right to freedom of association allows a person to realize their interests, which coincide with the interests of others, through an institution such as public organizations. It actually asserts the possibility of its existence.

According to A.F. Kryzhanovsky and O.A. Krese, if the activities of civil society institutions can occur outside of direct legal regulation, then the process of their formation is carried out only in the legal environment [5]

Civil society institutions are designed to help a person in satisfying private interests. They are created because the interests of a certain part of society coincide. After all, dissatisfaction with social interests and needs somehow distracts a person from higher goals at both individual and social levels. [8] However, there are interests that an individual cannot give up: this is life and freedom. It is they who ensure his rights, addressing their bearer as the highest value, proclaiming him a free person, protected from

personal and property encroachments. It is impossible not to agree that civil society and its institutions are conditioned by the immediate vital needs and interests of people. But in the substantive legal dimension civil society is primarily a sphere of implementation of fundamental human rights. [7]

Therefore, from the point of view of a specific subject included in the corresponding system of institutions, civil society is mainly the sphere of promoting the realization of the rights of the individual.

Human rights are fundamental principles that reflect the limits of state intervention in the space of civil society. At the same time, the uncertainty in the distribution of the spheres of influence of the latter and the state complicates the realization of the rights of individuals, since it gives rise to controversial situations that can be interpreted in favor of the state, which, of course, narrows the freedom of rights holders. The issue of state intervention in the space of civil society is of particular relevance in the context of its formation.

In this context, the importance of the relevant public institutions increases, since the degree of participation of the state in public relations depends on how they function. The specificity of civil society consists in the ability to make private interests public, for example, when an ordinary citizen, using the institutions and means available in society, draws attention to his violated or unrealized interest. In this case, the protection of private interest through the mechanisms of civil society can lead to a joint discussion of the problem that has arisen, and to attracting public attention. The means available to civil society can help attract the attention of the state to the problem and its appropriate resolution (for example, legislative regulation of such situations). The most acceptable, from our point of view, is the ratio of civil society and the state, in which they are in constant interaction, determining the status of interests and their distribution. It is also worth considering the possibility of the existence of common interests, for example, to protect the rights and freedoms of man and citizen.

We emphasize that human rights reflect the degree of interference not only by the state in the affairs of civil society institutions, but also by individual owners of rights in the affairs of others. So, if a person, using his right to freedom of conscience and religion, attends church on weekends, neither public associations of a different religious direction, nor an atheist neighbor has the right to prevent him from doing so. In other words, in civil society, the principle of the individual's realization of his rights and freedoms is respected, which should not violate the rights and freedoms of others. It follows that in it a person is forced to correlate the interests of his own and others, since all private interests are formally equal. [6] The equality of individuals in rights (and hence equal opportunities for the exercise of private

interests) generates conflicts of certain human rights in their implementation. We are talking about a clash of both several unidirectional rights (for example, to hold public office) and opposite in meaning (the rights to freedom of speech, to protect honor, dignity, business reputation, etc.).

In this sense, it is civil society as a whole and its institutions, in particular, that are the space of interaction of rights holders, built on the settlement of conflicts arising in the process of realizing human rights, exclusively by legal means. At the same time, one cannot agree with the statement that in civil society individuals and their groups strive to satisfy their own interests, but they cannot achieve them without interaction with others. [3]

Underdevelopment of civil society institutions (their small number, insufficient impact on social relations, legislative obstacles in functioning, etc.) makes it difficult for the public to control state power and can lead to a systematic violation of human rights by the state represented by its bodies and organizations. In this context, the vigorous activity of individuals in the creation and functioning of various associations is of great importance. The passivity of citizens and public associations leads to interference by the state authorities.

If the social relations that require regulation do not receive it with the help of the means at the disposal of civil society, this is carried out by the state. In this case, the space of the named society narrows and public associations cannot fully represent the interests of individuals.

Non-intervention of the authorities in private life and its simultaneous protection are defined as an unconditional indicator of the existence of civil society.

At the same time, the motives for protecting private life can justify cases of using state coercion, imperative methods of protection, etc. [2]. Meanwhile, civil society institutions act as the subject of control over the activities of the state, use the necessary means of responding to its excessive interference in the space of society - from coverage in the mass media information relevant human rights violations before going to court.

It should be noted that the institutions of civil society act as a direct combination of the interests of its individual members. Certainly, the latter can be the basis not only of civil, but also of other types of societies, but not a necessary condition for their existence.

In this sense, civil society is a set of not just autonomous individuals, but those with activity and the ability to express their interests both personally and through the institutions of this society. In society, a person has a choice: self-realization of interests, their self-defense or realization and protection through communication with other people.

After all, civil society relies on individuals endowed with freedom of thought, action and choice, with whom, when and for what to unite in various spheres of public life [4]. Persons included in the space of civil society are mainly distinguished by an active social, political and legal position and, therefore, choose to exercise their rights through its institutions.

It should not be forgotten that some of the citizens' associations (for example, human rights organizations) have the main goal of assisting in the implementation and protection of rights. Such organizations have (or at least should have), so to speak, a professional level of protection of human rights. In addition to activities to directly restore or prevent their violation, they have the most favorable conditions for analytical activities in the field of human rights - such as the preparation of independent reports on rights, statistics, proposals for legislation, etc.

The studied institutions serve as the basis for the implementation and protection of human rights also because it is more expedient, easier and faster to realize certain rights through these institutions than through the independent activity of an individual.

This is due to the fact that the relevant institutions are able to use specific means, they are also better provided with the necessary resources, and their mobility and innovativeness have a positive effect on the implementation and protection of the rights of the individual.

It should not be overlooked that civil society is characterized not only by the presence of a certain number of influential associations, but also by their solidarity in the implementation and protection of human rights. In our opinion, in this sense, the relevant institutions are a complex structured totality, which has a certain new quality. Just as law is objectively defined not just as a set, but as a system of norms, therefore, it cannot be argued that law is equal to a separate norm, since this gives rise to a sign of consistency, a certain new quality of law [1], and the institutions of civil society are not just a set of individuals, but a kind of qualitative community based on individual interests, but aimed at correlating them with the interests of other persons and relevant institutions, at the implementation and protection of human rights.

Thus, the institutions of civil society are the basis for the implementation and protection of human rights, since they are quite influential and independent of the state, they can use specific means of exercising the rights of individuals, they represent the space of their coinciding interests and communication.

The choice of individuals to exercise and protect their rights with the help of such institutions is based on their legal activity and awareness of

the value content of the relevant rights.

Civil society and human rights are mutually dependent: civil-society engagement plays a crucial role in protecting and promoting human rights, but equally, civil society can only flourish where human rights are comprehensively guaranteed. However, a robust legal framework that complies with international standards and effective access to justice are not in themselves enough: in order to make use of these major actors' potential to effect transformation in our societies, there is also a need for a beneficial political climate, access to information, scope for participation in decision-making processes and long-term support in the form of (adequate) resources. [9]

Civil society can be a catalyst for social, political, and economic progress. Civic groups mobilize people and resources to fight disease and hunger. They work to strengthen rule of law and promote accountability and transparency. They are also critical to economic development, because in our global economy, trade and investment flow to countries that give citizens the freedom to create and develop new ideas. Labor organizations are essential to set a floor on labor standards in a globalized marketplace. Strong civil societies uphold universal human rights and provide care to victims. Political systems that protect universal rights are more stable, successful, and secure. For the United States, strengthening and protecting civil society is not just a matter of good global citizenship; it is a more effective and efficient path to advancing key foreign policy objectives. [10]

But despite all the difficulties, every day in every part of the world, civil society contributes to the promotion, protection and advancement of human rights. Whatever they call themselves -- human rights defenders, human rights NGOs, bar associations, student clubs, trade unions, university institutes, bloggers, environmental rights activists, or charities working with discriminated groups – countless civil society actors work for a better future and share the common goals of justice, equality, and human dignity. [11]

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A DIFFERENTIATED APPROACH TO TEACHING SPRINTING TO STUDENTS OF THE FACULTY OF PHYSICAL EDUCATION DURING THE COVID-19 PANDEMIC, USING THE EXAMPLE OF GIVAT WASHINGTON ACADEMIC COLLEGE OF EDUCATION (ISRAEL)

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Abstract. This article presents the varieties of training programs in athletics for students of the Faculty of Physical Education of the Academic Pedagogical College. In the course of the study, results were obtained that reveal the similarities and differences in the content and effectiveness of the athletics curricula used during the Covid-19 pandemic and the possibility of their integration into a hybrid curriculum for the physical education of students.

Adaptation of modern approaches to professional-applied physical culture, taking into account the characteristics of the Pedagogical College contingent, contributed to an increase in the level of knowledge of female students obtained with the help of innovative teaching aids that combine theoretical and practical classes, as well as to improve the technique of running 60 meters already in the second attempt. The conjugate method made it possible to increase the motivation for learning, which led to an increase in running speed.

Keywords: vocational and pedagogical training, coupled approach, information and communication technologies, athletics, curriculum, students of a pedagogical college.

Introduction

All over the world, research is being carried out to study ways to adapt the curricula for the professional training of physical education teachers, taking into account the characteristics of the preparedness of the contingent and the conditions of training. In the process of formation of professional and pedagogical competencies of a teacher of physical culture, the problem of qualitative perception, mastering and demonstration of the technique of physical exercises of various sports is the most urgent [1].

In this regard, the solution of this problem involved the search and development of modern didactic approaches that allow comprehensively and comprehensively solving the problems of motor and methodological training of students. In this aspect, information and communication technologies (ICT), which are an integral part of the life of young people and used by them at the level of skill, can be considered an underused reserve [2]. In the communicative environment of general education schools, colleges, institutions of higher education, students and teachers use smartphones and tablets to transmit various types of information via e-mail, WhatsApp, Zoom, smartschool, Moodle and various Google programs. The practical significance of the use of these technologies was confirmed by the use of ICT for online learning and independent work of students during the coronavirus pandemic (COVID-19) [3].

Considering that, according to the curriculum of the Israeli Ministry of Education, in the process of professional and pedagogical training in college, future physical education teachers must master the exercise technique of 12 sports disciplines in just 48 hours (24 lessons), tight time frames require effective teaching methods, and the introduction of ICT in the educational process can be one of such approaches.

Methods and organization of the study

In the course of the study, the analysis of special literature and program documents, pedagogical testing, questioning, pedagogical observations, pedagogical experiment, mathematical and statistical processing and data analysis were used. In a pedagogical experiment conducted on the basis of the Givat Washington Academic College of Education (Israel) for one semester (10 weeks), two groups of 29 female students (aged 20-40 years) took part, studying in the specialty "Physical Education".

Results of the study and their discussion

In the process of analyzing special literature, it was found that studies by domestic and foreign scientists have repeatedly proved the influence of the technological learning environment on the motivational sphere of students [4,5], the effectiveness of visualization in mastering the technique of

sports movements [6,7], and the increase in students' progress [8]. At the same time, it is undeniable that the quality of mastering the technique of a sport or an element of technique by future teachers is the core basis in the formation of didactic competencies [9].

Studies aimed at studying the characteristics of the contingent of students have shown that the level of technical and physical fitness of first and second year students at the beginning of mastering the educational program does not allow for the effective formation of didactic skills and abilities. At the same time, in accordance with the curriculum of the Israeli Ministry of Education, already in the second semester of the first year, students undergo pedagogical practice in schools, which implies the presence of formed didactic skills in six types of athletics [10].

The presence of this problem determined the direction of designing the content of professional and pedagogical training and the ongoing research. The goal was a scientific substantiation of the most effective approaches to the formation of didactic skills and abilities necessary for future physical education teachers to teach athletics exercises at school.

In the process of designing an experimental training program, it was taken into account that in order to master the techniques of athletics, there should be an equal amount of training load, no more than three practical sessions of two academic hours should be allocated for each type of athletics all-around, identical conditions should be created for practical training and intermediate certification.

Approbation of the experimental program was carried out during the period of mastering the technique of 60 m sprinting. The students were organized into 2 groups: the control group - students according to the basic program using reproductive approaches to learning (n=29); the experimental group - students under the program, which involves the use of various forms of organization, methods and methodological techniques in combination with information and communication technologies (n=29).

In the experimental group, in the process of modeling conditions that require the performance of professional functions of a teacher of physical culture, the organization of the activities of students in small groups (4-5 students in a group) was used, which allowed them to compete in mastering the technique of any athletics type with each other and as part of a team (groups) at the same time. The female students in the simulated competitive conditions in sprinting performed the following functions: judges who evaluate the performance of the run; a judge evaluating the technique of a competitive exercise; competitor, secretary.

Acting as judges, the students filled out Google Forms electronic cards,

watching the sprinter of their small group and recorded the components of the technique when performing each of the four components of the running technique. The implementation of this function was aimed at developing: the ability to compare the style of sprinting with the style of the model (sprinter), the ability to identify errors in running, to determine the relationship between deviations from the technique and the effectiveness of running, acquired knowledge of methods for measuring with a stopwatch in athletics, the ability to give appropriate methodological instructions and etc. Performing the roles of a starter, assistant starter and announcer of the competition, the students of the hybrid group acquired and actually used active organizational communication skills, on the one hand, and on the other hand, acquired didactic skills: they shot a video to assess and correct the sprint running technique. The video served as an objective source of information for detecting errors, and also serves as a basis for analyzing the effectiveness of running technique and its correction.

In addition, the didactic material of the complex program (video and photography, electronic digital questionnaires, etc.) made it possible to optimize the independent work of students during extracurricular hours at home, supplementing and deepening the process of forming an idea of the technique of motor action. This reduced the time for the initial mastering of the running technique and improved the quality of analysis and synthesis, which was confirmed by the data of earlier studies [11].

Homework not only stimulated students' memory and developed their analytical skills when watching videos, but also allowed students to independently evaluate the running technique performed in the previous lesson. Error statistics were reflected in special electronic cards designed to assess running technique, and allowed both the student and the teacher to adjust the process of its development, taking into account the difficulties that arise. Oral guidance and selection of specific exercises to correct typical mistakes was carried out on the basis of the data presented in the theoretical information block of the program.

This block included modern materials on the theory and methodology of athletics and included a description of general preparatory, special preparatory and competitive exercises in the order corresponding to the sequence of their development. It was posted on the college website and is available for both distance learning and practical group classes at the stadium.

In contrast to the control group, in the experimental group, in addition to photos and videos of running technique, other didactic materials were used, which were used both in training sessions and at home: training cards describing the components of movement technique, algorithms for

performing technical actions; tables with a list of errors in the technique of movements; electronic cards for evaluation of running technique, videos with comments and instructions. Consistent study of such cards with the elements of running technique prescribed in them made it possible to proceed without much difficulty first to the imitation of fragments of movements, and then to the synthesis of a holistic motor action.

The teacher carried out operational control over the development of educational material on the basis of statistics data presented in Google Forms electronic cards. This made it possible to generalize the typical mistakes of students and correct the learning process, supplementing it with the necessary methods for creating an idea of movement, technical teaching aids, lead-in exercises, individualization and means of increasing motivation.

After completing the cycle of mastering the running technique, in the process of a comparative analysis of the effectiveness of the running technique, it was found that the female students of the experimental group performed 14% more repetitions in the 60-meter run without errors than the control group (figure 1).

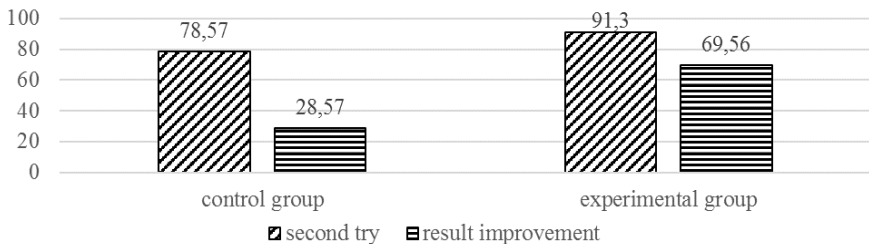


Figure 1. Dynamics of the quality of mastering the technique of sprinting (n=58; %)

This testified not only to a greater effectiveness of training, but also to a higher motivation of students in the experimental program to improve running technique. As a result, these female students improved their results in the 60-meter run by 41% more often than female students in the control groups.

The use of the "business game" encouraged students not only to increase the effectiveness of running, but also to form skills and abilities that are professionally significant for a physical education teacher. These innovations created a creative atmosphere for the manifestation of the in-

dividuality of each member of a small group, increased personal responsibility for the results of joint group activities and contributed to an increase in motivation for cognitive activity and self-improvement of students. That is, the comprehensive curriculum was more in line with the conditions of study in the academic teacher training colleges in Israel.

Conclusions

According to the results of pedagogical testing and expert assessment, it was found that the accepted approach to the use of teaching tools and methods in the control group is not effective enough, because it does not allow, in the conditions of limited time and the presence of a low level of motor fitness of students, to form the professional competencies necessary for teaching athletics at school. The complex methodology used in the experimental group contributed to the development of the didactic skills and abilities necessary for a future teacher of physical culture, and also increased the motivation to master the program of the section of the sports and pedagogical discipline "Athletics". Unlike other methods, it allowed in a short time to increase the motor fitness of students.

Future teachers of physical culture got the opportunity to practice solving functional problems at the early stages of professional training and conjugate to form motor and didactic skills in a business game. It has been established that the technique allows:

- to carry out modeling of the conditions for the implementation of professional and pedagogical functions of a teacher of physical culture in the process of a business game;
- monitor the development of professional motivation and students' awareness of the importance of the process of professional development;
- use modern ICT technologies, video, Internet, WhatsApp, electronic forms in Google format, allowing you to monitor and evaluate the quality of the educational process;
- simplify the procedure for identifying errors in the technique of exercises of basic sports;
- increase the efficiency of the process of formation of didactic skills and abilities of students before the passage of pedagogical practice.

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PEDAGOGY OF COOPERATION IN PIANO LESSONS IN CHILDREN'S MUSIC SCHOOLS AND CHILDREN'S ART SCHOOLS

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Abstract. The article deals with the pedagogy of cooperation, i.e. the desire of the teacher to help the child comprehend his own goals and neutralize negative ones, as well as understand himself, verbalize his goal. The pedagogy of cooperation in this article is revealed in the prism of additional education, within the framework of training in children's music schools and children's art schools.

Keywords: education in children's art schools, music education, specialty and sight reading, cooperation pedagogy.

The purpose of music education is the spiritual development of a person, the formation of musical culture, as well as the acquisition of special knowledge, skills and abilities.

The knowledge, skills and abilities taught in piano lessons, combined with a positive emotional response to the entire musical and educational process (and, consequently, to music itself), should contribute to the formation in children of a stable intellectual and emotional need for constant (throughout the entire life) communication with music of a high artistic level. A high percentage of people with such a need significantly increases the intellectual and moral level of society as a whole (we can cite Russia in the second half of the XIX century as an example, when the rapid development of musical education and enlightenment went hand in hand with positive social processes) and, accordingly, vice versa.

I see the way to achieve the goal of music education in piano lessons in an appeal to the pedagogy of cooperation.

The general idea of collaborative pedagogy can be expressed as a

change in the relationship between teacher and student from subject-objective, characteristic of traditional teaching, to subject-subjective.

There is no explicit goal of education in collaborative pedagogy. The goal is implied by the teacher, but it is not mentioned in any form - neither as the goal of the teacher, nor as the goal that the child considers his own. The goal of the child should actually arise directly from his positive nature and desire to learn, and not from the needs of the state, society or the teacher. "The awakening of the human will," writes Sh.A. Amonashvili, - which reveals huge reserve opportunities in a person, goes through desire. This is the source of life. Authoritarian pedagogy leads to the death of vital forces and, ultimately, to death.

The first step in the pedagogy of cooperation is the establishment of communication - a mutually trusting relationship between the teacher and the child. In the process of communication, the teacher seeks to understand the child - his potential, aspirations and interests.

The next degree of cooperation pedagogy can be defined as the teacher's desire to help the child comprehend his own goals and neutralize negative ones. It can be difficult even for an adult to understand oneself, to verbalize one's goal, especially for a child who needs help. The teacher is a friend, perceived by the child not as a carrier of someone else's "adult will, but an equal subject, who also doubts the choice of a goal, like the child himself, is able to gradually activate the positive personal potential of the child. In order not to alienate the child, the teacher must narrow the circle of prohibitions to the limit. The term "collaborative pedagogy" means the cooperation of the teacher with the student in realizing the child's potential.

Collaborative methods play a particularly important role in music education for two main reasons:

- 1) outside the mutual understanding of the teacher and students, by using only the methods of coercion, it is in principle impossible to comprehend the nature of music;

- 2) the highest achievements in the history of the pedagogy of music education are associated with methods of cooperation, examples of which can be traced in the pedagogical activities of outstanding domestic musicians.

Authoritarian pedagogy in music education is not a rare phenomenon, since at first glance it allows you to achieve the goal in the shortest way. At the same time, it turns out that work in the class of a teacher with a student has the character of coaching; the teacher's attention is directed to the polishing of external sound forms.

An authoritarian teacher tries to impose his vision on the child in the interpretation of the work because of the lack of trust in the student and confidence in his ability to find interesting interpretive solutions himself. He is afraid of risk and mistakes.

At one time, the German scientist F. Klein compared a student trained in this way to a cannon, which is stuffed with knowledge for some time in order to shoot out of it one day, leaving nothing.

Collaborative pedagogy influences the positive motivation of students to learn. Music education is not compulsory, unlike general education. This circumstance increases the importance of positive motivation in piano lessons.

The form of classes at piano lessons is individual, which creates favorable conditions for a student-oriented approach to the student and the establishment of positive communication.

In the pedagogy of cooperation, it is necessary to bring the desire of the child, with whom he comes to school at the initial stage, into conscious actions and constantly support them by modeling the environment of the creative community.

In the lessons on the subject of the Specialty and reading from the "Piano" sheet, it is necessary to be an authoritative friend for the student, to have a common interest and goal with him, which is music. Based on the principles of humanity, help the student to comprehend and understand the beauty of musical art, its artistic essence. Through this, the child learns to love beauty, love life and people. Then the student perceives all the work necessary for a musical work as a blessing aimed at realizing his own goal. "We strive to ensure that teachers and students are united by a spiritual community, in which it is forgotten that the teacher is a leader and mentor. If the teacher became a friend of the child, if this friendship is illuminated by a noble passion, an impulse towards something bright, reasonable, evil will never appear in the child's heart ...", said V.A. Sukhomlinsky.

The choice of repertoire is also very seriously necessary. The program should be carefully thought out, taking into account the content of the music, the individual age characteristics of the child, as well as his emotional preferences and wishes. You can use the lesson-concert form (that is, to play the student several pieces of the same type in solving pedagogical problems at this stage of his development, and at the same time he is free to choose the one that is closest to his soul. If the student wants to play something difficult for him a piece of music, he will probably agree, since with desire it is sometimes possible to overcome many difficulties, but at the same time warn that the play may not work, so that in case of

failure the student does not lose heart. It happens, on the contrary, that a student will like an easier piece, this option is also possible, since, firstly, an easy piece is sometimes difficult to play, and secondly, an easy repertoire will help the child feel more confident with the instrument.

Collaborative Pedagogy advocates deep learning, which is carried out in my classroom based on the creativity, independence and activity of students.

The creative development of students at the first level provides for various types of music-making: the selection of melody and accompaniment, writing, improvisation.

For example, when playing scales according to the DPOP (Piano) program, it is very useful to select popular songs together with a student in the key of the scale. In the lower grades, students are very fond of picking up their favorite song in all keys with the simplest accompaniment (T, S, D, fifths).

As part of the subject of the additional education "Specialty and sight reading (Piano)", it is simply necessary to pay special attention to improvisation, where learning takes place in stages and gradually according to the principle - from simple to complex.

1) Playing from a sheet of light melodies, where the student needs to find stable notes, then compose individual measures.

2) Improvisation on separate intervals and chords.

The following exercises are very interesting:

1. "Pipe". Quarter interval is used. Children come up with calling melodies: "Beginning of the lesson" (do-do-fa-fa-do-do-fa-fa), "End of the lesson" (fa-fa-fa-fa-fa-fa-do), "Lunch"(do-do-fa-fa-fa-fa-fa).

2. "Belfry". Composition of bell ringing melodies based on major or minor triads. You can offer different options: sequentially up, sequentially down, with a return to any sound of the triad.

3. Composition of melodies for some quatrain. The tonality is preselected and the rhythm of the poem is determined.

4. Children are invited to come up with melodies for various images: animals, people, natural phenomena. In advance, the image, its character, features of development, and the appropriate genre are discussed with the student. In this case, various strokes, dynamics, tempo are used.

5. Composition of melodies based on a certain harmonic sequence. Here you can also start with rhythm. The child first invents and writes down the rhythm, and then adds pitch to it.

6. Playing a familiar theme over other sounds in the rhythm of the original. (For example, a theme from J.S. Bach's fugue).

7. Elements of jazz improvisation.

Creative forms of music-making are an important preparatory stage for introducing the student to the world of musical, spiritual culture in general.

The second level of the student's creative development is the upbringing of independent thinking. According to G.G. Neuhaus, it is necessary "to make the student unnecessary, that is, to instill in him independence of thinking, working methods, self-knowledge and the ability to achieve goals, which are called maturity".

Independent thinking is not only a factor in the intellectual development of students, but, as psychological and didactic studies have shown, one of the main prerequisites for mastering knowledge, skills and abilities.

Independent creative rethinking of music means a transition from passive reproductive actions to productive ones, from reproducing ones to creative ones. The creative musical thinking of students is manifested through the interpretation of music, through its active and individually original rethinking. In this, an important role is played by the intra-auditory artistic image - students' imagination-based representations arising from creative desire.

When working on a musical image, the teacher should not impose a generally accepted interpretation on the student, engaging in a joint search to reveal the content, helping, guiding and checking the correctness of the concept. In this case, the image is adjusted taking into account the individuality of the student.

For a deeper understanding of the artistic image, it is necessary to turn to the life emotional experience of the child. For example, when working on the play "In Separation" by A. Grechaninov, the student can remember his emotional state in a similar situation: separation from his mother, from his beloved dog. You can also use associations with similar artistic images in music, poetry, and painting in piano lessons.

At the lesson, where the analysis of the play by V. Rebikov "Autumn Leaves" takes place, you can play him "Autumn Song" by P.I. Tchaikovsky from "The Seasons", as well as recall A.S. In the work on the solemn and powerful image of Berkovich's Prelude, one can show the student Aivazovsky's painting "The Ninth Wave".

The creative desire of the child is an indispensable condition for the interaction between the teacher and students. In many ways, it depends on the personality of the teacher, his creative passion for the matter, the ability to interest and "ignite" the student with music, and also to maintain this "burning" throughout the entire educational process. In turn, the creative activity of students stimulates teachers to further professional growth and search.

By participating in various concerts and class events, the teacher can perform solo, in an ensemble with children and other teachers, and not only as an instrumentalist, but also as an author of his own compositions and much more.

The interest of some children in improvisation led me to compose improvised sound play pieces in the style of Peter Heilbut's musical games.

A certain place in my lessons is occupied by a playful form of presenting material and overcoming difficulties. When a student does not succeed in any play or episode in a play, then you can perform the entire play for him, leaving only one phrase of his choice. The student then gradually plays phrase by phrase until he has learned the whole piece.

The game "Echo" will help in mastering the dynamics. A word sounded in the fairy forest (a short musical remark of the teacher in a low register on *f* or *mf*) and a magic echo (the student repeats everything three times in different octaves - *mp*, *p*, *pp*). The echo can be repeated non-literally - the rhythm remains, the intonation varies.

The end result of working on a piece of music in the classroom is its concert performance. Academic concerts are a certain violence against the personality of the child, as they are of a formal nature of reporting and are often accompanied by strong excitement. Excitement and discomfort is caused by the irregular nature of concert performances (at least two concerts per month can be considered the best option), and also students, as a rule, play a work once. In order for performances to be a joy for children, and not a burden, so that excitement does not prevent them from expressing themselves artistically, but, on the contrary, helps, joint efforts must be directed to creating an interesting creative atmosphere.

At specialty lessons in children's music schools and children's art schools, it is simply necessary to use various forms of extracurricular work, such as a closed class evening, a class concert with an invitation to the public (parents, friends, graduates), an intra-class competition, an evening of music making, a musical lounge, this is very developing, enriching the horizons of students and is a stimulus for their creative success. All this can be organized by the type of collective creative work.

All participants in extracurricular activities, depending on their capabilities, take part in one way or another in concert numbers, choosing a theme, writing a script, decorating a hall, preparing a tea party. Children can participate in friendly discussions with each other, as well as be members of the jury.

Sometimes professional musicians are invited to such concerts, who set a certain standard, which is also an incentive to study and has an edu-

cational value for parents. It happens that such meetings are accompanied by conversations on various topics and joint tea drinking. Here, human and musical contacts arise, the relationship "family-school-professional art" is being established.

Currently, there is a whole palette of digital tools for the development of creativity (for example, the use of digital workstations for ensemble activities, the use of various programs on a PC (creating video clips, video accompaniments, as well as artistic and creative or research projects, and much more).

Thus, various forms of extracurricular work, taking place in an atmosphere of friendly goodwill and celebration, unite children and the teacher into a single friendly team, and also form good human qualities in students: responsibility for the entrusted, the desire to justify the trust of the teacher and comrades. "Make sure that each of your pupils is eager to show himself in front of the team from the best side," V.A. Sukhomlinsky advised teachers, "so that exciting feelings remain in his soul for a long time just from the fact that people think well of him".

The friendly and homely atmosphere of such events creates favorable conditions for creating a "success situation", helps to develop public speaking skills and gives each student the opportunity to express himself, regardless of ability, as opposed to competitions, exams and academic concerts, which divide children into the best and worst, which can negatively affect the moral development of children.

The pedagogy of cooperation focuses on the moral development of the child's personality. Working in this direction, the teacher himself must meet the requirements that he imposes on children. Everything that we want to see in students (in terms of human qualities), we must first of all educate in ourselves. The teacher reacts to any human manifestations in a certain way. But if, looking back, he remembers his act, tries to analyze the consequences of his actions, then this is already a movement towards self-change.

The application of the principles of pedagogy of cooperation in pedagogical work in the system of children's music schools and children's art schools influenced the reorientation to higher moral and aesthetic values than just mastering the skills and abilities of playing the piano instrument. A personality-oriented approach, a favorable psychological background, a style of communication based on trust in the student, the construction of a pedagogical process aimed at creating favorable conditions for the moral and aesthetic development of the individual, increased children's interest in the subject of piano and activated their creative abilities, which had a positive effect on overall quality of education.

Based on the experience of work based on the pedagogy of cooperation, we can conclude that the main thing in teaching a student in the system of additional education is the spiritual development of the child by means of art, and not the desire to achieve better results in mastering the instrument. Competition is needed, as it helps to achieve results in mastering the instrument, but it must be benevolent, positive and also obey the main goal - the achievement of a moral ideal.

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THE PROBLEM OF FREE WILL AS A CIVILIZATIONAL CROSSROADS BETWEEN EAST AND WEST

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Abstract. Modern interest in the problem of human free will is largely centered on artificial intellect and transhumanism concepts. However, within a physicalist framework, in contrast with medieval thought, this issue is not considered to belong to the area of metaphysics. The article describes historical features of Eastern and Western approaches to this problem. The complicated issue of the autonomy of will in coordination with Providence is discussed, which demands antinomic combination of divine omniscience and the optionality of human choice. It is noted that in Western European tradition an attempt to go beyond the classical logic framework was made by Molinists in the doctrine of Middle Knowledge. The problem of the will in Eastern patristics was thoroughly investigated by Maximus the Confessor, who affirms that free will, unlike freedom of choice, is not actuality, but a certain goal for a person.

Keywords: free will, predestination, logic, libertarianism, fatalism, Augustine, Maxim the Confessor.

Interest in the issue of human free will today is largely stimulated by the emergence of the concepts of artificial intelligence and transhumanism and the problems of regulating legal relations between a person and "smart" objects, considered as certain subjects endowed with certain rights. However, one of the features of the modern approach to the problem of free will is its physicalist nature, in contrast to the formulation of this problem in the previous religious and philosophical tradition, when the "metaphysics of will" was studied.

In the medieval West, the theme of free will was first considered in most detail by Aurelius Augustine, who set the direction for its development for almost a millennium. In the Christian world description, the complexity of the problem lies in the need to combine two antinomic provisions: 1) the

omniscience of God and 2) the possibility of a person making an alternative choice. If God foresees the choice that man will make in the future, then this choice becomes the only possible one. How is this compatible with the idea of free will, theologians wondered, without which it is wrong to place blame on a person and it is difficult to justify theodicy?

Augustine's views on this issue underwent an evolution that gave rise to two lines of resolving the antinomy of freedom and grace - voluntaristic and fatalistic. And although Augustine himself had no doubts¹ about the need for some kind of paradoxical synthesis of both approaches, further fluctuations in the views of his followers occurred within this corridor of possibilities, the only one allowed by classical logic.

The question of free will, being brought to the ontological horizon of the Divine, required an antinomic description of the properties of the non-classical world by means of classical logic. The participants in the Ecumenical Councils faced a similar problem when formulating dogmata describing the realities of the spiritual and divine worlds. And its solution, too, consisted in choosing the antinomic "middle way" between the two rejected "logically irreproachable" extremes.

The reception of such decisions was usually lengthy and rather difficult, but other than Aristotelian logic in the era of Augustine (as well as much later) did not yet exist. Before its appearance, at least one and a half millennia should have passed².

An attempt to overcome the antinomies was made in scholasticism. The method of bypassing them, often used here, consists in introducing various distinctions into the described entities. With the help of conjugated concepts that have arisen due to this operation, it is possible to eliminate formal-logical contradictions in statements, but this does not resolve the problem of antinomies in essence, but only transfers its complexity from the logical plane to the terminological and semantic one. One example of such a transfer is the time/eternity distinction³, used in the discussion of the problem of free will by Boethius, Anselm of Canterbury and Gregory of Rimini.

¹The question of volitional decision and God's grace is difficult to deal with: the defense of free decision seems to deny grace; when grace is affirmed, it seems that free decision is abolished" - Augustinus, *De gratia Christi et de peccato originali*. I, 47, 52.

²See: G.H. von Wright. *Logic and philosophy in the 20th century*. // *Voprosy filosofii* 1992, №8. P. 80-91.

³It is appropriate to quote the words of Blessed Augustine: "If no one asks me about it, I know what time is; if I wanted to explain to a questioner – no, I don't know." (St. Augustinus, *Confessiones*, XI, 14, 17.) The concept of eternity presents even greater difficulties, both in terms of its description and in terms of accessibility in human experience.

The first in the Western European tradition to go beyond the framework of classical logic was carried out by the Molinists. In their view, "a man was created by God as a "fuzzy Adam", that is, a network with a set of different possibilities (behavior scenarios), of which only one will be implemented, corresponding to the free choice of a person. As we know today, fuzzy logic is paraconsistent".⁴

The doctrine of L. Molina about "average knowledge" met with strong opposition in the Catholic Church, which even required the intervention of Pope Paul V to stop the acute phase of disputes. And although it was supported and developed by another outstanding representative of late scholasticism, the Jesuit theologian F. Suarez, but, in general, revealing the theme of free will in the theocentric worldview, the philosophical thought of the West faced a problem that never received a final solution.

As B. Lourie notes, "in modern Western culture, where an aversion to thinking in contradictions is instilled, and freedom is associated exclusively with freedom of choice, a constructive answer is not given to this".⁵

The Orthodox East approached this issue differently. The theme of free will is most fully revealed here by Maximus the Confessor. At the center of his theology is the event of the Incarnation and Christ, who united in Himself the divine and human natures in their entirety with the free will inherent in each of them. Thus, the antinomy of divine knowledge and the freedom of human will received in the Christology of Maximus the actual resolution, which became paradigmatic for the approach that considers this problem in relation to an ordinary person.

According to Maximus, the human will, which was integral before the fall, then disintegrated, acquiring a gnomic component. *Γνώμη* is an exact correlate of the western *liberum arbitrium*. But "freedom and freedom of choice are not the same thing"⁶. Freedom in the true sense of the word implies not so much the ability to make a choice as the power to actualize what is chosen, which, in essence, means the acquisition of divine qualities by a person.

The idea of deification was central to the religious life of the Christian East. It becomes possible thanks to the Incarnation and is described by the principle of Gregory of Nazianzus - "what is not perceived is not healed" or, in other words, what is not perceived in the Incarnation is not deified.

⁴Lourie B. Maximus the Confessor and his Chinese logic. Pondering on new published works by G.I. Benevich with coauthors // Volshebnaya Gora 17 (2016) P. 477.

⁵Basil Lourie. A Freedom beyond Conflict: The Logic of Internal Conflict and the Free Will in Maximus the Confessor // Scrinium 14 (2018) P. 68.

⁶Cit. by: Basil Lourie. A Freedom beyond Conflict. P. 70.

However, the application of this approach to the will requires taking into account the fact that Christ did not have a gnostic will, since his human nature, when united with the divine at the moment of the Incarnation, was restored to its original perfection.

A different situation develops for a person with a gnostic will. He has to use this will and freedom of choice he has in such a way as to give up his gnostic will in favor of the will of God. "He continues to perform acts that correspond to human nature, but at the same time, it is not his gnostic will that acts in him, but the will of God, combined with not gnostic, but natural human will".⁷

In the eschatological perspective, this natural activity of the saints is, as it were, deactivated also. In the state of the fullness of holiness, man voluntarily gives up his natural action, having "only God acting in himself"⁸. According to Maximus, "there will be a coincidence in the will of those who are being saved with each other and God who saves them, so that He will completely enter into everyone in general and into each individually, <...> as if in the members, gaining fullness"⁹.

However, the question is natural - if the human will no longer has the slightest divergence from the divine and *liberum arbitrium* is abolished, what remains of freedom in its usual sense? Why does sin deny our freedom, but deification does not?

The logical difference between the states of "slave to sin" and "servant of God" is that the former is characterized by the impossibility of choice, while the latter presupposes a choice from a single possibility. The logic of "choice without choice" is not quite trivial and is related to the singleton mathematical paradox.¹⁰ In formal terms, such a choice is something "third" between necessity and impossibility. "If there is no need for A, but A is chosen, then it means that there was a choice. <...> This is the characteristic of the free will of God and the deified: for them there is nothing neither necessary nor impossible, but at the same time everything is there".¹¹

Thus, according to the Eastern Christian view, the state of free will, in contrast to freedom of choice, is not a starting point for a person, but the

⁷Lourie B.M. History of Byzantine Philosophy. The formative period. - SPb., 2006. P. 402.

⁸Ambiguities to John (1076C) / Maximus the Confessor. "Ambiguities" in the works of Gregory of Nazianzus and Pseudo-Dionysius. — M., 2006. P. 64.

⁹St. Maximus the Confessor. To Marin, Most Reverend Presbyter / Anthology of Eastern Christian Theological Thought. Orthodoxy and heterodoxy: In 2 v. V. 2. - M.-SPb., 2009. P190.

¹⁰For details see: Lourie B. On a free will a bit more formally. [<https://hgr.livejournal.com/2177551.html>]; Lourie B. On a free will once again formally. [<https://hgr.livejournal.com/2178504.html>]

¹¹ibid.

goal of the path. It is achieved by using the existing freedom of choice to overcome individualistic self-will and transform the will split by the fall into an integral will, corresponding to God's plan for man.

Conclusion

The history of discussions of the problem of free will went in parallel with the formation of the civilizational mentality of the two parts of the Christian world, which was expressed, in particular, in the way freedom is understood and what place it occupies in their system of values.

The search for it in the Orthodox East was directed, in the words of the apostle, to "where the Spirit of the Lord is" (2 Cor. 3:17). But this path has a very unusual feature. "In order to become free, one must first of all 'bind' oneself. <...> You need to bind passions in yourself so that they do not prevail over you".¹²

Western priorities have leaned towards rationalism and freedom of choice of a person in his usual state. But in practice, these factors lead away from communion¹³, with God, therefore it is natural that "in the XVII century, a tendency arose, and in the XX century it flourished, the tendency to reduce the problem of free *will* to the problem of *free action*"¹⁴, and there was a gradual transition from the theistic worldview to deism, and then to atheism.

The further autonomization of man from the One whose image he is presupposes a new stage, where the question will be about the fate of humanism as such. And in this perspective, a person may face a very dramatic choice, about which Pavel Florensky warned a century ago: "either to abandon the last remnant of Christianity, "Christian morality," or to abandon the entire course of the previous anti-Christian culture"¹⁵.

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MODERN UPBRINGING AND EDUCATION IN THE NANAI NATIONAL VILLAGES (BASED ON FIELD RESEARCH MATERIALS)

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In the past, it was the family that acted as the main institution of socialization, with which a person felt a connection throughout his life. Traditional upbringing, the transfer of experience from generation to generation, one of the conditions for the stability of everyday life and the key to success in fishing and hunting.

In the family, the upbringing of children strictly corresponded to the sex and age of the child, where everyone knew their duties from early childhood. In the upbringing of boys, the main thing was the development of traditional crafts, for girls, housekeeping. A necessary condition for the adaptation of children was physical and labor training. Hence, such personality traits as physical endurance, courage, independence, attentiveness were developed. Along with labor activity, Nanai children mastered a variety of games and entertainment, which were one of the main means of physical and labor education. Through teaching children fishing activities, the game gave them the opportunity to live in the conditions of the taiga. When selecting outdoor games, competitions, the level of their physical fitness was taken into account.

The main provisions of fishing etiquette were also mastered in the process of one of the forms of traditional knowledge - oral folk art. The folklore texts "telungu" or "nimgan" emphasized the morality arising from the content of the narrative.

Since the Nanai culture was formed under the influence of such factors as social, political, economic, transforming over a long time. In Soviet times, regardless of the national characteristics of culture, as a result of the reforms, there were significant changes in everyday life, material production, family and marriage relations, aimed at introducing new symbols, rituals, changing the values of the Nanai people. Serious

transformations took place in the school, which affected the education system and educational work.

The actual problem, therefore, is the analysis of the current state and continuity in the system of traditional education, as an important element in the preservation of the traditional culture of the Nanai people.

Keywords: national education, Nanais, customs, education, culture.

In 2019, 2021, we conducted field studies in the national settlements of the village of Kondon (Solnechny district), the village of Belgo, the village of Upper Ekon (Komsomolsky district), Khabarovsk Krai. In order to identify the characteristic ethnic features in the upbringing of Nanai children, where interviews were conducted with educators, questioning of parents of kindergartens, surveys of schoolchildren, teachers. In total, 100 students, 8 teachers, 6 educators, 38 parents of preschoolers in 2019, and 58 students, 6 teachers, 2 educators, 18 parents in 2021 were interviewed from three villages.

From the birth of Nanai children, they strive to educate them comprehensively. Developing them physically, morally, psychologically, morally, in this way, today national education appears before us with the previous forms, which in the modern world are filled with new content by children, this is due to the modernization of society, with the influence of Russian culture, where adults offer children consumer products through advertising, cartoons, computer games, the Internet.

The problem of the effectiveness of the means of national education of the child during preschool childhood is one of the most urgent problems. The main reason, in our opinion, is the lack of a coordinated educational environment of the children's educational institution and the family.

An important aspect in the implementation of modern ethno-cultural education is the kindergarten, which forms the general culture of people, and the main conclusions of the research on the formation of the foundations of the Nanai culture of children, already published by the author [1]. In the national village of Kondon in the kindergarten "Beryozka", 40 children are introduced to the national culture through artistic and aesthetic development under the program "Revival of National Traditions", which was introduced into all groups of the kindergarten. We paid attention to the fact that almost all elements in the kindergarten are connected with the Nanai culture. These are drawings on the walls, patterns on the windows, where each curl has a meaning, its own genetic origin [2, p.22]. Significance is attached to clothes on toys that children play with, patterns on children's furniture, inscriptions in groups.

Tatyana Valerievna Markova, a teacher of the Nanai language in kindergarten, said that teachers organize sports games once a week with elements of national sports and always in national costumes.

In the rural national settlement of Belgo and Upper Ekon, in the pre-school group, they study according to one work program "Siuken" (sunshine). The program is designed for 68 hours (i.e. 2 hours per week). Where, in a playful way, children form the initial skills and knowledge of their native language orally.

In the Belgovsky rural settlement in the kindergarten, 22 children, aged 5 to 7, attend the Nanai language group. With a repeated field study in 2021, additional classes appeared, which are held 2 times a week for 25 minutes. Eltun Marina Aleksandrovna, a teacher of the native language.

Children learn to trace according to a template, cut out Nanai patterns, select and know colors in their native language. For example, we observed how children are taught to count in the Nanai language in a playful way: Children circle their fingers with paints of different colors to get "5 fingers" drawings; children in the Nanai language count them and name each color with which they painted their fingers.

In the Upper Ekon kindergarten, 24 children get acquainted with the national culture through all kinds of activities: playing, learning, visual, musical, speech, dance, through creativity and the wonderful world of fairy tales.

According to our observations, in all three kindergartens, when reading Nanai fairy tales to children, they analyze every moment so that the child understands its meaning and learns moral lessons [3, p.255]. For children, masters from their villages are invited to a master class in arts and crafts. Children are shown how to dry and process fish skin. In the center of creativity, children regularly organize exhibitions of their works on a national theme. This is Akoan - a flat doll made of paper or fish skin, paper tuesas, applications with simple ornaments. The national exhibition provides a clear example for the perception of the elements of the Nanai culture.

In the gym, children are engaged in physical education with elements of Nanai games - pakachi, a ball game, ambakachi - a tiger game.

Celebrations in national costumes are held in the music hall. Children learn national dances, stage skits based on national fairy tales and learn songs.

A study in three villages showed that the use of national sports, outdoor, original games and some elements of the northern all-around in physical education lessons at school is a unique element of the traditional physical education of the Nanai people, rooted in history. To date, the all-Russian standard of education for the indigenous population has not

been developed, each region implements its own school curriculum. In national settlements, conditions are created for the development of the northern all-around, educating a hardy, hardened person. The process of modern physical education and training is considered as a single process of personality formation. According to Lyubov Afanasievna Khaitanin, a teacher of the II sports referee category in northern all-around, in the upper Ekoni, a significant problem is the development of modern models of sports equipment. Since the equipment and inventory for practicing the northern all-around is not sold in specialized stores, it is developed and manufactured by masters of traditional crafts.

During a conversation with the director of the school in the village of Belgo, Olga Ivanovna Kuzyurina, it turned out that there is another problem, due to the fact that the school has incomplete secondary education, and upon completion of the basic school, students go to study at secondary specialized educational institutions, in Komsomolsk-on-Amur, teenagers do not have the opportunity to create national sports teams in which they could continue to develop their skills.

Additional extracurricular activities in the villages are carried out by means of fine arts, music, and choreography. For example, amateur dance groups reflecting the legends and customs of the people.

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ON THE FORMATION OF AN ETHNIC MAP IN THE CENTRAL ASIAN REGION

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Abstract. Central Asia is a multinational region where five sovereign states are located: Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, and Turkmenistan. In each of the countries, in addition to the titular nation, representatives of many nationalities live. It is noted that representatives of many different ethnic groups lived and mixed in the region from time immemorial. It is emphasized that states with the definition of a titular nation in each of them appeared after the formation of new republics after the establishment of Soviet power. Attention is drawn to the fact that it was in 1920 that the "foundation" of today's territorial and interethnic conflicts was laid.

Keywords: Central Asia, ethnos, conflict, enclave, disputes.

Central Asia is more than just a link, more than a place of historical action, the consequences of which were felt far beyond its borders - both in Asia and in Europe. The Central Asian region is a meeting place of Christian, Islamic, Buddhist civilizations, the mutual influence of the Turkic-Mongolian, Indo-European, Finno-Ugric, Sino-Tibetan, which was reflected in the processes of ethnogenesis, the formation of the languages of many peoples of Eurasia" [5]. Many ethnic groups lived in the region, who, living on the Great Silk Road, constantly contacted each other. They conducted active trade, exchanged not only goods, but also got acquainted with the customs and traditions of each other. And, as a rule, regardless of the place of residence, they knew more than one language. Everything changed after the establishment of Soviet power.

As a result of the demarcation carried out by the Soviet authorities in 1924, the boundaries of the compact residence of certain peoples were determined and new state formations were created [1]. In those years when the borders of the new Soviet socialist republics were artificially estab-

lished, the Bolsheviks planted a "time bomb", which to this day is making itself felt with interethnic conflicts and border incidents on the territory of the Central Asian region. The aggravation of interethnic relations began to occur after the collapse of the Soviet Union.

Since ancient times, the territory of Central Asia has been a place where interactions of various ethnic groups took place, which belonged to different economic and cultural types: settled agricultural and pastoral (nomadic and semi-nomadic). With the advent of the Arabs in the region of Central Asia, profound changes took place, which turned out to be much deeper than previous foreign penetrations. After the Arab conquest, Maverannkhr (the interfluvium of the Amu-Darya and Syr-Darya) became part of the Arab Caliphate. With the advent of the Arabs, the establishment of a new religion, Islam, began here. As a result, the penetration of the Arabs and the emergence of a new religion marked the beginning of the formation of a new identity based on religious affiliation and faith. To the former economic division of the population into settled and nomads according to ethnic differences (Persians, Turks), another dividing line appeared: a Muslim and a pagan. The Samanid state was liberated from the Arab Caliphate and the formation of the Tajik people is taking place on its territory. There is also a consolidation of the Turkic-speaking groups of the population, which settle down and accept the norms of behavior, lifestyle, culture, and religion of the local population. In the 11th century, the state of the Karakhanids (840-1212) appeared, where Islam became the state religion. Integration processes receive a new impetus. In ethnic processes, the formation of a common Turkic ethnic group with tribal division took place. Later, the ethnonyms Uzbek, Kirghiz, Turkmen, Kazakh appear. The more or less established situation is diluted by the arrival, or rather, the invasion of the region by the troops of Genghis Khan. The Mongolian army was heterogeneous in ethnic composition. A significant number of the Turks were part of the Mongol army and over time, the Mongols themselves mixed with the Turks.

Over a long historical period, Turkic-speaking and Iranian-speaking peoples lived in the region and had close contact with each other. "... representatives of the Iranian-speaking peoples of Afghanistan constituted a permanent component of the population of East Turkestan, others (mostly merchants) lived here for more or less a long time..."[6].

Serious changes appeared in the development of interethnic relations in the region of Central Asia in the second half of the XIX century. And this is connected with the geopolitics of the "Great Game" when the territory of Central Asia is in the zone of interests of the British and Russian empires. After becoming part of Russia, a European population appeared here in

the person of the Russian colonial administration, officials, entrepreneurs, military men, workers, resettled peasants, and with them a new religion, Christianity. Most of the arrivals are ethnic Russians, but there are other peoples: Ukrainians, Tatars, Jews, etc.

Under these conditions, religious identity played a significant role. Residents of the Emirate of Bukhara (1756-1920), Kokand (1709-1876) and Khiva khanates (1512-1920), then the Turkestan Governor-General (1886-1917) considered themselves Muslims. Such identification was an important component of the self-awareness of the local population. However, as an identity, the place of origin was also recognized (this has been the case for a long time), as well as belonging to one or another ethnic group. And this situation was practically preserved in the region until the October Revolution.

During the period of the USSR, if problems of an interethnic nature arose, they were bypassed, hushed up by the authorities. And as a result, in the 80s there were conflicts on ethnic grounds in Kazakhstan, the Caucasus, and the Baltic states. The conflict in Isfara, the events in Fergana became the harbingers of the collapse of the USSR into national "apartments".

The aggravation of interethnic relations occurred during the crisis of Soviet society. The impetus was the course towards perestroika, taken at the plenum of the Central Committee of the CPSU in 1985, since it was perestroika that dealt a crushing blow to Soviet identity. Kazakhstan was called the "laboratory of friendship of peoples", while no attention was paid to the following key points: the formation of such a hierarchy, where ethnic inequality was manifested; such a system was formed in education, when recruitment was carried out according to ethnicity a) upon receipt of higher education b) holding leadership positions c) joining the ranks of the CPSU d) in presentation for awards, etc.

After the death of the Secretary General of the Central Committee of the CPSU L.I. Brezhnev, the central leadership from Moscow attempted to take control of all issues related to domestic politics, the driving factor was the campaign against corruption and nepotism.

After the collapse of the USSR, M.S. Gorbachev, touching upon issues related to the aggravation of interethnic relations and the emergence of open conflicts during the years of perestroika, noted that they (conflicts) were laid down by Stalin's national policy, that is, they were laid down several decades earlier before Gorbachev came to power. Speaking about the heavy legacy, Gorbachev said that "when national disputes and claims arose, Stalin considered them as a manifestation of anti-Sovietism..." [2].

Assistant to the President M.S. Gorbacheva A.S. Chernyaev, emphasized that his boss in national politics relied on "old methods" and underestimation of the consequences of unilateral support for certain lobbying ethnic groups [4].

Change of the first secretary of the Central Committee of the Communist Party of Kazakhstan D.A. Kunaev in December 1986, Gennady Kolbin was appointed in his place, which led to the performance of Kazakh youth. The speech was brutally suppressed by the forces of the MVD and the KGB of the USSR. Even before these events, in November 1986 D.A. Kunaev, agreeing to resign, asked who would take his place, to which Gorbachev replied that it would be decided without him. Thus, the beginning of the struggle against "Kazakh nationalism" was laid. The accusation of nationalism of an entire people who were loyal to the Soviet state, which caused a feeling of resentment and discontent among a significant part of the population of Kazakhstan. Thus, the performance of the youth of Kazakhstan in 1986 had the following consequence, as a result, the allied leadership abandoned the attempt to create the Virgin Land with its subsequent withdrawal from the Kazakh SSR.

In the XX century, inter-ethnic clashes in 1961 and 1990 were the most severe. According to the Ministry of Internal Affairs of the then Kirghiz SSR, during the clashes in 1990, the death toll was 305 people, 1371 people were injured. 573 houses were burned down. State institutions - 74 [3].

The south of Kyrgyzstan is highly susceptible to shocks. The confrontation between representatives of the communities of the Kyrgyz and Uzbeks in the southern part of the country was laid down in a long time, when the Russian Empire still existed and it began to develop this region. As you know, in the south of Kyrgyzstan, the Kyrgyz and Uzbeks live side by side, in the neighborhood, but each side considers itself a local, indigenous population, and the other a newcomer. As a rule, the Uzbek part of the population has been leading a sedentary lifestyle for centuries, being mainly engaged in trade and agriculture, is in no hurry to leave for the city and enter higher educational institutions, and does not show any zeal to go to public service. And the Kyrgyz part of the population of the cities of Osh and Jalal-Abad, most of whom are migrants from mountain villages (villages), tend to the city in order to get a higher education and then get a job in the public service. As a result, this leads to social and property division. On the one hand, the Uzbek part of the population, not always having a higher education, controls business and trade, shows a desire to live in their mahals (quarters), mainly in their well-equipped houses. And on the other hand, the Kyrgyz part of the population occupies administrative

posts, they, as a rule, are represented at almost all levels, from the heads of the village council to law enforcement agencies and above.

But, despite their administrative positions where they had a clear advantage, but still this did not affect their financial condition, that is, they had lower incomes than the Uzbeks.

Thus, the existing property stratification has become one of the key irritants. Among the countries of Central Asia, the situation between Uzbekistan, Kyrgyzstan and Tajikistan remains the most difficult. This situation is connected, first of all, with ethnic striping, lack of land resources, and even more water resources in an arid climate, which periodically leads to interethnic conflicts.

As you know, the Fergana Valley is called the "powder keg" of Central Asia. This part of the region is distinguished from others by a high population density, a high level of Islamization, a large number of issues and problems of a domestic and socio-economic nature. And this is where the borders of the three countries meet. In the Ferghana Valley are the Fergana, Namangan, Andijan regions of Uzbekistan, the Osh region of Kyrgyzstan, and the Sogli region of Tajikistan.

The problem of non-coincidence of state borders with the residence of ethnic groups (titular nationalities) was laid down as early as 1924-1925, when the process of national-state delimitation took place. As a result, large communities of other titular ethnic groups of Central Asia live in all three states.

* Tajiks, Kazakhs, Kirghiz, Turkmens in Uzbekistan;

* There is a large diaspora of Uzbeks in Tajikistan, Kyrgyzstan, Turkmenistan.

Thus, in Uzbekistan, the largest diaspora is Tajiks, while in other republics, the largest diaspora is Uzbeks.

During the demarcation in the 20-s of the XX century, such an important factor as the specifics of farming, was not taken into account. Nomads at one time of the year lived in one place, and then, for example, with the onset of winter in another. And they were simply, without looking, attached to the settled population. For these reasons, a number of regions with a Kyrgyz population ended up as part of Uzbekistan.

The distribution of land took into account the agricultural population and this was the decisive principle of allocating land, and the interests of the peoples leading a nomadic lifestyle were ignored and this eventually led to such a demarcation, which still responds to conflicts.

Another reason is cotton growing. The Soviet Union, in order to overcome dependence on other supplier countries, emphasized the cultivation

of this particular industrial crop.

The epicenter of the conflict remains the Fergana Valley, which has a high level of population density, the predominant ethnic group in the valley being the Uzbeks.

Thus, the origins of the complexities of interethnic relations were laid during the construction of the Soviet state, when instead of the "state of nations" it was supposed to create nation-states, which laid the foundation for future conflicts.

The last years of the existence of the Soviet Union (1985-1991) were characterized by increased inter-ethnic tension in society, and already in those years, here and there, conflicts broke out between representatives of different nationalities in one or another republic. The aggravation of relations between representatives of different nationalities was associated primarily with the growing claims of national elites for control over their republics. But, despite this, all the republics, with the exception of the Baltic states and Transcaucasia, were ready to coexist in a single state. However, the USSR was dissolved in December 1991 and all the former republics of the USSR faced a new geopolitical reality.

On the streets of Bukhara and Samarkand, Tajik was heard more than Uzbek. It should be noted that here, too, there is a difficulty, and this is due to the fact that previously the inhabitants of the region, as a rule, spoke three languages, regardless of nationality. Arabic is the language of prayer, Persian (Tajik) - literary and colloquial - Turkic.

And besides, until now, talk about who should own such beautiful cities as Bukhara and Samarkand remains a subject that excites many. The aggravation of this issue occurred after the end of the civil war in Tajikistan in 1992-1997 and turned this dispute into one of the difficult problems of Uzbek-Tajik relations.

Kyrgyzstan considers the most vulnerable territories in the southern part of the republic, where Uzbeks live compactly (about 28% of the population) and where the border between Kyrgyzstan and Uzbekistan passes. Note that the indicator of the specific weight of the growth of the Uzbek population is higher than that of the Kyrgyz. Based on this, the authorities of Kyrgyzstan constantly have a threat, or rather fears about the territorial integrity of the country. The factor of the presence of a large Uzbek diaspora is especially evident at the moments of the revolution in Kyrgyzstan, when there is a seizure of power either by representatives of the "South" or the "North". As is known, Kyrgyzstan is geographically divided into north and south, and these two parts are separated by mountain ranges, and only one road has become connecting both parts.

The economic difficulties of the region have worsened. The most active and industrious part of the youth left for neighboring Kazakhstan and Russia.

Local authorities were forced to pay more attention to the young Uzbeks who wanted revenge, they were oppressed by a sense of national resentment. Under these conditions, it was important to work on post-conflict settlement and take steps to establish interethnic dialogue. When the authorities were inactive, people's guards were organized from among the civilian population. These squads were created from among representatives of different nationalities, that is, they had an international character.

So, over the course of millennia, the ethnic map of Central Asia took shape and the process of formation at each stage had its own characteristics. Conflicts have a negative impact on the lives of people living in the region, and on this basis, it is necessary to closely study the causes of a particular conflict. Taking into account the fact that conflicts are in a latent form in many places, it is important to preempt them, and for this it is necessary to apply active preventive measures to relieve tension in order to avoid an open inter-ethnic conflict.

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ON THE ISSUE OF FORMING THE STATE BORDERS OF THE COUNTRIES OF CENTRAL ASIA

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Abstract. The article is devoted to the process of folding state borders in the Central Asian region (CAR). It is emphasized that the foundations of today's borders were laid in the early years of the formation of Soviet power and the formation of the USSR. It is noted that the demarcation took place without taking into account the historical heritage of the peoples living in the region, that is, the indicators of the number of settlements of various ethnic groups, the density of their residence were ignored. Attention is focused on the fact that such an approach was one of the key factors that, after the collapse of the Soviet Union, led to the aggravation of border disputed territories and the emergence of conflict zones in Central Asia (CA), which cannot but cause concern in CAR, as it could threaten stability in this region.

Keywords: Central Asia, states, ethnic groups, territory.

Central Asia is a multinational region where five sovereign states are located: Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, and Turkmenistan. In each of the countries, in addition to the titular nation, representatives of many nationalities live "...when studying the Central Asian region (CAR), it is necessary to take into account not only the new geopolitical situation and the conditions of the transition period, but also the role of historical heritage, the features and nature of the civilizational development of the peoples of the region" [5].

Since ancient times, the territory of Central Asia has been a place where interactions of various ethnic groups took place, which belonged to different economic and cultural types: settled agricultural and pastoral (nomadic and semi-nomadic) farms. "The development of the territorial boundaries of future peoples and states was not originally associated with the settlement of a single ethnic group" [5]. The arrival of the Arabs in the 7th century took a long time, and its consequences turned out to be much

deeper than previous foreign penetrations. After the conquest of Maverannkhr (the interfluvium between the Amur Darya and the Syr Darya) became part of the Arab Caliphate. With the advent of the Arabs, the establishment of a new religion, Islam, began here. As a result, the penetration of the Arabs and the emergence of a new religion marked the beginning of the formation of a new identity based on religious affiliation and faith. As a result, a new dividing line was superimposed on the former economic division of the population into settled and nomads according to ethnic differences (Persians, Turks): Muslim and pagan[3]. The Samanid state (875-999) was freed from the Arab Caliphate and a centralized state is being formed on its territory. There is also a process of consolidation of the Turkic-speaking groups of the population, which settle down and accept the norms of behavior, lifestyle, culture, as well as the religion of the local population. The state of the Karakhanids appears (942-1212) where in 960 Islam becomes the state religion. Integration processes receive a new impetus. In ethnic processes, the formation of a common Turkic ethnic group with tribal division took place. Later, the ethnonyms Uzbek, Kirghiz, Turkmen, Kazakh appear. The more or less established situation is diluted by the arrival, or rather, the invasion of the region by the troops of Genghis Khan. The Mongolian army was heterogeneous in ethnic composition. A significant number of Turks were part of the Mongol army and the Mongols themselves mixed with the Turks.

Serious and significant changes appeared in the development of inter-ethnic relations in the region of Central Asia in the second half of the XIX century. And this is connected with the geopolitics of the "Great Game", when the territory of Central Asia is in the zone of interests of two strong empires: the British and the Russian, which are actively competing for influence on this region. After the entry of the states of Central Asia into the Russian Empire, the situation changes radically. Representatives of the European population appear here in the person of the Russian colonial administration, officials, entrepreneurs, the military, workers, resettled peasants, and with them the new religion in CA, Christianity. Most of the arrivals are ethnic Russians, but there are other peoples: Ukrainians, Tatars, Jews, etc. Under these conditions, religious identity played a significant role. Residents of the Bukhara emirate, the Kokand and Khiva khanates, and then the Turkestan governor-general considered themselves Muslims. Such identification was an important component of the self-awareness of the local population. However, it is worth noting that, as an identity, the place of origin was recognized, as well as belonging to a particular ethnic group. And this situation practically remained until the October Revolution.

According to the "Declaration of the Rights of the Peoples of Russia" - a document adopted by the Council of People's Commissars of the RSFSR on November 2 (15), 1917, the main principles of national policy were proclaimed: equality, sovereignty, the right to self-determination up to secession, the abolition of national-religious privileges and restrictions. Given that most of the modern part of CA was part of the Russian Empire and the RSFSR, which became the successor to the USSR, this document played a significant role in determining the future of the CAR peoples after the collapse of the Soviet Union. The differences between the tsarist and Soviet resettlement course consisted in the fact that the tsarist government sought to solve the agrarian problem of the European part of the country through resettlement, while the Soviets tried to eliminate inequality in land use, eliminate economic, legal and other forms of inequality[4].

As a result of the demarcation carried out by the Soviet authorities in 1924 (still corrected in 1936), the boundaries of the compact residence of certain peoples were determined and new state formations were created[1]. It was precisely when the artificial demarcation of the new Soviet socialist republics took place that the Bolsheviks planted a "time bomb", which to this day is making itself felt with interethnic conflicts and border incidents on the territory of the Central Asian region. The aggravation of interethnic relations began to occur after the collapse of the Soviet Union. In territorial terms, the issues of demarcation turned out to be not simple, especially in the south of the Ferghana Valley, where there are disputed areas between Tajikistan, Kyrgyzstan and Uzbekistan. Disputes over delimitation and demarcation of borders often lead to armed conflicts in border areas. When defining the boundaries, the specifics of the way of life were not taken into account, for example, nomads, being the majority in a particular area, became a minority among the settled population, for example, territories inhabited by the Kyrgyz became part of Uzbekistan, forming an ethnic enclave. As a result, this led to the fact that border territorial claims became acute and the issue of borders became one of the most acute issues at the interstate level.

Among the difficult sections of the CA, the Ferghana Valley stands out, which has become the epicenter of the conflict, where the Sughd region (Tajikistan), Osh, Jalal-Abad, Batkent regions (Kyrgyzstan), Fergana, Namangan, Andijan (Uzbekistan) are located.

The most complex processes are taking place on the border with Kyrgyzstan, where there are two disputed points, one point in Uzbekistan and three in Tajikistan, and in total there are eight enclaves in the Ferghana Valley. Often, conflicts arise due to various reasons, including the lack of

water, pastures, agricultural land, and tightening of border crossing rules. There are more than 70 disputed areas on the border between Tajikistan and Kyrgyzstan. The most difficult two Tajik enclaves are Vorukh, Western Kalach-Isfra region. Khujand region and on the territory of the Batkent region of Kyrgyzstan. Tajik-Uzbek relations are complicated by contradictions associated primarily with the actual stratification of ethnic Tajiks and Uzbeks, which does not correspond to the borders and geographical location of national states[2].

During the period of the USSR, if problems of an interethnic nature arose, then their authorities often bypassed them, we can say that the problem was simply hushed up. And as a result, in the 80s there were conflicts on ethnic grounds in Kazakhstan, the Caucasus, and the Baltic states. The conflict in Isfara, the events in Fergana became the harbingers of the collapse of the USSR into national "apartments"[4]. In the last years of the existence of the Soviet Union (1985-1991), inter-ethnic tensions in society were characterized by increased, and already in those years, here and there, conflicts broke out between representatives of different nationalities in one or another republic. The aggravation of relations between representatives of different nationalities was associated primarily with the growing claims of national elites for control over their republics. But despite this, all the republics, with the exception of the Baltic and Transcaucasia, were ready to coexist in a single state. However, the USSR was dissolved in December 1991 by the decision of the three presidents of Russia (B.N. Yeltsin), Ukraine (L.M. Kravchuk), Belarus (S.S. Shushkevich) in the Belarusian Belovezhskaya Pushcha and, as a result, all the former republics of the Soviet Union had to face a new geopolitical reality. "Central Asia found itself in the center of a huge transport system, crossing the largest continent in different directions, where not only material, but also spiritual values flocked from all the outskirts, which is an important factor for the development of any civilization. The territory of CA is recognized in the scientific world as a crossroads of epochs and civilization" [6]. Therefore, it is clear that even today the Central Asian region has been and remains in the sphere of interests of both the great powers and neighboring countries, and this is due not only to the geographical location and natural resources, but also to the influence of the region on geopolitics.

Thus, it can be stated that over the course of millennia a complex ethnic map of the Central Asian region has evolved, and in the process of formation at each stage, this process had its own unique features. Undoubtedly, the emergence of any conflicts negatively affect the lives of people living in the region, and on this basis, it is necessary to closely study the causes

of the emergence of this or that hot or smoldering conflict. Taking into account the fact that in many places conflicts are in a latent form, it is important to prevent them, and for this it is necessary to apply active preventive measures to relieve tension in order to avoid an open inter-ethnic conflict, which can be a threat to the existence of the integrity of any state and the security of the region as a whole. And in order to solve acute issues of this nature, it is necessary to pay attention to the study of the historical past, which can largely contribute to the fact that the key to solving existing problems can be found taking into account the experience of the historical past, the peculiarities of the process of folding state borders.

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KAZAKHSTAN TV AND RADIO COMPANY "KHABAR": THE MAIN STAGES OF FORMATION AND DEVELOPMENT

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Abstract. In the modern world, a special place in the formation of the worldview of the population of each country is given to the media. Kazakhstan was no exception, where after the declaration of sovereignty and the beginning of the construction of an independent state, television played an important role. Among the emerging TV channels, a special place is given to the state television and radio company "Khabar" JSC, which became the first conductor of the state policy of Kazakhstan.

Keywords: TV and radio company, programs, Khabar, Kazakhstan, broadcasting.

At present, the information field plays one of the key roles in shaping public opinion throughout the world, since information coming from one country can almost immediately become available to a user anywhere in the world. In addition, "... globalization has turned Eurocentrism into an ideological justification for the legitimacy of the West's claims to a leading position in the world, the implementation of humanitarian expansion and the forcible change of the "codes" of cultures" of other nations, which, according to the ideologists of globalization, still live "out of history"[11]. Given these circumstances, the importance of the media is quite obvious. Let us turn to the development of television in Kazakhstan. Kazakh television took its start in early March 1958, when the first test transmission took place in the capital's Alma-Ata television studio (TV) - now it is the TV and Radio Company "Kazakhstan". Following the capital, own TV appeared in other large cities of the republic, in particular, in Ust-Kamenogorsk, Karaganda, in 1959 - in Dzhezkazgan, in 1960 - in Petropavlovsk, Tselinograd, Uralsk. In the city of Kostanay, television timekeeping began only after the collapse of the USSR in 1991 [5]. The requirements for television workers were high at the earliest stages; only highly qualified professionals could get on the screen. And this is confirmed by the words of the star of the

Soviet radio and television, Yuri Levitan, who noted: "The best announcer group in the Soviet Union - is from Alma-Ata". Speaking about those times, it is worth noting that during the years of the Soviet Union there was no announcer who would not dream of announcing the flight of Yuri Gagarin into space. On Kazakh television, such an honor fell to the first republican announcers - Nelli Omarova and Zulkhiya Zhumatova.

Already in the years of independence, on May 16, 1995, when the first client was connected to the "Alma-TV" television broadcasting system, it can be considered the beginning of the era of commercial television in the Republic of Kazakhstan. Simultaneously with independent Kazakhstan, the "Khabar" news agency appeared, which means "news" in Kazakh, which meant that now it was necessary to build not only a new statehood, but also a new information space. Khabar Agency is a "television family" that includes four channels broadcasting in three languages, Kazakh, Russian and English: "Khabar", the national satellite TV channel "Qazaq TV", round-the-clock informational TV channel "Khabar 24" and the film channel "EL ARNA". The National Television News Agency "Khabar" is managed by the Board of Directors (7 members, 3 of which are independent). The executive body is the Board. Average daily broadcasting: "Khabar" - 20 hours, "Qazaq TV" - 24 hours, "Khabar 24" - 24 hours satellite broadcasting and 18 hours - analogue signal distribution [3]. To date, the coverage of the TV audience is more than 90%. The agency has a developed correspondent network in all regions of Kazakhstan, as well as in near and far abroad. Representative offices of "Khabar" are open in the USA, Russia, Belgium, South Korea, China, Germany and Uzbekistan. The channels' air grids are presented very widely, they include news, series, feature films, documentaries and programs that can satisfy the needs of the most demanding and mixed-age audience. At present, it is "Khabar" TV Channel in the modern media space of the Republic of Kazakhstan that is the conductor of political, socio-cultural values and traditions. It is part of the "Khabar" Agency JSC, broadcasts in Kazakh and Russian. It broadcasts news, entertainment and educational programs, talk shows, documentaries and feature films. During his 27 years of activity, he has won the right to be called one of the most reliable sources of state information policy. Starting from December 1, 2012, it broadcasts in the republic from the "Kazmedia Ortalygy" media center located in Nur-Sultan. Since 2016 Khabar has been an associate member of the European Broadcasting Union. In the early 2000s, such programs as "Khabar-news", "Business-Khabar", "Khabar-zher" and so on appeared, more than 43 new projects. The most intensive programs were released in 2001, among them entertaining, edu-

cational and informative talk shows, live broadcast programs in the interview format – "Woman's World", "Leader of the 21st Century" and others. In 1996, for the first time in the history of the development of Kazakhstani television, Khabar began work on the creation of the series Crossroads, a Kazakhstani soap opera. The series was broadcast for five years, 465 episodes were filmed and aired. The series told about the life of ordinary people in the stagnant period of the 90s of the XX century. Each TV season the channel offers new projects. This is the first eco-friendly reality show in Kazakhstan - Eco meken, as well as the most frank program about the role of the father in the family - "Ake Bakty". Acute and topical problems of Kazakhstani society - "Department of Journalistic Investigations". The first TV program on how to build your business in Kazakhstan. Judging by the ratings and audience reviews, the historical films "Bauyrzhan Momysuly" and the first Kazakhstani series about the nuclear test site in Semipalatinsk - "Polygon 2: Operation Sapphire" deserve to be included in the country's Golden Fund. Considerable audience interest was caused by the television series "Kelinzhan" among them, "and other interesting domestic series, which raise such exciting topics as building harmonious relations within the family, preserving traditions and customs, the responsibility of young people, raising children, patriotism, relationships between generations and other universal values".

From season to season, the evening news block is relevant and viewed. A large team of professionals is working on news production. Like any editorial office, the news department on the "Khabar" TV channel has a hierarchy among employees. There are such positions: news editor-in-chief, editor-in-chief, news service producer, coordinator, reporters, cameramen, video engineers, presenters. Most of the correspondents can safely be called universal journalists due to the fact that they keep up with the times, namely, they have the skills of mobile photo and video shooting, basic editing, and editing. In situations of workload and lack of correspondents, producers can change them and leave for urgent shooting. There are few journalists who specialize in a narrow profile. Most often, he should be able to do everything and be able to replace a colleague.

Note that exclusive topics are valued in the editorial office much higher than the general ones that are present on news feeds and are known to competitors. Being the first to know about something on a regular basis is the pinnacle of journalism. The ideal option is when a journalist, when searching for topics, does not focus on the news feed at all, but proceeds from his own picture of what is happening, which arose after receiving information from his own, again, exclusive sources [4].

The TV channel offers partnership to production companies in the production of television projects. Genres of interest: information and analytical, journalism, entertainment, reality shows, serials, etc.

The submitted materials should contain, first of all: a detailed concept of the proposed project (indicating the purpose and objectives of the project, genre, timing, target audience); extended script synopsis; portfolio information about the creative staff (program host, producer, director, screenwriter, editors); pilot project of television material; transmittal letter.

So, throughout the history of the creation of various television programs, the creative team of the "Khabar" TV channel has been making every effort and effort to obtain a successful result. One of the main goals of the employees of the television program department is to follow and take into account the changing information needs of the modern viewer, to create relevant and useful content.

The Investigative Journalism Department program is unique in the Kazakhstani media market. In one year since the beginning of its creation, the project has found its audience and delights viewers with new "documentaries" that raise socially important topics. The official website states, "the objective of the project - is a systematic study of existing problems, a complete analysis of the facts and their comparison. Such investigations should be a reason, among other things, for the initiation of criminal cases and the revision of existing laws"[7]. "The Department of Investigative Journalism occupies a special place of honor. The difference between a television documentary and a program was most accurately formulated by S. A. Muratov, explaining that, "unlike a broadcast, we expect from a film a deeper understanding of the phenomena being studied or an understanding of the characters depicted, not to mention the degree of artistic organization of the material itself - otherwise, it just doesn't justify the creative, film and time investment that goes into this piece of screen production. In addition, unlike a transmission, a film is a product of multiple use. Of course, any program can be repeated more than once, and sometimes an unsuccessful picture should not be shown at all, however, the film was initially structurally conceived with such a margin of social and aesthetic strength that allows us to count on its longevity in comparison with, say, current television news"[10]. The film crew of the "Department of Investigative Journalism" travels to different regions of Kazakhstan in search of high-profile stories that require close attention of both the entire population of the country and responsible government agencies. Thanks to the program, the fate of many citizens who have sought the truth for many years has changed for the better.

"Big Week" is a socio-political discussion talk show where hot topics

are discussed. Among them: "Mass vaccination", "Ensuring the safety of the population", "The state of roads in the republic", "Using pension funds for treatment", "Should pedophiles be punished more severely?", "Pros and cons of distance education", "Is it necessary to register bloggers as media?", "Anti-crisis support" and many other vital issues.

For the Kazakh viewer, the genre of talk shows, especially socio-political ones, is completely new and young. The concept of a talk show from English is a colloquial presentation. A classic talk show is a triangle: the presenter - invited interlocutors (experts) - the audience in the studio. The talk show combines the techniques of journalism and stage techniques. And each of the participants in the talk show, whatever his service function within the program, is at the same time a character with a role assigned to him by the authors of the talk show. Analyzing talk shows of the Kazakh format and comparing them with the West, it is worth noting the caution and inactivity of the invited guests. This is due to the fact that in the Kazakh mentality it is not customary to discuss conflicts and problems in public. In this regard, the talk show genre is only gaining momentum. Hosting any talk show requires:

- the presence of a topical or topical issue that sets the content of the conversation (questions and answers)

- talk show participants (hosts, talk show characters, viewers, experts)

- registration of the venue of the case (artistic and musical)

- rules of discussion (determining the time and methods of organizing communication, expressed in the existing scenario)

- necessary for the implementation of the talk show material and technical support[1]. The implementation of the Big Week media project meets all of the above requirements. "People's Control" is a fundamentally new project, focused primarily on the viewer: his needs, needs and opinions. At the same time, the presentation of materials meets the highest requirements of journalism - objectively, honestly, promptly. Any problem in the program is considered from all sides, taking into account the opinion of all participants. The special reportage is a kind of "little movie", the most difficult kind of reportage on television. [8] The specificity of this genre is manifested in its style - emotional, energetic. At the same time, the use of means and techniques of figurative reflection of reality in off-screen text is typical - a vivid epithet, comparison, metaphor, and some satirical means. "ECO MEKEN" - is the first eco-friendly reality show in Kazakhstan. A show in which the participants will have to demonstrate by their own example that all great things start small. The media project involves 16 applicants who, throughout the season, accumulate knowledge and invaluable practical experience in improving the ecological state of the country. The win-

ner of the reality show will get a unique opportunity to implement their own eco-project. [6]. EcoMecen is a relevant modern and timely media project that captures the attention of viewers and raises environmental issues. The founders of the media project in each issue urge Kazakhstanis to treat the environment carefully and wisely.

Thus, Kazakh television, which originated in the late 50s of the XX century as a republican broadcaster within the USSR, after Kazakhstan gained independence, entered a completely new stage in its development and is currently one of the most advanced television that meets the requirements of the modern viewer, and among its first channels, as before, there is TV "Khabar".

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THE EFFECTIVENESS OF THE TREATMENT OF BURN TOXEMIA IN ADULTS UNDER 40 YEARS OF AGE

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Abstract. In the first decade of burn toxemia with the skin surface area burns of 2-3A degree, $43.8 \pm 12.5\%$, 3B degree $13.1 \pm 6.4\%$, IF 101.3 ± 15.3 units in patients aged 26.8 ± 5.2 years on the first day, the mesor of the circadian rhythm corresponded to the norm of 36.7°C . In the following days, there was a tendency to increase the average daily rate to 37.4°C on the 10th day. Limitation of vasodilating, anti-inflammatory, analgesic therapy after the seventh day may have been one of the possible factors that caused an increase in the inflammatory response on days 9-10. A longer complex intensive anti-inflammatory therapy, neurovegetative protection with an expansion of the spectrum of antibacterial therapy against the background of inevitable secondary infection (in conditions of a secondary immunodeficiency state) of patients by the end of the first decade of burn toxemia is advisable.

Keywords: intensive care, burn toxemia in adults.

Relevance

One of the reasons for the decrease in CO during the period of burn toxemia is oligemia with a subsequent decrease in the value of venous return of blood to the right heart. However, it occurs even before a pronounced decrease in CBV, being in this case the result of primary weakening of the myocardium. During the period of toxemia, plasma loss stops, with normalization of CBV, hemoconcentration on the 3rd–5th day after injury is replaced by anemia, hematocrit decreases, and the volume of circulating plasma decreases [1–4]. With a large number of results of studies of burn shock, toxemia, septicotoxemia of burn disease, there is not enough information in the literature on the dynamics of complex intensive care in severe burns, which caused the study of the results of monitoring infusion therapy and etiopathogenetically substantiated drug correction.

Objective

To study and evaluate the adequacy of complex intensive therapy for burn toxemia in adults under 40 years of age.

Material and research methods

The data of monitoring of infusion, analgesic therapy, drug correction, replenishment of hypodysproteinemia, energy-deficient state in 8 patients with severe thermal burns admitted to the Republican Scientific Center for Emergency Medical Care at the age of 19 to 40 years with a duration of intensive care in the ICU up to 20 days. The severity of the burn was assessed by calculating the surface area of the damaged skin and using the Frank index. The severity of damage to the skin surface was assessed by the area of the burn 2-3A degree, 3B degree, IF (tab. 1). Daily monitoring of the volume of intravenous daily fluid administration, kilocalories (glucose), the frequency of administration of painkillers (including sedatives), anti-inflammatory, vasodilators, antibiotics, heparin, vasopressor (dopamine), vitamin C, the amount of injected cytoflavin in ml/day, amino acids in ml/days, proteins in ml/day. The studies were carried out with 100% physiological need provided by enteral administration throughout the entire period of the study of burn toxemia.

Results and discussion

Table 1.
Characteristics of patients under 40 years of age

Duration of treatment in the ICU, days	11.6±2.4
Number of days in hospital	47.9±24.4
2-3A degree burn area, %	43.8±12.5
3B degree burn area, %	13.1±6.4
IF, units	101.3±15.3
Gender, male in %	87%
Age, years	26.8±5.2
Height, cm	175±5.7
Weight, kg	68.3±3.9

The average duration of treatment in the ICU for patients aged 26.8±5.2 years was 11.6±2.4 days, the total duration of treatment in the hospital was 47.9±24.4 days. A thermal burn of the skin surface area of 43.8±12.5% 2-3A degree, 13.1±6.4% 3B degree, IF-101.3±15.3 units was diagnosed (tab. 1).

Dynamics of mesor of the circadian rhythm of body temperature in the period of toxemia

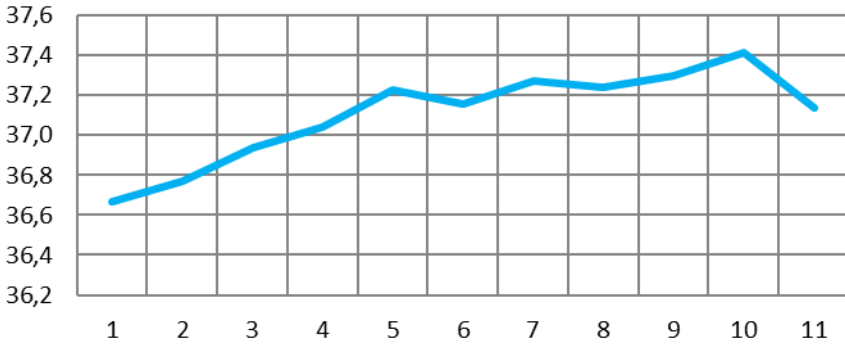


Figure 1. Dynamics of the mesor of the circadian rhythm of body temperature at the age of up to 40 years

In the first decade of burn toxemia with burns of the skin surface, the area of the burn was 2-3A degree, $43.8 \pm 12.5\%$, 3B degree $13.1 \pm 6.4\%$, IF 101.3 ± 15.3 units in patients aged 26.8 ± 5.2 years on the first day, the mesor of the circadian rhythm corresponded to the norm of 36.7°C . In the following days, there was a tendency to increase the average daily rate to 37.4°C on the 10th day (fig. 1). The progression of the systemic inflammatory response is confirmed by the tendency to increase the amplitude of diurnal fluctuations to a maximum value (0.5°C) on the 10th day (fig. 2).

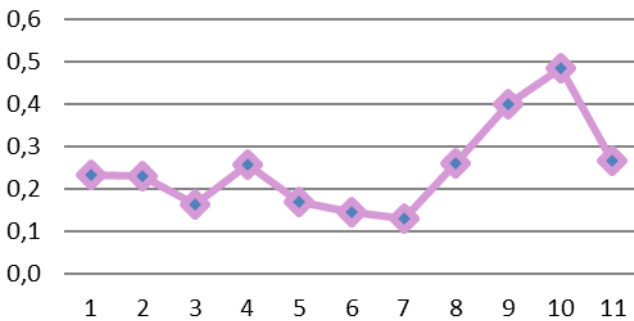


Figure 2. Change in the amplitude of daily fluctuations in body temperature up to 40 years in degrees C

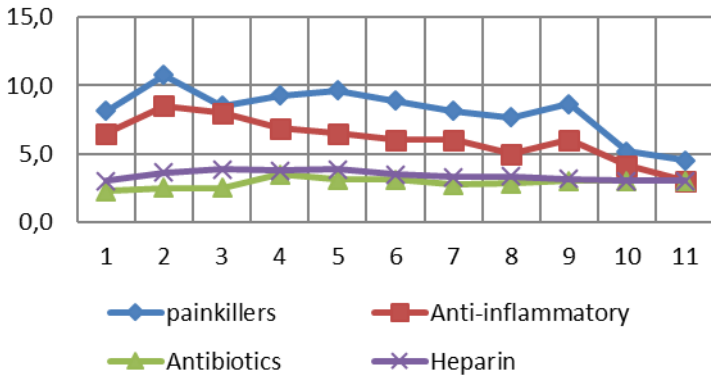


Figure 3. Drug therapy up to 40 years

As shown in fig. 3, the frequency of administration of antibacterial drugs, heparin was stable during the first 11 days of burn toxemia. Some discrepancy between the volume of anesthesia, the multiplicity of anti-inflammatory drugs, with a tendency to an increase in the systemic inflammatory response on days 7-10, draws attention.

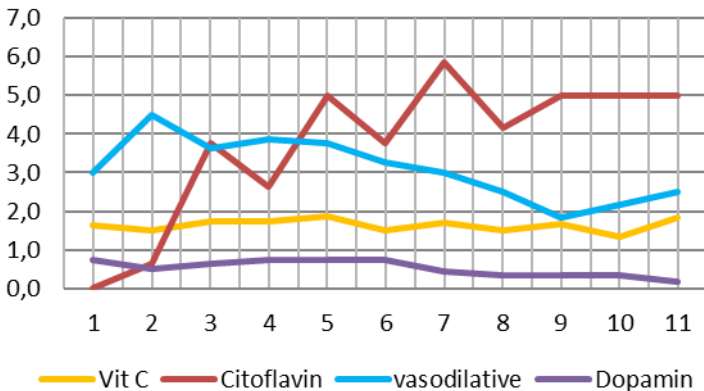


Figure 4. Metabolic and vasoactive therapy up to 40 years

In dynamics, there was a tendency to limit the introduction of vasodilators by the 9th day, a slight increase in cytoflavin to an average of 6 ml/day on the 7th day. Maintaining hemodynamics with dopamine and the frequency of vitamin C administration were unchanged (fig. 4).

Table 2.
Infusion therapy in group 1

Days	Intravenously	Kilocalories	Amino acids in ml	Proteins, ml	Number of types of solutions
1	3731.3±385.9	320.0±10.0	50.0±87.5	0.0	4.6±0.5
2	3725.0±615.0	390.0±70.0	243.8±182.8	201.4±173.5	5.9±1.4
3	3514.4±491.7	320.0±40.0	437.5±78.1	157.5±96.9	6.0±0.8
4	3292.5±481.9	350.0±62.5	493.8±131.3	288.8±138.8	6.4±0.7
5	3159.4±509.4	350.0±62.5	412.5±87.5	189.4±115.6	6.1±0.9
6	2713.8±537.8	295.0±101.3	318.8±176.6	140.6±116.9	5.3±1.0
7	2535.7±544.9	221.4±79.2	364.3±136.7	78.6±12.2	4.9±0.8
8	2465.8±400.8	273.3±75.6	441.7±77.8	16.7±7.8	5.0±0.7
9	2297.7±361.0	294.7±89.8	441.7±77.8	15.8±6.4	4.8±0.6
10	1948.3±675.0	273.3±113.3	250.0±166.7	40.0±6.7	4.2±0.9
11	2400.0±666.7	306.7±71.1	391.7±111.1	16.7±7.8	4.3±0.7

The volume of parenteral fluid administered varied from the maximum values at 1.2 days (3514.4±491.7 ml/day) with a gradual decrease to 10 days (1948.3±675.0 ml/day) (tab. 2).

Table 3.
Medical correction

Days	Anesthesia	Anti-Inflammatory	A/B	Heparin	Vitamin C	Cytoflavin	Vasodilator	Dopamine
1	8.1±1.4	6.5±1.5	2.3±0.4	3.0±0.5	1.6±0.6	0.0	3.0±1.0	0.8±0.2
2	10.8±1.3	8.5±1.1	2.5±0.8	3.6±0.5	1.5±0.9	0.6±0.1	4.5±1.6	0.5±0.2
3	8.5±1.8	8.0±1.5	2.5±0.9	3.9±0.2	1.8±0.8	3.8±1.6	3.6±0.8	0.6±0.5
4	9.3±2.4	6.9±1.6	3.5±0.6	3.8±0.4	1.8±0.6	2.6±1.7	3.9±0.9	0.8±0.4
5	9.6±2.4	6.5±2.1	3.1±1.1	3.9±0.4	1.9±0.9	5.0±1.3	3.8±1.1	0.8±0.6
6	8.9±2.4	6.0±1.8	3.1±1.1	3.5±0.5	1.5±0.8	3.8±1.7	3.3±1.3	0.8±0.4
7	8.1±2.8	6.0±2.9	2.7±1.2	3.3±0.8	1.7±0.5	5.9±1.4	3.0±1.4	0.4±0.1
8	7.7±2.6	5.0±2.3	2.8±0.8	3.3±0.9	1.5±1.2	4.2±1.2	2.5±1.0	0.3±0.1
9	8.7±2.2	6.0±1.7	3.0±1.0	3.2±1.1	1.7±1.1	5.0±1.0	1.8±1.2	0.3±0.1
10	5.2±2.2	4.2±2.2	3.0±0.7	3.0±1.3	1.3±1.0	5.0±1.0	2.2±1.2	0.3±0.1
11	4.5±3.5	3.0±2.7	3.0±1.0	3.0±1.0	1.8±1.2	5.0±1.0	2.5±1.5	0.2±0.1

The volume of intravenous infusion during the period of burn toxemia was of decisive importance in the first three days, with an increase causing the need for an adequate change in anti-inflammatory therapy (0.64) in 1 day, an increase in various types of parenteral solutions (0.84), heparin (0.71), protein preparations (0.82) on day 2, cytoflavin (0.84), protein preparations (0.65) on day 3.

Anesthesia. The day of admission to the clinic differed from the subsequent ones by a direct relationship between the frequency of pain relief and anti-inflammatory therapy (0.65) and with the introduction of a vasopressor (0.56), a direct relationship between pain relief and anti-inflammatory drugs reappeared on the 6th day (0.65). A direct correlation between the administration of painkillers (including sedatives) with the volume of intravenous infusion (0.73) and the number of types of solutions (0.72) characterize the advisability of correcting pain relief due to the peculiarities of infusion therapy. That is, with an increase in the volume and number of types of solutions, it becomes expedient to enhance neurovegetative protection on the 7th day of burn toxemia. On the 7th day there was a direct relationship between the frequency of pain relief and anti-inflammatory (0.92), pain relief and antibiotic therapy (0.78). On this day, the direct relationship of pain relief with heparin was (0.76), the need to increase the multiplicity of pain relief was directly related to the volume of administered amino acids (0.67), vasodilators (0.86). On the 8th day, there was a direct strong relationship between the multiplicity of anesthesia with the number of solutions (0.79), with anti-inflammatory (0.84), the amount of administered proteins (0.94). On the 9th day, a direct correlation was found between the frequency of pain relief with antibiotics (0.79), and the number of administered protein preparations (0.76). On the 10th day there was a direct correlation between the frequency of injection of painkillers with anti-inflammatory (0.89), with amino acids (0.88), and vasodilators (0.84). On the 11th day, against the background of a strong direct correlation between the frequency of analgesic therapy with anti-inflammatory (0.99) and vasodilators (0.94), a direct correlation appeared between the intensity of pain relief and the amount of injected cytoflavin (0.9), protein drugs (0.75), and dopamine (0.75).

Anti-inflammatory therapy. On day 1 of burn toxemia, a strong direct correlation was noted between the frequency of administration of anti-inflammatory drugs and dopamine (0.79), which again became significantly significant on day 11 (0.76). On the 2nd day, the appearance of a feedback trend of the introduction of anti-inflammatory and the number of types of solutions (-0.65) was noted. That is, a decrease in the types

of infusion media, there was a tendency to exacerbate the inflammatory reaction. On the 3rd day, at the height of the inflammatory response, there was a trend of inverse correlation between the frequency of administration of anti-inflammatory and heparin (-0.68), and vasodilators (0.76). Which, apparently, characterizes the situation when a decrease in anti-inflammatory therapy determines the feasibility of increasing the administration of anticoagulants and vasodilators. Perhaps the latter indicates the appearance of a risk of development of stage 1 DIC (hypercoagulable stage). On the 5th day, a significant trend of the inverse correlation between the frequency of administration of anti-inflammatory and vasodilators (-0.69) became significantly positive on the 6th day (0.79), which, apparently, was due to an exacerbation of coagulation on the 6th day due to the exacerbation of the mechanisms of inflammatory reaction peculiar to the 6th day of toxemia. Confirmation is the strengthening of the direct relationship between the amount of administered hypertonic glucose (0.72) and the amount of parenteral fluid administered (0.72) on the 6th day. On the 7th day, the trend of direct correlation of heparin with anti-inflammatory (0.66) and vasodilators (0.86) remained. On the 8th day, against the background of the continuing trend of direct correlation between anti-inflammatory and the amount of glucose administered (0.61), a direct significant correlation appeared between the introduction of protein media and anti-inflammatory therapy (0.91). On the 9th day, direct correlations of anti-inflammatory drugs with the amount of glucose (0.82), with the number of types of solutions (0.7), with the introduction of proteins (0.86) became stronger, a direct correlation appeared with the frequency of administration of AB (0.83). On the 10th day, the trend of correlation persisted between anti-inflammatory therapy and infusion of glucose (0.66), with amino acids (0.7), there was a tendency for a direct relationship between anti-inflammatory and vitamin C (0.61), and a direct relationship with the multiplicity of dilators (0.78). On day 11, a direct correlation between anti-inflammatory therapy and the administration of cytoflavin (0.9), vasodilators (0.92), cardiotoxic doses of dopamine (0.76), and the amount of proteins (0.76) became significantly significant.

Anticoagulant therapy. With a constant frequency of administration of the anticoagulant in dynamics, the change in correlations with other components of intensive care is excellent. On day 1, there was a tendency to a direct correlation between the frequency of administration of heparin and antibiotic therapy (0.67), and inversely with the frequency of administration of vitamin C (-0.82). On the 2nd day there was a direct relationship between the number of types of solutions and heparin (0.71). On the 4th

day there was a direct relationship between the frequency of administration of heparin and glucose (0.8). That is, it became expedient to increase anticoagulant therapy in order to improve capillary perfusion due to the tendency to increase the average daily temperature, the amplitude of daily fluctuations on the 4th day.

On the 5th day, a direct correlation appeared between the frequency of administration of heparin and AB in stable AB therapy (0.73).

On day 7 revealed a direct correlation between heparin and vitamin C (0.9) with a tendency to reduce the introduction of heparin and vitamin C (tab. 3). A direct strong correlation of heparin and glucose remained on the 8th day (0.84), but at the same time, the correlation of heparin and vitamin C (-0.9) changed in a mirror under conditions of persistently formed subfebrile condition (37.25 ° C) and the amplitude of diurnal fluctuations, indicating a trend towards an increase in the inflammatory response on days 8-9, 11.

Dopamine. On day 1, a direct strong correlation between anti-inflammatory therapy and maintenance of hemodynamics with a cardiotoxic dose of dopamine (0.79) was revealed, which was associated with volumetric infusion therapy during anti-shock measures against the background of an extreme stress response of the body to a burn injury. On day 2, a direct correlation between the administration of dopamine and vitamin C (0.75) is due to the need for a protective effect on vascular permeability, the overall protective effect of vitamin C and dopamine. In the following days of acute burn toxemia on the 6th day, a direct correlation between dopamine and glucose (0.72), as well as with the volume of intravenous infusion (0.7) became significantly significant. On the 7th day, a direct strong correlation was noted between the amount of cytoflavin administered and the frequency of dopamine administration (0.9), which can be explained by the negative dynamics in the general condition of the patient due to the exacerbation of signs of a systemic inflammatory reaction, as evidenced by the tendency to a hyperthermic reaction (fig. 1) to 7 days. On days 10-11, a strong direct correlation of dopamine with vitamin C (0.75), and cytoflavin (0.7), as well as on day 11, the appearance of a strong direct correlation of dopamine and the frequency of administration of painkillers (0.75), anti-inflammatory (0.76) are due to a significant exacerbation of the systemic inflammatory response, which is confirmed by the tendency to increase the average daily level of body temperature on day 10 (fig. 1). Apparently, the restriction of vasodilating, anti-inflammatory, analgesic therapy after the seventh day was one of the possible factors that caused an increase in the inflammatory response on days 9-10. In this regard, it

is logical to imagine it expedient to have a longer complex intensive therapy of an anti-inflammatory nature, neurovegetative protection, analgesic, possibly with an expansion of the spectrum of antibiotic therapy against the background of inevitable secondary infection (in conditions of a secondary immunodeficiency state) of patients by the end of the first decade (after 7 days) of burn toxemia.

Conclusion

In the first decade of burn toxemia with burns of the skin surface, the area of the 2-3A degree burn was $43.8 \pm 12.5\%$, 3B degree $13.1 \pm 6.4\%$, IF 101.3 ± 15.3 units in patients aged 26.8 ± 5.2 years on the first day, the mesor of the circadian rhythm corresponded to the norm of 36.7°C . In the following days, there was a tendency to increase the average daily rate to 37.4°C on the 10th day. Limitation of vasodilating, anti-inflammatory, analgesic therapy after the seventh day may have been one of the possible factors that caused an increase in the inflammatory response on days 9-10. A longer complex intensive anti-inflammatory therapy, neurovegetative protection with an expansion of the spectrum of antibacterial therapy against the background of inevitable secondary infection (in conditions of a secondary immunodeficiency state) of patients by the end of the first decade of burn toxemia is advisable.

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TREATMENT OF POSTTRAUMATIC ARTHRITIS OF THE TEMPOROMANDIBULAR JOINT USING A MODIFIED SPLINT

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Abstract. This article shows the research of 100 patients with posttraumatic arthritis of temporomandibular joint, who were divided into 2 groups: main group included 65 (65%) patients with posttraumatic arthritis of the TMJ, in whom a two-maxillary immobilization and rehabilitation splint was used and complex treatment, comparable group - 35 (35%) patients with posttraumatic arthritis of the TMJ in whom complex treatment of arthritis of the temporomandibular joint was performed without splinting and electrovibromassage. The aim of the study was to investigate the results of treatment of posttraumatic arthritis of the temporomandibular joint using a modified splint. Thus, our findings allow us to talk about the possibility of a significant increase in the effectiveness of treatment of posttraumatic arthritis, with the use of a modified immobilization and rehabilitation splint and electrovibration massage. Within 2 weeks of immobilization and subsequent rehabilitation with the use of electrovibromassage in posttraumatic arthritis exudate and blood in the joint cavity are completely dissolved, in this regard, the recovery of patients occurs.

Keywords: temporomandibular joint, trauma, modified splint

Disease of temporomandibular joint (TMJ) is one of the primary problems of modern dentistry. This is due to the frequency of occurrence of pathology of temporomandibular joint, and on the other hand - the complexity of diagnosis. Diagnostic issues of temporomandibular joint diseases, its structure and function in normal and pathological conditions have long attracted the attention of various specialists: dentists, otolaryngologists, surgeons, radiologists. However, the literature on these issues is extremely contradictory and demonstrates the absence of unified and

accurate views, on the anatomy and function of this joint, its normal variants and diseases. This can be explained primarily by the difficulties of clinical examination of the temporomandibular joint. The detected pathological symptoms are not always easy to interpret correctly, because many joint lesions of different origin and nature give a similar clinical picture. The manifestation is called Kosten's syndrome. It includes pain in the articular region, irradiating to the neck, ear, tongue, corresponding half of the head, restriction of movements, hearing disorders, hyperaesthesia of the skin in the articular region, flapping sounds when the mouth is opened [1,3,4].

For a precise diagnosis and pathological clinical examination in these cases, therapy alone is insufficient. Radiological examination has long been used to detect lesions of the temporomandibular joint. Radiographs help, in a number of cases, to detect morphological manifestations of existing pathological symptoms, to distinguish between diseases similar in clinical manifestations and articular lesions and extra-articular ones [6].

However, the topographic and anatomical features of the temporomandibular joint are such that it is impossible to obtain its image radiologically undistorted and devoid of tissue layering. Therefore, radiographs give an idea only of gross changes in the articulation (fractures of articular parts of bones with a large separation of fragments, massive bone adhesions in ankylosis, severe deformities of articular surfaces in inflammatory lesions, etc.). In case of initial or not sharply pronounced changes of the joint, radiological method of examination is useless, because the joint has a normal appearance on the radiographs. In these cases, the dentist must rely only on clinical examination data, which can lead to an incorrect diagnosis and therefore improper or even harmful treatment [4].

Modern radiographic techniques are not always helpful in assessing articular function, as well as joint shape and intra-articular relationships in various bite types. This deprives orthopedic dentists of a type of objective control over treatment and can sometimes lead to gross errors in determining prosthesis design [8].

The urgent need for perfect radiographic methods of the temporomandibular joint makes it necessary to turn to tomography, which provides an opportunity to alleviate or resolve the difficulties of radiological radiation of this joint [11].

Many authors have shown that the layer-by-layer radiological examination has undoubted advantages over all methods of radiography of the temporomandibular joint, without any shadow layering. Because of this, tomography can reveal a number of subtle changes inaccessible to volumetric radiography [2,5,7,12].

Inflammatory-dystrophic diseases such as arthritis and arthrosis have been extensively studied in general therapy, but methods of diagnosis and treatment of arthritis-arthrosis have not been widely used in dentistry. Thus, in the treatment of patients with posttraumatic arthritis arthrosis of the temporomandibular joints, the sequence of diagnostic procedures and the scope of treatment measures are still unclear. Hence, due to the low effectiveness of conservative treatment, after which the process becomes more severe, the development of chronic osteoarthritis continues in the temporomandibular joint. Together with this and the absence of the possibility to predict the results of treatment, the development of new highly effective methods of diagnosis and treatment of such TMJ disorders as posttraumatic arthritis remains relevant [9,10]. All of the above conditions necessitate further research.

The aim of the study was to investigate the results of treatment of posttraumatic arthritis of the temporomandibular joint using a modified splint.

Materials and methods of research

Our study of 100 patients with posttraumatic arthritis of the temporomandibular joint shows that when treating patients with temporomandibular joint disease, the minimum necessary procedures for making a diagnosis and treatment plan should be done in addition to clinical examination, imaging of the joint by computer or magnetic resonance tomography.

In semiotics, computed tomography in patients with traumatic TMJ injuries determines the degree of severity of internal disturbances of joint elements and the nature of dislocation of bone fragments. Magnetic resonance imaging determines the presence of lesions of soft tissue elements of the joint, signs of hemarthrosis, the nature of sanovitis in combination with damage to the integrity of the articular disc. Application of modern computer technologies as CT and MRI in combination with clinical methods of examination increases the efficiency of radial diagnostics at injuries and diseases of the temporomandibular joint, allowing to define precisely the presence of posttraumatic arthritis and make a plan of complex treatment. To treat patients with posttraumatic arthritis of the temporomandibular joint, we used complex methods of treatment, including orthopedic, physical therapy methods of treatment and drug therapy. Orthopedic methods of treatment are aimed at restoring the stable position of the mandible in the position of the central ratio, creating decompression of articular surfaces and the articular disc, and restoring adequate functional occlusion.

To compare the clinical effectiveness of the method of traditional treatment of posttraumatic arthritis of the temporomandibular joint, from the

method of complex treatment with the use of two jaw immobilization-rehabilitation dental splint, we conducted research - 100 patients with post-traumatic arthritis of the temporomandibular joint, who were divided into 2 comparison groups. All patients underwent radiological and MRI examination of the temporomandibular joint before and after treatment. The main group included 65 (65%) patients with posttraumatic arthritis of the TMJ, in whom a two-maxillary immobilization and rehabilitation splint (Patent KR №1448) was used [9] and complex treatment was prescribed in addition: melbec, diclofenac, electro-vibration massage in the joint area (Patent KR №134) [10]. Physiotherapeutic procedures - percutaneous electroneurostimulation. Myotension apparatus application is aimed at relief of pain syndrome of myogenic origin, optimization of functional interrelations in the musculature, which determines the movements of the lower jaw.

Comparable group - 35 (35%) patients with posttraumatic arthritis of the TMJ in whom complex treatment of arthritis of the temporomandibular joint was performed without splinting and electrovibromassage.

Results of the study and discussion

The results of the study showed that patients mostly seek medical care due to pain syndrome, so 99.5% of all patients examined with posttraumatic arthritis complained about pain in the joint area.

The leading symptoms accompanying posttraumatic arthritis are pain when opening the mouth in the area of the affected TMJ, limitation of mouth opening, difficulty in chewing food, and in some cases the presence of crunching when chewing. Patients with this diagnosis, depending on the side of the lesion, have soft tissue swelling, on palpation of which there is a sharp painfulness, and when making vertical movements of the lower jaw, the chin shifts toward the affected joint. Pain is also felt when palpating the masticatory muscles in the TMJ area.

Radiography does not reveal any abnormalities in the patient, if there was no mechanical impact, and the bone structures of the condyle are not fractured. In the presence of ligamentous apparatus ruptures, which cause hemorrhage in the articular area, an abnormal widening of the articular cleft is determined on the radiograph.

According to our data, pronounced clinical manifestations with severe pain syndrome are associated with soft tissue damage in the joint area. Thus, in patients with sanovitis, the most frequent painful sensations occur when opening the mouth (88.2%), and painful sensations in the TMJ area occur a little less frequently at rest (38.9%).



Figure 1. Temporomandibular joint arthritis

Clinical and laboratory studies in the short term showed that 60 (92.3%) patients in the main group had significant clinical improvement after imposition of the modified immobilization-rehabilitation splint and electrovibro-massage. Normalization of general well-being, reduction of edema as well as pain in the area of the temporomandibular joint were observed by the 2nd or 3rd day. This can be explained by the fact that after immobilization, when the joint is at rest and electrovibromassage is applied, edemas and intra-articular tension are quickly relieved, which helps reduce the period of restoration of function - movement of the lower jaw.

With the application of a two-jaw immobilization and rehabilitation splint for 14 days, the state of rest of the articular head of the lower jaw is obtained, with swelling reducing inside the capsule and dissolving the fluid in the joint area. After 14 days with the proposed splint, after removing the rubber rings, you can gradually put the functional load on the joints of the lower jaw. At the same time, the splint allows movement of the lower jaw only in the vertical direction.

In the compared group of patients with posttraumatic arthritis of the temporomandibular joint, where treatment did not include the splint application method and electrovibromassage, the tendency to normalization of the listed changes was noted only on day 5-6.

Long-term results of treatment of patients with posttraumatic arthritis of the temporomandibular joint - after the acute inflammatory phenomena in the temporomandibular joint had subsided and the complex treatment had been completed within 14 days, the main and compared groups of patients were discharged from the hospital and continued to be observed in the maxillofacial office of the outpatient diagnostic department of OIUCH. Evaluation of the long-term results of treatment in the main and compared groups was carried out after 1 and 3 months.

60 patients of the main group were examined after 1 month. 60 (92,3%) of them had free mouth opening in full volume, no pain in the joints was noted in earlier two-maxillary immobilization-rehabilitation splints. In 5 (7.6.2%), the opening of the mouth was slightly restricted, and there was no pain in the joints. The general condition was satisfactory. The bite was not disturbed. Sleep and appetite were also not violated. After complex treatment with the use of orthopedic methods, the number of manifestations of joint noises and the presence of clicking or crepitation when opening the mouth were not revealed.

In the compared group, 32 patients appeared for examination, 21(60%) patients complained of restricted opening of the mouth, 14(40%) patients had minor pain in the temporomandibular joint, 23(65.7%) patients had

clicking and crunching in the joint.

The next examination of the patients was carried out after 3 months, 84 patients (65 from the main group - 61 and 35 patients from the compared group - 23) came to the examination. In the main group, the patients had no special complaints, the movement of the lower jaw was complete and painless. Out of 2 (3%) patients who applied to the main group in the compared group, 9 (39.1%) patients still have restricted opening of the mouth, clicking and crunching in the joint, dull nagging pain in the temporomandibular joint area.

Thus, our findings allow us to talk about the possibility of a significant increase in the effectiveness of treatment of posttraumatic arthritis, with the use of a modified immobilization and rehabilitation splint and electrovibration massage. Within 2 weeks of immobilization and subsequent rehabilitation with the use of electrovibromassage in posttraumatic arthritis exudate and blood in the joint cavity are completely dissolved, in this regard, the recovery of patients occurs.

No exacerbation of arthritis and complications were observed in the main group of patients. When treated without the splint, posttraumatic arthritis develops into a chronic form with subsequent deformation of the articular head, which leads to the development of osteoarthritis of the temporomandibular joint.

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ON THE ISSUE OF ENSURING THE EFFECTIVENESS OF MEDICAL CARE FOR PATIENTS WITH NEUROSURGICAL PATHOLOGY

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Keywords: neurosurgical care, optimization, organizational measures

A special place in the system of medical and preventive care is occupied by the neurosurgical service, which is determined by a number of its features, among which are the high costs of financing this type of specialized care.

This circumstance becomes even more significant in conditions when the quality is controlled by a number of subjects of compulsory medical insurance interested in it, including the patient, the consumer society, insurance organizations, health authorities, professional medical associations, the licensing and accreditation commission, as well as the medical institution providing the service.

However, the issues of quality, its assessment and regulation for the neurosurgical service remain undeveloped. This determined the choice of the topic of this study.

Purpose and objectives of the study

The purpose of the study is to develop a set of evidence-based measures to improve the efficiency and quality of neurosurgical care.

Material and methods

The objects of the study in accordance with the stated goal were the neurosurgical service of Moscow, one of the largest cities in Russia, in combination with the morbidity and mortality of its population from neurosurgical pathology, the organization of the activities of neurosurgical departments, the problems of quality and efficiency of medical care for neuro-

surgical patients. Statistical processing of the material was carried out on the basis of working grouping tables using the standard Statistica software package.

Research results

The analysis of the development of the neurosurgical service showed that over the past decades it has been going along an intensive path, new departments and beds have been deployed in various cities of the country. In the process of such development, the material, technical and organizational base of the neurosurgical service was created on the basis of modern scientific and technical achievements. At present, the provision of the population of Russia with neurosurgical beds is gradually falling. However, an adjustment should be made to the fact that over the past 10 years, new technologies have been mastered in neurosurgery, which make it possible to significantly increase the effectiveness of treatment, which should be taken into account when planning. In addition, the economic difficulties experienced by the country are forcing more efficient use of available resources. This is evidenced by the data of a survey of neurosurgeons.

When conducting a survey of neurosurgeons in Moscow, it was revealed that 91.5% of the respondents were men. The highest proportion of neurosurgeons aged 31-45 years ($48.8 \pm 6.8\%$) among the surveyed, approximately equal share of age groups 46-55 years ($22.1 \pm 3.2\%$) and up to 30 years ($20.9 \pm \%$), while the proportion of people of retirement age is not large and amounts to 8.2%, which is most likely due to difficult working conditions.

Only $64.6 \pm 12.3\%$ of neurosurgeons have a qualification category ($38.5 \pm 6.5\%$ - the highest, $18.2 \pm 3.9\%$ - the first, $8.3 \pm 1.8\%$ - the second). Among those who do not have a category, young specialists make up only $35 \pm 8.9\%$. This indicates the insufficient attention of the administration of medical institutions to the issues of advanced training of neurosurgeons and is a factor that reduces the quality of medical care for neurosurgical patients.

The irrational use of the working time of highly qualified neurosurgeons should be considered a defect in organizational work. This defect can be eliminated by using the organizational and clinical model of the complex when organizing planned neurosurgical care: a neurological department with a diagnostic function, a neurosurgical department with an intensive care unit with the function of surgical treatment and early rehabilitation (before suture removal), a neurological department with the function of aftercare and rehabilitation. At the same time, a three-stage system of patient care should be introduced in the neurosurgical department.

The data obtained by us during the self-timing of neurosurgeons on the basis of the neurosurgical departments of Moscow, showed that it takes an average of 4.2 hours (252.0 ± 5.6 min) for a neurosurgical resident to work with medical documentation, which is almost two thirds of the working time (table 1), only about 1.5 hours the resident spends for visiting and examining patients. It takes 33.0 ± 2.8 minutes to work in the operating room, thus, a neurosurgeon performs an average of 0.26 operations per working day.

Table 1.
Distribution of the working time of the neurosurgeon on duty according to self-timing data (in minutes)

Work in progress	Time spent (min) \pm m	
Examination and consultation of patients	468.6	29.7
Preparation of medical documentation	215.7	29.7
Checking patients in the department and intensive care unit	98.6	7.1
Administrative checks	8.6	0.0
Reception and delivery of duty	22.9	2.7
Monitoring the work of nurses	15.7	2.7
Conferences, meetings	55.7	12.4
Operations, assistance	90.0	8.2
Bandagings	10.0	2.7
Carrying out diagnostic manipulations	27.1	1.7
Calls for consultants	34.3	1.6
Consultations in other departments	25.7	0.4
Interviews with patients and relatives	22.9	1.1
Telephone conversations	40.7	5.8
Rest	137.1	19.8

Although most of the working time of a neurosurgeon resident is spent rationally - on working with patients, dressings, diagnostic procedures, neurosurgeons note unproductive expenditure of working time (for searching and calling consultants). Neurosurgeons on duty take an average of 3.4 hours to complete medical documentation (about one-eighth of their working time). Examination and diagnostic manipulations for one incoming patient takes an average of 32.4 minutes (from 6 to 68 minutes).

In the process of duty, 0.92 operations are performed per 1 doctor. Doctors on duty and heads of departments did not note unproductive expenditures of working time.

Attention is drawn to the fact that the duration of the working day at the head of the department is approximately 1.5 hours longer than the established daily. At the same time, about half of the working time is spent on organizational work and the preparation of medical documentation, the rest of the time is spent on working with patients.

Thus, a significant proportion of the work of a neurosurgeon is carried out outside the operating room, which reduces the efficiency of using a qualified specialist.

Out-of-hospital care for patients with neurosurgical diseases is provided in the emergency departments of hospitals with neurosurgical departments, on selection committees and advisory appointments carried out by neurosurgeons of the hospital departments, a neuropathologist in a polyclinic; in addition to these traditional forms, such as a day hospital is also used. The study of the composition of patients who applied to a neuropathologist showed that 15.1% of patients with neurosurgical pathology at the appointment with a neuropathologist of the polyclinic, that is, the role of the outpatient clinic in the treatment of this category of patients cannot be underestimated.

The presence of a day hospital in a polyclinic and the organization of neurosurgical consultations at it is the exception rather than the rule. Traditionally, patients with neurosurgical pathology begin and end treatment with a polyclinic neurologist. We have studied the organization of the reception of a neurologist in a day hospital.

It was revealed that within a month 616 patients were seen by a neuropathologist, 15.1% of them (91 people) were patients with neurosurgical diseases. Initial visits were 57.2% (52 patients). Hospitalization in departments of various profiles (neurosurgical, neurological, rehabilitation) required 40.7% (37) of neurosurgical patients.

The distribution of patients with neurosurgical pathology by age is presented in table 2.

Table 2.
Distribution of patients with neurosurgical pathology who applied to a polyclinic neuropathologist, by sex and age (in absolute numbers and in % of the total)

Age (years)	male		female		Both sexes	
	abs.	%	abs.	%	abs.	%
15-19	1	1.1	3	3.3	4	4.4
20-29	7	7.7	2	2.2	9	9.9
30-39	5	5.5	13	14.3	18	19.8
40-49	11	12.1	9	9.9	20	22.0
50-59	6	6.6	10	11.0	16	17.6
60 and older	10	11.0	14	15.3	24	26.3
Total	40	44.0	51	56.0	91	100.0

Women predominated among the applicants. Attention is drawn to the large proportion of elderly people - over 60 years old, who accounted for 26.3% of all patients with neurosurgical pathology. This significantly distinguishes the appointment of a neuropathologist in a polyclinic and the appointment of a consultant neurosurgeon in a day hospital.

Among the patients who consulted a neuropathologist, patients with the consequences of trauma to the skull and brain prevailed, which accounted for more than a third ($34.1 \pm 8.7\%$) of all patients with neurosurgical pathology. Slightly less than a third were patients with herniated intervertebral discs ($30.7 \pm 5.6\%$). The third place is occupied by neurooncological pathology ($11.0 \pm 3.2\%$). Thus, patients with neurosurgical diseases occupy a significant share in the structure of the appointment of a neuropathologist in a polyclinic.

In the process of studying the work of the outpatient clinic unit on the basis of a neurological reception in the clinic, the following defects were revealed. 71.4% of neurosurgical patients (65 people) had already applied to other medical institutions before visiting a neuropathologist at a polyclinic, while 18.5% of them did not have any medical documentation about these appeals. More than a third - 35.8% (19 people) who applied to other medical institutions and were treated before visiting a neuropathologist in a polyclinic in the neurosurgical departments of the city, in the extract there were no recommendations for further management of the patient, as well as data on what was done to the patient in the hospital and the results of the survey. Thus, the principle of succession in the treatment of the patient was violated.

When interviewing neurosurgeons, it was found that, in general, the work of the outpatient department was assessed satisfactorily ($65\pm 6.7\%$ of respondents rated positively the work of the polyclinic, $69\pm 7.7\%$ - of the ambulance). However, the following significant shortcomings in the work of the polyclinic link were noted: poor contact between related specialists and neurosurgeons, poor work with related specialists through professional associations and societies, insufficient continuity, poor quality and lengthy examination of patients at the pre-hospital stage, a large workload for a doctor in a polyclinic, poor training of outpatient specialists in matters of neurosurgery, a lack of neurosurgical appointments in a polyclinic, and a lack of a standard for examining patients with suspected neurosurgical disease, which may result in late detection of a neurosurgical disease.

Neurosurgeons also pay attention to the late treatment of patients, their late hospitalization due to the low sanitary culture of the population, which indicates insufficient work in this area by district and family doctors.

As defects in the work of the ambulance, such as insufficient training of doctors and nursing staff in matters of neurosurgery, which can lead to gross diagnostic and tactical errors, poor transportation of patients, insufficient equipment of teams, lack of a full-fledged communication system due to poor funding, lack of personnel, lack of standardization of examination and treatment of emergency patients.

Conclusions

The system for ensuring the quality and efficiency of medical care for patients with neurosurgical pathology is built on the basis of the multilevel nature of its organizational structure with a rational distribution of functions between levels. The use and widespread introduction into practice of the system for regulating the quality of medical care for patients with neurosurgical pathology makes it possible to improve the quality and efficiency of medical care for this group of patients. Based on the research materials, the most promising directions for optimizing the system of organizing neurosurgical care in modern socio-economic conditions were proposed.

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SENSOR OF SURFACES CLEANLINESS DETECTION IN VACUUM

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Abstract. Measuring the surface cleanliness of vacuum equipment is an urgent task at this stage of the world development of nanotechnology. The International Union for Vacuum Science, Technique and Applications (IUVSTA) is looking now for ways to clean and evaluate the surface cleanliness of chambers in accelerators and equipment of nuclear systems. The developed sensor is able to solve this problem at many industrial facilities of the Russian Federation, in particular:

Joint Institute for Nuclear Research, Kurchatov Institute of Nuclear Physics, RFNC-VNIIEF, Sarov, Institute of Nuclear Physics. G.I. Budker SB RAS, Institute for Nuclear Research RAS, Institute of Reactor Materials, Research Institute of Physical Measurements, Penza, Institute of Spectroscopy RAS, Troitsk, VNIIFTRI, pos. Mendeleevo, Space Research Institute of the Russian Academy of Sciences.

Keywords: friction force, rest friction, high vacuum, ultrahigh vacuum, sorbate, monolayer, surface cleanliness

Introduction

The presented "Sensor of the purity of ultra-high vacuum (UHV) equipment of nuclear and space technology" for the first time allows you to control the number of layers of gas atoms sorbed on the inner surfaces of vacuum equipment, which are a source of deterioration of the working vacuum, hidden from vacuum measuring instruments and disrupting the operation of installations such as TOKAMAK, colliders, nuclear accelerators. The remotely controlled sensor created at Moscow State Technical University is capable of recording the state of UHV equipment surfaces in such processes as: deposition of thin films in vacuum, assembly of photoelectronic

devices in vacuum, manufacturing of semiconductor products and materials, manufacturing of micro- and nanorobots based on MEMS, manufacturing of molecular electronic devices based on based on graphene, micro and nanotechnological processes, atomic force microscopy, nuclear equipment (thermonuclear fusion, ITER, Tokamak).

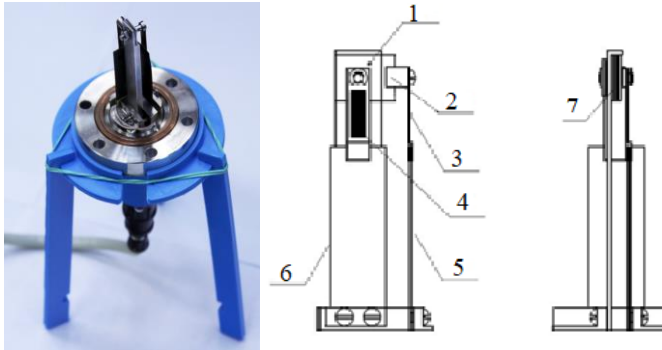


Figure 1. View and diagram of the mechanical part of the purity sensor. 1,- pressure plate, 2-retractable plate pull; 3,4 – force measurement strain gauges F_i ; 5,6 – bimorph drive plates, 7 – base fixed plate

The principle of operation of the sensor

The measuring unit of the sensor, which registers the forces (friction and pressing friction surfaces) is based on the use of strain gauges installed on the flexible elements of the plate drives located in the working area, fig. 1, which determine the force of breakaway (static friction) of the retractable plate of the F_T sensor. The signal received from the strain gauges from the measuring unit enters the information processing unit, where the **value of the cleanliness of the surface** of the plates is calculated according to the calibration curves of the parameters: 1-pressure force of the plate F_N , 2-pressure P , 3-temperature T 4- relative humidity RH , 5-stretching force of the retractable plate F_T .

The idea and design of the sensor shown in Fig. 1 are fixed by RF patents № 316744 C2 dated February 10, 2007, № 2617890 dated February 20, 2016 and three others. The sensor uses the relationship between the force (and coefficient) of friction and the forces of intermolecular interaction between molecules located on the contact surfaces and depending on the number of layers of atoms adsorbed on these surfaces.

The task of the authors was to isolate, when measuring the force of static friction, the component that depends only on the number of layers of molecules located on the surfaces and acting as "contamination", for which the sensor uses elements with smooth surfaces, where "mechanical" the component of the friction force from the shearing of microroughnesses is minimal, and the static friction force is measured at the moment of breaking off the surfaces of the samples. To measure the static friction force, we chose polished plates made of silicon or quartz single crystals, which provide the largest contact surface of the surfaces, as well as ensure the statistical significance of the influence of small sorbate thicknesses on the value of the measured force.

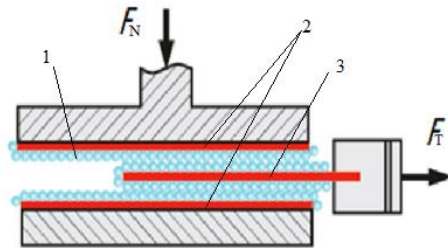


Figure 2. Scheme of operation of the purity sensor: 1 – sorbate, 2 – pressure plates 3 – pull-out plate, F_N – plate pressing force; F_T – pull-out force of sliding plate

Theoretical foundations for measuring the "cleanliness" of the surface

The sensor operation scheme (fig. 2) is simple - plate 3 is pressed between plates 2 with force F_N and the measured force F_T is pulled out. The main task is to obtain experimentally the force F_T , which is necessary for calculating the coverage coefficient. Developed at the Moscow State Technical University named after N.E. Bauman, the surface cleanliness measurement method is interpreted as a method for measuring the surface coverage factor with sorbate Θ , which is presented in the course of vacuum technology [1], as an indicator that depends on the degree of vacuum, temperature, and the size of the sorbate molecules.

- 1) So, **in the area of low and medium vacuum:**

$$\Theta = f(F_v AP(x) \mu V d_0) \quad (1)$$

F_v – viscous component of breakaway force, N; A – geom. contact area, m^2 ; $P(x)$ – contact probability; μ – sorbate dynamic viscosity coefficient, $kg \cdot s^{-1} \cdot m^{-1}$; V – sliding speed, $m \cdot s^{-1}$; d_0 – adsorbed molecule diameter, m

2) In the area of high vacuum ($1 < \Theta_{\Sigma} \leq 2$):

$$\Theta = F_{AV} E_L E_M A P(x) L_x \quad (2)$$

F_{AV} – adhesive-viscous component of the breaking force, N; E_L – specific heat of vaporization of sorbate, $J \cdot m^{-2}$; E_M – specific heat of fusion of sorbate, $J \cdot m^{-2}$; A – geometric contact area, m^2 ; $P(x)$ – contact probability; L_x – average step of microroughness, m.

3) In the field of ultrahigh vacuum ($\Theta_{\Sigma cr} < \Theta_{\Sigma} \leq 1$)

$$\Theta = f(F_{AN} E_A A P(x) L_x) \quad (3)$$

F_{AN} – normal component of the adhesive force of breaking away, N; E_A – specific bond energy "sorbate-solid body", $J \cdot m^2$; A – geometric contact area, m^2 ; $P(x)$ – contact probability; L_x – average step of microroughness, m

The physical model of the dependence of the static friction force measured by the sensor on the coverage coefficient Θ is based on the physics of the interaction of gas molecules with the surface. It is known [1] that the first and subsequent sorbate monolayers are associated with their base surface with an adhesion energy that decreases with increasing distance (the number of sorbate layers), according to the Lennard-Jones equation [2] (Fig. 3.)

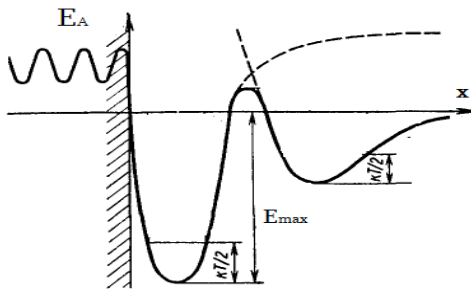


Figure 3. Energy of interaction of molecules (sorbate) with the surface of a solid

Comparison of the theoretically obtained diagram, fig. 3, obtained almost 300 years ago with the experimental diagram, fig. 4 [3] obtained by A.A. Gatsenko in the scientific group of departments MT-11 MSTU, convinces of the effectiveness of the theoretical foundations of this school.

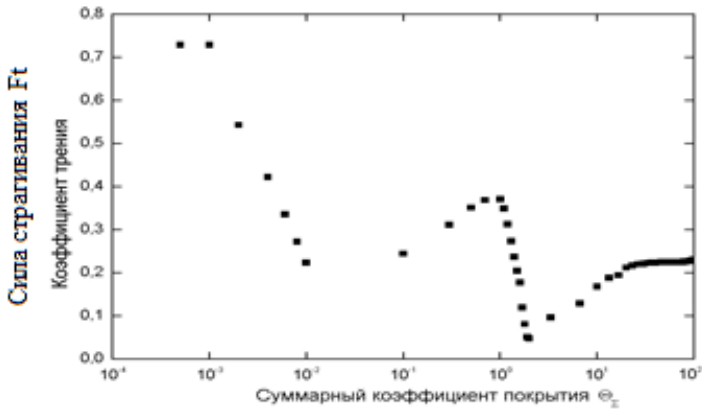


Figure 4. experimentally obtained [3] dependence of the coefficient of static friction (breaking force F_T) on the total coefficient of coverage of the contacting surfaces

When comparing the diagrams in Fig. 3 and 4, it should be taken into account that the (adsorption) energy E_A in Fig. 3 has a minimum value near the surface and changes with increasing distance from the surface. On Fig. 4, the same energy is presented by us as the breakaway force F_T , while it should be taken into account that the force F_T is measured in positive units, while the energy E_A in Fig. 3 in negative. For convincing comparison, the diagram in Fig. 3 can be represented in an inverted (mirror) image. This dependence, presented in Fig. 4, is used by us in the purity sensor as its calibration characteristic: "Coating coefficient Θ – parameter P" (vacuum).

Conclusion

At MSTU named after N.E. Bauman developed: 1 - a method and a sensor for measuring surface cleanliness in a vacuum. 2 – sensor layout that allows measuring the parameters of the working medium (vacuum), which determines the quality of technological processes in modern UHV equipment.

In the future, the authors plan to obtain all the calibration characteristics of the sensor and develop a project for its implementation.

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NUMERICAL SIMULATION OF A MESH DOME ROOF OF A TANK WITH A VOLUME OF 75,000 M³

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Abstract. Tank farms in Eastern Europe (Russia, Belarus) can be classified as aging, as more than 45% of the tanks have served their standard period of 20 years and need to be replaced. The article considers the issues of strength and stability of a mesh dome roof made of aluminum alloys for a vertical steel tank with a capacity of 75000 m³ in a linear and non-linear formulation of the problem. It has been established that the mesh domed roof of the tank with a diameter of 72 m has sufficient bearing capacity and can serve as an alternative to a floating roof.

Keywords: Vertical steel cylindrical tank, aluminum alloy mesh dome roof, strength and stability of mesh shells.

At present, vertical steel tanks with a diameter of up to 60.7 m with mesh domed roofs and pontoons made of aluminum alloys have found application for oil storage in Russia. The first domestic tanks with a diameter of 40 m with mesh domed roofs and pontoons made of aluminum alloys were built by CJSC "Neftemontazhdiagnostika" in 2001 at the "Starolekeevo" LPDS of "Transneft" JSC according to the project of TsNIIPSK [1]. It is known that with an increase in the unit capacity of the tank, the metal consumption of the tank per one m³ of the stored product decreases. In Belarus, at the beginning of the 2000s, vertical tanks with floating roofs with a capacity of 75,000 m³ were built on the "Friendship" main oil pipeline.

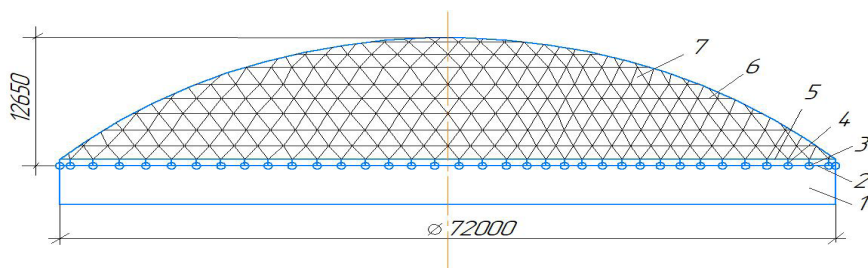
Earlier, the "Giprotruboprovod" Institute of "Transneft" JSC compared the cost of a dome roof and a pontoon made of aluminum alloys with a steel floating roof for the RVSPK 50000 tank. It has been established that a steel floating roof, taking into account the anti-corrosion coating, is more expensive than a domed roof and a pontoon made of aluminum alloys. Domestic experience (more than 20 years) in the design and construction of vertical steel tanks with aluminum domed roofs and pontoons has shown their high operational reliability.

The technique for the geometric construction of grid aluminum domed roofs was published in [2]. The technique for numerical simulation of an aluminum mesh dome roof for a vertical steel tank is presented in [3].

The aim of this work is to numerically study the design of a mesh aluminum dome roof and its load-bearing capacity for a vertical steel tank with a capacity of 75000 m³ and a diameter of 72 m.

Object scheme and initial data

Scheme of the aluminum dome roof of the tank (Figure 1) includes the upper chord of the tank wall (1); a steel support ring (2) designed to absorb loads from the domed roof; support assembly (3), consisting of a bracket with an axle. The load from the domed roof in the form of a bending moment in the support nodes is decomposed into vertical and horizontal components. Support posts (4) are made of aluminum box-section profile, and are designed to transfer loads from the tightening ring to the support nodes. The tightening ring (5) is made of an aluminum box-section profile, and is designed to partially absorb the forces in the dome frame rods. The supporting frame (6) of the domed roof is made of aluminum I-beams. The load-bearing beams are interconnected into knots by shaped aluminum plates with stainless steel bolts. Roof decking panels (7) are attached to the load-bearing beams with the help of slips.



1-section of the tank wall; 2-support ring; 3-support node; 4-support racks; 5-stretching ring; 6-rod frame; 7-panel roof decking

Figure. 1 Scheme of the domed roof of the RVS 75000

The initial data for the mesh dome roof of the tank were adopted in accordance with the terms of reference and Russian standards. General parameters are shown in table 1.

Table 1.
Mesh tank roof parameters

Name	Unit of measurement	Value
Tank diameter D	mm	72000
Roof radius $R_k = 0.8D$	mm	57600
Roof height, f	mm	12650
Thickness of roof sheets	mm	1.2
Reliability factor by purpose, γ_n	-	1.1
Coefficient of working conditions, γ_c	-	0.9
Normative snow load on the ground	kPa	1.4241
Normative value of wind load, w_0	kPa	0.23
Seismicity of the construction site	points	-
Ambient temperature range	°C	From -20 up to +20 °C

Geometric characteristics of sections of load-bearing beams. The supporting frame of the roof is formed by rod elements of two types of sections (figure 2). The geometrical characteristics of the sections are presented in Table 2. Beams with a square section were used for the manufacture of the tightening ring and support posts, all other connections were made of I-beams. The bearing beams are connected at the nodes by overlays made of AD31T1 alloy and M16 bolts made of stainless steel grade 14Kh17N2. Sheathing cards in the form of triangular elements are made of AMg3M alloy 1.2 mm thick and are fixed to the supporting beams with overlays and M8 self-tapping bolts made of 14Kh17N2 alloy.

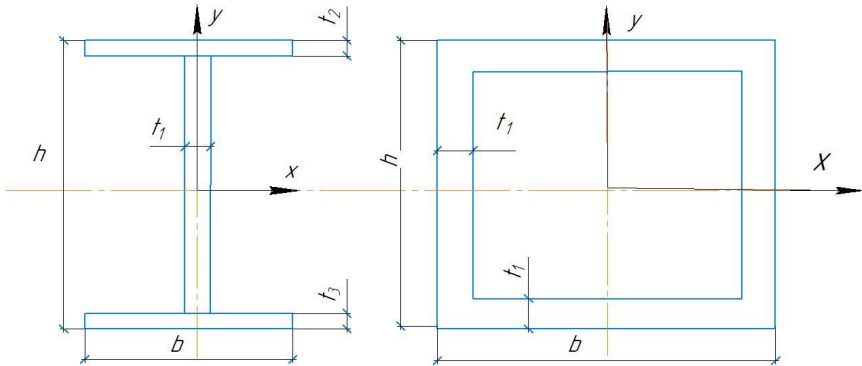


Figure 2. Sections of load-bearing beams

We accept: for an I-section $t_1 = 0.006$ m; $t_2 = t_3 = 0.0065$ m; for a square section $t_1 = 0.012$ m.

Table 2. Geometric characteristics of sections of load-bearing beams

Section type	Section height h, m	Section width b, m	Sectional area A, m ²	Moment of inertia, m ⁴		Modulus, m ³	
				J _x	J _y	W _x	W _y
I-beam	0.2	0.12	2.682* 10 ⁻³	1.788* 10 ⁻⁵	1.875* 10 ⁻⁶	1.788* 10 ⁻⁴	3.126* 10 ⁻⁵
Box	0.2	0.2	9.024* 10 ⁻³	5.337* 10 ⁻⁵	5.337* 10 ⁻⁶	5.337* 10 ⁻⁴	5.337* 10 ⁻⁴

Materials

In the developed model of the domed roof, materials with the following characteristics were used (table 3).

Table 3.
Characteristics of materials

Name	Designation	Unit of measurement	Value		
			AD35T1	Amg3	09G2S
Elastic modulus	E	MPa	70000	70000	206000
Punch ratio	μ	-	0.3	0.3	0.3
Density	ρ	kg/m ³	2710	2710	7850
Conditional yield strength	σ_T	MPa	327	78	305
Temporary resistance	σ_B	MPa	360	176	450

Loads

The load calculation was performed according to [4]. The following reliability factors were used in the calculations: - for the own weight of structures - 1.05; - for snow load - 1.4; - for wind load - 1.4.

Calculation of the domed roof for strength

The supporting frame of the domed roof is a spatial system consisting of a set of I-beam and square rods. The rods are presented in the form of rod finite elements (FE). The connection of the rods to each other in the nodes is rigid, the connection of the domed roof with the supporting part is hinged. Modeling of deck panels was carried out by three nodal FE. The tank wall is represented as four nodal finite elements. At the lower edge of the calculated section of the tank wall, there are connections that limit the wall displacements along the X, Y, Z axes.

The need to include aluminum panels in the calculation scheme is due to the nature of the application of loads on the dome frame. Since the plane of action of vertical loads does not coincide with the planes of the greatest and least rigidity of the beams, these loads lead to the appearance of flexural-torsional deformations of the rods. The presence of aluminum panels located on both sides of the bearing beams prevents the loss of their stability during the twisting process. In view of the above, the elements modeling the panels were attached to the rods of the dome.

Since the displacements of the dome under load are commensurate with the dimensions of the cross sections of the supporting elements of the frame, the calculations were performed in a linear and geometrically non-linear setting. The calculation scheme of the mesh aluminum dome roofs of the tank is shown in figure 6.

The calculation was carried out in the SCAD Office computer system (Certificate of Conformity № ROSS RU.SP15. H00146). By applying loads from the effects of its own weight and unevenly distributed snow load to the nodes of the domed roof, we obtained the displacements of the nodes of the dome, the forces and stresses in the elements of the domed roof.

The calculation in the linear formulation of the problem showed that the displacements along the Z axis from the own weight of the dome are equal to - 1.4 mm. Maximum movements along the Z-axis from the own weight of the dome, snow load and temperature effects in the nodes under the snow drift on the eleventh belt of the domed roof, where the movement $\Delta_{\max} = - 64.8$ mm. At the same time, the maximum forces in the load-bearing beams of the fifteenth zone were $N = 3.9$ T in the meridional beams, $N = 37.8$ T in the ring beams. The maximum hoop stresses are also in the fifteenth zone of the dome and are equal to $\sigma_{\max} = 70.9$ MPa.

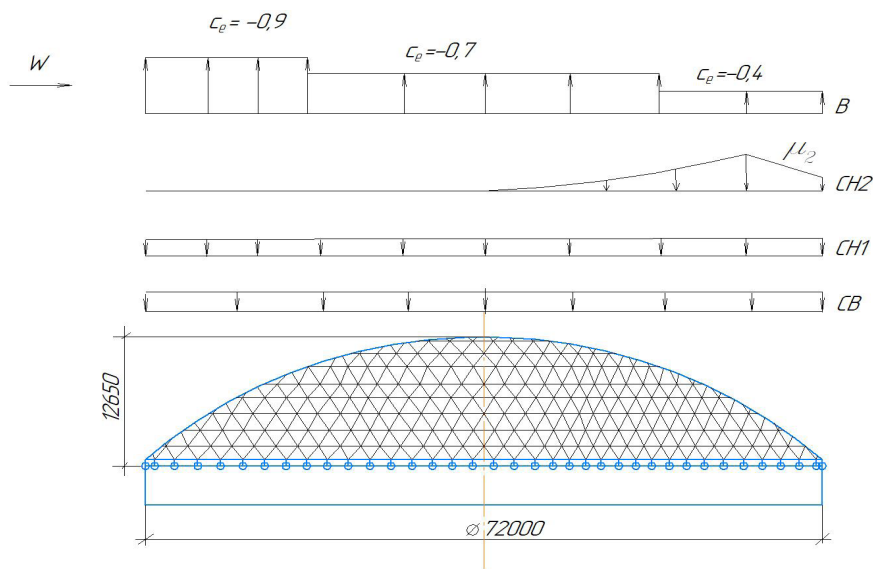


Figure 6. Calculation scheme for KAR 75000

The calculation of the domed roof of the tank was also made in a non-linear formulation of the problem with a hundred steps of increasing snow load. At the same time, the calculation showed that the maximum displacements of the roof under load from the own weight of the roof, unevenly distributed snow load and temperature effects in the 11th belt of the dome

$\Delta_{\max} = -70.3$ mm, and the maximum compressive stresses in the annular beams of the 13th belt are $\sigma_{\max} = -16.9$ MPa. At the same time, the maximum forces in the support beams $N_{\max} = -19.5$ T, in the tightening ring, the maximum tensile forces were formed equal to 34.3 tons and the maximum hoop stresses $\sigma_{\max} = 84.5$ MPa. Thus, the strength of the bearing beams is provided with a safety factor $K_{ZP} = R / \sigma_{\max} = 276 / 84.5 = 3.3$; where $R = \sigma_T^* \gamma_c / \gamma_n = 267$ MPa. Table 4 shows the values of forces, displacements and stresses in the rods in the cross section on the leeward side of the domed roof of the tank when calculating in a linear and non-linear formulation of the problem.

Table 4.
Forces, displacements and stresses in bars KAR 75000

№ of the belt	Moving, Δ_{\max} , mm		Ring forces, N_K^{\max} , T		Meridional forces, N_M^{\max} , T		Ring strains, σ_k^{\max} , MPa		Meridional strains, σ_m^{\max} , MPa	
	Linear	Nonlinear	Linear	Nonlinear	Linear	Nonlinear	Linear	Nonlinear	Linear	Nonlinear
1	-23.2	-22.4	10.9	11.0	8.0	8.1	41.8	42.3	34.4	34.5
2	-22.4	-22.5	10.3	8.5	9.1	9.2	41.7	33.0	25.6	37.7
3	-24.1	-24.0	9.7	9.6	8.9	7.7	37.7	39.3	32.4	32.6
4	-27.2	-27.4	8.7	8.8	6.7	6.5	34.0	34.3	27.3	26.7
5	-31.5	-32.4	7.4	7.6	8.5	7.2	28.4	28.8	29.6	30.1
6	-37.9	-39.0	5.6	5.8	7.2	7.5	22.0	22.5	26.7	30.9
7	-44.4	-45.9	3.7	3.9	6.4	6.6	14.7	15.0	25.5	25.5
8	-50.5	-52.1	1.9	2.0	6.6	6.5	8.6	9.3	25.4	29.0
9	-57.7	-59.7	-0.4	-0.6	5.8	6.3	-4.2	-6.0	22.0	28.4
10	-63.4	-67.3	-2.4	-3.0	4.9	5.3	-10.7	-13.8	26.4	26.2
11	-64.8	-70.3	-2.7	-3.5	4.1	4.5	-11.1	-15.7	28.8	25.3
12	-61.0	-69.1	-1.4	-2.9	4.0	3.9	-5.7	-14.4	28.7	25.3
13	-56.9	-68.9	-0.4	-3.4	3.3	2.7	-3.6	-16.9	22.6	25.6
14	-43.6	-53.1	3.8	1.6	2.6	3.7	18.9	12.2	37.0	49.5
15	-25.3	-29.7	37.8	34.3	3.9	2.1	70.9	84.5	39.8	54.1

Permissible stresses and displacements

Permissible displacements were determined according to [4] as the ratio of the span to 300, $[\Delta] = 72000 / 300 = 240$ mm, 70.3 mm $<$ 240 mm. Therefore, the maximum deflection of the grid aluminum dome roof of the tank is acceptable.

Permissible stresses in the bearing beams were determined from the design resistance of the material. For the manufacture of the load-bearing beams of the dome, aluminum alloy AD35T1 was used according to GOST 8617-2018, where the tensile strength $\sigma_B \geq 360$ MPa, the yield strength $\sigma_{0.2} \geq 327$ MPa with a design resistance in tension, compression and bending of at least 267 MPa. The design resistance of steel grade 09G2S with a thickness of more than 10 mm was taken as $R = 305$ MPa. The calculations are made from the following conditions

$$R_{\text{calcul}} \leq \gamma_c \sigma_{0.2} / \gamma_n, \quad (1)$$

where $\gamma_c = 0.9$ – working conditions coefficient; $\gamma_n = 1.1$ – reliability factor by purpose.

Hence 54.1 MPa $<$ 267 MPa. The strength of the domed roof is ensured.

Dome roof load bearing test according to API 650.

Permissible vertical load on the dome is determined by paragraph G.4.1.3 API 650

$$W_a = \frac{108,1 \cdot 10^6 \sqrt{J_x \cdot A}}{(SF)LR_K^2}, \quad (2)$$

where W_a – allowable vertical load on the dome, kPa; $J_x = 1.788 \cdot 10^5$ m⁴ – moment of inertia of the section in the plane of greatest rigidity; $A = 0,002682$ m² – cross-sectional area; $R_K = 57.6$ m – roof curvature radius; $L = 2.8$ m – average length of the dome frame rod; $(SF) = 1.65$ – safety factor.

$$W_a = 108.1 \cdot 10^6 (1.788 \cdot 10^5 \cdot 0.002682)^{1/2} / (1.65 \cdot 2.8 \cdot 57.6^2) = 1.54 \text{ kPa.}$$

The normative snow load for this construction area is $1.4241 < 1.54$. Therefore, the bearing capacity of the dome is provided.

Calculation of support posts

The support posts are made of a square profile (see fig. 2) of aluminum alloy AD 35T1, 0.51 m long. The maximum load on the support post is located on the leeward side of the domed roof and consists of a compressive force $N^{\text{max}} = -129.6$ kN and a bending moment $M_y^{\text{max}} = -13.1$ kN*m. At the same time, tensile stresses $\sigma_{\text{max}}^{\text{up}} = 39.5$ MPa appeared in the upper shelf of the support post, and compressive stresses $\sigma_{\text{max}}^{\text{down}} = -10.8$ MPa

appeared in the lower shelf. Considering that the calculated resistance of the AD35T1 alloy is $R = 267$ MPa, we can conclude that the strength of the support legs is ensured. K_{zP} safety factor = 6.8.

Checking the bearing capacity of the support ring

The support ring is made of plates 420*25 mm, low-alloy steel 09G2S and welded to the upper belt 12 mm thick of the tank wall. Therefore, the bearing capacity of the support ring of the domed roof will be considered together with the upper chord of the tank wall. It has been established that in the support ring there is a maximum tensile force equal to $N_{\max} = 124.06$ t and bending moments $M_x = 0.54$ t*m; $M_y = 0.1$ t*m; $M_z = 3.98$ t*m. This load caused normal stresses in the cross section of the ring equal to $\sigma_{\max} = 237.8$ MPa and displacements along the global axis X of the tank $\Delta_x = 3.2$ mm. Displacements and stresses in the tank wall are shown in Table 5.

Table 5 shows that the maximum displacements $\Delta_x \max = 8.4$ mm and hoop stresses $\sigma_y^{\max} = 256.5$ MPa caused by the edge effect are located in the contact zone of the dome support ring and the upper chord of the tank wall. Therefore, in practice, in the area of the support nodes, the connection of the support ring and the tank wall is reinforced with stiffeners. The results obtained show that the strength of the support ring is ensured. K_{zP} safety factor = $305 / 237.8 = 1.28$.

Calculation of the domed roof for stability

The stability of the domed roof of the tank is determined by two parameters. The local and general stability of the dome is calculated. The local stability of the dome is determined by the stability of the most loaded bearing beam in accordance with [4]. Taking into account the fact that the meridional beams of the dome are affected by compressive forces N caused by the weight of the overlying chords, and, in addition, the snow load acts on the beams, we will accept the calculation scheme for the stability of the compressed-bent element. Let's choose an annular load-bearing beam in the 11th belt of the dome, in which the node received the maximum displacement $\Delta = 70.3$ mm.

Table 5.
Parameters of the stress state of the upper chord of the tank wall

scheme	Node number	Movements Δ_x , mm	Voltage σ_y , MPa	Moment M_y^{max} , tm/m
	1	3.2	237.8	0.54
	2	8.4	256.5	0.75
	3	8.2	65.2	0.36
	4	6.2	48.5	0.19
	5	4.0	35.0	0.12
	6	2.2	22.5	0.07
	7	1.1	10.5	0.04
	8	0.5	3.1	0.01
	9	0.2	-2.7	-0.02
	10	0.1	-2.5	-0.01
	11	0	-1.8	-0.01

I – support ring; II – tank wall.

Calculation for local stability of a domed roof

The calculation for the stability of compressed-bent elements of constant section in the plane of action of the moment, coinciding with the plane of symmetry, is performed according to the formula

$$N / (\varphi_e A R \gamma_c) \leq 1, \tag{3}$$

where φ_e – coefficient of stability in compression with bending, is determined depending on the conditional flexibility $\bar{\lambda}$ and the reduced relative eccentricity m_{ef} ; $N = -36.4$ kN - compression force; $M = 0.3$ kN * m - bending moment; $A = 0.002682$ m² – cross-sectional area of the bearing beam; $L = 2.5894$ m – beam length; $R = 267$ MPa – design resistance of aluminum alloy; γ_c – coefficient of working conditions, $\gamma_c = 0,9$.

Design characteristics: $i = \sqrt{\frac{J}{A}} = 0.082$ m – radius of gyration of the section in the plane of action of the moment; $\lambda = L / i = 31.578$ – element flexibility; $\bar{\lambda} = \lambda \sqrt{\frac{R}{E}} = 1.637$ – conditional flexibility; $e = M / N = 0,008$ - eccentricity of longitudinal force application; $m = e^*A / W = 0.1236$ - relative eccentricity; $m_{ef} = \eta m$ - reduced relative eccentricity, where η – coefficient

of influence of the section shape – we determine according to Table E.3 [4] for the case $0.1 \leq m \leq 5$, $0 \leq \lambda \leq 5$, $A_f / A_w = 1.39$; $\eta = 1.58$. Then the reduced relative eccentricity is equal to $m_{ef} = 0.1953$. Depending on the reduced relative eccentricity m_{ef} and conditional flexibility λ according to table E. 1, the value of the coefficient $\varphi_e = 0.832$ was determined. Thus

$$N / (\varphi_e A) = 16.3 \text{ MPa} < R^* \gamma_c = 240.3 \text{ MPa}.$$

The stability of the frame element under consideration is provided with a stability factor of $K_{ZMU} = 14.7$.

Calculation for the overall stability of the mesh dome roof of the tank

Wright D.T. [6] determined that there will be no “snapping” of rigid knots in mesh shells if the condition

$$L^2 / (R_k \cdot i) < 9, \quad (4)$$

where L – rod length, $L = 2.5894$ m; R_k – shell curvature radius, $R_k = 57.6$ m; i – radius of gyration of the bar cross section, $i = 0.082$ m.

$$2,5894^2 / (57.6 \cdot 0.082) = 1,4 < 9.$$

The overall stability of the domed roof is provided with a stability factor $K_{ZOU} = 6.4$.

Findings

1. Calculations have shown that the bearing capacity of the mesh aluminum dome roof for a vertical steel tank with a capacity of 75.000 m³ is ensured for the given loads. Safety factors for strength: load-bearing beams $K_{ZP} = 3.3$; support legs $K_{ZP} = 6.8$; support ring $K_{ZP} = 1.28$; local stability factor of $K_{ZMU} = 14.7$; the safety factor of the overall stability of the K_{ZOU} dome = 6.4.

2. API 650 dome roof load-bearing capacity ensured.

3. The maximum deflection of the dome under the influence of its own weight, unevenly distributed snow load and temperature effects is equal to $\Delta_z^{\max} = -70.3$ mm, which is an acceptable value for a tank diameter of 72 m.

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ANALYSIS OF CHANGES IN WELL PRESSURE AT DIFFERENT MOMENTS OF TIME IN PULSATING CASES OF WELLHEAD PRESSURE VALUES

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Abstract. The well pressure varies depending on the wellhead pressure value. This leads to a change in oil production. In this study, the change in well pressure depending on the wellhead pressure value and the associated oil production were studied.

In order to increase the permeability and productivity of oil production, pulsations are created in the values of wellhead pressure and initial pressure. The elastic waves generated by the generator help to clean the pores of the formation from blockages and gas pads, while increasing the permeability of the formation and oil refining. When it penetrates to the depth of the formation, it can release the energy stored under the influence of the rocks inside, and activates the previously located parts of the oil, thereby increasing the extraction of oil from the formation. In addition, moving in the pores of the rock, elastic waves change the nature of the pressure distribution in the formation and increase the permeability [1,2-6,7]. Previous studies have analyzed changes in well pressure and oil production at pulsating values of initial pressure. Now, the pulsating values of wellhead pressure will analyze the change in well pressure and oil production accordingly. Wellhead pressure values vary with the following regularities. [8] In the first case, by creating pulsations through the generator, the wellhead pressure changes with the following regularity.

$$P_y(t) = \Delta P_{y1} + \frac{\Delta P_y}{2} - \frac{4\Delta P_y}{\pi^2} \sum_{m=1}^n \frac{\cos\left((2m-1)\frac{\pi t}{T}\right)}{(2m-1)^2}, \tag{1}$$

The cost of the fixed parameters is given below.

$$\begin{aligned}
 r_T &= 3 \cdot 10^{-2} \text{ m}; \quad a = 10^{-1} \text{ c}^{-1}; \quad \mu = 10^{-3} \text{ Pa} \cdot \text{c}; \quad h = 10 \text{ m}; \quad k = 10^{-13} \text{ M}^2; \quad \rho_{\text{ж}} = 4 \cdot 10^2 \text{ кг/ M}^3; \\
 l &= 2000 \text{ m}; \quad \chi = 0.17 \frac{\text{m}^2}{\text{c}}; \quad P_c(0) = 1,2 \cdot 10^7 \text{ Па}; \quad \Delta P_{01} = 11 \cdot 10^6 \text{ Па}; \quad P_{\text{ycm}}(0) = 1 \cdot 10^6 \text{ Па}; \\
 P_k &= 1,4 \cdot 10^7 \text{ Па}; \quad P_{\text{амм}} = 10^5 \text{ Па}; \quad R_k = 100 \text{ м}; \quad \pi = 3,14; \quad C = 1000 \text{ м/с}; \quad g = 10 \text{ м/с}^2 \\
 r_c &= 7.5 \cdot 10^{-2} \text{ м}, \quad B(x_v) = 0.114; \quad b_v = 0,0002048; \quad Q_c(0) = 1407,724120 \text{ кг/с}; \\
 Q_{\text{cm}}(0) &= 1407,72571 \text{ кг/с}; \quad Q_{\phi}(0) = 0,00159217410 \text{ кг/с}.
 \end{aligned}$$

According to reports from the literature, the well pressure was found to be as follows [9-15].

$$\begin{aligned}
 \bar{P}_c &= 2\pi h \rho_{\text{ж}} \frac{k}{\mu} \frac{1}{\ln\left(\frac{R_k}{r_c}\right)} \cdot \frac{\Delta P_{\text{cy}}^2}{\Delta P_{\text{c1}}} (s+2a)(s+b_v)((s+a)^2 + \omega_i^2) \cdot \frac{1}{s\psi(s)} - \\
 &- 4\pi h \frac{k}{\mu} \rho_{\text{ж}} B_v \left(x_v \frac{r_c}{R_k}\right) \cdot \Delta P_{\text{cy}} \frac{(s+2a)((s+a)^2 + \omega_i^2)}{\psi(s)} + \\
 &+ 2\pi h \rho_{\text{ж}} \frac{k}{\mu} P_c(0) \cdot \frac{1}{\ln\left(\frac{R_k}{r_c}\right)} \cdot \frac{\Delta P_{\text{cy}}}{\Delta P_{\text{c1}}} (s+2a)(s+b_v)((s+a)^2 + \omega_i^2) \cdot \frac{1}{s\psi(s)} - \\
 &- 4\pi h \frac{k}{\mu} \rho_{\text{ж}} B_v \left(x_v \frac{R_k}{r_c}\right) \cdot P_c(0) \frac{(s+2a)((s+a)^2 + \omega_i^2)}{\psi(s)} + \\
 &+ \frac{f_k}{l} \cdot (s+b_v) \cdot ((s+a)^2 + \omega_i^2) \cdot \frac{\bar{P}_0}{s\psi(s)} + \frac{f_k}{l} \cdot i\pi \cdot (s+b_v) \cdot \frac{1}{\psi(s)} \cdot [s\varphi_i(0) + \dot{\varphi}_i(0) + \\
 &+ 2a\varphi_i(0) - \frac{2}{\pi}(sP_c(0) + \dot{P}_c(0)) + \frac{4}{\pi}P_c(0) - \frac{2}{\pi}\bar{P}_0 - \frac{4a}{\pi}\bar{P}_0] + \\
 &+ \frac{f_k Q_c(0)(s+b_v)((s+a)^2 + \omega_i^2)}{\psi(s)} + \frac{f_i \bar{P}_{\text{ycr}}(t)(s+b_v)((s+a)^2 + \omega_i^2)}{l \cdot \psi(s)} + \\
 &+ \frac{f_i \pi(s+b_v)}{l \cdot \psi(s)} \cdot [s\varphi_{i1}(0) + \dot{\varphi}_{i1}(0) + 2a\varphi_{i1}(0) - \frac{2}{\pi}\bar{P}_{\text{ycr}} - \\
 &- \frac{4}{i\pi}\bar{P}_{\text{ycr}} + \frac{2}{\pi}(sP_c(0) + \dot{P}_c(0)) + \frac{4a}{\pi}P_c(0)] - \frac{f_i Q_{\text{smes}}(0)(s+b_v)((s+a)^2 + \omega_i^2)}{\psi(s)} \quad (2)
 \end{aligned}$$

where

$$\begin{aligned}
 \psi(s) &= F(s) \cdot [(s+a)^2 + \omega_i^2] + 2 \frac{f_k}{l} (s+b_v) + 4a \frac{f_k}{l} (s+b_v)s + \\
 &+ 2 \frac{f_l}{l} (s+b_v)s^2 + 4a \frac{f_l}{l} (s+b_v)s, \quad (3)
 \end{aligned}$$

$$F(s) = 2\pi h \rho_{sc} \frac{k}{\mu} \frac{1}{\ln\left(\frac{R_k}{r_c}\right)} \cdot \frac{\Delta P_{cy}}{\Delta P_{cl}} (s+2a)(s+b_v) - 4\pi h \frac{k}{\mu} \rho_{sc} B_v \left(x_v \frac{R_k}{r_c}\right) \cdot s \cdot (s+2a) + \frac{f_k}{l} (s+b_v) + \frac{f_l}{l} (s+b_v) \quad (4)$$

$Q_{cm}(0)$ and $Q_c(0)$ found in the following expressions,

$$Q_{cm}(0) = Q_c(0) + \frac{\rho_{sc} Q_{\phi}(0)}{2\pi_c h}, \quad Q_{\phi}(0) = 2\pi h \frac{k}{\mu} \frac{P_k - P_c(0)}{\ln \frac{R_k}{r_c}}$$

$$Q_c(0) = \frac{P_0(0) \cdot \exp\left(g \frac{\rho_{am} l}{P_{am}}\right) - P_c(0)}{\exp\left(g \frac{\rho_{am} l}{P_{am}}\right) - 1} \frac{\rho_{am} g}{2a P_{am}}$$

$\xi_1, \xi_2, \xi_3, \xi_4$ (4) are the roots of the equation

$$\psi(s) = 0 \quad (5)$$

$$\xi_1 = -0,03764469709 + 0,9071083878i$$

$$\xi_2 = -0,0002045376$$

$$\xi_3 = -29,69372812$$

$$\xi_4 = -0,03764469709 - 0,9071083878i$$

Return to the original by writing the given parameters and the value of $P_y(t)$ in the (1) expression of \bar{P}_c . In this case, we can get the mathematical expression for the well pressure.

$$P_c = 1,200000859 \cdot 10^7 - 0,2861792028 \cos(0,5233333333t) - 0,02666616024 \cdot \sin(0,5233333333t) + 1,09406197 \cdot 10^{-83} e^{-0,000204537607t} (-2,467867847 \cdot 10^{81} + 6,675463335 \cdot 10^{73} \cos(0,5233333333t)) + 2,451803503 \cdot 10^{-132} (1,814216776 \cdot 10^{11} \cdot \cos(0,9071083878t) (2,60782157 \cdot 10^{119} \cos(0,5233333333t) - 5,358963048 \cdot 10^{121}) + \sin(0,9071083878t) (3,916170748 \cdot 10^{132} + 5,265622502 \cdot 10^{128} \cos(0,5233333333t))) e^{-0,03764469709t} + 8,974839335 \cdot 10^{-62} (2,017518108 \cdot 10^{63} - 1,292486551 \cdot 10^{60} \cdot \cos(0,5233333333t)) e^{-29,69372812t} \quad (6)$$

The time dependence graph of the mathematical expression of pressure (6) is given in Figure 1.

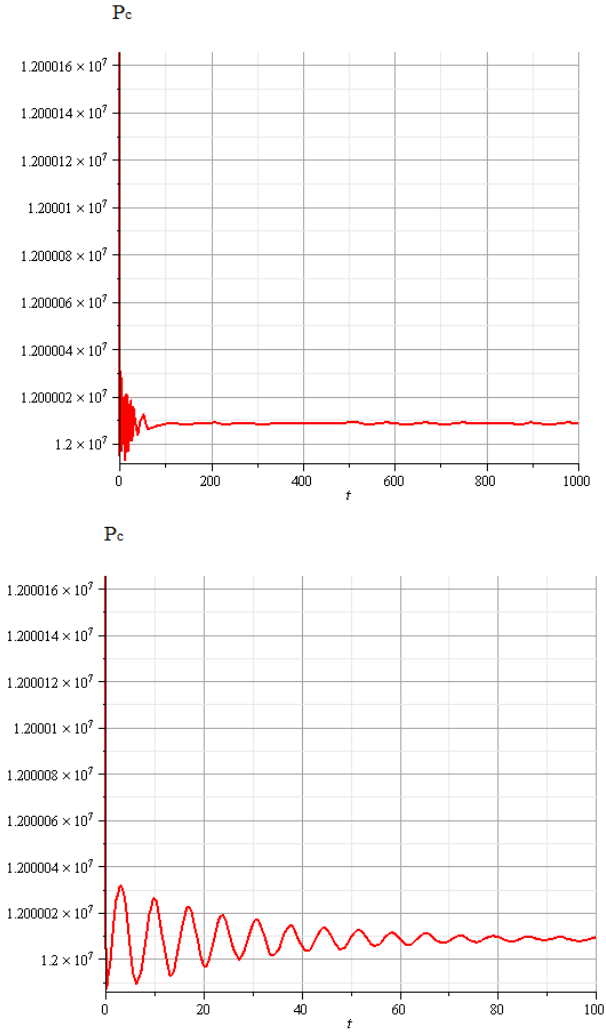


Figure.1. Time dependence graph of well pressure at the pulsating value of wellhead pressure given by formula (1) at large and small moments of time

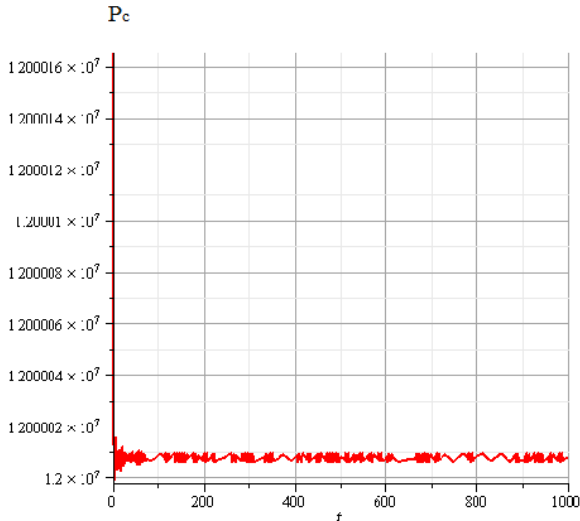
In the next step, we write the parameters and given value of $P_y(t)$ (7) in the expression P_c and return to the original.

$$P_y(t) = \Delta P_{y1} + \frac{2\Delta P_y}{3} - 3\Delta P_y \sum_{m=1}^n \frac{\cos\left(2\pi m \frac{t}{T}\right)}{\pi^2 m^2} + \frac{\Delta P_y}{\pi} \sum_{m=1}^n \frac{3 \cos\left(2\pi m \frac{t}{T}\right) \left(\cos\left(\frac{2\pi m}{3}\right) + \cos\left(\frac{4\pi m}{3}\right) \right)}{2\pi m^2}, \quad (7)$$

In this case, we can get the mathematical expression for the well pressure.

$$P_c = 1,200000772 \cdot 10^7 + (0,7261362358 + 4,629198727i)e^{(-0,0376446979-0,9071083878i)t} + (0,7261362358 + 4,629198727i)e^{(-0,0376446979+0,9071083878i)t} + (-0,7274117250 + 0,1785073446i)e^{-1,047197551t} + (-0,7274117250 - 0,1785073446i) \cdot e^{-1,047197551t} - 0,0258741302e^{-0,000204537807t} + 157,8256897e^{-29,69372812t} \quad (8)$$

The time dependence graph of the mathematical expression of pressure (8) is given in Figure 2.



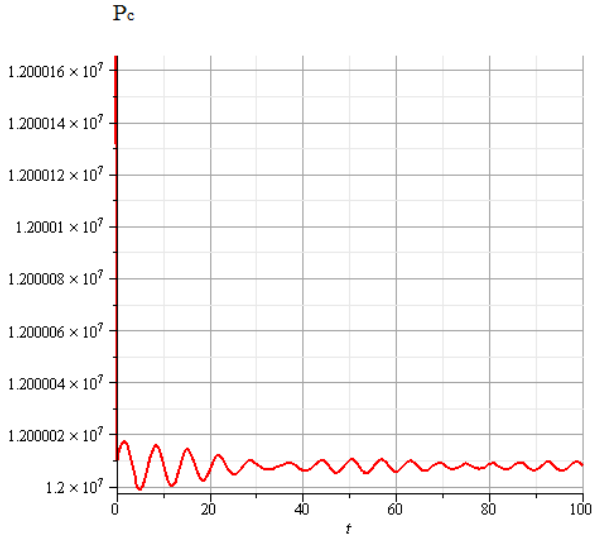


Figure.2. Time dependence graph of well pressure at pulsation value given by formula (7) of wellhead pressure at large and small moments of time

The subsequent pulsating value of the wellhead pressure (9) is in the form of a mathematical expression.

$$P_y(t) = \Delta P_{y1} + \frac{2\Delta P_y}{\pi} - \frac{4\Delta P_y}{\pi} \sum_{m=1}^n \frac{\cos\left(2\pi m \frac{t}{T}\right)}{4m^2 - 1}, \tag{9}$$

We return these values and data of the wellhead pressure in the expression (6) and return to the original. In this case, we can get the mathematical expression for the well pressure.

$$P_c = 1,200000782 \cdot 10^7 + (0,3027636663 + 4,715652270i)e^{(-0,0376446970 - 0,9071083878i)t} + (0,3027636663 - 4,715652270i)e^{(-0,0376446970 + 0,9071083878i)t} + (-0,3693303164 + 0,09063391717i)e^{-1,047197551t} + (-0,3693303164 - 0,09063391717i) \cdot e^{-1,047197551t} - 0,02601229543e^{-0,000204537007t} + 157,8485767e^{-29,69372812t} \tag{10}$$

The time dependence graph of the mathematical expression of pressure (10) is given in Figure 3.

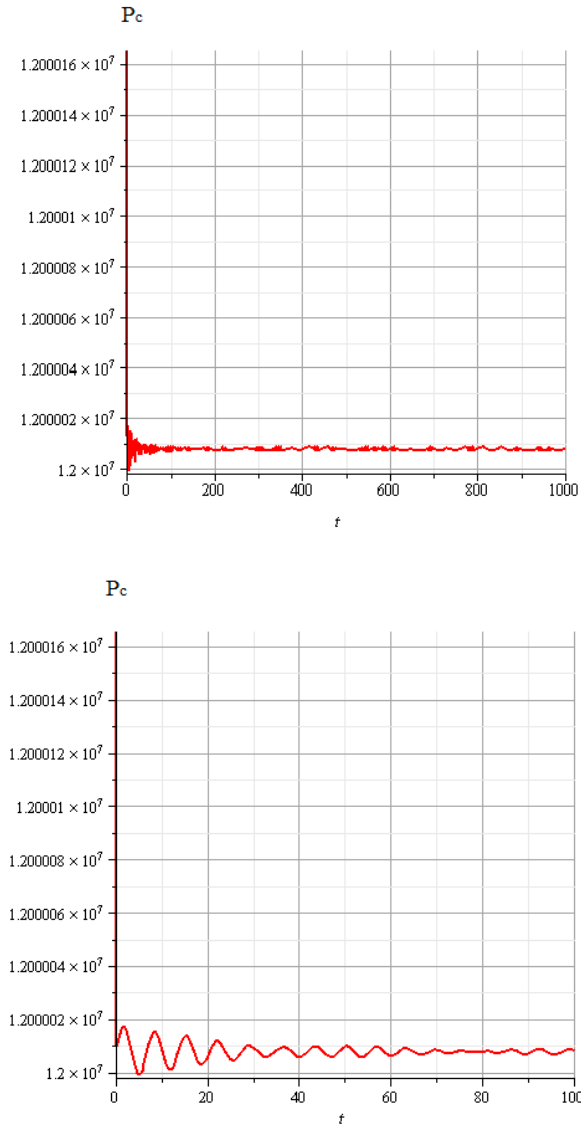


Figure.3. Time dependence graph of well pressure at pulsation value given by formula (9) of wellhead pressure at large and small moments of time

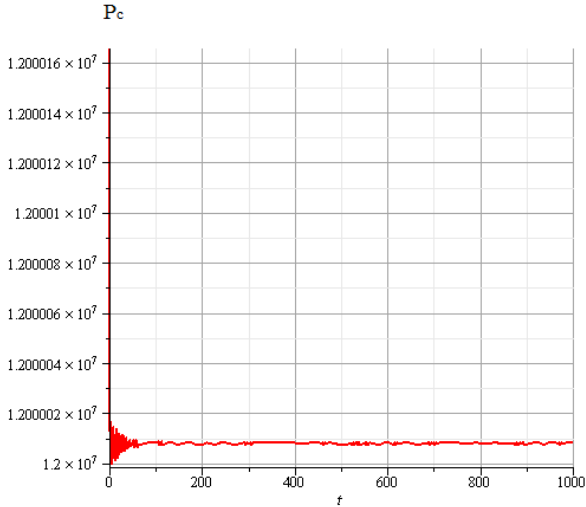
The subsequent pulsating value of the wellhead pressure (11) is in the form of a mathematical expression.

$$P_y(t) = \Delta P_{y1} + \frac{\Delta P_y}{2} - \frac{\Delta P_y}{\pi} \sum_{m=1}^n \frac{\sin\left(2\pi m \frac{t}{T}\right)}{m}. \tag{11}$$

We return these values and data of the wellhead pressure in the expression (6) and return to the original. In this case, we can get the mathematical expression for the well pressure.

$$P_c = 1,200000796 \cdot 10^7 + (-0,07498108861 + 5,152931791i)e^{(-0,0376446979-0,9071083878i)t} + (-0,07498108861 - 5,152931791i)e^{(-0,0376446979+0,9071083878i)t} + (-0,06797543794 - 0,2769977373i)e^{-1,047197551t} + (-0,06797543794 + 0,2769977373i) \cdot e^{-1,047197551t} - 0,02618656593e^{-0,000204537807t} + 157,8256897e^{-29,69372812t} \tag{12}$$

The time dependence graph of the mathematical expression of pressure (12) is given in Figure 4.



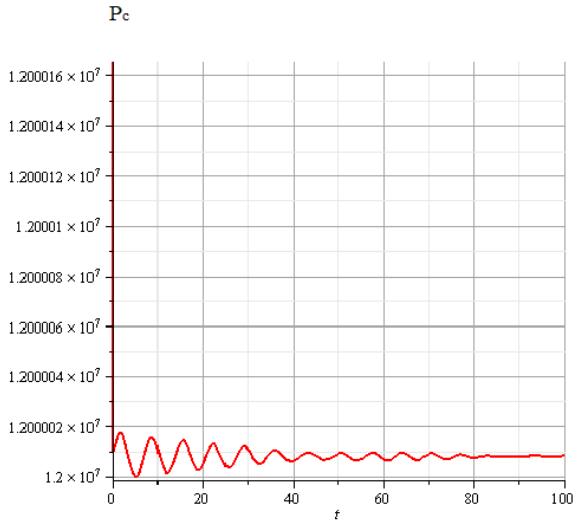


Figure.4. Time dependence graph of well pressure at pulsation value given by formula (9) for big and small moments of time

In previous studies, in contrast to this study, the dynamics of well pressure changes were studied by generating pulsations in the value of the initial pressure of the well by means of a generator. Comparing these studies, it is also clear from the graphs and calculations that when the value of the initial pressure of the well or the wellhead pressure fluctuates, the values of the well pressure also change.

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**SYNTHESIS, STRUCTURE AND ANTHELMINTIC ACTIVITY
OF TRIPHENYL-(3,5-DI-TERT-BUTYL-4-HYDROXYBENZYL)
PHOSPHONIUM NITRATE¹**

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Abstract. Anthelmintic antinematodose pharmaceutical substance - (3,5-di-tert-butyl-4-hydroxybenzyl)triphenylphosphonium nitrate has been synthesized. The structure of the drug has been proven by physical and chemical research methods, as well as by X-ray diffraction analysis. The anthelmintic activity of the drug against *Ascaris suum* nematodes on spontaneously infected piglets was studied. High bactericidal and fungicidal activity and low toxicity of the substance are shown. A low single therapeutic dose of 10 mg/kg of live animal weight was established.

Keywords: quaternary phosphonium salts, 2,6-di-tert-butyl-4-methylphenol, *Ascaris suum*, antibacterial activity, antifungal activity.

Introduction

Helminthiasis, namely nematodes, is one of the main parasitic diseases of domestic and farm animals and causes significant damage to the global economy. Clinical manifestations in all nematodes vary widely depending on the massiveness of the invasion and the presence of polyinvasion. Therefore, the development of means for the prevention and treatment of nematodes affecting various links of the pathological process is one of the main tasks of pharmaceutical chemistry [1, 2].

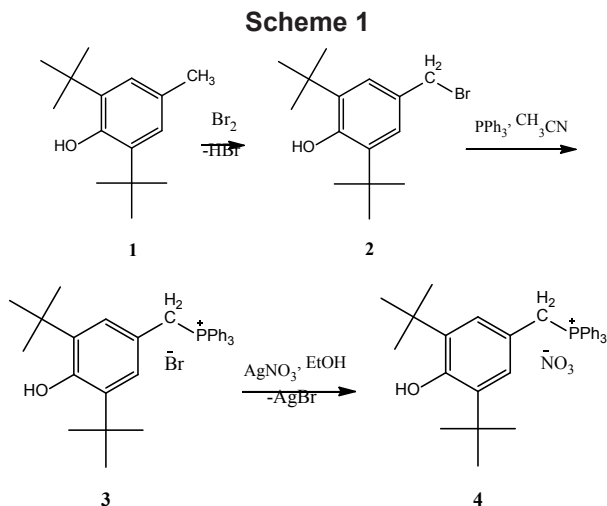
Over the past twenty years, systematic research has been conducted at Kazan Federal University, at the A.M. Butlerov Chemical Institute, in the

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Laboratory of Chemistry of Biologically Active Substances together with parasitologists, pharmacists, microbiologists and other specialists on the development and testing of antiparasitic pharmaceutical substances and medicines based on them [3-7].

Results and discussion

In this study, we synthesized a stable salt of phosphonium - (3,5-di-*tert*-butyl-4-hydroxybenzyl)triphenylphosphonium nitrate (**4**) in three stages. Initially, bromination of 2,6-di-*tert*-4-butylmethylphenol (**1**) produced a bromine derivative **2**, quaternization of which with triphenylphosphine produced a phosphonium salt **3**, the final salt (**4**) obtained by a simple exchange reaction, as shown in scheme 1.



The structure of the phosphonium salt (**4**) has been proven by X-ray diffraction analysis (XRD) and is shown in Figure 1. It should be noted that the crystal structure of compound **4** is symmetrical (the crystal is rhombic, centrosymmetric).

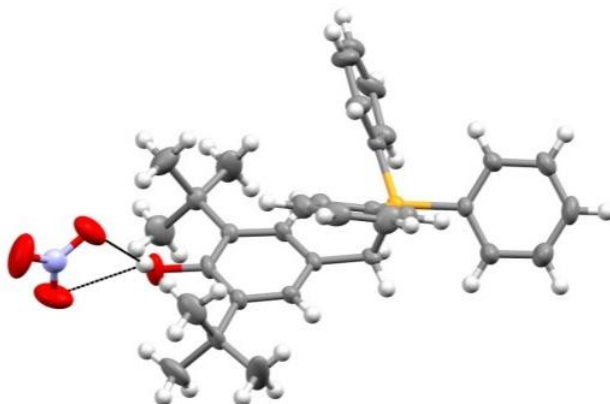


Figure 1. Geometry of phosphonium salt - (3,5-di-tert-butyl-4-hydroxybenzyl)triphenylphosphonium nitrate (4)

In vitro fungicidal and bactericidal activity of phosphonium salt 4 was studied on test cultures of pathogenic microflora of humans and animals: *Escherichia coli*, *Salmonella paratyphi B*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Candida albicans* [8]. Chlorhexidine and Clotrimazole were examined as the control substances. The results of the studies are shown in Table 1.

Table 1.
Antibacterial and antifungal activity salt 4 and reference compounds
(c = 10 mg/ml)

Salt	Zone of inhibition, d/mm				
	<i>Escherichia coli</i>	<i>Salmonella paratyphi B</i>	<i>Pseudomonas aeruginosa</i>	<i>Staphylococcus aureus</i>	<i>Candida albicans</i>
4	19±5	17±4	18±3	43±4	45±5
Chlorhexidine	19±3	18±3	15±5	20±3	17±3
Clotrimazole	0	0	0	0	18±4

The acute toxicity of salt was determined on 70 white mice, males and females, weighing 18-21 grams. The drug in the form of an aqueous suspension was injected into the stomach once using a probe. The animals were divided into 7 groups: 6 experimental and one control. The experimental groups were administered the drug in increasing doses - 50, 100,

150, 200 and 300 mg / kg of body weight. Distilled water was injected into the stomach of the control group mice. The animals were monitored for 14 days. Deaths were recorded, fallen animals were opened. The results are shown in Table 2.

Table 2.
Results of the study of acute toxicity of salt 4 in white mice

Group number	The dose of the drug, mg/kg	The number of animals in the group at the beginning of the experiment	Dead animals	Surviving animals	Lethality, %
1	50	10	0	10	0
2	100	10	3	7	30
3	150	10	4	6	40
4	200	10	7	3	70
5	250	10	9	1	90
6	300	10	10		100

The calculation of the average lethal dose was carried out according to the Kerber method. With oral administration, the LD₅₀ of the drug was 160 mg / kg of body weight. Thus, the synthesized salt 4 when administered orally in accordance with GOST 121.007-76, according to its characteristics, belongs to hazard class III - substances moderately dangerous for warm-blooded animals.

The anthelmintic activity of the drug against *Ascaris suum* nematodes was studied on 60 piglets spontaneously infected with ascariasis in «Sarsaza Agrofir» in Tatarstan. Based on caproscopic studies, three groups of piglets of 20 heads at the age of 3 months were formed. Piglets of group 1 received the drug at a dose of 10 mg/kg of weight once with feed. Piglets of group 2 received the well-known drug Fenbengran granulate 22.2% once mixed with mixed feed at a dose of 22 mg per 1 kg of live weight. The third group of piglets did not receive drugs and was a control group. Faeces of piglets in groups were examined before treatment and on day 14.

As a result of the experiment, the intensity of invasion in the groups before treatment ranged from 32±2.3 to 34±2.1 eggs in the field of view of the microscope. 14 days after treatment, the intensity of invasion in group 1 was 5±0.4, and in 2 - 11±1.2. In the control group, the intensity of invasion during the experiment was almost preserved.

Experimental

3.1. The initial 2,5-di-tert-butyl-4-methylphenol (**1**) - "Ionol" is a well-known selling drug [9-11].

3.2. Synthesis 4-((bromomethyl)-2,6-di-tert-butylphenol (**2**)

To a solution of 2.2 g (0.01 mol) of compound **1** in 20 ml of CCl₄, a solution of 1.6 g (0.01 mol) of bromine in 20 ml of CCl₄ was slowly added drop by drop. The precipitated oily product crystallized during freezing. The crystals were washed from the starting materials, dried. The product (**2**) yield was 2.75 g (92%), mp 56 °C. Elemental analysis of C₁₅H₂₃BrO. Found: C 60.54; P 8.01. Calculated: C 60.20; H 7.75.

3.3. Synthesis (3,5-di-tert-butyl-4-hydroxybenzyl)triphenylphosphonium bromide (**3**)

A solution of 0.262 g (0.001 mol) of triphenylphosphine in 5 ml of CH₃CN was added to 0.299 g (0.001 mol) of compound **2** in 5 ml of CH₃CN. The reaction took place within 10 minutes. The solvent was partially removed and the product was precipitated with ether. The precipitate was filtered and washed with cold ether. The yield was 0.533 g (95%). Elemental analysis of C₃₃H₃₈BrOP (**3**). Found, %: C 70.70; H 7.00; P 5.62. Calculated, %: C 70.58; P 6.82; H 5.52, mp 225°C. NMR spectrum ³¹P, CH₃OD, δ 23.47.

3.4. Synthesis of nitrate (3,5-di-tert-butyl-4-hydroxybenzyl)triphenylphosphonium (**4**)

To 0.561 g (0.001 mol) of product **3** in 10 ml of ethanol 0.170 g (0.001 mol) of silver nitrate in 10 ml of 50% ethanol was added. The precipitate was removed. The filtrate was evaporated in vacuum; the crystalline precipitate was washed with water and dried in air. The yield was 0.516 g (95%). Elemental analysis of C₃₃H₈₈NO₄P (**4**). Found, %: C 72.94; H 7.10; P 5.87. Calculated, %: C 72.91; H 7.05; P 5.70, mp 189 °C. NMR spectrum ³¹P, CH₃OD δ 23.42.

In conclusion, we have developed a new efficient synthesis of nitrate (3,5-di-tert-butyl-4-hydroxybenzyl)triphenylphosphonium (**4**) with high product yield. The resulting phosphonium salt showed high antimicrobial activity against pathogenic microflora of humans and animals, anthelmintic activity against *Ascaris suum* nematodes.

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**THE MAIN ASPECTS OF THE FORMATION AND ELIMINATION
OF ACCUMULATED HARM TO THE ENVIRONMENT FROM THE
OBJECTS OF PLACEMENT OF PRODUCTION AND CONSUMPTION
WASTE**

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Abstract. Changes in legal documents regulating the activities of users of natural resources, tougher liability for economic entities operating on the territory of the Russian Federation, made it possible to identify areas with accumulated environmental damage.

The period of plunder, irresponsible consumption of natural resources, aimed at personal uncontrolled enrichment ended with sad results for the environment. Diversity, occupied areas, the degree of impact of objects of accumulated harm, do not allow the use of a unified approach to their elimination.

The formed unified database of objects of accumulated environmental damage made it possible to group objects by types and start work on eliminating damage, which includes monitoring the state of environmental objects, mapping territories and developing projects to eliminate damage.

Keywords: environment, regulatory framework, accumulated harm, production and consumption waste, production problems, waste, damage elimination.

The intensification of nature management in the last century and the active development of the technosphere has led to a significant transformation of the environment, the negative aspect of which lies, first of all, in the pollution of all its components. The scale and duration of this process led to the formation of significant amounts of accumulated environmental damage (damage).

Objects and methods of investigation

An effective solution to the problem of accumulated environmental damage (AED) requires a developed regulatory framework. The object of the study was legal documents, and the subject was the accumulated harm to the environment.

In Russia, the formation of a conceptual, regulatory and legal framework for solving the AED problem began in 2008. Currently, a significant amount of regulatory documents has been accumulated, however, the complexity and magnitude of the problem of accumulated environmental damage requires monitoring and constant optimization of the regulatory and legal support for its solution as experience is gained in the liquidation of objects and the rehabilitation of AED territories [1].

The most important source of accumulated harm to the environment are the objects (territories) of waste disposal (OWD) of production and consumption (fig. 1).

Purpose and types of waste disposal facilities			
Storage of waste from extraction and enrichment of natural resources	Storage of waste generated in manufacturing and other industries	Waste disposal of mining, processing and other industries	Burial of solid municipal waste
- dumps of mining waste; - dumps of mineral processing wastes; - storage facilities intended for storage of mining and/or mineral processing wastes, except for dumps.	- dumps of waste, manufacturing industries; - dumps of waste from the production of electricity and steam; - storage facilities intended for storage of waste from manufacturing industries, except for dumps; - storage facilities intended for storage of wastes from the production of electricity and steam, except for dumps.	- landfills for near-surface disposal of liquid and liquefied wastes; - underground disposal systems for liquid and liquefied wastes when buried in a reservoir; - underground disposal systems for liquid and liquefied wastes when buried in an underground reservoir; - underground disposal systems for solid and hardened wastes.	- objects of disposal of municipal solid waste (MSW).

Figure 1. Types of production and consumption waste disposal facilities [2]

Results and discussion

Among the environmental aspects of waste disposal, the most significant ones that have a strong negative impact on the environment and which can be managed can be identified:

- entry of pollutants into underground and surface water bodies, rocks, soils;
- emissions of pollutants into the atmospheric air;
- handling of substances hazardous to the environment;
- withdrawal of land resources or subsoil plots for the construction of OWD;
- fire hazard (for wastes with flammable properties or emitting flammable substances during storage);
- biological pollution of the environment (when placing MSW).

The formation of accumulated environmental damage begins with the allocation of a certain territory, withdrawn from the sphere of productive land use, for the storage of certain waste. The accumulation of waste for a long time is accompanied by internal processes of their transformation, also occurring under the influence of external geoclimatic conditions, and the formation of an OWD "body" - a waste layer characterized by volumetric geometric and physical parameters. The dynamic balance of internal and external processes over time leads to the formation of a specific zone that differs in its characteristics from natural geocological environments in the OWD location region. The contours of such a zone, as a rule, go beyond the boundaries of the territory where the object is located. Thus, on the territory of the waste disposal facility and adjacent areas, a zone of anthropogenic geochemical anomaly is formed, the processes of self-development of which lead to the accumulation of negative environmental consequences and form the accumulated environmental damage (fig. 2).

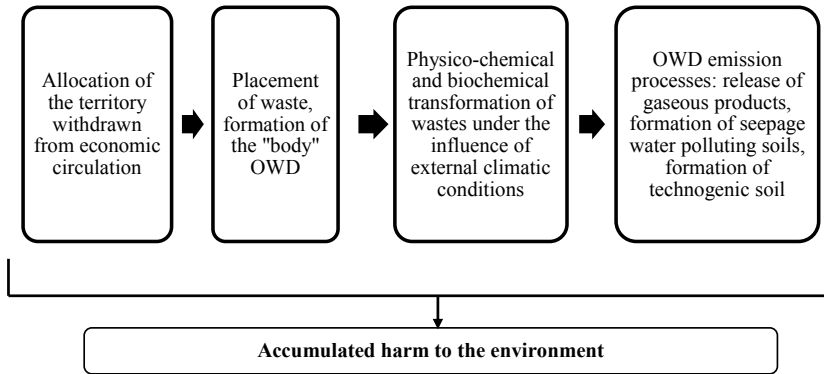


Figure 2. Stages of formation of accumulated harm to the environment

An analysis of the processes of formation of accumulated harm to the environment from various waste disposal facilities made it possible to identify typical forms of accumulated harm to the environment [3]:

- OWD territory taken out of economic land use;
- atmochemical halo of pollution;
- lithochemical halo of pollution;
- hydrochemical halo of pollution;
- technogenic geomorphological forms that affect the weather and climatic conditions of the area.

The development of solutions to the problem of accumulated environmental damage from waste disposal facilities includes several stages:

- 1) AED identification on OWD;
- 2) AED ranking by hazard and elimination priority;
- 3) economic assessment of the amount of accumulated environmental damage (damage)
- 4) choice of methods and technologies for eliminating AED at OWD.

Elimination of accumulated environmental damage at waste disposal sites includes two main aspects:

- termination of disposal and neutralization of waste at the facility (territory), elimination or isolation of the source of harmful effects on the environment in order to stop this impact;
- liquidation of the actual accumulated environmental damage (rehabilitation, land reclamation, rehabilitation of groundwater and surface water bodies).

Organization of work to eliminate the accumulated harm includes:

- a) conducting the necessary surveys of the object, including engineering surveys;
- b) development of a project of work to eliminate the accumulated harm (hereinafter referred to as the project);
- c) coordination and approval of the project;
- d) carrying out work to eliminate the accumulated harm;
- e) control and acceptance of the work carried out to eliminate the accumulated harm.

Conclusions

The possibility of effective application of technological solutions (technologies) to restore the initial characteristics of the territory where the waste disposal facility was located depends on a number of factors, such as:

- type, degree of danger and amount of pollutants in various components of the environment (soil, soil, groundwater, etc.);
- object lifetime;
- geographical location, size of the object, diversity and breadth of influence on natural systems;
- natural and climatic conditions at the location of the waste disposal facility (characteristics of underlying rocks, climatic parameters of the warm season, etc.);
- the degree of development of socio-economic indicators within the boundaries of the influence of AED objects (infrastructural, transport and labor resources);
- ecological, economic and cultural value of the territory where the object is located;
- information and technical security of the possibility of applying technological solutions

Conclusion

Thus, the analysis of the regulatory, methodological and technological support for the elimination of AED from waste disposal facilities allows us to conclude that it is necessary to deeply develop strategic and tactical decisions to eliminate accumulated environmental damage.

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