SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

Materials of the International Conference

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参与者的英文报告

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"Scientific research of the SCO countries: synergy and integration"

Part 1: Participants' reports in English

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Materials of the International Conference
"Scientific research of the SCO countries: synergy and integration" - Reports in English

(June 29, 2019. Beijing, PRC)

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

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

CONTENT

MEDICAL SCIENCES

Foreword

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

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

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

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

前言

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

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

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

范福宽，
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俄罗斯公民债务负担增长分析

ANALYSIS OF THE GROWTH OF THE DEBT BURDEN OF RUSSIAN CITIZENS

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注解。 本文讨论了俄罗斯联邦人口债务负担增加的可能原因。 分析了2019年信贷市场的主要参数。 已经揭示了人口实际收入与人口债务负担增长之间的关系。
关键词：债务负担，贷款，实际收入关键词：债务负担，贷款，实际收入

Annotation. This article discusses the possible causes of the growth of the debt burden on the population of the Russian Federation. Main parameters of the credit market for 2019 are analyzed. The relationship between real incomes of the population and the growth of the debt burden of the population has been revealed.

Keywords: debt load, loans, real income Keywords: debt burden, loans, real income

Currently, many individuals and legal entities use borrowed funds to expand the scope of activities, to get out of a difficult situation, to improve their financial situation and so on. The term "debt overload" that emerged recently in the Russian financial environment has extended to many areas of activity, that are affecting economic relations. In practical terms, this term means an excessive debt load of the population and leads to a general decrease in the standard of living of the population (defined as the ratio of current loan payments to the borrower's income level) [10]. According to the Bank of Russia, the growth of the debt burden of Russians is approaching the maximum set in 2014, and is 9.9% in 2019 [8].

The currently observed growth rates of unsecured consumer lending (22.7% for 2018) are significantly ahead of the growth of nominal incomes (4.3%) and wages (9.9%) of the population [9].

This is due to several reasons:

First, this is due to a modification in the field of processing of loan applications. Every year there is an automation of processing and reducing the requirements for a potential borrower. The minimum requirements are shown on the example of PJSC Gazprombank in table 1.

Table 1 - Minimum requirements for the borrower of PJSC Gazprombank[1]

Requirements	Condition
Age from 20 to 65 years	Yes
Registration or permanent residence on the territory of the Russian Federation	Yes
Citizenship of the Russian Federation	Yes
Official labor relations with the employer, legally documented	Yes
The length of service for a period of at least 6 months (for those who receive a wage of at least 3 months.)	Yes
Absence of negative credit history	Yes

If earlier it was necessary to collect a full package of documents for filing an application, now the process takes a minimum of time. There are opportunities to submit applications without visiting the office: bank site, online bank. For banks, this carries additional risks, but at the same time it will allow to increase the loan portfolio.

Secondly, the growth of unsecured consumer lending is associated with a decrease in interest rates on the credit market. In 2017, the average rate on consumer lending without collateral was 14.5%, in 2018 it was 12.5, and in 2019 the rates vary from 10% [7]. Table 2 below shows comparisons of rates by banks for March 2019.

Table 2 - Comparison of rates on consumer loans without collateral, 2019.[2]

Condition	Gazprombank	Sberbank	VTB	Alfa Bank
Min % rate	10,8	11,9	11,0	11,9
No payroll project	+1,0	+1,0	+0,3-0,5	-
Without insurance	+5,0	-	+1,5-8,5	-
Max. % rate	17,8	19,9	19,5	23,5

In 2014, the growth of rates was affected by the unstable economic and political situation in Russia, the growth of the key rate. For 2019, the key rate is 7.5% (demonstrating a significant decrease since 2014 - 17%) [7].

Due to low interest rates on loans, the demand of the population is rising. At the same time, 43–45% of Russian borrowers made a loan overdue [9]. People often take loans and do not think that the next 3-5-7 years they will need to make monthly payments.

[1]Compiled by the author: [3]
[2]Compiled by the author: [2, 3, 4, 5]

Also, thirdly, the decline in real disposable incomes of the population during 2014-2018 played a role. The dynamics of income and wages are presented in table 3.

Table 3 - Dynamics of income and wages of the population, 2014-2018[3]

Year		2014	2015	2016	2017	2018
Income, %	nominal	7,1	10,6	0,9	2,4	3,9
	actual	-0,7	-3,2	-5,8	-1,7	-0,2
wages, %	nominal	9,1	5,1	7,9	7,3	9,9
	actual	1,2	-9,0	0,8	3,5	6,8

Despite the growth in wages, real falls in the income of a citizen continue to fall. Given the rise in prices for consumer goods, people may require all the necessary funds. As of February 2019, the average nominal wage in Russia is 43 thousand rubles. But in some regions the average salary does not rise above 25 thousand rubles. According to the state statistics service, the poor are the most heavily indebted, since there are not enough funds for basic purchases: clothes, appliances.

The banks themselves understand that people are heavily indebted, and therefore they often offer to refinance existing consumer loans, replacing them with new ones - with an increased amount, but at a lower rate and with a longer period [11]. Therefore, in part, it is not the share of new loans that is growing, but refinancing or, in the worst case, restructuring of previously taken commitments. Thus, among the representatives of the poorest segments of the population, the debt burden remains the highest among all categories of citizens. In 2015, the Law "On Bankruptcy of Individuals" was passed, regulating the possibility of declaring an individual as a bankrupt, due to the fact that borrowers cannot be liable for their debt obligations [1].

Summing up, in the credit market in 2019, there is an increase in consumer lending and, as a result, an increase in the debt burden on the population. An increase in debt load occurs for several reasons: a fall in real incomes and, as a result, it is not always possible to purchase any product or service; reduction of interest rates on loans, which causes the demand for banking services; lower requirements for borrowers; as a result, loan funds are available for a wider range of citizens. Also, such a product as refinancing affects the debt load - customers prefer not to take a new loan, but to refinance an old one at a lower rate and receive a portion of the money "on top".

The state is alarmed by this increase in the debt burden of the population and offers measures to restrict lending. For example, to prohibit banks from issuing a new loan to a client, if taking into account current obligations, more than half of the income will be taken for its repayment. [8].

[3]Compiled by the author: [6, 12]

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人事管理能力的诊断是企业智力资本的最重要组成部分
DIAGNOSTICS OF PERSONNEL MANAGEMENT COMPETENCIES AS THE MOST IMPORTANT COMPONENT OF THE INTELLECTUAL CAPITAL OF AN ENTERPRISE

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注解。由于企业智力资本的主要结构部分是其人员，在现代条件下，形成提高其管理和专业能力的新方法的相关性增加。本文通过对中层管理人员的人事管理能力的诊断，以最具动态发展领域的企业之一 – 数字经济产品的开发，实施和阐述为例，来证实其中一种方法。该研究的主要方法是选择评估中心的工具包，使用该工具包可以将不同时期评估管理和专业能力水平的动态方法付诸实践。还对管理人员的管理能力进行了定性和定量分析，以确定他们在企业智力资本形成中的作用。在研究过程中获得的定性和定量分析的结果允许实施集体或个人方法来培训企业人员并发展其必要的管理和专业能力。
关键词: 企业，智力资本，人员，管理能力，诊断，评估中心方法的工具包。

Annotation. Since the main structural component of the intellectual capital of an enterprise is its personnel, in modern conditions, the relevance of the formation of new approaches to improving its managerial and professional competencies increases. This article substantiates one of these approaches with the help of diagnostics of personnel management competencies in the person of middle management managers on the example of one of the enterprises of the most dynamically progressing sphere - development, implementation and elaboration of digital economy products. The main method of the study was the selection of the assessment center's toolkit, the use of which makes it possible to put into practice a dynamic approach to assessing the level of managerial and professional competences for different periods of time. A qualitative and quantitative analysis of the managerial competencies of managers was also performed in order to determine their role in the formation of the intellectual capital of an enterprise. The results of the qualitative and quantitative analysis obtained in the course of the study allow the implementation of a group or individual approach to training the personnel of the enterprise and developing its necessary managerial and professional competences.

Introduction

The sectoral identity of each enterprise and a number of key features of its production activities individualize the approaches to the formation of its intellectual potential. At the same time, the structural components of the intellectual potential to a greater or lesser extent influence its formation. However, as practice shows, the intellectual capital of an enterprise has the determining influence from all the structural components of the intellectual potential. Many Russian and foreign researchers understand the intellectual capital of an enterprise as the combination of managerial and professional competences and abilities of its personnel, which it can develop and use in the production activity of an enterprise. Naturally, the managerial and professional competencies of the personnel of the enterprise are constantly changing in time. Therefore, it is of paramount importance to ensure an optimal balance between them depending on the profile of the production activity of the enterprise, its industry sector and a number of other key factors. To do this, it is advisable to use existing or develop new diagnostic methods for managerial and professional competencies of the enterprise staff.

Purpose of the study

The main objective of this study is to substantiate the possibility of using the toolkit of the Assessment Center for diagnosing managerial competencies of staff on the example of middle managers as an important structural component of the intellectual capital of one of the enterprises of the most dynamically progressing sphere - development, implementation and elaboration of digital economy products.

Materials and methods

To achieve this goal, the most significant six managerial competencies of middle-level managers were selected in terms of their impact on the performance of each manager and the company as a whole. The selected managerial competencies include the following: result orientation, leadership, performance management, teamwork, stress tolerance, self-organization.

As a methodological support of the research and evaluation of managerial competencies, the tools of the Assessment Center (AC) were used [2; 3;]. To assess the managerial competencies of middle managers of the enterprise, a three-point scale was chosen with a step equal to "0.25" points. The research sample consisted of 12 middle managers of the enterprise (heads of departments), whose age ranged from 24 to 47 years. The process of assessing the managerial competencies of middle managers of an enterprise using the AC method was carried out using standard technology and contained all the steps involved [1, p. 74; 4]. Below are the results of the qualitative and quantitative analysis of managerial competencies.

Results and discussion

The final scores for each competence and for the totality of competences for each of the 12 middle management managers of the enterprise are given below (see Table 1).

Table 1

Final marks on the competence of middle managers of the enterprise

№ p/p	Evaluation criterion (competence)	Participants											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Orientation to the result	1,25	2,25	2,0	1,75	2,0	1,75	2,0	2,0	1,5	1,75	0,5	2,0
2	Leadership	0,75	1,5	1,5	2,0	1,5	1,5	1,5	1,75	1,0	1,25	1,0	1,25
3	Performance Management	1,0	2,0	1,25	1,75	1,5	1,75	1,5	2,0	1,5	1,25	1,75	1,25
4	Teamwork skills	1,5	1,0	1,75	1,75	1,5	1,25	1,75	1,75	1,5	2,0	2,25	1,75
5	Stress tolerance	1,75	1,5	1,75	2,0	1,75	1,75	1,5	1,5	1,5	2,0	1,0	2,0
6	Self-organization	1,5	1,5	1,5	2,0	1,5	1,5	1,5	2,0	2,0	1,75	1,75	1,75
Final Competency Assessment		1,3	1,6	1,6	1,9	1,6	1,6	1,6	1,8	1,5	1,6	1,4	1,7

The qualitative and quantitative analysis of the data in Table 1 is given below.

Estimates of the managerial competence "*Result Orientation*" show that for the majority of mid-level managers in an enterprise this level should be recognized as above average (1.75÷2,0). It is recognized by all managers and is actively used by them in practice. From this we can conclude that the majority of middle management managers clearly understand the tasks assigned to them, are focused on achieving results, put some effort into the implementation of planned tasks. General similar values for the given competence of the following groups of respondent managers attract attention: №№ 2, 3, 5, 7, 8, 12 (2,25; 2,0; 2,0; 2,0; 2,0; 2,0 respectively); №№ 4, 6, 9, 10 (1,75; 1,75; 1,5; 1,75, respectively). For the worse, the overall picture highlights the assessments of this managerial competence among respondent managers № 1 and № 11 (1.25 and 0.5 points, respectively).

The "*Leadership*" management competency scores for the majority of middle managers are in the development zone and are generally the weakest expressed competence in the sample under study. Most managers, with few exceptions, do not seek to occupy a leadership position in the group, preferring the role of an observer and a performer, or are seeking to transfer this function to a stronger leader. In communications, managers manifest, as a rule, a partner style of communication, both among themselves and in situations of interaction with subordinates, which, obviously, is part of the corporate culture of the enterprise. According to

this competence, the following groups of respondent managers are distinguished with similar estimates: №№ 1, 9, 11 (0,75; 1,0; 1,0 respectively); №№ 2, 3, 5, 6, 7 (1,5; 1,5; 1,5; 1,5; 1,5, respectively).

The "*Performance Management*" competency scores of most managers are at average and above average levels; therefore, they are generally aware of and apply this managerial competence in practice. They are able to set tasks for subordinates, to evaluate the results of their work. Some managers are aware of the need and importance of delegating their powers, however, as a rule, they do it intuitively, not always understanding exactly which functions can be delegated to others. According to this competence, the following groups of managers with similar ratings are distinguished: №№ 2, 4, 6, 8, 11 (2,0; 1,75; 1,75; 2,0; 1,75, respectively); №№ 1, 3, 10, 12 (1,0; 1,25; 1,25; 1,25, respectively).

Competency ratings "*Teamwork skills*" indicate that it is at a high enough level. So, all middle management managers showed an interest in solving team-based tasks, effective and efficient teamwork, the ability to create a comfortable working atmosphere in a team and a willingness to contribute to the development of this managerial competence. By this competence, the following groups of managers with similar ratings are distinguished: №№ 2, 6 (1,0; 1,25, respectively); №№ 3, 4, 7, 8, 12 (1,75; 1,75; 1,75; 1,75; 1,75, respectively); №№ 1, 5, 9 (1,5; 1,5; 1,5, respectively); №№ 10, 11 (2,0; 2,25, respectively).

Competency ratings "Stress tolerance" are on average. During the study, all managers showed the ability to keep their emotions under control, to adequately respond to an unfriendly attitude, to remain calm, to work effectively in stressful situations and recover quickly after them, as well as high performance during prolonged strain with a large amount of information. By this competence, the following groups of managers with similar ratings are distinguished:№№ 1, 3, 4, 5, 6, 10, 12 (1,75; 1,75; 1,75; 1,75; 2,0; 2,0 respectively); №№ 2, 7, 8, 9 (1,5; 1,5; 1,5; 1,5, respectively); only one manager is distinguished № 11 (1, 0 point exactly).

The "self-organization" competency scores are close to the average level. Managers know how to plan their actions in time, rationally set priorities, although they do not always do it effectively, confuse the notion of urgency and importance of tasks, most managers prefer to see and track tight deadlines, some know how to build things harmoniously and efficiently throughout the day, group them by degree of importance, but only a small part. Almost all managers understand the importance of managing a resource such as tracking time within a business task when it is executed, but do not actually track it. By this competence, the following groups of managers with similar ratings are distinguished: №№ 1, 2, 3, 5, 6, 7 (1,5; 1,5; 1,5; 1,5; 1,5, respectively); №№ 4, 8, 9, 10, 11, 12 (2,0; 2,0; 2,0; 1,75; 1,75; 1,75, respectively).

In the obtained assessments of a number of competencies of the studied sample of middle management managers, the following circumstances draw attention to themselves

1) lack of assessments above 2.25 points for any competence, which indicates the degree of development of competencies only at the level of experience, when competence manifests itself in standard situations, therefore, the manifestation of competences in non-standard, creative situations that require initiative is not typical for the studied sample;

2) the possibility of identifying groups according to the level of development of competencies, which makes it possible to structure the sample from the point of view of developing training programs for developing those competencies that are not yet sufficiently developed in the sample under study.

Before conducting a correlation analysis, the obtained assessments of managerial competencies were checked for the normal distribution of Kolmagorov-Smirnov. Since the distribution turned out to be abnormal, it was decided to use the non-parametric Spearman test.

Below is a table of correlations between all variable competencies (see Table 2).

When analyzing the correlation matrix of answers given by respondents, an average positive relationship was found between the competencies "*Result Orientation*" and "*Leadership*" (0.601). It is due to the fact that in both competencies there is a proactive component, since each of them implies the activity of the manager in achieving the goal. A positive relationship was also found between the "*Leadership*" and "*Performance Managemen*t" competencies (0.574). Its presence can be interpreted in the following way: both competences are related to personnel management and are acquired by managers during this process. Accordingly, it can be assumed that the manager, who pays more attention to the management of others and to the growth of his professionalism, developed both competencies simultaneously.

Table 2

Correlations between all variable competences

			Orientation to the result	Leader-ship	Perfor-mance Manage-ment	Team-work skills	Stress tole rance	Self-organization
Ro Spear man	Orien-tation to the result	Correlation coefficient		**0,601**	0,228	-	0,046	-
		Values (Two-sided)		0,039	0,476	0,415	0,888	0,328
		№		12	12	12	12	12
	Leader-ship	Correlation coefficient			**0,574**	-0,072	0,131	0,071
		Values (Two-sided)			0,051	0,823	0,684	0,826
		№			12	12	12	12
	Perfor-mance Manage-ment	Correlation coefficient				-0,183	**-0,509**	0,250
		Values (Two-sided)				0,569	0,091	0,432
		№				12	12	12
	Team-work skills	Correlation coefficient					0,080	0,440
		Values (Two-sided)					0,804	0,152
		№					12	12
	Stress tolerance	Correlation coefficient						0,036
		Values (Two-sided)						0,912
		№						12

Attention is drawn to the identification of an average negative relationship between the management competencies "*Stress tolerance*" and "*Performance Management*" (–0.509). This may be due to the fact that more stress-resistant managers are able to work with more information and tasks and lesser need to delegate tasks to others (the latter belongs to the "*Performance Management*" competence), while less stress-resistant managers tend to delegate more tasks to other performers, to "unload" themself and reduce the influence of stress factors such as multi-tasking and the need to work with a large amount of information.

Tables 3

Identificaton of the relationship between the variable assessments of managers' competencies

		1	2	3	4	5	6	7	8	9	10	11	12
1	Pearson Correlation		-0,347	**0,453**	0,124	0,243	-0,055	0,081	-0,388	**0,644**	**0,924**	0,184	**0,828**
	Value (Two-sided)		0,445	0,308	0,790	0,600	0,907	0,864	0,390	0,118	0,003	0,693	0,021
2	Pearson Correlation			0,055	-0,312	**0,611**	**0,833**	0,340	**0,557**	0,000	-0,412	-0,636	-0,001
	Value (Two-sided)			0,907	0,496	0,145	0,020	0,455	0,194	1,000	0,358	0,124	0,998
3	Pearson Correlation				-0,176	**0,798**	-0,001	**0,798**	-0,230	0,000	**0,698**	-0,479	**0,835**
	Value (Two-sided)				0,705	0,031	0,998	0,031	0,620	1,000	0,081	0,277	0,020
4	Pearson Correlation					-0,221	0,003	-0,656	0,450	0,000	-0,006	-0,210	0,003
	Value (Two-sided)					0,634	0,996	0,110	0,311	1,000	0,990	0,652	0,995
5	Pearson Correlation						**0,583**	0,715	0,003	0,000	0,352	-0,785	**0,696**
	Value (Two-sided)						0,170	0,071	0,994	1,000	0,438	0,037	0,082
6	Pearson Correlation							-0,002	0,097	0,000	-0,241	-0,661	0,121
	Value (Two-sided)							0,997	0,835	1,000	0,603	0,106	0,797
7	Pearson Correlation								0,295	0,000	0,352	-0,324	**0,522**
	Value (Two-sided)								0,521	1,000	0,438	0,479	0,230
8	Pearson Correlation									0,386	-0,411	0,093	-0,241
	Value (Two-sided)									0,392	0,360	0,842	0,603
9	Pearson Correlation										**0,461**	0,366	**0,463**
	Value (Two-sided)										0,297	0,419	0,296
10	Pearson Correlation											0,111	**0,886**
	Value (Two-sided)											0,812	0,008
11	Pearson Correlation												-0,282
	Value (Two-sided)												0,540

In order to obtain grounds for the formation of training groups for the subsequent development of managers' competencies, a correlation analysis of the assessments for all competencies between them was carried out. As a result, the following relationships were identified:

- high positive relationship between managers №№ 1 and 10 (0,924) (correlation is significant at level 0,01 (Two-sided)) and between managers №№ 10 and 12 (0,886) (correlation is significant at level 0,01 (Two-sided));

- average positive relationship between managers №№ 1 and 12 (0,828) (correlation is significant at level 0,05 (Two-sided)), between managers №№ 2 and 6 (0,833) (correlation is significant at level 0,05 (Two-sided)), between managers №№ 3 and 7 (0,798) (correlation is significant at level 0,05 (Two-sided)); between managers №№ 3 and 12 (0,835) (correlation is significant at level 0,05 (Two-sided)).

For optimal planning of activities for the development of managerial competencies, it is possible to combine managers into groups on the principle of the proximity of their results. To do this, you can use the results of qualitative and quantitative analysis of the obtained assessments of their competencies (see Tables 2 and 3).

Based on these results, the following groups are formed: group 1, in which it is advisable to include managers under №№ 1, 3, 5, 7, 9, 10, 12; group 2, in which it is advisable to include managers under №№ 2 and 6. For managers under №№ 8, 11 and 4, no connections were found in the correlation matrix.

Conclusions.

1. Identified as a result of diagnostics, the difference in assessments of managerial competencies can be used to form the intellectual capital of an enterprise through training and development of managerial competencies for the formed groups of managers and individually, which subsequently will allow to manage the formation of the intellectual potential of the enterprise.

2. The results indicate the efficiency of the application of the Assessment Center method for assessing the managerial competencies of middle management managers as one of the important components of the company's intellectual capital. This method is advisable to use as a new dynamic approach to managing the formation of the intellectual potential of an enterprise, tracking the dynamics of changes in managerial competencies of managers and specialists over time.

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定义企业智力潜力的概念和结构的新方法
NEW APPROACH TO THE DEFINITION OF THE CONCEPT AND STRUCTURE OF THE INTELLECTUAL POTENTIAL OF THE ENTERPRISE

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注解。在现代条件下，国民经济的竞争力和确保每个国家可持续社会经济发展的基础在很大程度上取决于产生新知识，有效使用和分配的可能性，以及在企业中创造突破性信息技术以及它们在创新产品生产中的应用。因此，改革国民经济的主要目标应该是通过企业的智力资源，向知识产品的生产过渡，增加高新技术产品在GDP的部门结构中的份额。要实现这一目标，必须为企业的智力和创新能力的发展及其在生产活动中的实际应用创造有利条件。在这方面，智力潜力的形成和发展问题，智力资源使用的加强对工业企业的发展和竞争力比以往任何时候都更加重要。

关键词：企业，人员，智力资源，智力潜力，结构成分，经济本质。

Annotation. *Under modern conditions, the competitiveness of the national economy and the basis for ensuring sustainable socio-economic development of each country largely predetermined by the possibilities for generating new knowledge, its effective use and distribution, as well as the creation of breakthrough information technologies in enterprises and their application in the production of innovative products. Therefore, the main goal of reforming national economies should be the transition to the production of intellectual products and increasing the share of high-tech products in the sectoral structure of GDP through the use of the intellectual resources of enterprises. To achieve it, it is necessary to create favorable conditions for the development of the intellectual and innovative capabilities of enterprises and their practical application in production activities. In this regard, issues of the formation and development of intellectual potential, the intensification of the use of intellectual resources are more relevant than ever for the development and competitiveness of industrial enterprises.*

Keywords: *enterprise, personnel, intellectual resources, intellectual potential, structural components, economic essence.*

Introduction

The development of the intellectualization of labor consists in the generation of new knowledge, ideas, hypotheses, which are subsequently transformed into the development of innovations and modern information technologies. Thus, the personnel of enterprises becomes specialists of intellectual work and owners of not only new knowledge and information, but also one of the defining resources of a knowledge-based information economy. In other words, specialists of intellectual labor form the intellectual potential of modern enterprises.

The concept of the intellectual potential of an enterprise is rather difficult to unambiguously define, since it includes a wide range of other concepts, such as the generation of new knowledge, increasing managerial and professional competencies, and the development of the staff's abilities for self-realization through continuous improvement of their skills. At the same time, the totality of these and other concepts undergoes dynamic changes over time under the influence of a large number of multidirectional factors. In the present study, the authors will clarify the definition of the concept of intellectual capital, disclose its economic essence and the structure of its components.

Purpose of the study

The purpose of this study is to clarify the definition of the concept of intellectual capital of an enterprise in relation to the peculiarities of the development of a modern economy, the disclosure of its economic essence and structural components, as well as the consideration of factors of production activities that contribute to improving the competitiveness of enterprises.

Materials and methods

Many modern economists are paying more and more attention to the research of such a thing as the "intellectual potential" of an enterprise. However, with regard to the practical activities of the enterprises themselves, a clear definition of this concept has not yet been formulated. In the majority of existing works, individual components of this concept are disclosed, which correspond to the specific conditions and types of production activities of enterprises. A systematic approach to the disclosure of the economic essence of the concept of "intellectual potential" of an enterprise and its structure has been used in a small number of studies that were rather fragmented. Meanwhile, almost all domestic researchers have come to understand that in modern conditions the development of the intellectual capital of an enterprise ensures the growth of its competitiveness and an increase in the efficiency of its production activities.

The main methods used in this work will be a comprehensive analysis of modern research and the approaches used to uncover the economic essence of the notion "intellectual potential" of enterprises and its structure, as well as to identify the practical features of its use to improve the efficiency of their production activities.

The concept of intellectual potential was first introduced into economics by the famous American economist J. Galbraith in 1969. Initially, he defined its value as a product of "intellectual activity" or intellectual property as part of patents, copyrights, trademarks, and know-how, and other forms [3, p. 78]. Then, many scientists began to consider the intellectual potential as a combination of intellectual property and knowledge of enterprise personnel. So, T. Stewart believed that intellectual potential is a body of knowledge of the entire personnel of an enterprise, which ensures its competitiveness. However, he did not take into account the organizational features of the practice of managing this knowledge and the dynamics of their change over time [8, p. 79]. Some founders of the theory of intellectual potential identified it with the intellectual potential of the enterprise staff, regarding it as a decisive resource, contributing to the growth of competitiveness based on the use of new knowledge and modern production organization technologies [7, p. 216]. This approach is quite close to the definition of intellectual potential made by B. Lev, who defined this concept as "an immaterial source of future benefits generated by innovations, unique technologies for organizing production and managing human resources" [9, p. 127].

At the beginning of our research, it seems necessary to dwell on the content of the concept of intellectual potential. In accordance with the definition of Gavrilova MA and Shepeleva VM, the potential can be considered as a space of probabilistically determined possible states of an enterprise as an economic entity carrying out its production activities in specific conditions. Probably determined possible states depend not only on environmental factors, but on the controlling influences of the company's management, which influence the redistribution of the weights of its probabilistic states through the effective use of existing and the formation of new conditions for the production activity of an enterprise [2, p. 150]. Based on this definition, the intellectual potential of an enterprise should be understood as the totality of the abilities of its personnel to generate new knowledge, their systematization and further transformation into information resources and technologies necessary for successful production activities of an enterprise.

The intellectual potential of an enterprise can be viewed as its stock of knowledge, information technology and other kinds of intellectual resources that can be realized through its structural components to increase competitiveness and generate additional income for the owners of the enterprise.

At the same time, intellectual resources of an enterprise are determined by the totality of knowledge, professional skills and abilities, intellectual capability of its personnel, on the basis of which innovative products are created [1, p. 171]. Thus, the intellectual potential of an enterprise determines the processes of generating new knowledge and other information resources, the availability and effective use of modern information management and production technologies, as well as other components.

On the basis of previous studies and on the results of analysis of existing approaches of different scientists to the concept of the intellectual capital of an enterprise, in relation to modern realities, it should be understood as the totality of its structural components (personnel, social and organizational capital), which is in continuous development based on increasing managerial and professional competencies, expanding the practice of using modern information technologies and the constant generation of new knowledge.

From this definition follows the economic essence of the intellectual potential of an enterprise, which can be presented through a set of intellectual abilities of the personnel of an enterprise, which include the professional qualification level, the required amount of theoretical knowledge, practical skills and experience, and intellectual work experience. They should be effectively used in the production activities of the enterprise to maintain its competitiveness. In addition, the economic essence of the intellectual potential of the enterprise is determined by the emergence of the system of relations of its components and the presence of causal relationships between them.

Consequently, the next stage of our research will be the determination of the structural components of the intellectual potential of an enterprise and the identification of the presence of causal relationships between them.

In fact, the structure of the intellectual potential of an enterprise can be represented as a combination of immaterial intellectual resources that it possesses and which can be used to create innovative products and increase the value of the enterprise [5, p. 309]. As you know, the market value of an enterprise is influenced by all the factors of production that form its income. In the context of the development of the knowledge economy, it seems legitimate to assert that the value of intellectual resources in shaping the market value of an enterprise becomes the determining factor of production [6, p. 7].

Currently, the most common approach is that there are three main components of the intellectual potential structure: intellectual capital (intellectual abilities of enterprise personnel and their effective use), social (management) capital and organizational (structural) capital (intellectual technologies, software products and other informational resources). The last two structural components are nothing more than the technology of enterprise management and its production activities, as well as relationships with the counterparties of the enterprise). At the same time, information technology management in modern conditions it is advisable to allocate into a separate - fourth (informational) - structural component of the intellectual potential of the enterprise. This proposal can be quite easily justified if we take into account the fact that modern information technologies are formed on the basis of the generation of new knowledge and represent an intellectual resource, partly related to the intel-

lectual property of an enterprise, along with such forms of its manifestation as inventions, utility models, trademarks , industrial brands, know-how, etc. In other words, the information component of the intellectual potential structure will contribute to its development and increase only under the conditions of regular conduction of research and development works by the enterprise [4, p. 131].

For the measurement of the intellectual potential of an enterprise, there is also no generally accepted approach yet. At the same time, many researchers adhere to the theory that it is possible to use integral indicators for its assessment, which characterize the development of the intellectual potential of the main divisions, and hence the entire enterprise. Assessment of the intellectual potential of the enterprise should be at least once a quarter. This will allow to constantly monitor the dynamics of its changes and timely make appropriate management decisions and carry out the necessary organizational measures in order to ensure the effective use of the intellectual potential of the enterprise, develop its production activities and maintain competitiveness in the domestic and foreign markets. This implies the need to include another (fifth) component - dynamic in the structure of the intellectual potential of the enterprise, which allows to track over time the possible changes in the assessments of its measurement and on this basis quickly make management decisions to maintain a certain amount of calculated indicators.

Results and discussion.

Based on the results of the study, the structural composition of the intellectual potential of the enterprise, in addition to the three traditional components - intellectual capital (intellectual abilities of the personnel of the enterprise and their effective use), social (management) capital and organizational (structural) capital (intellectual technologies, software products and other information resources) - was supplemented by two fundamentally new components - informational and dynamic, which allow to take into account to the maximum extent of its influence on the increase of competitiveness of domestic enterprises under modern economic conditions. Thus, the approach proposed by the authors to the definition of the concept of intellectual potential and its structural components has signs of novelty. At the same time, the authors do not pretend to the final completeness of both the definition of the concept of intellectual potential itself and the definition of the essence of its traditional and proposed new structural components. Currently, these issues in modern economics have not been studied enough, despite the presence of a sufficiently large number of existing and newly emerging studies. This circumstance even more clearly confirms the relevance and importance of conducting this kind of research in relation to the objective realities of the development of the Russian economy.

Conclusions

1. Under modern conditions, the competitiveness of the national economy is largely determined by the ability of enterprises to generate new knowledge, their effective use and dissemination, as well as the creation of breakthrough information technologies and their use in the production of innovative products.

2. Under the conditions of widespread informatization of production, the personnel of enterprises can be regarded as specialists of intellectual labor who possess not only new knowledge and information, but also form the intellectual potential of modern enterprises.

3. The formulation of the concept of intellectual potential, which is most relevant to modern approaches to the organization of production, the use of knowledge and competence of staff, and also includes the conditions necessary to maintain the competitiveness of enterprises, has been clarified.

4. The novelty of the results obtained consists in expanding the number of structural components of the intellectual potential of an enterprise from three traditional to five by including two fundamentally new components that make it possible to take into account its impact on enhancing the competitiveness of domestic enterprises in modern economic conditions.

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将公司的价值管理模型引入商业组织管理系统
INTRODUCING THE COMPANY'S VALUE MANAGEMENT MODEL INTO A COMMERCIAL ORGANIZATION MANAGEMENT SYSTEM

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抽象。 现代管理需要使用最相关和最先进的业务管理方法来确保和保持其有效性。 商业价值是表征其创始人最终战略结果的最重要指标。 大多数企业的传统公司治理体系只关注企业的盈利能力，这说明其目前的表现，但它没有回答关键问题 – 从长远来看如何恰当地投资于这个目标。 本文讨论了与公司治理体系中成本法实施相关的主要问题。

关键词: 业务效率，公司管理系统，成本管理，公司价值管理系统

Abstract. *Modern management requires the use of the most relevant and progressive methods of business management to ensure and maintain its effectiveness. Business value is the most important indicator characterizing the final strategic result belonging to its founders. The traditional corporate governance system of most enterprises focuses only on the profitability of the business, which speaks of its current performance, but it does not answer the key question - how appropriate is investing in this object in the long term. The article discusses the main issues related to the implementation of the cost approach in the corporate governance system.*

Keywords: *business efficiency, company management system, cost management, company value management system*

Modern business functions in rather difficult conditions of constantly changing environment. The question of the effectiveness of doing business does not cease to be relevant in any society. Intensive development rates require continuous improvement of the company's management system to ensure its sustainable growth.

In itself, business management is designed to ensure its effectiveness, primarily to the owners. The management system of the company is an organizational complex consisting of goals, objects, material resources, information, activities and management tools [2, p.11].
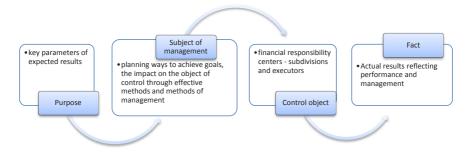
Figure 1 - Company Management System

The target setting is a reference point in the business management system, as it determines the desired intermediate and final results. Taking into account the set strategic objectives, the subject of management (the head and his team), work out ways to achieve them, using various methods and tools. The subject of management affects the object (divisions, processes, centers of financial responsibility, etc.), obtaining an intermediate and final result.

The actual results of the activities characterize the effectiveness of the management system, they reflect the extent to which the goals have been achieved. In the process of management at all stages of activity, a feedback system is needed to optimize it and improve business performance. In addition, the influence of the external environment on the fulfillment of goals and plans should also be considered.

In the management of the company should distinguish the level of indicators characterizing its effectiveness. Traditionally used in financial management indicators, such as revenue, profit, profitability refers to the short-term performance of the company, while the value of the business - to the long-term.

Traditional monitoring and reporting systems based on financial indicators have significant limitations that do not allow managing the company's efficiency in full. They do not reflect the cost of intangible assets, do not reflect the expectations of all stakeholders (customers, staff, suppliers, partners). They reflect the past development of the company and do not take into account the accumulated potential of the company and future prospects. In addition, financial indicators are too aggregated and summarized. It is impossible to determine which factor or management decision determined the result.

All this speaks of the need to develop a system of monitoring and reporting in the company, aimed at providing all interested parties with information that allows making management decisions that contribute to the growth of business value.

In this regard, it is advisable to introduce a cost management system into the company's financial management system.

Company value management (Value-based Management, VBM) is a process of consistently implementing a financial model for analyzing a company based on the principle of economic profit, including building on its basis and with its help strategic and operational decisions of the company's management [1, p.62].

Rationally implemented cost management of a company means that all its plans, methods and applied management methods are aimed at one common goal: to help the company maximize its value by organizing management decision-making based on the consideration of key cost factors.

Figure 2 - *Stages of the transition to a company value management system*

The transition to value management involves the introduction of a value management system in the enterprise, which can be divided into several stages, presented in Fig.

Practical implementation of a company's value management system into a financial management system implies assignment to company structures and executors of cost factors as objects of control and responsibility.

The management of the company determines the methods of cost management, based on information from responsibility centers. The key factors of cost and analytics are monitored, deviations of actual results from expected ones are determined, if necessary, adjustments are made to the goals and plans.

Table 1 - *The main reasons for the resistance of employees*
to strategic change [1]

Individual reasons	Organizational reasons
1. Habit 2. Economic factors 3. Job security 4. Fear of the unknown 5. Selective processing of information	1. The threat of the established hierarchy 2. The threat to the established resource allocation 3. Structural inertia 4. Limited focus of change 5. Group inertia

It should be noted that the system of managing the company's value in Russian practice is not widely distributed. This is due to several reasons, the main of which are listed in Table 1. In addition, an important reason for this fact is the low number of public companies in the total number of economic entities in the country. Nevertheless, the transition to cost management has obvious prospects, since it is he who allows the management process to be guided not only by short-term results in the form of profit, but also by the final strategic result of business efficiency in general, i.e. its cost.

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引入平衡计分卡作为确保组织财务安全的工具
INTRODUCTION OF A BALANCED SCORECARD AS A TOOL TO ENSURE THE FINANCIAL SECURITY OF THE ORGANIZATION

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注解。 在现代商业条件下，提高财务管理效率的问题具有高度相关性。 组织的财务安全是其有效性的最重要参数之一。 传统上，它被视为企业经济安全的一部分。 企业财务管理的现代方法说明需要有自己的系统来管理其财务安全，并需要有适当的工具来评估和确保

关键词: 企业财务安全，企业财务安全管理，财务安全评估方法，企业财务安全指标

Annotation. In modern business conditions, the issue of improving the efficiency of financial management is highly relevant. The financial security of an organization is one of the most important parameters of its effectiveness. Traditionally, it was considered as part of the economic security of the enterprise. A modern approach to the financial management of an enterprise speaks of the need to have its own system for managing its financial security and the appropriate tools for its assessment and ensuring

Keywords: financial security of an enterprise, management of financial security of an enterprise, methods for assessing the level of financial security, indicators of financial security of an enterprise

Assessing the level of financial security of a commercial organization is a relatively new look at analyzing the financial condition of business entities.

The concept of "financial security" appeared in the Russian economic literature relatively recently. In general, we can distinguish two points of view on maintaining a stable financial position of an enterprise. The first, traditional, considers financial security as an element of the overall economic security system of an enterprise. The second brings financial security to the development of measures of

crisis management of the enterprise. The constant complication of the business environment and the increase in the number of enterprises in a crisis financial situation leads to the need to accept the fact of insufficient effectiveness of the business management system in the absence of a developed financial security management system.

According to I.A. Blank "financial security of an enterprise is a quantitatively and qualitatively determined level of its financial condition, ensuring stable protection of its priority balanced financial interests from identified real and potential threats of external and internal nature, the parameters of which are determined on the basis of its financial philosophy and create the necessary prerequisites for its financial support sustainable growth in the current and future period " [1, p.24].

Karanina E.V. defines the financial security of an enterprise as "its state of protection from the negative impact of external and internal threats, destabilizing factors, which ensures the sustainable implementation of the main commercial interests and goals of the statutory activities" [3, p.100].

In our opinion, the essence of financial security of an enterprise consists in its ability to independently develop and conduct financial strategy and tactics in accordance with the basic goals of operating a business in an uncertain and competitive environment.

Financial security is a universal category, reflecting the security of subjects of socio-economic relations at all levels. Financial security is a state of an enterprise that:

- allows you to ensure the financial balance, stability, solvency and liquidity of the company in the long term;
- meets the needs of the enterprise in financial resources for sustainable expanded reproduction of the enterprise;
- ensures sufficient financial independence of the enterprise;
- able to withstand existing and emerging hazards and threats that seek to cause financial damage to the company or change the capital structure undesirable, or forcibly liquidate the company;
- provides sufficient flexibility in making financial decisions;
- ensures the security of the financial interests of the owners of the enterprise.

Managing the financial security of an enterprise involves a certain sequence of steps, presented below.

1. Analysis of risks and threats to the financial security of the enterprise

2. Development of methodological tools for assessing the state of financial security of an enterprise

3. Development of a financial security management strategy for an enterprise

4. Development of a mechanism for managing the financial security of an enterprise

5. Evaluation of the effectiveness of the financial security management system of the enterprise

6. Adjustment of the strategy and tactics of financial management of the financial security of an enterprise in accordance with changing conditions

Figure 1 - The process of managing the financial security of the enterprise [4]
Competent diagnostics of the level of financial security of an enterprise
is the key to building an effective system to reduce real and potential threats
to its stability

Numeric and quantitative	Normative	Statistical and mathematical modeling
Analog method	Expert ratings	Financial experiment
Monitoring	Behavioral Finance	Programming

Figure 2 - Research methods used to assess financial security [2]

To assess the level of financial security can be used various research methods. In general, their classification is presented in Figure 2.

As the most traditional indicators of the level of financial security of an enterprise, a system of financial indicators is recommended, recommended by most authors for diagnosing financial condition. Summarizing their work, you can present a balanced system of indicators of financial security of the enterprise, consisting of four groups.

Table 1 - Indicators of financial security of the enterprise

Indicator	Score indicator	
	Threshold value	**Dynamics**
Liquidity ratios		
Absolute liquidity ratio	0,2	Increase
Critical liquidity ratio	1	Increase
Current liquidity ratio	2	Increase
Financial Sustainability Indicators		
Financial stability ratio	0,5	Increase
The ratio of financial activity	1	Reduction
The ratio of own working capital	0,1	Increase
Business activity		
Profit growth rate	Revenue growth rate	Increase
Revenue growth rate	Asset growth rate	Increase
Asset growth rate	1	Increase
Accounts receivable turnover	12	Increase
Accounts payable turnover	12	Increase
Customer diversification	10%	Reduction
Economic Performance Indicators		
Return on total capital	Inflation index	Increase
Return on equity	15%	Increase
Return on sales by net profit	5%	Increase

The above indicators take into account not only the ratio of various sources of financing and the direction of their placement, but also the effectiveness of their attraction, characterizing the stability and efficiency of business. This list of indicators is basic and can be adapted depending on the industry sector, scale of activity, strategic management objectives, etc.

To obtain the most complete picture of the level of financial security of an enterprise, it is advisable to reduce the indicators under consideration into a single integral indicator. When calculating it, it is advisable to compare the desired (normative, average industry, etc.) and actual values of the indicators in order to obtain greater visibility and informativeness. If the integral indicator itself shows the actual state of the level of financial security for the relevant period, then its dynamics may indicate a major trend for further development and prospects for the enterprise.

On the basis of the information received, the management of the enterprise should develop a set of operational and long-term measures to counter negative factors, as well as to prevent and overcome possible negative consequences and threats.

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法律虚构结构中的虚假（欺骗）：道德和法律问题
FALSE (DECEPTION) IN THE STRUCTURE OF A LEGAL FICTION: MORAL AND LEGAL ISSUES

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注解。 这篇科学文章探讨了在某些生活（包括 – 法律）情境中使用谎言（欺骗，虚构）的可能性，它的地位和价值作为法律虚构的结构要素以及"谎言，作弊，制造"类别的转变 "在"法律虚构"现象的定义中。 在这篇科学文章中，术语"法律制造"和"法律虚构"被视为同义词。

关键词：谎言，欺骗，小说，小说，法律小说，fictitio，我们。

Annotation. *This scientific article explores the possibility of using the lie (deceit, fiction) in certain life (including - legal) situations, its place and value as a structural element of the legal fiction and the transformation of the categories of "lying, cheating, fabrication" in the definition of the phenomenon of "legal fiction ". In this scientific article the terms "legal fabrication " and "legal fiction" are regarded as synonyms.*

Keywords*: lies, deception, fiction, fiction, legal fiction, fictitio, us.*

As in everyday life, the term "fiction" is often used in the scientific field. The Explanatory Dictionary of Foreign defines fiction (from the Latin. Fictio) as "artifice, fabrication, non-existent, false", this is "...a technique consisting in the fact that reality is brought under a formula that does not correspond to it or even has nothing in common with it in order to draw any legal conclusions from this formula."[1]. In one of the Russian dictionaries, fiction is understood as "... a deliberately created, invented position, a construction that does not correspond to reality and is usually used for some specific purpose."[2]. The philosophical-logical analysis of the category "fiction" allows us to say that fiction is a kind of formation or process, a procedure characterized by vagueness, falsity, imagination, having the characteristic "non-existent"[1], never existed, etc.

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[1]Nadel-Chervinskaya M.A., Chervinsky P.P. Explanatory dictionary of foreign words. Rostov on/D, 1995. P. 552.

There is no doubt that the terms "false", "deception" and terms similar to, derived from them, contradict such social values as honesty, justice, morality. They also contradict a category that is one of the fundamental scientific principles - the truth. And despite this, we meet with legal definitions that use the categories of "lie" and "deception" to explain the essence and content of legal fictions.

We give examples in which the concept of "juridical (legal) fiction" is explained using the terms "lie" and "deception".

So, the famous Russian lawyer GF. Dormidontov spoke of fiction as a well-known method of thinking, consisting in the assuming of a known non-existent circumstance as existing or, on the contrary, existing as non-existent , in solving the problem using a false position, going through this definition of fiction in the true legal sense as the same technique, but allowed and even prescribed in certain cases by the objective law[2].

So A.V. Markin notes that legal fiction is a deliberate deceit built into a regulatory rule. [3]. Legal fiction is a mean of legal engineering, by means of which a knowingly false position is conditionally recognized as truth, the possibility of refutation of which, as a rule, has no legal value[4], R.K. Lotfullin believes. A.V. Melekhin calls legal fiction as a deliberately false, not a true statement, to which the legislator attaches significance af a legal fact[5]; egal fiction is a mean of legal engineering, with the help of which legal norms fix a deliberately false irrefutable provision, distorting reality in a certain way in order to protect various interests (individuals, society and the state)[6], O.E. Zatsepina points out.

In our opinion, the use of these terms is unacceptable, which we are trying to justify in subsequent parts of this article.

First of all, we note that the ancient dictum "Jus est ars boni et aequi" - "Law is the art of good and justice" wich reveals the organic connection between law, justice and morality. I. Kant emphasized that "the Law prescribes not only legality, but also morality." In his work "Philosophy of Law", G.V.F. Hegel considered questions of law in an organic connection with questions of morality, calling morality and ethics the structural elements of law.

Modern authors also highly value moral principles in law. So, the Russian lawyer AB Vengerov stresses that: "Law and morality are closely connected with each other, complement each other, although there may be significant disagreements

[2]Ozhegov S.I. Explanatory dictionary of the Russian language. M., 2010. P. 681.

[3]Logical reference dictionary. M., 1975. P. 395.

[4]Dormidontov G.F. Classification of the phenomena of legal life attributable to the cases of the use of fictions. Part one. Legal fictions and presumptions (part one) // Bulletin of civil law. - 2011. - № 1. P. 217-269.

[5]Markin A.V. Fictions in Roman law: logical nature and legal expediency // Vector of science TSU. 2011. № 2 (16). P. 243-245.

[6]Lotfullin R.K. Legal fictions in the history of national law // History of State and Law. - Moscow: Lawyer, 2006, № 1. - P. 12.

between them. But, in general, moral standards reinforce legal (there is a so-called moral right), and violation of legal norms, as a rule, entails moral condemnation of the offender"[7].

"It is not by chance that law is sometimes called the legal formulation of morality, because law requires compliance with the rules that are supported by morality, legal and moral decrees, prohibitions, prescriptions are sometimes absolutely identical,"[8]continues T.N. Radko. Professor V.I. Chervonyuk also notes that "the law must meet the requirements of morality: first of all, the generally accepted, universal and elementary requirements corresponding to the basic principles of Christian culture or other cultures that are of the same order in moral values (Confucianism, Buddhism, Islam)"[9]. "Law is a phenomenon of deep moral order and its action is impossible without the direct inclusion of moral criteria and assessments in the fabric of law," [10] concludes V.I. Chervonyuk.

And how do law and lie, deception relate? It can be concluded that for the law lies and deception are unacceptable attributes: the right does not tolerate deceit and lies, moreover, many of their manifestations are legally punishable or other adverse consequences are foreseen. So, let us recall the legal liability established by the state for perjury, for example, in Russia, Article 307 of the Criminal Code of the Russian Federation [11] establishes criminal liability for knowingly false testimony of a witness, victim or expert opinion or testimony, specialist testimony, as well as deliberately incorrect translation in court or during preliminary investigation). Article 165 of the Criminal Code of the Russian Federation establishes criminal responsibility for causing material damage by deception or abuse. Russian civil law also has a negative attitude towards fraud.

P. 2 of Art. 179 of the Civil Code of Russia establishes the consequences of the invalidity of a transaction concluded under the influence of deception, violence, threat or adverse circumstances, in particular, it is established that a transaction concluded under the influence of deception may be declared invalid by the court at the suit of the victim. In accordance with paragraph 2 of Art. 179 of the Civil Code of the Russian Federation, deliberate silence about the circumstances about which the person had to report with the good faith that was required of it under the terms of turnover is also considered to be a deception.[12].

That is, on the one hand, we see the negative attitude of the low towards deception and lies, both of legal theory and legislation, on the other hand, there are

[7]Melekhin A.V. Theory of State and Law: a textbook. - Moscow: Market DS, 2007 P. 296.

[8]Zatsepina O.E. To the question of the essence of legal fiction // Prologue: Journal of Law / Prologue: Law Journal. - 2017. - № 2. P. 11. P. 7-13.

[9]Vengerov A.B. Theory of State and Law: studies. - 4th ed. - Moscow: Omega-L, 2007. P.355.

[10]Radko T.N. Theory of State and Law: studies. - 2nd ed. - Moscow: Prospectus, 2009. P 282.

[11]Chervonyuk V.I. Theory of State and Law: Textbook. - INFRA-M, 2006. - p. 283.

[12]Chervonyuk V.I. Theory of State and Law: Textbook. - INFRA-M, 2006. - P. 284.

opinions in jurisprudence that allow the use of the categories of "lie" and "deception", even if "noble" purposes, bearing in mind precisely the definitions of "legal (juridical) fiction". That is, one can argue about the presence of a legal paradox: some authors consider fiction, lies and deception as an integral element of the concept of legal fiction, and, at the same time, they are clearly negative in nature, and even punishable phenomena.

In our opinion, one of the reasons for such views is the works of thinkers of various epochs, who admit, and often directly call for the use of deceit and lies in certain life situations, as an exception.

For example, ancient philosophers ambiguously assessed not only the categories of "lie", "deception", but also such categories as "verity" and "truth": on the one hand, lie is harmful, often dangerous and gives rise to legitimate mistrust, indignation and even contempt for the liar, but on the other hand, it may be relevant and useful; for example, Plato argued that in human intercourse a lie might be useful, like a medicine[13]. In Plato, the lies on the part of state representatives, the rulers receive a grounding and justification in the treatise "Laws", in which he talks about educating young people with the help of false, fictional (and in fact - creative) poetic and mythological ideas, the purpose of which is "to force voluntarily, rather than being forced to act in all things fairly. "[14].

G.V. Hegel pointed out that truth is not a minted coin, which can be given in finished form and hidden in a pocket in the same form. There is no false or evil [15]. The Thinker emphasized the subjectivity of the study of the problem of truth or falsity in the perception of objects and phenomena of each person.

Russian thinker V.S. Solov'ev believed that the question of necessary lies, that is, whether it is permissible or impossible to make statements consciously inconsistent with factual reality in extreme cases, for example, to save someone's life, is essential in moral philosophy.[16].

The modern Russian philosopher D.I. Dubrovsky in his research analyzes in detail the issues of the social functions of deception [17]. In his classification, he emphasizes: intentional deception (self-serving or disinterested, that is, dictated by considerations of duty, tact, or caused by coercion, blackmail) and unintentional; malicious and virtuous; half-truth; self-deception. He considers the essence of vir-

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[13]Criminal Code of the Russian Federation dated 13.06.1996 No. 63-ФЗ // Meeting of the legislation of the Russian Federation. 1996 № 25. Art. 2954.

[14]Civil Code of the Russian Federation (Part One) of 11/30/1994 No. 51-ФЗ // Collection of Legislation of the Russian Federation. 1994. № 32. Art. 3301.

[15]Myasnikov A. G. Antique philosophy on the expediency and forced nature of lies // News of PSPU after. V.G. Belinsky. 2008. № 13. P. 9.

[16]Plato. Laws // Collected Works in 4 v. V. 4. - M., 1994. p. 113.

[17]Hegel G.V.F. Phenomenology of the spirit. - SPb., 1992. p. 20.

tuous deception (including from the state and its bodies)[18]. In this scientific work, the paragraph "The lie of N.I. Bukharin "[19], in which the need to distinguish the good intentions and beneficence of deception is closely examined.

Another researcher, R.G. Apresyan remarks: "I don't say that a lie is worthy. A lie is always unworthy, but the situation we are discussing shows that a lie can be permissible and justified as a last resort to resist attackers. "[20].

And the examples we have cited are by no means the only ones in scientific views. Accordingly, it can be concluded that the attitude towards deception by science, above all - philosophy, is not always negative.

In our opinion, the use in the legal sphere of the categories "lie", "deception" even "for good" has significant drawbacks, for example, "goodness" of such a lie does not abolish the lie itself, i.e. a lie (deception) remains a lie (deception), and this lie (deception), as a rule, anti-moral, and often anti-legal in nature. Moreover, this type of lie (deception) deprives the right of the subject of independent choice of behavior, "deceived for the good", rather than when he would know the truth, in essence, disregarding voluntary nature of legal relations, i.e. , the liar imposes certain behavior to another person, or significantly affects victims behavior. In the future, the use of lies and deceit compels the subjects to defend themselves against it, the credibility of people and organizations that have fallen to a lie decreases, or complete distrust appears. As Mark Tullius Cicero remarked: "We don't believe a liar even when he speaks the truth".

Even assuming the possibility of using, approving a lie (deception) in a law (a lie for the sake of achieving a socially useful goal, saving lives, etc.), a number of significant problems still arise, the most serious of which can be called the complexity of defining the boundaries between "Useful lie" and a lie in the literal sense of the word, i.e. - low and immoral. Such a situation, at a minimum, leads to the substitution of the concepts "good" and "evil", "truth" and "lie, deception", "truth" and "delusion", "fiction" and "objective reality", etc., at most, "lie" and "deception" become for society and the state the same normal, positive, desirable phenomenon as "truth", "honesty", etc.

The above statements about the relationship between law and morality, allowing to assert that law must have a high degree of morality (even despite the presence of certain contradictions and differences between law and morality), as well as justice, humanism and, which is very important for our research – objectivity, also do not provide grounds for using the categories of "lie" and "deception" in law, otherwise we will encounter internal contradictions in law, because morality, ethics act as antagonists of the initially low, immoral, negative social manifestations - lies and deception. It is difficult to imagine how the moral component and the elements of falsehood (deception) in law will interact.

[18]Soloviev V.S. Works. - M., 1988. p. 698-702.
[19]Dubrovsky D.I. Deception. Philosophical and psychological analysis. M., 2010. p. 39-50.
[20]Same. p. 51-89.

You can also cite the following grounds, according to which the terms "lie" and "deception" should in no way be present in the concept of "legal fiction", as well as explain, define the essence of legal fiction.

So, unlike the originally low, immoral, illegal, etc. the goals of deception and lies in the true understanding of these concepts, legal fictions have socially useful, truly "noble goals"[21].

The fictions in law are aimed at the implementation and protection of the rights, freedoms and legitimate interests of various subjects.

It is worth noting that often this "utility" extends to entire nations in a subjective dimension and in the territory of one or several states - in a territorial dimension (for example, constitutional and legal fictions), which, again, is difficult with regard to lies and cheating.

Moreover, as a rule, when creating and implementing legal fictions, known awareness is assumed (for example, law enforcers, in particular judges) about certain discrepancies between legal fictions and reality, which cannot be said about deception and lies, because the awareness of a subject to whom falsehood or deception is applied , nullifies the achievement of the goals that lie and deception are aimed at.

Thus, we can conclude that legal fiction arises due to the need for legal regulation of certain public relations, but at the same time lawmakers face the lack of traditional legal opportunities for such a settlement, as a result of which the possibilities of legal fiction towards "negative" or "mirror" are used. »The consolidation of the situation, a phenomenon in the norms of law, the realization of which leads to the" positive "result laid down in such a norm, while the tasks are solved and the goals are achieved in front of the state, society and (or) those who seek, respectively, to solve and achieve particular individuals or their organizations.

Of course, this explanation of the essence of legal fictions requires further development, refinement, improvement, but, most importantly, in legal science, people increasingly begin to think about the high positive meaning of legal fictions, their non-standard possibilities that contribute to the optimal regulation of social relations, but without the use of terminology, that is in fact, alien to the law.

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在正常发育的学龄前儿童和自闭症谱系障碍儿童中形成性别认同。 比较方面

FORMATION OF GENDER IDENTITY IN NORMALLY DEVELOPING PRESCHOOL CHILDREN AND IN CHILDREN WITH AUTISM SPECTRUM DISORDER. COMPARATIVE ASPECT

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注解。 本文讨论了正常发展的学龄前儿童和自闭症儿童中性别认同的理论问题。 描述了性别认同形成的阶段。 突出了违反性别认同的参数。 给出了正常发育的学龄前儿童和自闭症谱系障碍中性别发展的比较方面。

关键词：自闭症，性别认同，性别，学龄前儿童。

Annotation. *The article addresses the theoretical problems of gender identity in normally developing preschoolers and in children with autism. The stages of the formation of gender identity are described. Parameters of violation of gender identity are highlighted. A comparative aspect of the development of gender in normally developing preschool children and in with autism spectrum disorder is given.*

Keywords: *autism, gender identity, gender, preschoolers.*

The pre-school period is extremely important for the development of a child's gender identity. What is gender identity. Gender identity is a kind of social role that implies behavioral patterns characteristic of a man or a woman. However, the social role is an external manifestation of directly internal feelings of oneself, as a representative of a certain sex.

Gender identity is formed after the birth of a child. Gender-social stereotypes are already formed and are applied to the newborn in the maternity hospital: boys are swaddled in blue envelopes, girls in pink and so on. Thus, the development of gender identity began and will take shape until the end of life.

Socialization is directly related to gender. Children are raised as "boys" or "girls", ranging from clothing to behavioral patterns. With age, this process becomes more and more complicated. At about two years old, a child can already become aware of his gender (is it a boy or a girl), but he cannot name the characteristics of this gender. In a child with an autism spectrum disorder, this process

may not occur at this age, because they have violation of ideas about their own body and there are problems in understanding of addressed speech, through which gender attitudes are transmitted to the child from the environment.

The notion of one's own gender is a component unit of the self-concept of a person, on the basis of which his notion of himself as a person is built, his self-consciousness, as well as the ability to assume a certain social role depending on his own gender.

In modern psychiatry and correctional pedagogy and psychology, the concept of early childhood autism replaced the concept of autism spectrum disorder for a reason. The reason for replacing the concepts is quite clear. Autism is not a childhood disease and is not always detected in early childhood. The complexity of this disease lies in the fact that objective criteria for its diagnosis have not yet been developed. And not always autism can be highly functional. All this leads us to the fact that on the "spectral axis" of autism there can be completely different people, but all of them will be united by the lack of communication and the lack of social interactions. Focusing on the concept of gender as a "social gender," we consider it extremely important to form a correct idea of sex-role relationships among pre-schoolers with ASD, against the background of changing cultural clichés of masculinity and femininity.

If the self-image is suffering, this naturally leads to problems in the development of the psyche and the personality as a whole, which creates serious difficulties for the child and his social environment. Comprehension and understanding a child with an autism spectrum disorder of the device of his gender is extremely important for full mental development. In turn, "gender self-awareness" is an important aspect of socialization. In turn, the key to the socialization of the child is his communication.

In addition to the practical relevance of studying the concept of the body pattern in children with ASD, the theoretical aspect of the work is also significant. Under the conditions of co-education of boys and girls, it becomes possible to lose the distinction between the social roles of a man and a woman, therefore gender-role socialization occurs spontaneously, and in some moments may become distorted. This leads to the fact that typical personality traits in children of different sexes: masculinity in boys, femininity in girls — appear less distinctly. Thus, the study of the formation of ideas of gender identity in children with ASD can provide valuable information about the patterns of mental diontogenesis.

At the age of three, a normal child can determine the gender of others by external signs. A child with an autism spectrum disorder may not be available because expressive speech suffers and there were problems at the previous ontogenetic stage.

At 6-7 years old, a child can already clearly define his/her gender and describe the gender of those around him. In a child with autism, we can observe mutability, variability, error tolerance in the description of one's gender and the other's gender.

At this stage of social development, we are witnessing the erasure of clear boundaries between gender, a clear definition of masculinity and femininity. In the modern world, it's not pretentious for women to perform male and male to perform female roles. Both in the profession and in behavior. Nevertheless, the decisive factor in this choice is the family, its composition and values, the nature of the relationship between the son-father, mother-daughter, parenting model and behavior of parents, the relationship of parents among themselves.

The second most important factor for a child developing normally will be the environment of the kindergarten, children's fiction, cartoons, fairy tales. For a child with autism, these factors, as a rule, carry more stimulating, sensory information than gender stereotyping.

Bern S. Says that a child goes through four stages of the formation of gender identity:

"Gender identification" - attribution of self to one or another gender. This is the first parameter described by Bern. As we have already defined above, a child at the age of two years is already aware of his gender. A child with autism, even if it does this, is hampered by the transmission of this information to the society;

"Gender constancy" is an understanding of the fact that sex can be changed, but gender is not. It is also characteristic of a child developing normally, but difficult for a child with ASD, since this contingent has, in principle, difficulties in understanding;

"Differential imitation" - the behavior of boys corresponds to the male, girls - to female. A child normally imitates the behavior of his father or mother depending on gender in manners, paralinguistic forms of communication, gestures, and so on. For a child with autism, this spectrum is narrower due to a violation of communication as a secondary defect.;

"Gender self-regulation" - the child controls his sex-role behavior independently. In a child with autism, self-control is not developed [1 p. 210].

The American Psychiatric Association has developed a manual for the diagnosis of mental disorders. According to their data on gender identification can be judged by a number of parameters. Let us analyze these parameters from the point of view of the development of a child in normal conditions and with autism.

Normal Child Development	Autism Child Development
Repeatedly declares (insists on) his own belonging to his gender	As a rule, does not speak. Answers the question about the gender with speech stereotypes
In the case of girls: prefers to dress in a woman's dress or showcase women's clothing; in the case of boys: insists on wearing only stereotypical men's clothes	Wears certain clothes, reacts inadequately to the change of clothes, prefers to wear the same thing.
In a role-playing game and fantasies: strongly and consistently prefers the roles peculiar to their gender.	Does not participates in role-playing games. The game is not distinguished by gender role.
Wants to participate in games and activities typical of their gender.	Prefers to play alone with inanimate objects.
Prefer to play with children of their own sex more often.	Does not play with other children in principle.

The American Psychiatric Association notes that in violation of gender identification in a child without autism, the above characteristics also have deviations. For example, in a role-playing game and fantasies: strongly and steadily prefers the roles peculiar to the opposite sex, or much more often prefers to play with children of the opposite sex. But if a child without autism spectrum disorder is much easier to diagnose these abnormalities, because they all in one form or another will manifest themselves in behavioral patterns, then a child with ASD is much more complicated, because It is extremely difficult to bring this child to interpersonal communication.

Our observations suggest that the idea of gender was poorly formed in an autistic child. Quite often they do not even understand what it means to be a boy or a girl. However, this is an extremely important aspect of personal identification, since self-awareness and socialization are two things that complement and shape each other.

Selection of these signs will allow us to further improve the quality of monitoring of carried out correctional work on the formation of gender identity in children with autism spectrum disorder.

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形成民族服装学士学位的艺术活动
FORMATION OF THE ART-ACTIVITY OF BACHELOR STUDENTS ON DESIGNING THE NATIONAL COSTUME

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抽象。 在本文中，作者通过设计民族服装来探讨艺术活动的发展问题，旨在发出和描述艺术活动的组成部分。 本文论述了本科生在设计民族服装时艺术活动的形成，考虑了创作活动形成的阶段。
关键词：艺术活动，模特，服装设计，组件，民族服装。
Abstract. In the current article, author examines the problem of development of the art activity by designing national costume, aims to emit and describe components of the art-activity. The paper discusses formation of the art-activity of bachelor students on designing the national costume, considers the stages of the formation of creative activity.
***Keywords:** Art-activity, model, costume design, components, national costume.*

Modern society needs active individuals who are able to quickly respond to changes and find creative, high-quality solutions to problem situations. There is also increased attention to the inner world and the unique capabilities of each individual.

The current structure of education should purposefully form and develop such properties and personality traits of students that would allow it to act effectively in any life circumstances, skillfully use not only the knowledge and skills obtained during the training, but also find a creative solution to the problems encountered.

By virtue of these needs, the goal of a student-oriented, creative development of bachelor students is set before higher education and solved with the help of two main activities: first, the student develops on the basis of the past experience

of humanity through familiarity with modern culture, secondly, in the process of development, the student realizes his / her possibilities autonomously, thanks to the development of creative activity in extracurricular activities.

The development of students' creative activity was studied by scientists from diverse fields of scientific knowledge - philosophy, psychology, pedagogy, and others. The authors (V.I. Andreev, G.S. Altshuller, M.I. Makhmutov, T.V. Kudryavtsev, A.M. Matushkin, A.I. Uma and others) of modern psychological-pedagogical literature pay attention to growth. efficiency of cognitive activity, organization and management of joint creative activities of students; many-sided issues of organizing students' creative activities using problem-solving situations, developing and improving creative activity of students' methodological culture in the process of performing various creative tasks.

One of the early psychological concepts of creative activity is the concept of S. Mednick. The creative process, according to S. Mednick, is the restructuring of associative elements into new combinations, as well as the overcoming of stereotypes [4]. J. Renzulli considers creative activity as personality traits expressed in the original means of product production, problem solving achievements, new approaches to the problem from different points of view [9], F. Barron [8] considers the creative activity of the person as the ability to bring something something new to experience; S. Taylor - as a set of different abilities, each of which can be represented to a certain extent; He singled out the criterion of giftedness [10]. Morozov, summarizing these studies, notes that all of them are combined by the assumption that each individual has some hypothetical properties relevant to creative abilities [5].

Thus, the **problem** of our research is the study of the conditions for the formation of creative activity among bachelor students by means of the design of a national costume.

The main goal of the research is the analysis of theoretical approaches to the problem of developing the creative activity of bachelor students, highlighting the conditions for creating creative activity of bachelor students by means of the design of a national costume and creating a theoretical model based on the selected conditions.

The generalization of the theoretical foundations of research on the phenomenon of creative activity of an individual allowed us to single out a broader definition of the concept of "creative activity" as an individual's ability to adaptively respond to the need for new approaches and new products / activities, which makes it possible to realize the variability of objective reality reflected in subjective images.

Accordingly, a creative person is considered today not as a passive organism reacting to external stimuli, but as a researcher seeking to understand, interpret and control systems of personal choices and experiences, with the goal of effective interaction with the environment, flexible adaptation to changing conditions of existence.

Thus, forming the creative activity of the student bachelor, we form personally significant qualities, because students, being realized in creativity, manifest themselves in various activities. Education of creative activity based on the study of national costume, is formed in stages.

The first level can be considered the presence of a multicultural educational environment that orients students towards immersing students in cultural diversity. In this environment, students gradually begin to understand the cultural heritage of each nation, an individual as a carrier of its various culture samples: historical facts, legal knowledge, traditions, national clothes, principles of a healthy lifestyle, etc.

At this stage, the emotional value and cognitive component of the creative activity of the individual is being formed.

A student subconsciously accepts an emotional choice in favor of one or another cultural aspect, experiences emotional experiences, shows openness, interest, communication, trust in another nation. In this situation, we can say, on the one hand, that a multicultural environment with a variety of nationalities forms a tolerant, interested attitude, on the other, a tolerant student himself forms an external and internal cultural environment.

At the second level, communion with other cultures is carried out through folk culture and craft - embroidery, costume. This is only possible through dialogue, the productivity of which depends on the identity of the individual with his own cultural affiliation and dialogue with other cultures. Being a complex system, culture includes different levels, subsystems. The most important place in its production belongs to the spiritual culture, which represents, "in a broad interpretation, the cumulative spiritual experience of humanity, spiritual activity and its results" [6].

At the initial stage, the formation of creative activity of students in the university involves familiarity with the multicultural educational environment, the presentation of values and traditions of different cultures. The result will be students' understanding of the essence of national creativity and, as a result, creative behavior. The means of acquaintance at this stage can be: presentations of different cultures, festivals, national dance classes, etc.

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For an intercultural dialogue, it is important to gain experience of creative activity in new conditions, which presupposes a reflection of the individual in relation to the content of a foreign culture, rethinking their cultural experience. The results of this experience may be different:

- the assimilation of the values and norms of a foreign culture and the adoption of their personality;

- rejection of the values of the new culture and the preservation of their own cultural identity;

- the emergence of a crisis of identity, when a person does not perceive any of the cultures as native;

- a balance between identifying individuals with a new culture and preserving their own.

The last named result is the most preferable because it provides a smooth entry of the personality into a new socio-cultural environment, which contributes to the formation of tolerant thinking and creative activity of students.

In this regard, we have identified three levels of creative activity of students of the university:

- motivational and value level - the desire for creativity;

- cognitive level - knowledge of how to create;

- activity level - the creation of a product of creativity.

Thus, the formation of creative activity of students occurs under the influence of various external and internal factors, such as:

a) an education system that creates the conditions for the formation of creative consciousness, thinking and behavior;

b) the educational activities of the student himself, ensuring the formation of a system of his personal qualities;

c) training and education as a factor in the integration of the student into the multicultural environment and the source of knowledge about the cultural values of other nationalities based on the study of national costume [7].
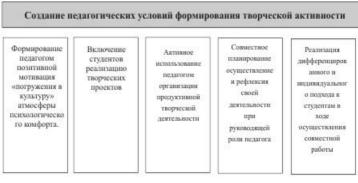
For example, undergraduate bachelor students in the course of educational detail on special disciplines: "Costume Design" and "Volga Costume History" study and become familiar with the costumes of various nations, accessories and their stylistic décor features. Since 2010, at the Department of Design and National Arts of the Institute of Philology and Intercultural Communication of the Kazan Federal University, the costume studio "Tatarstyle" has been working in extracurricular activities. In its archive copyright, stylized collections of students in the ethnic style of various peoples of the Volga region are kept. The main activities of the studio costume:

-development of creative and practical skills of students in the field of modeling, designing and designing a suit;

- promotion of new fashion trends, avant-garde ideas and national trends in costume design.

Also, the creative team participates at various levels of contests and festivals, travels and exchanges experience in foreign countries, such as Germany, Stockholm, Finland, France, Sweden and neighboring countries Kyrgyzstan, Kazakhstan.

Figure 1. Theoretical model of creating conditions for the formation of creative activity of bachelor students by means of the design of national costume

Since 2011, the annual Volga student festival of folk art "National Treasure" has been organized and held at the IPIC KFU. The festival aims to foster a culture of tolerance among young people of different nationalities and religions and is designed to instill in the younger generation a love for their homeland, a distinctive and unique culture of peoples, and their traditions. Students of all nationalities can present their individual and collective creativity in all directions: dance, artistic expression, vocal and costume design.

It should be noted that the educational process at the university assumes the existence of different levels of the formation of creative activity, which are facilitated by filling the content with ideas of creativity.

Involvement of the future student-designer in such a dialogue with the aim of shaping creative activity is possible when creating the corresponding multicultural educational environment of a higher educational institution.

Culture in modern society, on the one hand, is the custodian of the spiritual and moral values of the nation, on the other - the condition for the realization of the creative and spiritual potential of the individual and society, a form of affirming the identity of the people.

Knowledge of specific historical experience, its positive results and the formation on its basis of a new professional thinking can provide substantial assistance in the preparation of modern high-level specialists [1].

Based on the analysis, we have proposed a theoretical model for the development of the creative activity of bachelor students at the IPIC KFU based on the design of the national costume (see Figure 1).

The proposed model of the formation of creative activity of bachelor students by means of the design of a national costume has a systematic nature, it sequentially, in blocks, reflects the sequence of the teacher's activities, indicates the didactic mechanism of the formation of creative activity. The stages of the formation of creative activity are highlighted and the form of activity that contributes to the formation of creative activity at each stage is indicated. The pedagogical conditions for the formation of creative activity of bachelor students are determined.

We have identified components of the creative activity of students:

- emotional - development of an emotional response to a socially-creative product, motivation for creativity - development of the desire to do it yourself.

- cognitive - understanding the ways and means of creation (learning the technology of creating a creative product).

- activity - active participation in the project, on the basis of interaction with the teacher and (or) a group of like-minded people, and the presentation of the product of the creative project at the department or creative and research student competitions.

The pedagogical conditions for the formation of creative activity of bachelor students on the basis of studying the national costume design are highlighted by us and included in the program-informative unit of the model.

The model provides for the principles of training and technology activities of the teacher, in the process of interaction with students and the implementation of project activities, based on a system-activity and student-centered approach.

The expected result of the developed model is the formation of the necessary competencies of bachelor students (design and research, communication, motivational, organizational, creative, reflective) and teachers of educational organizations: (innovative, design, technological, creative) in the process of implementing the content of research work on the introduction of a theoretical model.

Thus, in the proposed model, directions are clearly defined, it has a systematic, logical substantiation, theoretical and methodological substantiation and content of the activities of a teacher of an educational organization, has practical-oriented significance for the formation of professional competencies in bachelor students.

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牙科中的附加数字技术
ADDITIVE DIGITAL TECHNOLOGIES IN DENTISTRY

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注解。 数字技术正在迅速发展和改进，为牙医提供了新的，更有效的治疗患者的选择。 对技术的需求是由于制造整形外科结构和修复体的高质量。新的添加剂数字技术和材料的开发是牙科领域的一个新的科学方向，牙医应该意识到数字技术提供的各种机会。 对数字技术领域的医务人员进行及时和合格的培训非常重要，并且是确保提高牙科护理质量的主要条件。

关键词：数字添加剂技术，类型，修复牙科，牙科建筑质量。

Annotation. *Digital technologies are now rapidly developing and improving, providing dentists with new, more effective options for treating patients. The demand for technology is due to the high quality of manufacturing orthopedic structures and restorations. The development of new additive digital technologies and materials is a new scientific direction in dentistry and dentists should be aware of the range of opportunities offered by digital technologies. Timely and qualified training of specialists among medical workers in the field of digital technologies is of great importance and is a leading condition for ensuring the improvement of the quality of dental care.*

Keywords: *Digital additive technologies, types, prosthetic dentistry, quality of dental constructions.*

The active development of the dental equipment market in the world is noticeably ahead of other branches of medicine today. Great success in dentistry is undoubtedly the introduction of digital technologies that are widely used at various stages of dental care, and the most common among them are CAD / CAM systems. (Computer Aided Design / Computer Aided Manufacturing) [2, 9, 12, 13, 24,

28, 5, 7, 20, 29]. Digital technologies can be divided according to the method of manufacturing (materializing the virtual model) into subtractive methods, that is, subtraction methods, and additive methods, that is, adding methods. Subtractive methods use milling and grinding processes to remove excess structural material and create a given shape of the structure. This principle of obtaining the design was that gave the name to the method - "subtractive method" (Eng. subtractive).

Additive methods include stereolithography, 3D printing, selective laser sintering and direct injection printing [26]. These production methods of various designs are an alternative to subtractive methods and are called "adding" (eng. Additive).

Additive manufacturing or fabber technologies, also called rapid prototyping technologies, are based on the automatic transformation of electronic CAD-models into solid-state physical objects using so-called fabbers - special digital machining devices. Fabber technology is currently being actively used to create metal elements of removable structures, replacing the technology for producing structures by casting using wax modeling [3, 17]. In addition, they are used for the manufacture of more volumetric parts and structures (for example, a facial prosthesis and skeletal models), which is not available for CAD / CAM methods that are more suitable for the production of small parts. Additive production also allows to make blanks from materials of different consistency and properties [14]. In Russia, a single classification of additive technologies does not currently exist. Methods of additive production are divided by the materials used, by the presence or absence of a laser, by the methods of layer formation, energy supply, etc.

With the additive method of production, two fundamental technologies are mainly applied - laser and jet.

Laser technologies are:

• laser printing, in which the ultraviolet laser gradually illuminates the liquid photopolymer. There are technologies where the photopolymer is illuminated by an ultraviolet lamp using a photomask that changes with a new layer. At the same time, the photopolymer hardens and turns into plastic that is quite durable in its characteristics;

• lamination, when the part is created from a large number of layers of material. In this case, the layers gradually overlap and stick together, and the laser cuts in each contour of the cross section of the specified part;

• laser sintering, in which the laser burns out the contour of the programmed part in layers in an easily fused plastic powder. After the process is complete, excess powder is removed from the finished part.;

Jet technologies are:

• bonding or sintering the material in the form of a powder, inherently the same as laser sintering, only this powder is connected by an adhesive substance coming from a special jet head. With this method, you can get multicolored details using a binder of various colors;

• freezing of material by cooling. In this case, the dispensing head squeezes onto a low-temperature platform - the basis of the composition in the form of a heated thermoplastic, while the drops quickly solidify and stick together with each other, thereby forming the layers of the future object [30].

One of the methods of rapid prototyping used in dentistry is laser stereolithography. The term "stereolithography" was first used in 1986 by Charles V. Hull, who patented the method and equipment for the production of solid-state physical objects using the technology of sequential layering of photopolymer material. This method was based on the photopolymerizable composition polymerized by laser radiation (PPC). With the help of this technology, a virtual three-dimensional object designed in the program is being built from liquid PPC by successive thin (0.025–0.2 mm) layers formed with the participation of laser radiation on a mobile platform [6]. As a rule, the horizontal section generation processor pre-reformats the description of the 3D model of the future object from the STL file format into a set of layered sections with the required height step, the volume of which is written to the executive file with the specified extension. The STL file is a set of two-dimensional vector quantities that provide sequential control of the orientation of a laser beam in space using mirrors during the synthesis of an object, as well as commands to turn on the laser, move the platform, feed the material, etc. [1, 4,10,15,16]. Next, the laser is turned on, affecting only those parts of the polymer that correspond to the walls of the target object, while causing them to harden. After that, the whole platform plunges somewhat deeper, by an amount equal to the thickness of the next layer. The number of layers can vary from 100 to 1500-2000, depending on the level of accuracy and volume of the fabricated structure. Also at this moment, a special nozzle irrigates areas that could remain dry due to some surface tension of the liquid. Upon completion, the object is removed from the platform and immersed in a bath with special compounds to remove excess material and peelings. And finally, the final irradiation of the model with a powerful ultraviolet light is carried out for the final solidification.

Like many other 3D prototyping methods, SLAs require the construction of supporting structures that are manually removed upon completion of construction, and the surface is carefully processed with a finishing cutter [4]. This method differs from others in that it uses as a "building material" not powders, but photopolymers that are in a liquid state. A mesh platform (elevator) is placed in a container with liquid photopolymer, on which the prototype is "grown" [31].

Photopolymers are subdivided both according to the intended purpose of the products (surgical patterns, models, frames for the subsequent manufacture of cast structures, etc.,) and by color, depending on the addition of pigment (white, black, gray, transparent, etc.).

The process of 3D printing allows you to save significant funds, as well as significantly improve the quality of surgical operations, such as dental implantation. In addition to the manufacture of orthopedic prostheses, crowns, bridges with the help of three-dimensional printing, it is possible to manufacture aligners for orthodontic treatment. To do this, the teeth are scanned (possibly intraoral scanning), and on the basis of it, 3D-modeling, treatment planning, coordination with the attending physician and subsequent printing of models of dentition, on the basis of which the aligners are made, take place [32].

The technology of laser stereolithography allows in the shortest time (from several minutes to several hours) to go from planning or design idea to a finished part model. Selective laser sintering is one of the technologies that are used to make permanent ceramic or metal dental restorations. An example is the technological dental systems Medifacturing (Bego Medical AG, Germany) and Digi Dent (Hint-ELs, Germany). With this method, the computer calculates the trajectory of the instrument, as well as in other existing CAD / CAM-systems. However, the system does not grind, but bakes a layer of material with a laser beam. When this happens, the laser beam moves along a predetermined program path inside the tank filled with layers of ceramic or metal powder. Each subsequent layer is soldered to the previous one. In dentistry, stereolithography has found its application in such areas as: orthodontics, orthopedics, implantology, and maxillofacial surgery [20, 21, 22].

Thus, digital technologies are now rapidly developing and improving, providing dentists with new, more effective options for treating patients. The demand for technology is due to the high quality of manufacturing orthopedic structures and restorations: aesthetics, full control of thickness, volume and spatial structure, as well as the geometric accuracy of the dimensions of the critical design and technological elements and the shape of the product. In addition, additive digital technologies reduce the consumption of construction materials, reduce the number of necessary personnel and significantly reduce the time of transferring information about a patient from a dentist to a dental technician, thereby reducing the time needed to make prostheses. Saving data in a digital format allows you to replicate the orthopedic design, if necessary.

The development of new additive digital technologies and materials is a new scientific direction in dentistry. Since the market for these technologies is growing rapidly not only abroad, but also in Russia, dentists should be aware of the range of opportunities offered by digital technology. Timely and qualified training of specialists among medical workers in the field of digital technologies is of great importance and is a leading condition for ensuring the improvement of the quality of dental care.

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人胎儿下颌下腺唾液腺的形态学
MORPHOLOGY OF THE SUBMANDIBULAR SALIVARY GLANDS OF HUMAN FETUSES

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摘要。 研究了胎儿蜕膜发育过程中下颌下腺唾液腺的形态学特征。 研究了变异解剖学，11-27周发育的胎儿下颌下腺的器官特征的年龄动态，并进行了复查显微镜检查。

关键词：产前发育，下颌下腺，变异解剖学。

Summary. *The morphological features of the submandibular salivary glands in the fetal period of ontogenesis are considered. The variant anatomy, the age dynamics of the organometric characteristics of the submandibular glands of the fetus of 11-27 weeks of development were studied, and a review microscopy was performed.*

Key words*: prenatal ontogenesis, submandibular glands, variant anatomy.*

Introduction

The study of the development of organs in the fetal period of human ontogenesis is of interest to the fundamental science [1-5]. The goal is to study the structure of the submandibular glands in the prenatal human ontogenesis.

Research methods

The study was performed on autopsy material - glands of 49 fetuses of 11 - 27 weeks of development, which were fixed in 10% solution of neutral formalin. Macro- and micro-dissection of the submandibular salivary glands was performed, and microscopy was conducted. Then, variant anatomy was studied and organometry was performed (volume, mass, width, thickness, along the contour of the

gland the area was measured). Sectional material was divided into groups depending on age and side affiliation (right / left). The data are statistically processed using non-parametric statistics. Statistical analysis was performed using SPSS, 19.0.

Results and discussion

When studying the variant, the submandibular glands of polygonal shape were found - 32.5%, oval - 24.3%, roundish - 24.3%, triangular - 18.9%. When comparing the forms of the gland depending on the belonging to the side, it was revealed that the glands of the oval shape prevailed on the left (42%), the polygonal shape - on the right (51%).

The morphometric studies revealed an increase in the volume and mass of the submandibular salivary glands, depending on the gestational age. The mass of the submandibular salivary glands increased from 53.0 mg in the early-fetal period to 89.0 mg; the volume practically did not change and was equal to 0.1 cm^3 (Table.1).
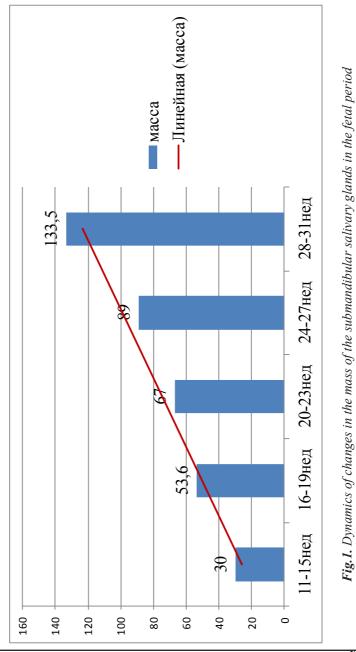
Table 1

Organometrical characteristics of the submandibular glands of early fetal and mid-fetal fetuses (Me (Q$_1$-Q$_3$))

Period	Weight (mg)	Volume (cm^3)	Width (mm)	Thickness (mm)	Surface area (mm^2)
Early-fetal (11-19 weeks)	53,0 (30-73,0)	0,1 (0,1-0,11)	4,3 (3,2-4,9)	2,65 (2,2-3,2)	30,5 (19,0-42,0)
Mid-fetal (20-27 weeks)	89,0 (67,0-133,5)	0,1 (0,1-0,15)	4,3 (3,18-5,78)	3,0 (2,725-3,625)	35,0 (26,0-42,5)

Organometric indicators of a statistically significant age in weeks are ($p < 0.05$) (Fig. 1).

The average direct correlations in pairs were observed: mass - volume, mass - area, mass - width, mass - thickness, mass - age, volume - surface area, surface area - width, surface area - thickness, surface area - age ($p = 0.001$).

When examining microscopy of the submandibular salivary glands in prenatal ontogenesis, a pronounced stromal component of the gland, formed lobules, ducts were detected, in some cases diapedes hemorrhages, vascular congestion, infiltration were detected (Fig.2.3).

Fig.1. Dynamics of changes in the mass of the submandibular salivary glands in the fetal period

Fig.2. *Submandibular salivary gland of the fetus of 16 weeks.*
Coloring hematoxylin and eosin, 10x20

Fig.3. *Submandibular salivary gland of the fetus of 26 weeks.*
Coloring hematoxylin and eosin, 10x10

Conclusions

1) In fetuses 11–27 weeks, the submandibular glands had an oval, rounded, triangular, and polygonal shape, with a predominance of polygonal glands.

2) Organometrical characteristics had a pronounced age dynamics (increasing mass, width, thickness, surface area), while the volume indicators differed in stability.

3) Viewing microscopy draws attention to the pronounced stromal component of the gland, forming lobules, ducts, in some cases, determined diapedes hemorrhages, vasoconstriction, infiltration.

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棉花工作台部署的拖拉机工作条件的卫生评估，一种新的国内恶性毒性粉丝，它们对生理年龄和精神情绪状况的影响

HYGIENIC ASSESSMENT OF THE WORKING CONDITIONS OF THE TRACTORISTS, DEPLOYED BY THE COTTON TABLE, A NEW DOMESTIC MALOTOXIC FANBARAKA DEFOLIANT AND THEIR INFLUENCE ON THE IOLOGICAL AGE AND PSYCHO EMOTIONAL CONDITION

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注解。 研究表明，新的国产落叶Fanbaraka并没有影响拖拉机驾驶员的工作条件。 然而，在工作动态中，他们的心理 – 情绪状态恶化，经过10年的职业工作，身体过早衰老，这表明需要制定和实施一系列改善工作条件的措施。
关键词: 拖拉机操作员，工作条件，新落叶剂，生物学年龄，心理情绪状态。

Annotation. Research has shown that the new domestic defoliant Fanbaraka does not affect the working conditions of the tractor drivers who defoliate the cottonman. However, in the dynamics of work, their psycho-emotional state worsens, and after 10 years of work in the profession, premature aging of the body occurs, which indicates the need to develop and implement a set of measures to improve working conditions.

Hygienic assessment of various production factors that have an adverse effect on the functional state of the body, is the result of the development of preventive measures. One of the leading industrial enterprises is cotton growing. The technological process of cotton cultivation consists of several stages. Every year, Uzbek scientists chemists at the Institute of General and Inorganic Chemistry of the AS of Uzbekistan develop new, import-replacing, low-toxic defoliants that gently and effectively act on cotton, provide more than 88% leaf fall, increase the maturation rate of cotton bolls, positively affect the quality of fiber and seed oiliness.

In order to develop recommendations for improving the working conditions of tractor drivers, defoliation of new imports by replacing the low-toxic defoliant "Fanbaraka" in the framework of the state grant project PZ-2017091231 "Development of toxicological and hygienic standards of new domestic imports of pesticides in the environment and justification of measures to protect public health" studies have been conducted to study working conditions in the defoliation of cotton by the Fanbarak defoliant and their influence on the biological age and psycho-emotional state of tractor drivers.

Biological age (BA) is an integrated expression of age-related pathology hidden or manifested in the form of non-diagnosable diseases [3, 7.8]. The calendar age (CA) is a convenient measure, which can be used to estimate the likelihood of a decrease in a person's functional abilities and deterioration in his health, but cannot be an ideal indicator due to the significant individual variability of aging of the organism [1]. Available data indicate that between the rate of aging and a number of socio-hygienic factors there are certain statistical relationships that can be determined with reference to a specific situation of human life [8]. Biological age may reflect a decrease in the functional capabilities of the organism and its performance (functional age) or a decrease in the viability of the organism (gerontological age) [8]. The data available in the literature indicate that biological age is an adequate indicator of a person's functional state, his professional performance, health status, and that there is a close correlation of BA with working conditions [2, 5, 5].

Diagnostics of the psycho-emotional state of a working person during the working day allows determining the dynamics of his state of health, activity, mood [4, 10].

Materials and research methods. Working conditions were studied by traditional methods using an aspirator, psychrometer, anemometer, sound level meter, luxmeter in accordance with the requirements of SanPiN No. 0294-11 [12], 0325-16 [13], 0141-03 [14], 0324-16 [15], KMK 2.01.05-96 [6], as well as the methodology "Methodology for assessing working conditions and certification of workplaces under labor conditions" [10].

The biological age of men of tractor operators (BA) was determined by the formula [9]: $BA = 26.985 + 0.215 \cdot BPS - 0.149 \cdot BHT - 0.151\,SB + 0.694 \cdot SHA$, where BA is the biological age; BP- systolic blood pressure, mm Hg. v .; BHT - breath-holding time during inhalation, sec; SB - static balancing, sec; SHA - subjective health assessment, units.

Biological age was compared with the proper BA (PBA), which characterizes the population standard of aging. The proper biological age of men was determined by the formula:

$$PBA = 0,629 \cdot CA + 18,56, \text{ where}$$

PBA – proper biological age; CA– calendar age.

The rate of aging was determined by the index (BA: PBA), which determines how many times the BA of the subject is greater or less than the average age of his peers [3.8].

To study the nature and dynamics of the psychoemotional state, the psychological method "SAN" was used, based on self-esteem of well-being, activity and mood [4,11]. The method is based on the fact that the subject is asked to correlate his state with a number of signs, presented in the form of polar opposites, between which the seven-membered scale is located. The characteristic "well-being" reflects strength, health, fatigue. The characteristics of movement, mobility, speed, and rate of flow of functions are referred to the category of "activity", and the characteristics of the emotional state to the category of "mood". When analyzing the obtained data on the SAN test card, it was taken into account that a change in the responses about the state of health and mood in the ball system from 1 to 7 indicates a deterioration in self-assessment indicators with an increase in the number of points, and responses to the activity assessment indicate a deterioration in indicators with a decrease in the number of points.

The working conditions, biological age and the dynamics of the psychoemotional state of practically healthy tractor drivers aged 37 to 60 years with experience from 5 to 40 years have been studied. The studies were carried out with field trials of defoliants on experimental plots of the Yukorichirchik district of the Tashkent region.

Research results. Defoliation was carried out by ground processing of cotton, using the tractor spraying method. Mode of operation from 8 am to 18 pm, a break of 1 hour. Tractor operators worked on wheeled tractors with a sealed cab, with 4 window openings. They spent up to 10% of their working time to refill sprayers with defoliant solutions, up to 5% to eliminate technical defects of the tractor, the rest of the time they were defoliating. Research materials showed that carbon monoxide is determined in the air of the tractor driver's working area in the tractor cabin - 25.6 ± 0.29 mg/m^3 (MPC - 20.0 mg/m^3) and dust -8.52 ± 0.17 mg/m^3 (MPC – 6,0 mg/m^3). The tractor cabin air was polluted by exhaust gases and dust penetrating from the engine compartment through holes in the floor for control levers, as well as through a hole for ventilation and window joints. The defoliant concentration did not exceed the MPC (MPC-3.0 mg/m^3).

The workplace low-medium-high-frequency noise in the range of sound energy of 31.5 Hz (engine frequency) was determined. Equivalent noise level is 101 dBA. The noise source is a working tractor engine. On the floor of the tractor cabin, the general vibration was also determined, which was of low-mid-frequency nature; the vibration level ranged from 94 to 110 dB (RCU - 101 dB) in vibration velocity (Z axis). The sinusoidal nature of the vibration was disturbed by the appearance of jolts caused by the soil relief and the falling of stones under the tractor wheels. The parameters of jerky vibrations transmitted to the seat were 5-10 times higher than the standard values. Vibration, transmitted to the hands through control levers, did not exceed the MPC, was equal to 102 dB, was high-frequency.

During the work shift, the air temperature in the tractor cab increased from $15,1 \pm 0,23^0$C at a relative humidity of $38,0 \pm 0,79\%$ and mobility of $0,42 \pm 0,02$ m/s to $23,3 \pm 0,22^0$C at a relative humidity $47,8 \pm 1,13\%$ and air mobility $0,71 \pm 0,26$ m/s. An increase in the air temperature in the tractor cab during the first half of the working day was associated with engine operation and with the roof heating by solar insulation. By the end of the work, the air temperature decreased to $18,5 \pm 0,14^0$C at a relative humidity of $40,5 \pm 0,45\%$ and a mobility of $0,42 \pm 0,02$ m/s.

Illumination at workplaces ranged from $64,6 \pm 2,3$ to $150,8 \pm 5,7$ lux, overhung from daylight hours.

The labor process of the tractor driver is characterized by intense character, which is caused by the duration of concentration of attention and the degree of responsibility for the quality of the work performed. In terms of the complex of unfavorable production factors, the working conditions of the tractor drivers are classified as grade 3 and degree 3 of harm [14].

Table 1 shows the indicators of biological age, proper biological age, calendar age and the rate of aging of the tractor drivers, depending on the length of service.

Table 1. Some indicators of the biological age of tractor drivers

Indicator, years	Work experience, years		
	5 - 10	11 - 20	21 and older
Biological age (BA)	49,9±1,8	61,6±1,6	66,5±1,5
Proper biological age (PBA)	44,5±1,5	48,5±1,4	52,2±1,8
Calendar age (CA)	47,0±1,3	53,9±1,8	60,1±1,6
Aging rate (BA: PBA)	1,12±0,02	1,27±0,04	1,27±0,05
BA- PBA	5,4±0,6	13,1±0,3	14,3±0,4

Studies have shown that with work experience of 5-10 years, the average value of BA of tractor drivers is 49.9 ± 1.8 years, more than PBA by 5.4 ± 0.6 years. With work experience of 11–20 years, the average value of BA is 61.6 ± 1.6 years, which exceeds the PBA by 13.1 ± 0.3 years, and at one year of 21 years and above, the average value of BA is 66.5 ± 1.5 years, exceeding PBA by 14.3 ± 0.4 years.

According to the classification [8], the difference between BA and PBA up to 5 years is characterized as the normal rate of aging, from 5 to 10 years as slightly prematurely aged, and more than 10 years as prematurely aged.

Thus, the results of the study of the biological age of the tractor drivers have shown that working in harmful and dangerous conditions (work class 3.3) accelerates the aging of the body. The degree of aging is determined by the work experience. Slightly premature aging of the body is observed with work experience of 5 to 10 years, and premature aging is found with experience of more than 10 years.

Studies have also found that in the dynamics of the working day, the self-assessment of the tractor driver's health according to the SAN test significantly (p <0.001) worsens from 1.94 ± 0.09 points at the beginning of work to 4.12 ± 0.15 points at the end of works, i.e. in the dynamics of work, the indicator of well-being deteriorates by 212% from the background level to the working level (Figure 1).

Figure 1. Dynamics of indicators of psycho-emotional state
of tractor drivers during defoliation of cotton

The self-assessment of activity from the beginning to the end of the work deteriorates from 5.2 ± 0.15 to 3.1 ± 0.17 points, i.e. in the dynamics of the activity indicator decreases by 41.2% from the background to the working level. At the beginning of the working day, mood self- assessment was 1.91 ± 0.09 points, by the end of the working day 3.59 ± 0.42 points, i.e. in the dynamics of change, the mood significantly (p <0.001) worsens by 187% from the background to the working level.

Consequently, the performance of the labor process in adverse hygienic conditions causes a worsening of the psycho-emotional state of the tractor drivers in the dynamics of the working day.

Thus, working conditions and the nature of work processes adversely affect the psycho-emotional state of tractor drivers engaged in defoliation of cotton even with a low-toxic defoliant, which indicates the need to develop and implement a set of measures to improve their working conditions.

Conclusions.

1. A new low-toxic import replacing defoliant of cotton "Fanbaraka" is not a source of air pollution of the working area of the tractor drivers.

2. Tractor drivers are exposed to the adverse effects of dust, gas, low-medium-high-frequency noise, general low-medium-high vibration, the intense nature of the labor process.

3. Aging of tractor drivers working in adverse conditions (grade 3, degree 3 hazard) is determined by the length of service. Premature aging is observed after 10 years of work as a tractor driver.

4. From the beginning to the end of the working day, the tractor drivers are deteriorating their psycho-emotional state, which indicates the need to develop measures to improve working conditions.

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慢性牙周炎患者的牙根管微生物区系
DENTAL ROOT CANAL MICROFLORA IN PATIENTS WITH CHRONIC PERIODONTITIS

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注解。 慢性根尖周炎患者根管微生物区系的种类和数量组成的测定。 排泄的频率和诊断微生物的定量检测水平在很大程度上取决于牙周牙周的过程的严重程度。 因此，分离任选的厌氧菌血链球菌，变形链球菌，唾液链球菌，金黄色葡萄球菌，表皮葡萄球菌，粪肠球菌以及真菌白色念珠菌（白色念珠菌）的频率。 所获得的数据证明了不同微生物群体参与牙周组织破坏性病变的发病机制，并且对于适应特定临床情况的分类选择的颅内冥想方法而言是重要的，这开辟了新的方法。 进行抗菌治疗。

Annotation. *Determination of the species and quantitative composition of the root canal microflora in chronic apical periodontitis. the frequency of excretion and the quantitative level of detection of diagnosed microorganisms was largely determined by the severity of the process in the apical periodontal. Thus, the frequency of isolation of the optional anaerobic bacteria Streptococcus sanguis, Streptococcus mutans, Streptococcus salivarius, Staphylococcus aureus, Staphylococcus epidermidis, Enterococcus faecalis, and also of the fungi Candida albicans (Candida albicans). The obtained data prove the participation of different groups of microorganisms in the pathogenesis of the destructive lesion of the periodontium and are important in terms of the differentiated selection of methods of intracanal meditation, adapted to the specific clinical situation, which opens up new approaches to the conduct of antibacterial therapy.*

Chronic apical periodontitis is an inflammatory process of periodontal tissues, developing as a result of bacterial invasion of periodontal tissues. Bacterial invasion initiates pulp necrosis, and the infected contents of the root canals through the apical aperture cause inflammation of the periapical tissues and their destruction. The damage and destruction of the tissues of the periodontal ligament, with a constantly present center of inflammation and destruction of the periodontium, is observed in 30% of patients and is fraught with the development of local and systemic complications.

A significant amount of research has been devoted to the study of the composition of the root canal microflora. In various forms of endodontic pathology, more than 400 species of microorganisms have been isolated and identified from the detachable root canals. It is emphasized that various combinations of microorganisms are found in samples of teeth with various forms of pathology.

This study is due to the need to improve the effectiveness of endodontic treatment of chronic apical periodontitis, for which it is necessary to detail the specific and quantitative composition of the microflora of the root canals of the teeth in the dynamics of increasing severity of chronic apical periodontitis.

Objective: to determine the specific and quantitative composition of the microflora of the root canals in chronic apical periodontitis.

Materials and methods

The study was conducted at the Department of Therapeutic Dentistry of the Tashkent State Dental Institute.

The patient groups included 120 people with clinically and radiologically confirmed diagnoses of chronic apical periodontitis of the teeth, aged from 23 to 44 years, without severe somatic pathology, including 70 patients with fibrous form of chronic apical periodontitis (1400 teeth); with a granulating form of 66 patients (130 teeth) and with a granulomatous form of 60 patients (1200 teeth). Clinical, radiological and bacteriological studies were carried out on the recommendation of WHO, including basic and additional research methods. The main methods consisted of the collection of complaints, anamnesis of life and disease, examination, sensing, percussion and palpation, additional methods of research: from x-ray, electrical donation diagnostics (EDI) and microbiological methods.

The X-ray data were taken as decisive in determining the form of the disease: in chronic fibrous periodontitis, the X-ray pattern revealed an expanded periodontal space in the apical region in the absence of resorption of the alveoli bone wall; in case of chronic granulating periodontitis in the apical region a portion of bone tissue was found with fuzzy boundaries ranging in size from 1 to 8 mm; in chronic granulomatous periodontitis, a clearly defined rounded contour of the area of destruction of the bone structure around the apex of the tooth root was recorded.

Bacteriological examination of the contents of the root canal was carried out before treatment. The studied material of the root canals of teeth with chronic apical periodontitis was sown on nutrient medium (special media for aerobes and anaerobes, for Peptostreptococcus spp. And periodontal pathogenic species created anaerobic conditions). The results were expressed in terms of the decimal logarithm (lg) of the number of colony forming units (CFU), the frequency of occurrence - in%.

Statistical processing of digital data was carried out using descriptive, parametric and non-parametric statistics on a personal computer using Statistica 6, StatSoft, USA. The arithmetic mean (M), the standard error of the arithmetic mean

(m) were determined. The assessment of the significance of differences in arithmetic means was carried out using Styudent's criteria (t) and significance level (p). Differences were considered statistically significant at p <0.05.

Results and discussions

In patients with chronic apical periodontitis in the dischargeable root canal, representatives of the flora have been identified with both obligate-anaerobic and mixed breathing (facultative-anaerobic and microaerophilic), as well as strictly anaerobic forms of periodontal pathogens. Colonies of cocci, mainly streptococci, anaerobic microorganisms, and yeast-like fungi were detected.

It should be noted that the frequency of isolation and the quantitative level of detection of the diagnosed microorganisms were largely determined by the severity of the process in the apical periodontium. Thus, the frequency allocation facultative anaerobic bacteria Streptococcus sanguis, Streptococcus mutans, Streptococcus salivarius, Staphylococcus aureus, Staphylococcus epidermidis, Enterococcus faecalis, as well as fungi - Candida albicans (Candida albicans) in patients with fibrinous form of disease ranged 15.75% - 45.71%; in credits from 1.85 ± 0.07 to 3.02 ± 0.07 lg CFU / ml. An increase in the severity of periapical lesions before granulating periodontitis was associated with an increase in the frequency of registration of facultative anaerobic bacteria to 32.31% - 84.62%; with average titers from 3.22 ± 0.14 to 4.21 ± 0.18 lg CFU / ml. In granulomatous apical periodontitis in the root canal, the frequency of detection and the concentration of optional anaerobic ones increased to maximum values, while in the root canal they were detected in 71.67% - 98.33% of cases; and the concentration ranged from 4.81 ± 0.18 to 6.01 ± 0.24 lg CFU / ml.

In the root canals of periodontal, representatives of strict anaerobes were found: Peptostreptococcus sp., Actinomyces sp. The frequency of detection of Peptostreptococcus sp in the fibrous form of the disease was $42.85 \pm 4.18\%$; with granulating - $63.0 \pm 4.23\%$ and granulomatous $86.67 \pm 3.10\%$; with average credits of 2.65 ± 0.12; 3.91 ± 0.17 and 4.65 ± 0.17 lg CFU / ml; The corresponding detection rate for Actinomyces sp. amounted to 30.00 ± 3.87; $50.760 \pm 4.58\%$ and $65.00 \pm 4.35\%$; with average credits of 3.01 ± 0.14; 4.11 ± 0.17 and 6.21 ± 0.28 lg CFU / ml;

Molecular genetic studies have shown a high incidence of detection of virulent anaerobic and microaerophilic species of bacteria (A.actinomycetemcommitans, P.intermedia, P.gingivalis,) and their persistence in root canals.

The frequency of isolation of A.actinomycetemcommitans, P.intermedia, P.gingivalis with the fibrinous form of the disease ranged from 31.43 - 45.71%; with granulating it increased to 53.85 -64.61% and the granulomatous was maximum - 76.66 -91.67%; the corresponding titers in the fibrinous form of the disease were recorded in the range from 1.75 to 2.66 lg CFU / ml; granulomatous - increased to 2.65 -3.22 lg CFU / ml and granulating reached 3.25 - 4.54 lg CFU/ ml.

Thus, it has been established that the special conditions of the root canal environment stimulate the selective growth and persistence of anaerobic bacterial species, while longer infection of the root canal leads to the predominance of bacteria such as periodontal pathogenic bacteria, fuzobacterium and peptostreptokokki in its ecosystem (up to 90% of the association).

In apical periodontitis in the acute stage, various microflora represented by aerobic and facultative anaerobic microorganisms are released from the root canals; the presence of periodontal pathogenic species in the detached root canals indicates their role in the destructive periodontal lesion.

On average, with fibrous lesions of the periapical lesion, 9 species of bacteria were detected (from 2 to 15), and with granulating and granulomatous lesions of 15 species (from 10 to 15), which confirms the increase in the spectrum of the bacterial composition and the increase in the bacterial load with an increase in the destructive damage of the periodontal disease.

The obtained data prove the participation of different groups of microorganisms in the pathogenesis of the destructive lesion of the periodontium and are important in terms of the differentiated selection of methods of intracanal meditation, adapted to the specific clinical situation, which opens up new approaches to the conduct of antibacterial therapy.

红唇病患者的生活质量
QUALITY OF LIFE PATIENTS WITH RED LIP DESEASE

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注解。 本研究旨在从生活质量的角度确定干性和渗出性剥脱性唇炎患者的牙齿健康特征。 作为研究结果获得的数据表明了唇损对生活质量水平的影响，以及美学在自我认知和社会关系中的重要性。 渗出型患者的生存率最高（因此生活质量下降幅度最大），干燥患者的牙齿健康状况对生活质量的影响最小。 按重要性排列，沟通问题凸显出来； 与进食相关的其他问题和日常生活中的问题（工作，休息）。

Annotation. This study was aimed at identifying the features of the dental health of patients with dry and exudative forms of exfoliative cheilitis in terms of quality of life. The data obtained as a result of the study indicate the impact of lip damage on the level of quality of life, as well as the importance of aesthetics in self-perception and relations in society. The highest rate (and therefore the greatest decline in the quality of life) was found in patients with exudative form, the least impact on the quality of life associated with dental health was observed in patients with the dry form. In order of importance, problems in communication come to the fore; further problems associated with eating and problems in everyday life (work, rest).

The subjective assessment of the quality of life, made by the patient, reflects his psychological status, the effectiveness of the treatment, allows to determine the effect of the disease itself, as well as the treatment carried out on the patient's condition. The assessment of dental quality of life is determined by subjective indicators illustrating the effect of oral health on the quality of life of a person, along with an assessment of his need for dental services [7].

Currently, quite actively carried out research to assess the impact of dental status on the quality of life. dedicated to assessing the quality of life of patients with dentition anomalies, diseases of the oral mucosa, and hard dental tissues [1, 3, 4]. The use of questionnaires to determine the level of quality of life is informative both in epidemiological studies and in the practice of a dentist-therapist. Assessing the quality of life of patients using the OHIP-14 questionnaire allows you to identify priority problems, improve the interaction between the physician and the patient, and evaluate the response to the treatment.

However, in the literature available to us, we did not find works devoted to the study of the quality of life of patients with exfolitory cheilitis, which makes our research relevant.

The purpose of research is to assess the dependence of the quality of life of patients on the clinical form of exfoliative cheilitis.

Materials and methods

In accordance with the objectives of the study, 27 patients with various clinical forms of ECh were selected for the study, including 17 from "dry" and 10 from "exudative"; the average age of the examined was 34.4 ± 1.25 years, 10 patients without the pathology of the red border of the lips constituted the comparison group. Comparison groups were randomized by sex and age structure, as well as the frequency and severity of background somatic pathology.

The study was conducted on the basis of the clinic of therapeutic dentistry of the Tashkent State Dental Institute.

All patients with ECh were questioned using the most frequently used OHIP-14 questionnaire, which determines the level of quality of life associated with dental health. The questions of the questionnaire were adapted by us to the problems associated with diseases of the red border of the lips. The questionnaire consists of 3 blocks - problems with eating, problems with communication, problems in everyday life. Thus, the questionnaire questions covered several large groups, such as the patient's well-being, his ability to fully feed, to communicate with other people, to perform social functions. This questionnaire is convenient because it contains only 14 questions, while the results obtained are reproducible [10]. The study used the Russian-language version of the questionnaire, which we adapted for lip diseases [2].

Patients completed the questionnaire independently, according to the instructions given by the researcher. Each answer in the questionnaire was awarded a corresponding score: "never" - 0; "Rarely" - 1; "Sometimes" - 2; "Quite often" - 3; "Very often" - 4 points. Thus, higher scores corresponded to a lower quality of life associated with dental health.

Statistical data processing was carried out using a personal computer and the statistical software package STATISNIKA - 6. At all stages of the study, the arithmetic mean (M), the arithmetic mean error (m), the standard error of the arithmetic mean (Sx), and the confidence criterion (t) were determined. Differences between groups were considered statistically significant at $p < 0.05$.

Results and discussions

We carried out a detailed analysis of which complaint compels the patient to seek help, and to what extent this problem affects the quality of life depending on the clinical course of ECh (Table).

During the analysis of quality of life indicators, the highest indicator (and therefore, the greatest decline in the quality of life) was found in patients with exudative form, the least impact on the quality of life associated with dental health was observed in patients with dry form.

Thus, the average score of problems associated with the admission of patients with the exudative form of the disease was 2.27 ± 0.07 points against the corresponding indicator in patients with the dry form 0.50 ± 0.02 points (P≤0.05).

Among priority problems, patients with exudative form note a decrease in the quality of nutrition - 2.77 ± 0.12 points versus 0.035 ± 0.017 (P≤0.05) with the dry form; eating difficulties 2.65 ± 0.10 against 0.25 ± 0.02 (P≤0.05) point and interruption of food intake 2.65 ± 0.10 against 0.45 ± 0.02 (P≤0 , 05) points respectively.

The most significant problems were related to communication. The mean score of problems associated with communication was also maximal in patients with exudative form - 2.40 ± 0.08 points against the corresponding value in patients with the dry form 0.46 ± 0.015 (P≤0.05); the problems in communication turned out to be the most significant problem - 3.25 ± 0.14 points versus 0.45 ± 0.02 (P≤0.05) points; and also finding the patient in an awkward position due to problems with the lips - 2.75 ± 0.20 points versus 0.65 ± 0.03 (P≤0.05) points; as well as increased irritability when communicating 2.20 ± 0.10 points versus 0.40 ± 0.14 (P≤0.05) points; estimated points of difficulty in the pronunciation of words and inconvenience in communication were equal, respectively, 2.10 ± 0.08 points against 0.35 ± 0.016 (P≤0.05) points and 1.65 ± 0.07 points against $0.45 \pm 0 , 02$ (P≤0.05) points.

Somewhat less significant were the problems associated with everyday life (work and leisure). The mean score of these problems was in patients with exudative form 1.87 ± 0.0 points versus 0.38 ± 0.015 (P≤0.05) points in patients with the dry form. In terms of importance, difficulties in working with this group of problems are 2.72 ± 0.13 points versus 0.65 ± 0.02 (P≤0.05); quality reduction rest 2.45 ± 0.12 points versus 0.45 ± 0.01 (P≤0.05); decrease in interest in life - 1.65 ± 0.0 points versus 0.15 ± 0.002 (P≤0.05) and a "total loss of life" 0.65 ± 0.07 points against 0.38 ± 0.02 (P≤0.05), respectively, in patients with exudative and dry forms.

Analysis of the answers we received shows the impact of lip lesions on the level of quality of life, as well as the importance of aesthetics in self-perception and relations in society. The importance of identifying the reasons forcing a patient to seek specialized medical care is obvious. Equally important is the extent to which these causes affect the quality of life. Assessing the quality of life of patients using the OHIP-14 questionnaire allows you to identify priority problems, improve the interaction between the physician and the patient, and evaluate the response to the treatment. A significant reduction in the quality of life in patients with exudative form consistent with a more severe course of the disease can be explained by the pathological effect of a local lesion on the soft tissue of the red border of the lips, as well as by the presence of somatic pathology in this group of patients.

Obviously, when assessing the amount of necessary assistance, treatment planning, it is necessary to focus, among other things, on the patient's assessment of his dental status.

Thus, our study allowed us to identify the most frequent dental complaints in patients with various forms of exfolitory cheilitis, related to quality of life, to identify priority problems in the planned treatment, as well as to evaluate the effectiveness of therapeutic measures.

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复发性口疮性口炎患者颊上皮细胞电动力学特征的研究
PROPERTIES OF ELECTROKINETIC CHARACTERIZATION OF BUCCAL EPITHELIAL CELLS IN PATIENTS WITH RECURRENT APHTHOUS STOMATITIS

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注解。 在143名患有CRAC的患者中评估了颊上皮细胞的电动移动性，其在疾病的各个阶段具有负担和不复杂的遗传：峰值，缓解和康复。 将这些数据与40名性别和年龄相当的健康患者进行比较。 结果表明，在遗传性负荷患者中，颊上皮胞的ECA降低与疾病临床过程的严重性增加和高复发率相关。
关键词：复发性口疮性口炎（RAS），颊上皮细胞。
Annotation. *The electrokinetic mobility of buccal epithelial cells was assessed in 143 patients with CRAC with burdened and uncomplicated heredity at various stages of the disease: peak, remission and convalescence. The data are compared with 40 practically healthy patients of comparable gender and age. The results indicate that in patients with hereditary burden, a decrease in ECA of buccal epithelial cells is associated with an increase in the severity of the clinical course of the disease and a high recurrence rate.*
Key words: *Recurrent aphthous stomatitis (RAS), buccal epithelial cells.*

Recurrent aphthous stomatitis (RAS) is a chronic recurrent disease of the oral mucosa, characterized by periodic remissions with exacerbation and rashes of aft. According to WHO, up to 20% of the population is affected.

Buccal epithelial cells, as well as all epithelial cells of the mucous membranes, are actively involved in the system of humoral-cell homeostasis [1].

The bioelectric properties of native cell nuclei, including the electrokinetic potential, characterize the potential energy of the genome (PEG). PEGs are those energetic properties of the nuclear genome, on which the development of various manifestations of quantitative heredity depends, in particular, nonspecific resistance [2,3].

The study of genetic and epigenetic mechanisms for the development of RAS will provide new data and become the basis for the development of a set of criteria for hereditary susceptibility to multifactorial diseases, will allow you to select a group of genetically burdened patients to develop adequate etiologically and pathogenetically sound approaches to treatment and preventive measures.

In the Republic of Uzbekistan, the frequency of RAS among all diseases of the oral mucosa disease is 6.22% and tends to increase, therefore, the study of the electrokinetic activity of buccal epithelial cells in patients with burdened and non-burdened heredity pathology is of undoubted practical interest.

Materials and methods. The indicator of electrokinetic activity - ECA,% of buccal epithelial cells was determined using the method of intracellular electrophoresis [1]. The collection of cell fractions was carried out by scraping the cells from the inside of the cheek of the studied persons with the addition of 0.5 µl of phosphate buffer [pH 7.0] without staining the native material.

Then the material was placed in an electrophoretic chamber connected to a microelectrophoresis device. A mode of 0.1 ± 0.01 mA was obtained with an electric field voltage of 20–30 V. Studies were performed under a microscope, the percentage of living cells was calculated, i.e. their electrokinetic activity is ECA,%.

122 patients were examined with a clinically verified diagnosis of RAS. Depending on the clinical form of the disease, fibrinous disease was isolated - 100 patients and scarring - 22 patients. Taking into account the role of the hereditary factor in the genesis of the disease, patients with RAS were divided into individuals with a history of RAS from relatives 1 or 2 lines of kinship (hereditarily burdened) and not having RAS from relatives (hereditary not burdened.

In general, hereditary burden was found in 60 patients with the fibrinous form of the disease and in 34 patients with scarring. The average age of patients was 37.71 ± 1.64 years. The control group consisted of 40 patients with a mean age of 38.01 ± 1.59 years, of comparable sex and age without a pathology of cardiovascular therapy,.

All patients with RAS received standard treatment, including the appointment of a dietary (gentle nutrition), sanitization of the oral cavity, antiseptic surface treatment of erosive-ulcerous elements, epithelializing and regenerating therapy (solcoseryl detailed adhesive paste, Mundizal gel), immunomodulators and detoxification means.

Studies were carried out during the height of the disease, during recovery and remission. To characterize the severity of the disease, we used indicators of the frequency of diseases during the year, the severity of the course of relapse in IEP indexes (total disease severity), and the duration of treatment of relapse.

Statistical processing of the research results was performed using student's criterion. The data are presented as $M \pm m$, where M is the arithmetic mean value, and m is the error of the mean. The difference was considered statistically significant at $p < 0.05$.

Results and discussions. It was established that in patients with RAS, the index of electrokinetic activity of the nuclei (EAN,%) of the buccal epithelium was statistically significantly reduced compared with the control group (table, figure). The levels of ECA decline were determined by the stages of the disease and the presence of hereditary burden.

So, at the height of the ECA disease, buccal epithelial cells in patients with the fibrinous form of RAS without hereditary burden were reduced relative to the control group by 57.35% (P ≤ 0.01); during remission by 43.15% (P ≤ 0.01); in patients with scarring, respectively, by 62.62% (P ≤ 0.01); 44.43 (P ≤ 0.01). The negative dynamics of maintaining reduced electrokinetic activity of epithelial cells in patients with hereditary burdens remained and the remission period while ECA epithelial cells in patients with fibrinous form of the disease remained 26.64% (P ≤ 0.01) lower than that in the comparison group; in the cicatrizing form, the corresponding decrease was 28.89% (P ≤ 0.01).

The somewhat different dynamics of ECA of buccal epithelial cells during different periods of treatment of the disease was established in patients without hereditary burden. Thus, during the height of the disease, the ECA of patients with the fibrinous form of the disease was lower than the control group by 43.25% (P ≤ 0.01); increased in the remission period, remaining below the control values of 18.78% (P ≤ 0.05) and fully restored to the values of the control group in the remission period lower by 3.67% (P ≥ 0.05); the corresponding dynamics in the cicatrizing form was 44.37% (P ≤ 0.01); 27.74% (P ≤ 0.01) and 2.76% (P ≥ 0.05).

It should be noted that during all the studied periods of the disease of ECA epithelial cells in patients with a hereditary history, the corresponding values of patients without hereditary burden were lower (P ≤ 0.05).

Based on the electrokinetic characteristics of buccal epithelium cells, one can objectively evaluate the functional state of a person, ECA of epithelial cells as an integral indicator of metabolism in the body as a whole.

To assess the relationship of ECA to buccal epithelial cells and the severity of RAS, a correlation analysis was made of indicators of the severity of the disease and the level of ECA in a specific period of the disease.

There is an inverse correlation relationship between indicators of the severity of the clinical course of RAS and ECA of buccal epithelial cells, meaning that the increase in the severity of the clinical course of RAS is associated with a decrease in the functional activity of buccal epithelial cells. It should be noted that in patients without hereditary aggravation, the identified relationships were strong (- 0.65 - 0.01) at the height of the disease, decreased to moderate during remission (- 0.48 - - 0.55) and disappeared during the recovery period; at the same time, in patients with hereditary burdens, the correlation interrelations remained in the period of convalescence.

Analysis of the obtained results allows us to conclude that the functional state of epithelial cells depends on the severity of RAS and the presence of hereditary burden. It is not possible to judge unequivocally the cause of this phenomenon, taking into account the etiology of the pathology studied and the lability of the ECA index.

This pathology is characterized by the presence of various somatic pathologies, developing against this background oxidative stress and activation of non-enzymatic protein cleavage, reduction of the energy state, activity of enzyme systems, all biochemical and biophysical processes at the tissue and cellular level contribute to the development and chronicity of the disease [1].

RAS is characterized by a number of metabolic disorders, activation of the reaction of free radical oxidation of macromolecules, accumulation in the cells of the products of tissue degradation, reducing the adaptive capacity of the organism. These and many other mechanisms occurring in the body of the patient RAS affect the electrokinetic potential of cells. Biologically active substances through interaction with membrane receptors and penetration of cells into the cytoplasm affect the state of the genetic apparatus.

Another important factor that also affects buccal epithelial cells is oral fluid, the amount and chemical composition of which varies as in the case of pathology of the oral mucous membrane, periodontal diseases, anomalies of the oral cavity, the presence of orthodontic structures, etc. At the same time, buccal epithelial cells are exposed to proteolytic enzymes and products of disturbed metabolism of the oral fluid, which also disrupt the differentiation of epithelial cells. The multifactor nature of XRAS suggests the existence of a complex of endogenous mechanisms in patients with hereditary burdens, as well as local factors of the oral cavity that act on epithelial cells.

Conclusion. Thus, on the basis of the obtained data, it can be assumed that in the conditions of the clinical picture of RAS, a decrease in the electrokinetic mobility of epithelial cells is observed in buccal epithelium cells.

Since ECA is a marker of the state of physiological and pathophysiological reactions in the body, its definition along with information about the hereditary stress of RAS can be used for diagnostic purposes when planning treatment and prophylactic measures in patients with RAS.

When planning treatment-and-prophylactic measures, it is necessary to take into account that during the period of remission, the combination of ECA reduction in epithelial cells and burdened heredity with RAS is an unfavorable prognostic sign indicating a high severity of the clinical course and the possibility of frequent relapses of the disease.

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老年和老年患者牙科病理的患病率和强度
THE PREVALENCE AND INTENSITY OF DENTAL PATHOLOGY IN PATIENTS OF ELDERLY AND SENILE AGE

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注解。　根据337名年龄在45–60岁及以上的人的牙科检查，确定所有检查年龄较大的年龄组（与35–44岁的指数年龄组相比）需要治疗牙周病，超过三分之一（更多）　超过33.33%）研究组需要治疗非龋齿病变。　龋病的治疗由100.0%的老年人检查表明，包括龋齿治疗，替代劣质填充物和牙髓治疗。

关键词：老年病学，老年人和老年人，强度，牙齿发病率，龋病发生率，牙周病，口腔粘膜疾病。

Annotation. *Based on a dental examination of 337 people aged 45–60 years and older, it was established that all examined older age groups (compared to the index age group of 35 -44 years) need treatment for periodontal diseases, more than a third (more than 33.33%) the study group need therapeutic treatment of non-carious lesions. The treatment of caries is indicated by 100.0% of the examined older age groups, including the treatment of caries, the replacement of poor-quality fillings and endodontic treatment.*

Key words: *gerontology, elderly and old age, intensity, prevalence of dental morbidity, incidence of caries, periodontal disease, diseases of the oral mucosa.*

The global aging of the population of the Earth, preserving its high rates, arising in connection with this new challenges in the development of mankind, are attracting more and more attention of specialists of various directions, both for expert assessments of the situation of various aspects of aging, and for practitioners who implement gerontology policy in one country or another or region. [4,5]

Numerous studies have been devoted to the study of the general health of elderly and senile people [1, 3, 7, 9, 10, 11]. There are separate works devoted to the assessment of dental status, on the basis of which needs are assessed and the organizational principles for the provision of dental care are justified [2,6,7,8,12,13]. However, the state of dental health, the study of risk factors for the development and exacerbation of dental diseases, researchers do not pay enough attention.

The purpose of this study was to study the prevalence and intensity of dental pathology in people of residential and senile age.

Materials and research methods

To register the dental status, an oral examination map was developed, which we developed on the basis of the WHO standard map (1995). A total of 337 people were examined, including in the index age group of 35 - 44 years old - 102 people; middle age (45 - 60 years) - 100 people; elderly (61 -75 years) - 80 people; senile (76 - 89 years old) - 40 people and long-livers (more than 90 years old) - 15 people born and permanently residing in Tashkent. All examined were randomized according to social and living conditions and material status.

Inspection data describing the dental status of each patient examined was added to the "Dental Status Assessment Map of the Adult Population". Based on the research program, specialized teams were organized as part of dentists.

The intensity of dental caries was determined by the index of the CSE. The intensity of carious lesions was assessed by the amount of carious –element "C", sealed - element "S" and extracted teeth.

Assessment of periodontal lesions and the need for treatment measures was carried out according to the WHO Periodontal Index - CPITN (the Community Periodontal Index of Treatment Needs) and standardized recommendations for its evaluation. The prevalence (in%) of dental diseases of the oral mucous membrane, lips and tongue, periodontal and teeth was estimated. The obtained data were processed using Microsoft Excel 2010, Statistica 6.0 (StatSoftInc., USA).

Results and discussions

Epidemiological studies have revealed a high prevalence and intensity of dental diseases in elderly and elderly people. The prevalence of periodontal disease (K05 Gingivitis and periodontal disease according to ICD-10) is 55.88% in the index age group (35- 44 years) and is progressively increasing with the enthusiasm of the age surveyed, making up 70.0% in the age group 45-59 years; in older age groups, periodontal disease is found in all patients - 100.0%.

Informative are the comparative data of the index assessment of periodontal status with increasing age in people of identical socio-economic status and other factors. Comparative studies have shown that in the index age group the intensity of periodontal diseases according to the CPITN index is 2.8 affected sextant, with an increase in the age of the examined, this value progressively increases to 3.0 sextants (age range 45 - 59 years) and 5.0; 5.8 and absence, respectively, in the age periods of 60 - 74 years: 75 - 89 years and more than 90 years.

In the structure of CPITN, the intensity of gingival bleeding (element 1) in the index age group of 35 -44 years is 1.2 ± 0.05 sextants, respectively; in the age group of 44 - 59 years old -1.5 ± 0.04; 60 - 74 years -0.4 ± 0.02; 75 - 89 years - and more than 90 years - 0.1 ± 0.003 and no; the corresponding dynamics of element

2 (tartar) was 0.6; ± 0.02; 0.7 ± 0.03; 1.3 ± 0.05; 0.5 ± 0.02 and 0.1 ± 0.004; periodontal pockets 4–5 mm deep (element 3): 0.3 ± 0.01; 0.8 ± 0.03; 1.2 ± 0.04; 1.6 ± 0.07 and 0.7 ± 0.03; as well as periodontal pockets with a depth of more than 6 mm (element 4): 0.2 ± 0.01; 0.4 ± 0.02; 0.8 ± 0.03; 1.2 ± 0.05 and 2.0 ± 0.09. Thus, with an increase in the age of the examined, an increase in the intensity of a heavy periodontal lesion with pockets deeper than 6.0 mm is noted.

Excluded sextants (element "X") were encountered in isolated cases in the index age group of 35-44 years old 0.5 ± 0.05 and in middle-aged individuals - 0.6 ± 0.02; with increasing age of the examined, the intensity of the element "X" progressively increased, reaching a maximum at the age of 90 years and older - 3.2 ± 0.14, which is obviously associated with the progressive loss of teeth.

Comparative studies of the specific weight of the elements of the CPITN index show that in the index age group the maximum specific weight falls on healthy sextants - 53.33 ± 4.93%; with age, the proportion of intact sectarians progressively decreases, reaching 33.33 ± 4.71% in middle-aged persons; elderly - 16.67 ± 4, 16%; senile -3.33 ± 2.84%; long-livers have no healthy sextants. Against the background of a decrease in the proportion of healthy sextants, an increase in the proportion of elements characterizing severe inflammatory and destructive periodontal damage is found: periodontal pockets 4-5 mm deep (element 3) and deeper than 6.0 mm (element 4), as well as a significant increase in excluded sextants (element X).

Thus, the intensity of periodontal disease increases with age; with an increase in the age of those examined in the CPITN structure, the proportion of sextants with periodontal pockets and excluded sextants is progressively increasing.

The prevalence of caries was determined to be 100.0% (K02 Dental caries) in all groups of patients examined. CSE index (intensity of caries) increases with increasing age: the intensity of caries in the index age group 34 -44 years was 11.26 ± 0.42 affected teeth; in the age group 45–59 years old — 15.25 ± 0.63 (P ≤ 0.05); in older age periods, an even more significant and statistically significant (P ≤ 0.05) increase in the intensity of caries is observed: the value of the CSE index in the age group of 60 - 74 years is already 18.31 ± 0.77; 74 -89 - 27.42 ± 1.312 and over 90 years - 30.41 ± 1.48. In the structure of the CSE index, in the index age group (35–44) years and middle-aged persons (45–59 years), the sealed teeth are dominated by the intensity of the element "S", respectively, 6.25 ± 0.25 and 8.46 ± 0.37, while specific gravity of 55.51% and 55.47%; with increasing age in the elderly (60–74 years), old (75–89 years) and centenarians (90 years or more), the size and proportion of the element "S" progressively decrease, respectively -1.88 ± 0.07; 1.62 ± 0.06 and 1.25 ± 0.04 and 10.27%; 5.91% and 4.11%.

The intensity of the element "C" - carious teeth increases from 3.11 ± 0.12 carious teeth in the index age group to 6.11 ± 0.25 in the elderly; for old men and

long-livers, the intensity of caris is 2.11 ± 0.08 and 2.03 ± 0.07; It should be noted that the proportion of the element "C" in the structure of the CSE index in the index age group, among middle-aged and elderly people, varies between 26.72% - 33.37% and sharply decreases with increasing age: among the elderly - 7.69 % and centenarians - 6.68%.

It should be noted a dynamic increase in the intensity and specific gravity in the structure of CSE of extracted teeth - the element "E". In the index age group (35–44 years) and in middle-aged people (45–59 years), in the elderly (60–74), senile (75–89 years) and long-livers (more than 90 years), the intensity of the element "E" is equal to 1.90 ± 0.08; 2.37 ± 0.11; 10.32 ± 0.43; 22.69 ± 1.02 and 27.13 ± 1.25; and the share in the CSE index structure is 16.87%, respectively; 15.54%: 56.36%; 82.75% and 89.21%.

With increasing age, diseases of the lips, tongue and oral mucosa were more often diagnosed. Thus, the frequency of occurrence of meteorological cheilitis in the index age group (35 - 44 years) was 0.98%: among middle-aged people (45-59 years) -2.0%; in the elderly (60-74) –7.5%; for seniors (75–89 years old) - 17.5% and for long-livers (more than 90 years) - 13.33%; the corresponding dynamics of exfoliative cheilitis is -0.98%; 1.0%; 18.75%; 30.0% and 20.0%; the frequency of occurrence of congestion in the corners of the mouth is 1.96%; 1.96%; 12.5%; 22.5% and 26.67%; and herpetic lesions of the lips - 0,0; 2.94%; 10.88%; 12.5% and 13.38%.

When inspecting the oral cavity and oral mucosa, there is a loss of gloss, thinning and pallor of the oral mucosa membrane. Changes in the surface of the oral mucosa membrane solution with atrophic phenomena increases synchronously with the age of the patients. Thus, the loss of luminosity of oral mucosa is noted in 1.96% of middle-aged persons and in 73.33% of long-livers; and the thinning and paleness of the oral mucosa, respectively, in 0.98% and 53.33%.

An analysis of the results of an epidemiological dental examination showed that aphthous and herpetic stomatitis (K12.0 recurrent aphthasis of the oral cavity, B00.2 Herpetic gingivostomatitis) were predominant, in rare cases leukoplakia and lichen planus (K13.2 Leukoplakia and other changes in the oral epithelium , L43.9. Deprive red flat unspecified), prosthetic stomatitis was diagnosed, as well as leuklaplakia of the oral mucosa membrane.

Revealed an increase in the prevalence of mucosal diseases with increasing age.

More than a third (more than 33.33%) of the studied population is in need of therapeutic treatment of non-carious lesions (local fluoroprophylaxis, application of a seal according to indications.

The treatment of caries is indicated by 100.0% of the examined older age groups, including the treatment of caries, the replacement of poor-quality fillings and endodontic treatment.

Epidemiological studies have shown that in older age groups, the frequency of occurrence of various diseases of the oral mucosa membrane, periodontal pathology, hard dental tissue and tongue significantly increases the causes of which are unknown in most cases. Probably one of the factors predisposing to the development of oral pathology is age-related changes and peculiarities of its condition depending on the somatic status. According to many researchers, comorbid pathology and the intake of many drugs is important in the occurrence of dental pathology in older age groups. On the background of comorbid pathology, metabolic-trophic processes, microcirculation are disturbed, chronic ischemia develops and trophic changes occur in tissues, including periodontal tissues, hard dental tissues, salivary glands, and the mucous membrane of one oral cavity and tongue. Partial absence of teeth, reduction of the function of the salivary glands, impairment of trophic support of the oral mucosa, lead to different, but closely interrelated and forming a single pathogenetic complex, functional and morphological changes in all elements of the dental system.

Significant for practical health care are data on the frequency and structure of oral diseases in people of different age groups, which can be used in outpatient dental institutions for the organization and planning of follow-up and follow-up of people with this pathology.

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多发性妇女牙周炎动力学中钙磷代谢的研究
STUDY OF CALCIUM AND PHOSPHORUS METABOLISM
IN THE DYNAMICS OF PERIODONTITIS
IN MULTIPAROUS WOMEN

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注解。已经在多产妇女的牙周炎动力学中研究了钙磷代谢。

为了研究矿物质代谢指标，选择了76名多胞胎女性（生下3个或更多孩子）；73-低速妇女（生下2个或更少的孩子）和69个未分娩的妇女。 30名健康牙周组女性组成对照组。通过比色法测定口腔液中总钙（Ca）和磷（P）的含量。

确定了Ca 2+浓度的增加，这表明牙周组织的严重损伤，其伴随着来自牙槽突的骨组织的Ca 2+的释放和其再吸收的进展。

在患有GP的患者中，观察到Ca／P比率的显着变化，这是不利的迹象，证明了骨组织再吸收过程和再矿化过程受损的优势。

颌面部骨组织病理过程与骨系统之间的揭示关系表明，实施了预防和治疗多发性女性全身性牙周炎中骨质疏松症的措施。

关键词：多胎女性，广泛性牙周炎，口服液中钙浓度，离子钙，磷，矿物质代谢。

Annotation. *Calcium-phosphorus metabolism has been studied in the dynamics of periodontitis in multiparous women.*

To study the indicators of mineral metabolism, 76 women with multiple births (who gave birth to 3 or more children) were selected; 73 - women with low speed (who gave birth to 2 or less children) and 69 women who did not give birth. 30 women with a healthy periodontal group formed the control group. The content of total calcium (Ca) and phosphorus (P) in the oral fluid was determined by a colorimetric method.

An increase in the Ca^{2+} concentration was determined, which indicates a severe lesion of the periodontium, which is accompanied by the release of Ca^{2+} from the bone tissue of the alveolar process and the progression of its resorption.

In patients with GP, a significant change in the Ca / P ratio was observed, which is an unfavorable sign, testifying to the predominance of processes of bone tissue resorption and impaired remineralization processes.

The revealed relationship between pathological processes in the bone tissue of the maxillofacial area and the bone system as a whole suggests the implementation of measures for the prevention and treatment of osteoporosis in generalized periodontitis of multiparous women.

Key words: women with multiple births, generalized periodontitis, Ca concentration in oral fluid, ionized calcium, phosphorus, mineral metabolism.

Proved a decrease in bone mineralization in multiparous women of reproductive age, accompanied by severe impaired mineral metabolism, the development of osteoporosis [1,8].

However, it is known that prognostic signs of periodontitis are dystrophic-destructive changes in the bone tissue of the alveoli, osteoporosis of the bone and, as a result, atrophy of the interdental septa. Recently, the relationship of periodontitis and systemic osteoporosis. The latter is manifested in the form of a decrease in bone mass and a violation of the skeletal bone tissue of the entire skeleton [3,3,11,12].

In women of reproductive age, a decrease in the mineral density of skeletal bones aggravates the periodontal pathology [3,4,5].

In connection with the foregoing, **the purpose** of these studies was the study of calcium-phosphorus metabolism in the dynamics of periodontitis in multiparous women.

Materials and methods

When studying the indicators of mineral metabolism in MPW, 76 women with multiple births (who gave birth to 3 or more children) were selected; 73 - women with low speed (who gave birth to 2 or less children) and 69 women who did not give birth. 30 women with a healthy periodontal group formed the control group.

In drawing up the survey groups, we took into account the severity of generalized periodontitis (GP), the age and frequency of background somatic pathology.

Determination of total calcium (Ca) and phosphorus (P) content in the oral fluid was carried out by means of calorimetry: calcium according to Kartashov A.V. and Vichev E.V .; phosphorus - according to the method of Boltsa D.D., Luka I.G. in modification Conway V.D. and Leontiev V.K. [7].

The content of ionized calcium was determined spectrophotometrically by the method of Kornishchenko A.I., Antonov V.G. [2].

The research results were processed statistically using the methods of variation statistics.

Research results

When studying the parameters of the trace element composition of the oral fluid and serum, a violation of Ca-P metabolism was found in all women with generalized periodontitis, which was manifested by an increase in the concentrations of the trace elements in both media. At the same time, the dynamics of changes in Ca concentration significantly outpaced the corresponding values of concentrates P.

The changes were most clearly established in women with multiple births. So, in multiparous women with GPLS in the oral fluid, the concentration of Ca was higher than the corresponding control values by 14.55% (P <0.05); with GPST and GPTS, respectively, by 30.0% (P <0.01) and 77.27% (P <0.01); similar dynamics in low-lows was 9.93% (P> 0.05); 23.18% (P <0.015) and 40.0% (P <0.01); while those who did not give birth, respectively, 4.55% (P> 0.05); 7.29% (P> 0.05) and 13.18% (P> 0.05).

The concentration of ionized calcium (Ca^{2+}) also increased with an increase in the number of genera; in multiparous women with GPLS, the increase in Ca^{2+} concentration was 16.36% (P <0.05); GPST - 27.93% (P <0.01) and GPTS - 62.16% (P <0.01); in malogorzhavshih and not giving birth, respectively, 8.11% (P <0.05); 13.51% (P> 0.05) and 38.74% (P <0.01) and 0.90% (P> 0.05) and 27.93% (P <0.01).

An increase in the concentration of ionized calcium (Ca^{2+}) was more pronounced. Thus, in multiparous females, the concentration of Ca^{2+} was increased with GPLS by 15.74% (P <0.05); GPST - 48.15% (P <0.01) and at GPTS - by 64.80% (P <0.01); the corresponding exceedances of the low-population ones amounted to 8.33% (P <0.05); 11.11% (P> 0.05), 25.92% (P <0.01) and 4.63% (P> 0.05); 6.48% (P> 0.05) and 11.11% (P> 0.05)

In multiparous women, an increase in the concentration of phosphorus in the oral fluid was as follows: in the case of GPLS — 4.76% (P> 0.05); GPST - 7.20% (P> 0.05) and GPTS - 11.81% (P> 0.05). The corresponding dynamics in the low-lows was 2.04% (P> 0.05) and 7.03% (P> 0.05); while those who have not given birth have 0.6% (P> 0.05); 2.04% (P> 0.05) and 4.31% (P> 0.05).

It should be noted that the phosphorus content in the oral fluid is more than 3 times its concentration in the serum. It is known that salivary glands are able to accumulate phosphates and their concentration in the oral fluid more than 2 times higher than serum [6, 14].

An increase in the Ca^{2+} concentration indicates a severe lesion of the periodontium, which is accompanied by the release of Ca^{2+} from the bone tissue of the alveolar process and the progression of its resorption.

In patients with GP, a significant change in the Ca / P ratio was observed, which is an unfavorable sign, testifying to the predominance of processes of bone tissue resorption and impaired remineralization processes.

Thus, in the oral fluid of the multiplying organisms, the Ca / P ratio increased compared with the control data by 3.92% (P <0.05); 21.57% (P <0.01) and 42.75% (P <0.01); 41.96% (P> 0.05); 17.65% (P <0.05); 25.49% (P <0.05) and 0.0%; 1.96% (P> 0.05); 9.80% (P> 0.05), respectively, with GPLS, GPST and GPTS.

The most intense was an increase in the Ca^{2+} / P phosphorus coefficient. In the oral fluid of multiple-burrs, already with GPLS Ca^{2+} / P, the coefficient increased by 12.0% (P <0.05); with GPST - by 24.0% (P <0.01) and with GPTS - by 60.0%

(P <0.01); among those with low growth this dynamics was 8.0% (P> 0.05) ;; 20.0% (P <0.05) and 40.0% (P <0.01); and in non-survivors - 4.0% (P> 0.05); 8.0% (P> 0.05) and 20.0% (P <0.05).

The revealed relationship between pathological processes in the bone tissue of the maxillofacial area and the bone system as a whole suggests the implementation of measures for the prevention and treatment of osteoporosis in generalized periodontitis of multiparous women.

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组织成人牙周护理
ORGANIZATION OF PERIODONTAL CARE FOR ADULTS

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注解。 本文介绍了科学研究的现代趋势，旨在改善医疗牙科机构治疗牙周病的组织方法。 作者描述了旨在提高牙科服务质量的组织措施的类型，这些措施与优化牙周病的治疗和预防性护理的组织和质量控制相关，强调需要规划专业护理的数量和结构，以及行业的发展标准

关键词：成人人群，牙周治疗，广泛性牙周炎，牙医的跨学科互动。

Annotation. The article presents the modern trends of scientific research aimed at improving the organizational approaches to the treatment of periodontal diseases in medical dental institutions. The author describes the types of organizational measures aimed at improving the quality of dental services related to optimizing the organization and quality control of treatment and preventive care for periodontal diseases, emphasizes the need for planning the volume and structure of specialized care, the development of industry standards

Key words: adult population, periodontal care, generalized periodontitis, interdisciplinary interaction of dentists.

Polyetheologicity and a large number of risk factors in the occurrence of inflammatory periodontal diseases create difficulties in diagnosing, predicting the course and treatment of these diseases [5, 6, 9, 10].

The satisfaction of the population with dental care in combination with other characteristics of health care facilities can serve as one of the criteria for evaluating the effectiveness of the service. In order to increase the satisfaction of dental care, in addition to the treatment process, it is advisable to take into account non-curative components (attention of medical staff, minimal time loss, reasonable prices), as well as gender and age differences in negotiability [9, 14].

«The classifier of services, works and technologies makes it possible to systematize the methods of therapeutic treatment of dental diseases for each nosological form presented in ICD-10C [3].

When building a strategy for the development of dental care in the Primorye Territory, the paramount decision requires the following: the formation of a single organizational and management structure of the regional dental service; the participation of legislative and executive authorities in the formation of a unified territorial policy in the field of the protection of dental health of the population; improving the management of resources of dental institutions and organizations of all forms of ownership; implementation of investment policy in the dental service, the development of a new model of professional education for dental professionals [2,4].

The model of improving the organization of the dental service in terms of providing periodontal care to the population of the Krasnoyarsk Territory includes improving the activities of the Health Centers and setting up a target program for the development of the periodontal service [7,8].

The concept of optimizing dental care for the population of Evenkia is the methodology for assessing the dental health of the population and the organization of dental care; regulatory support, including an adapted procedure for the provision of dental care; ensuring the availability of dental care due to functional changes in the existing system; the formation of a healthy lifestyle through the program of prevention of dental diseases in the adult population, taking into account regional characteristics; training and retraining system [1, 5].

To optimize dental care, national standards for the provision of dental services for all dental diseases are developed, containing not only a well-defined algorithm of medical actions, but also their evaluation criteria [11,12].

To this end, on the basis of a special agreement between the Department of Dentistry of the Institute of Postgraduate Medical Education of the Voronezh State Medical Academy. N.N. Burdenko and the regional dental clinic of the city of Kursk developed a program of activities of the training center and forms of joint educational and scientific research, which include lectures, seminars and workshops, field cycles aimed at improving the skills of doctors, especially paid dentists [1,4, 13 ,14].

In order to improve the efficiency of development and management of the dental care process, a step-by-step mechanism has been proposed, aimed at forming a model of optimizing dental care services to the adult population consisting of 5 blocks: system-forming, medical, organizational, informational, and marketing. The introduction of the model has allowed to expand the territorial CMI program in terms of providing dental care to the population; to organize two city advisory dental clinics, based on the integration of their activities with the dental faculty of the Krasnoyarsk State Educational Institution of Higher Professional Education, has increased the proportion of sanitized patients from 73.0% to 84.0%, expanded the territorial compulsory medical insurance program to include high-quality filling materials in it two urban advisory dental clinics, to increase by 17.5% patient satisfaction with the quality of medical services [5, 6, 9, 11, 13].

The development and implementation of the basic protocols of pathogenetic therapy of chronic generalized periodontitis in clinical dentistry has significantly improved the quality of treatment by 25.5%, reducing the cases of unsuccessful treatment by 5.44% (p <0.05) [11,12].

A card for examining a patient with periodontal diseases was developed and introduced into the practice of a dentist, which makes it possible to fully describe the objective data, consistently expand the diagnosis and substantiate the choice of methods for complex treatment of the patient. Algorithms for diagnosing and treating inflammatory periodontal diseases, as well as criteria for an objective assessment of the quality of complex treatment, made it possible to: conduct a consistent examination of patients, set a detailed diagnosis, rationally plan treatment, thereby improving clinical performance by 80%, quality of life by 15%, and quality of treatment - 67% [4,5].

In recent years, the question has been raised of the need for scientific research aimed at finding arguments and justifying the expediency of perceiving European experience in the development of dental care to the population in close cooperation with the system of public health protection in general [1, 4]. To implement this direction, a dental care strategy has been developed that is integrated into the primary care system at the municipal level, the goal of which is to reduce preventable oral health losses. The implementation of the model is carried out through the interaction of dental and somatic clinics, the creation of a health-preserving dental environment through primary prevention and the influence on the risk factors of oral diseases; monitoring and evaluation of results [3, 4].

Individual studies concern the improvement of the organization of dental care for patients with diabetes. It has been shown that the organization of periodontal care should be carried out in the following areas: improvement of funding for dental care; improvement of the organization of planned rehabilitation; improving the quality and strengthening the preventive nature of dental care. It is emphasized that the organization of dental offices on the basis of diabetological territorial (district) centers does not preclude patients from applying for dental care at the place of residence [2,4, 7, 14].

In determining the main directions of improving the availability and quality of dental care, a questionnaire on studying the patient's opinion has been developed and introduced into the practice of the dental clinic, which can be used to organize the study of the opinion of consumers of medical services about the quality of help they receive in dental clinics in other regions [1,2, 7.8].

The introduction of a new organizational model of the state dental clinic based on the example of the public autonomous institution "City Dental Clinic" of Cheboksary by combining all dental medical organizations of the city on the basis of a large dental clinic with centralized logistics and financial support showed its high competitiveness in the market of dental services, with this, the turnover of fixed assets was reduced to 104 days, and the rent The efficiency has increased more than 4 times [5, 7, 9].

Another model for improving the work of the dental service is the changes in the documents regulating the organization of the work of dentists, dental units and organizations [10].

With the rapid development of dentistry at the present time there is a need to use information technology in the organization of the treatment and prevention process. Using the system of intellectual support for making preventive medical decisions can increase patient satisfaction with medical care by automating operations with primary documentation and making rational use of material, financial and human resources. This will save time and increase the efficiency of the dentist [9].

An effective and affordable for a wide range of users method of studying the competitiveness and the formation of competitive advantages of a dental medical organization is the analysis of its internal environment and its closest competitors [2, 4,].

Based on the identification of system-wide patterns of development, the course of inflammatory periodontal diseases, the urgent task of developing efficiency prediction and optimizing periodically repeated therapeutic and preventive measures for the population, which has important medical importance, has been solved [32].

A comprehensive analysis of the survey of patients with periodontitis and case histories revealed the causes of the prevalence of severe disease associated with deficiencies in the organizational and professional sphere of the treatment process. Long-term clinical observations show that, despite the favorable effect achieved in the process of therapeutic measures, patients with periodontal disease sooner or later return to the doctor with an exacerbation of the disease [1, 7, 9, 11, 12, 14].

In the treatment of periodontal diseases, there is often a lack of a multidisciplinary approach; internist doctors are rarely involved. In most cases, the so-called "monotherapy" is carried out when a specialist of one profile is involved - as a rule, a dentist-therapist. In the same place where complex treatment is applied, often all stages are carried out in an arbitrary order, without clear planning and control of effectiveness due to the lack of planning methods and criteria for evaluating effectiveness. There is no clear algorithm for complex treatment depending on the individual characteristics of the patient and the course of the disease [8, 9].

According to numerous observations, a large proportion (up to 40%) of severe generalized periodontitis is revealed, the tendency of complication of periodontal diseases and somatic pathology is clearly manifested, which indicates the disadvantages of prevention and early detection of these patients [9, 13].

Based on an analytical review of the available literature, the need for managerial changes at various levels of the health care system is obvious. In this regard, issues of management and organization of treatment of periodontal diseases in somatic patients, taking into account the interdisciplinary interaction of dentists

and internists, is relevant and is of great theoretical and practical interest. Hence the need to conduct comprehensive medical and organizational research and the development of guidelines and models for improving dental periodontal care for patients with somatic pathology.

In order to improve the efficiency of periodontal treatment and manage the process of interdisciplinary interaction, it is necessary to develop a model of optimizing the provision of dental care to the adult population at various stages of medical care.

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慢性复发性唇裂患者严重程度的临床评估
CLINICAL ASSESSMENT OF THE SEVERITY OF PATIENTS WITH CHRONIC RECURRENT LIP CRACK

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注解。 75名慢性复发性唇裂患者的调查结果显示，唇部红色边缘长期存在的缺陷降低了SF-36问卷所有尺度上患者的生活质量指标。 疾病临床过程的严重程度与生活质量的下降同步。

健康的平均身体（PH）和心理（MH）成分的比较表明，在心理健康方面，生活质量下降得更明显。 随着嘴唇红色边缘的严重程度的增加，慢性压力因素的加重和相互负担以及生活质量下降，身体和精神功能受损。

关键词：生活质量，嘴唇慢性裂，心理－情绪领域，身体健康。

Annotation. *The results of a survey of 75 patients with chronic recurrent lip crack showed that long-existing defects of the red border of the lips reduce the patient's quality of life indicators on all scales of the SF-36 questionnaire. The severity of the clinical course of the disease is synchronized with a decrease in the quality of life.*

A comparison of the average physical (PH) and psychological (MH) components of health shows a more pronounced decline in the quality of life in terms of mental health. With an increase in the severity of the red border of the lips, there is an aggravation and mutual burdening of the chronic stress factor and a reduced quality of life, impaired physical and mental functioning.

Key words*: quality of life, chronic fissure of the lips, psycho-emotional sphere, physical health.*

The urgency of the problem.

Chronic recurrent lip fractures (CRLF) are considered today as a chronic disease of the red border, the mucous membrane of the lips and the corners of the mouth, accompanied by a linear violation of the integrity of the lip tissue. [6,7]. The disease is characterized by a long and recurrent course, which has a tendency (about 6% of cases) to malignant degeneration [5,8,9].

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Characterized by a prolonged progressive course with frequent addition of infection, cheilitis, which leads to the aggravation of disturbed trophic and metabolic processes and pronounced structural-functional and aesthetic disorders. [1,2,3,4]. The course of chronic recurrent lip cracks is accompanied by instability of the psycho-emotional sphere, manifested by depression and anxiety-phobic states [10].

The presence of a chronic defect on the red border of the lips in combination with the instability of the psycho-emotional sphere may be factors leading to a decrease in the quality of life (QOL). The feasibility and relevance of the study of the quality of life of patients with CRLF is obvious.

Objective: to study the quality of life of patients with chronic recurrent lip crack.

Materials and methods

75 patients with CRLF were examined, whose mean age was 45.64 ± 2.11 years, of which the proportion of men was $65.00 \pm 7.54\%$; women - $35.00 \pm 7.54\%$;

The control group included 40 people who did not have the diseases of the red border of the lips, whose average age was 45.22 ± 1.82 years, the majority of which were men - $66.67 \pm 5.44\%$; less women - $33.33 \pm 5.44\%$.

To assess the severity of the clinical course of CRLF, we used the method "Clinical assessment of the severity of the pathological process in chronic recurrent lip fracture", suggesting a clinical assessment of the severity of pain, symptoms of intoxication, the size and localization of CRLF, the degree of bleeding, the state of the crack edges, the state of infiltration at the base of the crack , pain when bimanual palpation, the condition of the surface of the red border of the lips, the condition of the surface of the crack, the number of cracks, the presence of additional Yelnia elements lesions and the presence of concomitant diseases lips. Each sign (from among those included in the analysis) was evaluated on a 3-point scale: 0 — no sign or symptom; 3 points - the maximum severity of the symptom. When assessing the severity of the course of CRLF, the sum of the estimated points for each patient is divided by their number. In accordance with the developed evaluation points of 0.1 to 1 points corresponds to a mild degree of CRLF; from 1.1 to 2.0 moderate severity and 2.1 - 3.0 points - severe course of CRLF.

The results of clinical studies showed that 11 patients suffered from mild CRLF; 24 had a moderate course of the disease and 40 had a severe course of CRLF.

To assess the quality of life (QOL), we used the Russian version of the SF-36 questionnaire as an acceptable version for assessing the quality of life of healthy people and patients with various types of pathology (Short Form Medical Outcomes Study -SF-36).

The 36 items of the questionnaire are grouped into eight scales, divided into two indicators: the "physical" component of health "and the" psychological "component of health:

I. The physical component of health (Physical health-PH), constituent scales

1. Physical functioning (PF)
2. Role-based physical functioning (RP)
3. Scale of pain (BP)
4. General health (GH)

II. Mental Health (MH) Component Scales:

5. Scale of viability (VT)
6. Social Functioning (SF)
7. Role-Emotional Functioning (RE)
8. Psychological health (MH)

A higher score indicates a higher quality of life (QOL). All patients self-completed the SF-36 questionnaire before starting treatment. Mathematical calculations were carried out using the program Statistica 6.0. The level of significance was taken at the level of 0.05.

Results and discussions

The survey results showed that long-existing defects of the red border of the lips reduce the patient's quality of life indicators on all scales of the SF-36 questionnaire.

Analysis of the scales of the indicator "physical" component of health "showed that the presence of pain syndrome (PF) has the most significant effect on reducing the quality of life. The physical functioning of patients with CRLF decreased dramatically due to the constantly present pain syndrome on the red border of the lips, even the pain index (BP) was reduced by 53.7% relative to the control ($P \leq 0.05$); the increase in severity contributed to a more significant decrease in the quality of life in terms of pain (BP) - by 69.8% and 84.2%, respectively, with the course of moderate severity and severe. At the same time, the increase in the severity of the disease and the presence of pain syndrome leads to a decrease in the quality of life indicators on the scale of physical functioning (PF), a decrease in daily physical activity was observed with a light course of - 20.0%; the course of moderate severity - by 37.5% and in severe course — by 50.0%; the corresponding reduction in role-based physical functioning (RP) was 25.94%; 34.62% and 47.18% and a decrease in general health (GH) occurred, respectively, by 14.53%; 27.12% and 30.63%.

It should be noted that the presence of a defect on the visible part of the red border of the lips worsens emotional status and mental health, which was recorded due to a sharp deterioration in the quality of life in terms of the psychological component of health.

At the same time, the maximum decline in the quality of life in the emotional status and mental health section was marked on the psychological health (MH) scale, where the value of the estimated score decreased relative to the control group in patients with mild disease by 36.63%; with an average current - by 62.27% and with a severe course - by 80.25%; the corresponding dynamics of the decline in the quality of life on the vitality scale (VT) was 19.73%; 32.67% and 44.53%; on a scale of social functioning (SF) - 21.89%; 34.78% and 55.22%; and on the scale of role emotional functioning (RE) - by 21.90%; 39.40% and 59.30%.

At present, the concept has been approved, according to which the instability of the psycho-emotional sphere with psychopathological disorders, depression and anxiety-phobic states [10,11] acts as an etiological factor for the development of CRLF.

A comparison of the average physical (PH) and psychological (MN) components of health shows a more pronounced decline in the quality of life in terms of mental health. This tendency is most clearly illustrated in Figure 2. As can be seen from Figure 2, for patients with mild course, the indicator of quality of life in the physical component was reduced relative to the control group by 18.95%; and mental - by 33.15%; with the course of moderate severity, respectively, by 35.68% and 48.91%, and with severe course, respectively by 38.10% and 53.86%.

With an increase in anxiety and depression, there was a decrease in the integral indicator of the quality of life and all its scales, which confirms the relationship of psychosomatic disorders and reduced quality of life.

Thus, the presence of chronic recurrent lip fissure has a negative impact on the quality of life of patients, and the chronic stress factor and the reduced quality of life and physical and mental functioning are aggravated and mutual aggravated.

Findings:

1. The quality of life of patients with chronic recurrent lip fissure is characterized by a decrease in all scales constituting integral indicators of mental (MN) and physical health (PH). The severity of the clinical course of the disease is synchronized with a decrease in the quality of life.

2. Comparison of average physical (PH) and psychological (MN) components of health shows a more pronounced decline in the quality of life in terms of mental health. With an increase in the severity of the red border of the lips, there is an aggravation and mutual burdening of the chronic stress factor and a reduced quality of life, impaired physical and mental functioning.

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引力宇宙假说
GRAVITATIONAL UNIVERSE HYPOTHESIS

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注解。　本文基于宇宙的创造和发展在封闭空间的主导外部重力（主要在微观世界中）和以太的宇宙重力（主要在宇宙中）发生的证明，提出了物理学发展的新的真实路径。　，控制四种形式的四种相互作用中的所有过程。

关键词：空间；能源;阿米尔；外部重力；宇宙引力；极限密度；最大速度；醚；宇宙的细菌；空间；当前重力因子。

Annotation. *The article proposes a new real path for the development of physics, based on the proof that the creation and development of the Universe occurs under the dominant external gravity of closed Spaces (mainly in the microcosm) and cosmological gravity of the Ether, mainly in Cosmos, controlling all the processes in the four forms of four interactions.*

Keywords: *space; energy; Amer; external gravity; cosmological gravity; ultimate density; maximum speed; Ether; The germ of the Universe; Space; current gravity factor.*

The Universe was born a Black Hole (Amer), was born from a Black Hole (Germ) and is rapidly moving apart in the form of a Black Hole (Ether).

The parameters given below are calculated according to our hypothesis of the birth of the Universe on the basis of the following physical indicators firmly established by science:

- limit value of the speed of light: $s = 3*10^8$ m/s;
- Boltzmann constant: $K = 1,38*10^{-23}$ J/c;
- proton radius: $R_{pr} = 0, 87*10^{-15}$ m;
- proton mass: $M_{pr} = 1,667*10^{-27}$ kg;
- highest density (proton): $q_{max} = 6*10^{17}$ kg/cc. m;
- proton rest energy: $W_{rest} = 938,24$ MeV;
- gravitational constant coefficient (experimentally): $G_{eff} = 6,674*10^{-11}$ m^3/s^2 kg;
- the temperature of the background radiation today (the temperature of Ether): $T_{et} = 2,7$ K;
- electron mass: $M_{el} = 9,1*10^{-31}$ kg;
- and etc.

The scheme of the birth and evolution of the Universe: *The non-physical Zero-Space - the manifestation of the first physical particle (Amer) - the birth of the Ether Nucleus from 10^{95} Amers connected by external gravity - the merging of a part of Amers (74%) into protons- an increase in the Nucleus temperature to $3*10^{12}$ K due to free proton movement = increase in internal pressure up to 10^{34} N/sq. m due to the free movement of Amers = the beginning of the expansion of the Ether Nucleus due to internal pressure (the birth of the Universe) - the birth of hydrogen and helium - the birth of atoms and molecules - the birth of stars and galaxies - the birth of life.*

We will show the approximate parameters of the Universe before the birth of the Universe and in present days.

Before the birth of the Universe.

At the beginning, before the birth of the physical world, there was only Zero-Space with zero entropy. Then the first physical particles (Amers), connected by external gravity, which formed the Ether Nucleus, appeared from it. At a certain mass, the pressure in the Nucleus has increased so much that a part of the Amers merged into protons (10^{12} Amers per proton).

1. Zero-Space – the unborn, nonphysical Space, which gave birth to the first physical closed Spaces of Amer Aether of the future Universe. Before the birth of the Universe, it occupied 6.8% of the volume of the Ether Nucleus (Reff$=3*10^{12}$ m), today it is almost 100%. We do not know this Space, but assuming that it has zero entropy, it can influence the physical world. We can name some of its properties:

- fixed zero-space has zero entropy;
- Zero-Space does not hinder the movement of matter;
- when Zero-Space moves, it carries matter;
- Zero-Space creates external gravity around closed black holes (Amers, protons, supernovae and galactic black holes), creating inertia. Physical bodies cannot do this, therefore their mass in the Universe is constant;
- Zero-Space is responsible for stimulation of the mass in the BH (Mbh=Wkin/s^2) and external gravity (Gbh=c^2Rbh/Mbh).

2. Amer – the only physical particle born of the non-physical Zero-Space (before the birth of the Universe), which, unlike the others, has only external gravity. *Amer is a child of Zero Space.* Has spirit spawned flesh? Amer are the bricks of Ether, as protons are the bricks of the Cosmos. Amer appeared as a result of *the first triune law* (Space - Mass - Gravity). It means that none of these parameters can exist *separately.* Amer is the highest energy concentration (10^{34} J/cubic meter). In order to compress the Space to such an extent ($q_{cbh}=10^{34}$ N/m), it is necessary to expend the gravitational energy (rest energy): Wgr=Wrest=GamMam^2/Ram. With the external gravity coefficient of Amer (s^2Ram/Mam), the gravitational energy of the closed Amer space will be: Wam=s^2Mam, and mass: Mam=Wam/s^2.

That is, only closed spaces (CBH) possess mass, which is the energy to keep this compressed Space from dissipation. Similar picture for other CBH (proton, SBH and GBH). Amer began free movement at top speed at the moment of the start of the expansion of the Ether Nucleus. Amer has the following basic parameters:

- time of birth: $t_{am}=(M_{am}G_{am}/s3)^{1/3}=10^{-27}$ s;
- radius of closed space: $R_{am}=s/(4/3pq_{max}G_{am})^{1/2}=0,79*10^{-19}$ m;
- rotation speed - maximum;
- centrifugal acceleration: $a_{am}=s^2/R_{am}=10^{35}$ m/s²;
- rest mass: $M_{am}=3KT/s^2=1,242*10^{-39}$ kg;
- density: $q_{max}=M_{pr}/Q_{pr}=6*10^{17}$ kg/ cube meter;
- free motion energy: $W_{dv}=3KT=1,12*10^{-23}$ J;
- rest energy: $W_{rest}=s^2M_{am}=1,12*10^{-22}$ J;
- outer surface gravity potential: $F_{out}=s^2$, J/kg;
- mass energy intensity (for all CBH): $W_{ow}=W_{rest}/M_{am}=s^2=9*10^{16}$ J/kg;
- surface tension coefficient: $q_s=W_{rest}/S_{am}=10^{15}$ H/m;
- constant external gravity coefficient: $G_{am}=s^2R_{am}/M_{am}=10^{37}$ m³/s² kg;
- speed of free movement (after the birth of the Universe) - the maximum: $V_{mov}=3*10^8$ m/s.

3. Ether Nucleus – Limit ellipsoid of rotation from densely packed Amers, connected by external gravity, located in Zero-Space. It was formed, gaining mass, but reducing the coefficient of its gravity, before the birth of the Universe. The Ether Nucleus had the following main indicators:

- time of birth: $T_{charged}=G_{nuc}M_{un}/s^3=10^4$ s (2,8 hours);
- mass: $M_{nuc}=M_{un}=6,75*10^{55}$ kg;
- number of Amers: $N_{nuc}=M_{nuc}/M_{am}=10^{95}$ Amers;
- shape: limiting ellipsoid of rotation: $K_{ler}=R_e/R_p=2,82$;
- rotation speed - limit: $V_{rot}=3*10^8$ m/s;
- radius: equatorial $R_e=2^{1/2}(3M_{vs}/4\pi \ q_{charged})^{1/3}=8,5*10^{12}$ m, polar $R_p=R_s/2=3*10^{12}$ m;
- mass: $M_{charged}=M_{vs}=s^2R_{eff}/G_{eff}=6,75*10^{55}$ kg;
- average density: $q_{charged}=0,74q_{max}=4,44*10^{17}$ kg/cubic m;
- number of protons (after the merging of Amers): $N_{pr}=10^{82}$ protons;
- current coefficient of internal gravity (before the birth of the Universe): $G_{charged}=4*10^{-26}$ m³/s² kg;
- pressure of fusion of Amers into protons: $P_{fus}=10^{33}$ kg/sq. m;

4. Proton:

Protons were formed in the nucleus of Ether at the confluence of 10^{12} Amers into one proton under a pressure of about 10^{33} kg/sq. m. The energy released from the reduction of the surface area of protons forced them to move at the speed of

light, raising the temperature in Nucleusto $3 * 10^{12}$ K. The mass of the proton can be found from the reliably established rest energy of the proton. According to our hypothesis of the birth of the Universe, the nature of mass is manifested in *the external gravity of closed Spaces*. The substance is transparent to Amers, nucleons are not. Therefore, they are addicted to the accelerated flow of Amers as the Ether moves apart. It is known that to create a mass of substance (Msub) cosmological gravitational energy is needed in the field of Ether: Wet= GetMsub^2/Rsub. In the field of external gravity BH, for example, proton, energy is required: Wpr=GprMpr^2/ Rpr. With the proton external gravity coefficient Gpr=s^{2}Rpr/Mpr, rest energy will be equal: Wpr=s^2 Mpr. This rather rigorous derivation of the Thomson formula (E=mc^2) was made for the first time, because it is based on the external gravity coefficient of closed BH. It follows that mass is equivalent to energy, it will be equal to: Mpr=Wpr/s^2 For a proton, this will be (at a rest energy of 938,2 MeV): Mpr=1,667* 10^{-27} kg. Its main indicators are presented below:

- radius: Rpr=0,87*10^{-15} m;
- mass: Mpr=1,667*10^{-27} kg;
- density: q_{max}=6*10^{17} kg/cub. м;
- rotation speed - limit: Vrot=3*10^8 m/s;
- centrifugal acceleration: a_{pr}=s^2/Rpr=10^{26} m/s^2;
- number of Amers fused into one proton: Nam=1,34*10^{12} Amers;
- rest energy: Wrest=938, 2 MeV;
- constant external gravity coefficient: Gpr=4,7*10^{28} m^3/s^2 kg;
- surface tension energy: Wsur=1.466*10^{-10} J;
- surface tension coefficient: q_S=10^{19} N/m;
- mass energy intensity: Wow=Wrest/Mpr=s^2=9*10^{16} J/kg;
- external surface gravity potential: Fex=s^2, J/kg;
- he motion of electrons in the orbits of atoms and molecules is described by the external gravity of Amers, protons and neutrons. For example, for an electron in a lower orbit and a nucleus (proton) in a hydrogen atom: Fgr=(Gbh$_1$+Gbh$_2$) Mbh$_1$Mbh$_2$/r^2=0,83*10^{-10} H, which corresponds to its value calculated according to the law of Coulomb forces.

After the birth of the Universe:

5. Ether:

After the beginning of the free movement of Amers with a top speed, the pressure in the Ether Nucleus rose to 1033 kg / sq. m, which made him move apart from each Amer at the same speed, creating a gas-like ether and cosmological gravity in nucleons accelerated by *the masses of their Amers.* For Amers of Ether substance is transparent. The most obvious analogue of the accelerated expansion of the Ether of the Universe is helium balloons growing in water. We found evidence of the domination of Ether in all the processes of the Universe. The speed of

separation of Amers at the birth of the Universe has become the limit (Vexp=3*10^8 m/s). Since then, the distance between Amers increases. The same with the orbits of electrons and planets. So the Earth's orbit since the day of its birth has increased on average by 5 meters per year. Isn't it strange that the official physics does not recognize Ether, although it is not only in front of our eyes, but literally "*in our eyes*" - in the form of photons. *It created us* (proton, neutron and electron consist of Amers)*, he gives us light* (photons are vortices of Amers of Ether)*; he feeds and clothes us* (photons of sunlight give life to plants and animals)*, he works for us* (electromagnetic energy is the flow of Amers Aether). In our era, Ether has the following main current indicators (except for mass and rotation speed):

- radius: Reth=sTun=1,3*10^{26} m;
- volume: Qeth=4/3pReth^3=2*10^{78} cub. m;
- mass of Amers: Meth=1,75*10^{55} kg;
- shape: nearly a perfect sphere;
- rotation speed - limit: Vrot=3*10^8 m/s;
- centrifugal acceleration: a_{eth}=s^2/Reth=10^{-9} m/s^2;
- rate of increase of the radius of the Nucleus (limiting): Vrad=3*10^8 m/S;
- number of Amers: Nam=Meth/Mam=10^{95} Amers;
- average distance between Amers: h_{am}=2*10^{-5} m;
- the number of Amers in 1 cub. m: Nm=10^{16} Amers;
- average run length of Amers: Lam=0,1 m;
- current internal gravity ratio: Geth=8ps^{2}Reth/Meth=6,67*10^{-11} m^3/s^2 kg;
- average density: q_{eth}=Meth/Qeth=1,9*10^{-26} kg/cub. m;
- kinetic energy of one Amer: Wam=3KT=1,12*10^{-22} J.

6. Cosmos (the formation of stars and galaxies). Cosmos began to form in the Ether Nucleus at the time of merging about 74% of Amers into protons. At the same time, the volume of the Nucleus was released (up to 19.6%) and the surface area of the protons decreased relative to the fused Amers (10^4 times), while releasing the energy of the surface tension of Amers (Wmov=s^{2}Mvs/2). This energy made the protons move freely, raising the temperature in the Nucleus up to 3*10^{12} K. Later, under the influence of temperature, neutrons, electrons, atoms and molecules were formed from Amers and protons. The main structures of the Cosmos are stars with planetary systems, galaxies consisting of stars and interstellar gas, clusters and superclusters of galaxies. Note that the only movement in the Universe is the motion along equi-gravitational orbits according to *the main law of the Universe*: the force of action is equal to the force of reaction or the total energy of particles (V^2/R=GM/R^2). Besides it, there are other laws, as its derivatives;

– the birth of galaxies and their clusters occurs from the intergalactic gas vortex, which received a rotational impulse in the *primary protogalactic vortex* at the beginning of the expansion of the Nucleus at the birth of the Universe. In the

galactic vortex, due to the shape of the Germ (LER), the vortices of stars are generated, in them there are the vortices of the planets, and in those satellites of the planets. They all feed on the energy of the primary vortex. The birth of galaxies and stars occurs *simultaneously*: without stars, a galaxy could not be born, and without a whirlwind of galaxies, stars could not be born.

- the birth of a galaxy (take a spiral) begins with the onset of the rotation of the galactic vortex, which causes it to shrink, and with it all the eddies of lower rank. ***The cause of compression of any free gas-like inhomogeneous vortex is the drift of its more dense fragments to the axis of rotation, and under the gravity to the center of the gas Cloud.*** In this case, the transfer of mass and speed of rotation by fragments of matter from the periphery to the axis of rotation of the vortex (transfer of angular momentum) *causes it to rotate rapidly*. The increased central angular momentum converts the *solid-state rotation of the Cloud into* a differential, then into a Keplerian one. At the same time comets and planets *change the direction of their drift to the opposite* - to the periphery. This allows to save them from being absorbed by the star (this saved our Earth too). This principle is characteristic of the birth of galaxies, stars, planets, their satellites and some comets from the whirlwinds. In the galactic vortex, fragments of matter are mostly denser vortexes of stars, in the vortex of stars - even denser vortexes of their moons and comets. This determined the sequence of their birth: *the star is born last*. Since star formation encompasses the entire volume of the galactic vortex, with its onset, the gas dynamics in the vortex lose their dominant properties, which transfer to the stars, since almost all the gas of the galactic vortex is concentrated in them. The end of star formation means that further the vortex (in the inner part of the galaxy) begins solid-state rotation (those stars who were born before have Keplerian rotation), as the driving force of the gas weakens and the stars began to spiral along the center of the galactic Cloud (vortex). If the Galactic Cloud has sufficient sizes so that the stars in the fall could reach the speed of light, then in collision their nucleons will merge into *standard* galactic closed Spaces (GBH with parameters corresponding to the value of the *current* cosmological gravity coefficient ($Gj=8ps^2Rj/Meth$). Since the galactic BH is standard, the total mass of the GBH compact in the center of the galaxy includes thousands of standard BH. Such a compact with its mass and gravity ensures the stability of the galaxy;

- stars, unlike galaxies, are born constantly since the birth of the galaxy. The first stars born by primary star vortices scattered long ago, new ones are born in the interstellar medium already under the influence of an external angular momentum. Having received a *threshold rotational impulse*, the inhomogeneous gas Cloud of a future star, detached from the interstellar medium, begins to rotate with compression due to transfer (drift) to its center of angular momentum by more dense fragments of the Cloud (ice particles, cometary nuclei, satellite moons). As soon as

the Keplerian rotation is established in the Cloud, the drift of the dense fragments remaining after the star has absorbed changes to the periphery, which leaves some of the planets in the star's habitability zone. Thus, the star is born last. A similar scenario for the birth of satellites of planets and comets. Calculations showed that in the center of a star such pressure is created, at which atoms and molecules begin to radiate energy at all frequencies due to the kinetic energy of Amers of Ether. When the gas cloud rotates in the interstellar medium at high speed, it takes the form of the *Limit ellipsoid of rotation* with the asymmetry of the equatorial and polar radii equal to: $Kler=Requ/Rpol=2(2)^{1/2}$, which *does not allow him to blur in space* in a thin disk By the way, most galaxies, stars, planets and their satellites have this form. This may explain *the faults of the earth's crust into lithospheric plates and "star-shocks" in pulsars when they slow down*, that is, when their more spherical shape is formed. We found the dependence of the equatorial radius (Re) of a gas-like Cloud on its rotational speed (Vrot):

$$Re=Rsph(1+RsphVrot^2/GeffMsph)^{1/2},$$

where Rsph and Msph – radius and mass of spherical clouds.

This formula allows you to find the threshold speed of rotation at which the Cloud takes the form of LER. The cosmological gravitational attraction of bodies in the structures of matter is determined (except for the forces of attraction of the external gravity of nucleons) by the Newton formula. The main parameters of the Cosmos will be:

- Radius of the Cosmos is equal to the radius of Ether: $Rcos=1,3*10^{26}$ m);
- mass: $Mcos=5*10^{55}$ kg;
- average density – about 10^{-26} kg/cub. m;

average distance between particles: $h_{pr}=3-5$ m;

- current coefficient of internal gravity: $Geth=8ps^2Reth/Meth=6,67*10^{-11}$ m³/s² kg.

7. Closed spaces of limiting density (closed black holes).

In the Universe, only closed Spaces have maximum density (Amer, proton, and SBH in supernovae and GBH in the center of galaxies), which have mass and gravity. Amer and protons, which were born as a result of the merging of Amers, povilis before the birth of the Universe, and SBH in supernovae and in the center of galaxies - after its birth. The mechanism of the birth of a closed Amer space is unknown, but the birth of its external gravity is similar to a spherical outflow into it with a limiting speed of Zero-Space (through its surface), attracting all the physical particles around itself according to the inverse square law. Note that this process is not available to physical bodies. The response to the flow pulse is not suitable for the role of the Amer mass, since its external gravity changes with Amer concentration, and the mass remains unchanged. The proof of the analogy of this process is that the external gravity coefficient of compacts from Amers (germ),

protons (nuclei of atoms) or GBH (in the center of galaxies) is proportional to the surface area of BH (mass to volume) and decreases inversely proportional to the degree 2/3 of the number of BH. For example, the helium nucleus has an external gravity coefficient (4 nucleons) already 1.58 times less than that of a hydrogen nucleus (one proton), and a nucleus with 90 nucleons - 20 times. This suggests that the outflow in each BH is "shadowed" by its neighbors, reducing the total flow of Zero-Space. For *the mechanism of mass formation* (even for the resting) BH, only the rotational energy of BH remains with a limiting velocity (Mbh=Wrest/s^2), к which never changes. It seems that the CBH mass arises as a reaction of the BH Space to the centrifugal acceleration of the BH rotation. Amer manifests itself, having a mass (with a maximum rotation), when Amers merge into protons: they transmit a rotational moment to them, and those already merge protons into SBH and GBH, they transfer them to them. All types of closed BH probably do not interact with the substance, and partially with the Zero-Space.

7.1. *In supernovae nowadays (SBH):*

At the end of their short life, massive stars explode as supernovae with the release of large amounts of energy (about 10^{40} J). We believe that the cause of the explosion is an increase in the internal pressure of a star of a certain mass due to a decrease in the speed of its rotation around its axis, exceeding the "threshold of strength" of protons. The energy of pressure released in the SBH protons by reducing its surface area (up to 10^{44} J) is enough to create the SBH and release the shell of a star at a speed of 10,000 km/s or more. After the shell has been dropped, a black hole appears in the place of the star - a closed space of limiting density with a maximum speed of rotation. If these limits are not reached, a neutron star is born. The closed spaces in supernovae (SBH) and in the center of galaxies (GBH) are the last stage of the evolution of matter in the Universe. It seems that all superdense objects after the explosion of stars weighing less than 22 Ms are neutron stars. Some indicators of this SBH birth process are shown below (approximately):

- radius: Rsbh=3,4*10^4 m;
- standard mass: Msbh=4,5*10^{31} kg;
- density: q_{max}=6*10^{17} kg/cub. m;
- rotation speed - limit: Vrot=3*10^8 m/s;
- centrifugal acceleration: a_{sbh}=s^2/Rsbh=10^{13} m/s^2;
- number of protons: n=3*10^{58} protons;
- total proton surface area: Sprot=10^{29} кв. м; SBH: Ssbh=1,4*10^{10} squ. m;
- constant external gravity coefficient of SBH: Gsbh=6,82*10^{-11} m³/s^2 kg (in our era almost coincides with cosmological gravity);
- force of gravity to another BH: Fbh=(Gbh$_1$+Gbh$_2$)Mbh$_1$Mbh$_2$/r^2;
- mass energy intensity: Wow=Wsbh/Msbh=s^2=9*10^{16} J/kg;
- energy released while reducing surface area SBH:

$$\text{Wsbh} = q_{pr} (S_{before} - S_{after}) = \text{order } 10^{44} \text{ J;}$$

- surface gravity potential: $\text{Fex} = s^2$, J/kg.

7.2. *In the center of the galaxies (GBH).*

At the birth of galaxies in their center, where stars collide with the speed of light, creating sufficient pressure, closed black holes (GBH), standard for a given epoch (cosmological gravity values), are formed by fusing protons. If the Galactic Cloud has sufficient sizes so that the stars in the fall could reach the speed of light (that is, as star matter is transparent for the stars), then when they collided, their nucleons merged into the *standard for this epoch* galactic closed spaces (GBH) with parameters corresponding to the magnitude of the linear *current* cosmological gravity coefficient ($\text{Gj} = 8ps^2Rj/\text{Meth}$). Since the galactic BH is standard, the total mass of the SBH compact in the center of the galaxy includes thousands of such standard BH. That is, they are formed in large numbers. These BH in the center of galaxies are connected in *a compact set of closed black holes* by powerful external gravity, and their total mass depends on the mass and size of the galaxy ($\text{Mcom} = 3*10^{-26} \text{ Rgal}^3$). The enormous amount of energy emitted when stars collide with the speed of light in the center of the galaxy at the stage of the formation of GBH, today appears as a quasar. The compact of standard black holes in the Milky Way has the following key parameters:

- compact mass (estimate): $\text{Mgbh} = 4*10^6 \text{ Ms} = 10^{37} \text{ Kg;}$
- coefficient of cosmological gravity of Ether at the moment of birth of GBH (12 billion years ago): $\text{Ggbh} = s^3\text{Tun/Meth} = 27*10^{24}*6*10^{15}/10^{53} = 1,6*10^{-12} \text{ m}^3/\text{s}^2 \text{ kg;}$
- GBH compact density: $q_{birth} = 0,74 \ q_{max} = 4,44*10^{17} \text{ kg/cub. m;}$
- radius of each GBH: $\text{Rgbh} = 3*10^8/(4*6*10^{17}*1,6*10^{-12})^{1/2} = 1,5*10^5 \text{ m;}$
- mass: $\text{Mgbh} = q_{max}*\text{Qgbh} = 8,5*10^{33} \text{ kg;}$
- rotation speed - limit: $\text{Vrot} = 3*10^8 \text{ m/s;}$
- centrifugal acceleration: $a_{gbh} = s^2/\text{Rgbh} = 10^{13} \text{ m/s}^2;$
- mass energy intensity: $\text{Wow} = \text{Wgbh/Msbh} = s^2 = 9*10^{16} \text{ J/kg;}$
- surface gravity potential: $\text{Fex} = s^2$, J/kg;
- number of standard GBH in compact MP: $\text{Ngbh} = 10^{37}/8,5*10^{33} = 1 \ 170 \text{ GBH.}$
If the galaxy was formed today, GBH in a compact would be 850 times larger, and the mass of each would be so many times smaller ($4.5 * 10^{31}$ kg).

8. Gravity.

In the Universe, only closed BH (Amers, protons, SBH and GBH) have **mass**, and hence **external gravity**. In Ether, cosmological (internal) gravity is excited in nucleons due to the accelerated separation of the masses of its Amers. Each closed space creates its own gravity - external ($\text{Gbh} = s^2\text{Rbh/Mbh}$), and Ether - internal ($\text{Geth} = 8ps^2\text{Reth/Meth}$). Unlike mass, the internal gravity of a dense group of Amers or protons decreases (they "shade" each other). So it was in the germ of ether, so it is in the nuclei of atoms. These two types of gravity are universal, only the ex-

ternal one dominates in the microworld, and the internal one - in the macrocosm. Note that if the mass of BH does not depend on their concentration, then its nature is different. Most likely the mass is excited by the limiting speed of rotation of the Zero-Space in BH. The constant coefficient of external gravity of Amer is $1,16*10^{37}$, proton– $4,6*10^{28}$ m^3/s^2 kg. The pull of external gravity between BH and the body of mass (m) is calculated by the formula: $Fgr=mc^2Rbh/Ro$, and the pull of external gravity between two BH by formula: $Fgr=(M_1R_2+M_2R_1)s^2/Ro^2$. The current coefficient of the internal gravity of Ether is about $6,67*10^{-11}$ m^3/s^2 kg, cosmological attraction between matter is determined by Newton's formula. The absolute evidence of the reliability of our theory of gravity is the fact that the true theoretical value of the gravitational radius of the proton is established. Thus, the *gravitational radius* of the proton in official physics is determined by the formula: $R_G=2GM/s^2=2,48*10^{-54}$ m. This is 39 orders of magnitude smaller than the physical radius. Two mistakes were made here: the Schwarzschild formula is not true (it doubles the true result) and instead of the coefficient of the closed space of the proton ($4,6*10^{28}$ m^3/s^2 kg), the current gravity factor of Ether ($6,67*10^{-11}$ m^3/s^2 kg), that is, an indicator of a completely different physical space. According to our method, the gravitational radius of the proton is about $0,87*10^{-15}$ m ($Rpr=GprMpr/s^2=4,7*10^{28}*$ $*1,67*10^{-27}/9*10^{16}=0,87*10^{-15}$), which corresponds to its *physical value*, which physicists have recently specified experimentally. In addition, the orbits of electrons in atoms also correspond to calculations by our method (at the indicated value of the coefficient of external gravity of the proton). And etc.

- The question is why the forces of gravitation are inversely proportional to the square of the distance between bodies is solved by the fundamental property of three-dimensional space. The specific "throughput" of the surface of a sphere, on which gravity depends, is inversely proportional to the square of the radius of the sphere;

- in Cosmos, there are also forces of artificial centrifugal gravity of *rotation and circulation of matter*, as a reaction to the centrifugal forces of its rotation and circulation (together with the gravity of closed Spaces). In this case, for example, on Earth, body weight is converted into centrifugal force, that is, into artificial gravity. For example, with a horizontal rotation of a load of 1 kg on a flexible thread, 1 m long, at a speed of 10 m/s, its weight (attraction to the ground) disappears. In order to cause the levitation of such a load, it is necessary to apply a horizontal force of "gravity" to the load (Fgr), equal to the gravity of the Earth at this height: $Fgr=Fcen=MgrV_{circle}^2/Rgr= 9,81$ kg. Note that this process converts the vertical vector of the force of weight into the horizontal force of thread spinning. At the same time, the rotation speed cannot be increased, therefore the lifting force of the load cannot be obtained.

Thus, the stated scenario of the birth of the Universe is quite logical and justified, since it relies on facts that have been reliably established by science. But at the same time, regardless of this scenario, there are five unexplained questions about the processes occurring *before the birth of the Universe*:

- what is non-physical Zero Space?   -

What is the mechanism for the birth of a physical Amer from a non-physical zero-space??

- why are the parameters of Amers exactly such that they are not allowed to merge further into protons (with other parameters of Amers, the Universe could not be born)?

- why when merging Amers, the proton mass stopped at a mass of $1{,}666\ldots 10^{-27}$ kg?

what is the structure of closed spaces (Amer, proton and BH in supernovae)?

Conclusions:

1. The manifestation of the Universe began not from a single particle. The origin of the Universe began before its birth by the manifestation of about 10^{95} closed Spaces (Amers) of the Ether Germ, connected by powerful external gravity. The birth of the Universe happened with the beginning of the Spreading of the Ether Ether ($Rnuc=3*10^{12}$ m) with a speed limit ($3*10^8$ m/s) under the influence of internal pressure ($p_{charged}=10^{33}$ kg/squ. m).

2. The Universe is three-dimensional and consists of five Spaces: the unborn non-physical Zero-Space, three closed Spaces (Amers, protons, BH in supernovae and in the center of galaxies) and an open Space - Ether. The radius of closed spaces (closed black holes) is determined by our formula: $Rbh=s/(4/3q_{max}Gbh)^{1/2}$.

3. In the microcosm and in the cosmos of the Universe, all processes are governed by **gravity.**

4. Only closed spaces have a limiting density (Amer, proton, SBH and GBH) have mass, and hence gravity. Mathematically, the mass is equal to the ratio of the centrifugal energy of BH to the square of the limiting velocity, and physically it is the response of BH to the centrifugal forces of its rotation.

5. Space, mass and external gravity are *inseparable.*

6. There are two types of gravity: *external*, which appeared in Amers from Zero-Space, and protons, in addition to Amers, before the birth of the Universe ($Gbh=s^2Rbh/Mbh$), and *internal* - cosmological, which was excited in the nucleons by the accelerated separation of the masses of Amer aether from each Amer after the birth of the Universe ($Geth=8ps^2Reth/Meth$). External gravity BH dominates in the microcosm, its potential (the force of attraction on the surface of any closed BH, from Amer to SBH) is *the same* for all BH: $Fвн= GbhMbh/Rbh=s^2=9*10^{16}$ J/kg). Cosmological dominates in *Cosmos*, its potential is *different* ($Feth=GethM_J/R_J$) and depends on the mass and radius of the body. For example, the Earth has –

$6,5*10^7$ J/kg, the Sun has – $2*10^{11}$, and the SBH has– $9*10^{16}$ J/kg (as well as the external one). All this confirms our hypothesis. Obviously, the gravitational waves *cannot* form either on Ether or in Cosmos.

7. Our hypothesis of the birth of the Universe does not need the Mach principle (distant stars do not affect gravity), moreover, the Hubble law is not true: the Hubble *constant* (H) expresses the ratio of the rate of expansion of the Universe (s) to the *current* radius of the Universe (Run_j), that is, it is a *variable* quantity, which means that this is not a law, but statistics. And etc.

8. *The original particle of matter* is Amer – closed physical space (closed black hole), which became a component of the remaining closed BH and elementary particles: proton (10^{12} Amers), neutron (10^{13} Amers), electron (10^9 Amers), photon (around 10^3 Amers), SBH and GBH (more than 10^{58} protons). In fact, the Universe consists of closed Spaces (black holes), rapidly moving apart in the Zero-Space, which created the Amer. That is, on the face of an evolutionary picture of the World.

9. The first physical law was *the triune law* of birth of a closed physical space (Ram=GamMam/s^2), mass (Mam=s^{2}Ram/Gam) and external gravity of Amer (Gam=s^{2}Ram/Mam).

10. The fundamental properties of the three-dimensional Universe are also a *decrease in volume* by 19.6% when any number of spheres merge, and the *reduction in surface area* depends on the number of merged spheres (in the Nucleus 104 times).

11. At high speed, any gas-like cloud in Space does not turn into a thin disk, as is commonly believed, but takes the form of the *Limit Ellipsoid of Rotation* (LER) with the asymmetry of the equatorial and polar radii: Kler=Re/Rp=$2*2^{1/2}$. At birth, the races in its center create such pressure at which atoms and molecules begin to radiate energy at all frequencies due to the kinetic energy of Amers Ether.

12. It seems that all processes occurring before the birth of the Universe were governed directly by the Creator, and after birth, by the unshakable laws of Nature, established by him, under his control.

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关于铝酸盐溶液结晶机理的探讨
ON THE MECHANISM OF CRYSTALLIZATION OF ALUMINATE SOLUTIONS

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The decomposition of aluminate solutions occurs under conditions of mass crystallization, which has its own characteristics in contrast to the growth mechanism of single crystals. Under conditions of mass crystallization, the growth of particles occurs in a wide range of supersaturations with vigorous stirring, with the formation of complex particles representing aggregations of small crystals with a significant surface.

Under these conditions, it is considered [1] that neither the two-dimensional nucleation mechanism nor the diffusion mechanism is decisive throughout the process. The dislocation mechanism is also unlikely, since the sizes of the crystals of the sediment are relatively small, and the supersaturation is significant. It follows from this that the mass crystallization mechanism is more complicated, especially considering the presence of internal bond [2], existing between the initial supersaturation value, the rate of formation and growth of crystals and the surface of the solid phase. It is assumed that the regularities inherent in heterophase reactions are more appropriate. To describe the mass crystallization process, chemical kinetics equations were proposed [3], where the concentration of reactants was replaced by absolute supersaturations:

$$\frac{d\sigma}{dt} = k * \frac{s}{v} * \left(C - C_p \right)^n \tag{1}$$

Where V – solution volume ;
n - process order;
σ – crystallization surface.

It was found that at high supersaturations, n = 1, which suggests that the rate of crystallization in this case, despite intensive mixing, is determined by diffusion.

It should be noted that equation 1 is valid only for the portion of the kinetic curve C = f (t) after reaching the maximum growth rate. In this case, the rate of

crystallization increases, which contradicts the equation. The increase in speed in this case is due to an increase in the surface. In the initial period of crystallization, the expansion of the surface plays a significant role. The dependence of the linear crystal growth rate on the surface increase rate was studied by Roginsky and Todes [4]. The authors note that of the various properties of a solid, the dispersion is most directly related to the kinetics of formation. The total number of crystals and their size distribution, first of all, is determined by the ratio between bulk and flat nucleation, both in the case of simple crystallization and in the case of chemical crystallization. In this work, the laws of the primary distribution of particles over radii and areas during free growth are investigated. Separately, the cases of crystallization with a constant linear velocity, and in the case of a change in the linear velocity, increasing with the size of the crystals, are considered. The laws of the primary distribution of the dispersions of the simplest case of crystallization with a falling concentration affecting both nucleation and crystal growth are also analyzed. The obtained characteristic "kinetic" distribution curves allowed the authors to assert that the primary distribution in length, surface and volume always differs significantly from Gaussian and approaches the latter as a result of secondary processes of collective crystallization and coalescence.

In [5], it is proposed to estimate the rate of crystallization by direct methods through the linear growth rate of crystal faces.:

$$L = \frac{dl}{dt} \tag{2}$$

or increment the number of nuclei formed per unit volume:

$$N = \frac{dn}{dt} \tag{3}$$

as well as an increment of the mass of crystals at the beginning and at the end of the experiment. Direct methods of measuring these quantities are very laborious and time consuming, and it is considered [6], that they only allow to carry out qualitative calculations in certain particular cases.

For the general case, it is proposed [7] to determine the rate of addition and loss of particles on the growing surface.:

$$-\frac{d\sigma}{dt} = ks\sigma - \frac{k\sigma'}{\sigma} \tag{4}$$

K and K' - corresponding rate constants;
S – surface

In the simplest case, the reverse reaction can be neglected, since the supersaturation is great:

$$-\frac{d\sigma}{dt} = k, S - \left(\frac{c}{c_p}\right)^n \tag{5}$$

Accepting the assumptions S = const, the solution of the equation is:

$$Ln\frac{c}{c_p} = k\Delta t \qquad (6)$$

$$\text{or } \Delta t = \frac{1}{\kappa 1}lg\frac{c_n}{c_p} - \frac{1}{k}lg\frac{c}{c_p} \qquad (7)$$

where Δt — **crystallization time.**

In engineering and chemical calculations, it is proposed to proceed from the first order equation and use the system of equations to describe mass crystallization:

$$d\,\sigma/dt = kFs$$
$$ds/dt = A\text{-}KFS \qquad (1\text{-}40)$$

where G is mass of crystals per unit amount of suspension;

S – supersaturation;

A – the rate of creation of supersaturation in the solution, that will be determined from the material balance equation:

$$A = \frac{dG}{dt} = \frac{C_0 B_w\left(1-\frac{C_0}{C_r}\right)-(1-\frac{C_0}{C_r}-B_w t)}{1-\frac{C_0}{C_r}} * \frac{dC_0}{dt} \qquad (8)$$

When solving a system of equations together, an expression describing the change in the amount of excess substance in the system, provided that the surface area of the crystals F is persistent, crystallization rate constants K and supersaturation A creation rate are:

$$G\text{-}G_n = At + \left(2n - \frac{A}{KF}\right) * \left(1 - e^{-kFt}\right) \qquad (9)$$

If, simultaneously with the occurrence of supersaturation, growth and the formation of new nuclei occur, the dependence of supersaturation on time will be expressed:

$$\frac{ds}{dt} = A - kFS - k_m S^m \qquad (10)$$

where $kFS = 3\alpha\rho_\tau LE$ - rate of release of a substance from a unit mass due to growth:

$K_m S^m = \alpha\rho_\tau Jr^3$ – the rate of excretion of matter due to the formation of new nuclei.

Giving calculations of industrial periodic crystallization with constant supersaturation, it follows from equation 1-43 that to maintain constant supersaturation, it is necessary to increase the rate of its creation as the total surface of crystals F increases, and at the beginning of the process it should be very small, although in practice this rule is not respected. For the case of creating supersaturation by cooling, the author calculated the modes with an increase in the cooling rate from 0.16 C/hour to 13.4 C/hour, the results of which were experimentally verified.

The crystallization of aluminum hydroxide during the decomposition of aluminate solutions, both by stirring with a priming and by carbonization, is the process of crystallization of aluminum hydroxide. According to Mazel [8], part of the hydroxide, formed as a result of hydrolysis of aluminate, is deposited on the priming grains (heterogeneous nucleation), and most of it is emitted in the form of tiny particles, crystallization centers.

Herrmann and Stipetich proved that grains of the reverse priming cannot serve as crystallization centers. They only split off amorphous, slightly crystalline particles, which serve as crystallization centers. To describe the decomposition process at a constant temperature and the application of the priming of medium activity, an empirical equation is proposed.

$$\frac{C_x}{\tau} = k(\delta - C_x) \tag{11}$$

where δ – the difference between the equilibrium and initial concentration. Al_2O_3;
C_x – the amount of hydroxide released from the solution, recalculated to Al_2O_3;
K- autocatalytic reaction decomposition rate constant.

According to S.I. Kuznetsov and V.N. Derevyankin [9] it is difficult to assume that the priming hydroxide contains amphorae hydroxide, the formation of which is impossible due to greater solubility.

Wrigge and Ginsberg [10] studied the decomposition of aluminate solutions at high priming ratios, when simple growth of priming crystals prevails, and the formation of new ones is insignificant. The authors do not explain the mechanism of the formation of new centers.

Maric erroneously concluded that the sources of new nuclei can only be priming particles, no more. Check Kuznetsova S.I. and Derevyankina V.N. showed that the coarse-grained priming is capable of inducing nuclei.

In the works of Mazel it is stated that the growth of hydroxide crystals occurs both due to the simple growth of individual crystals, and by the accretion of particles upon their contact. However, Arakelyan and Chistyakov [11] explain the growth and enlargement of aggregates not by the accretion of small particles, but due to the formation of dislocations, which serve for the nucleation of new crystals.

Crystal optics studies have confirmed that the resulting carbonization aluminum hydroxide consists of spherulites, along with which there are idiomorphic crystals of rectangular and wedge-shaped forms.

As a result of electron microscopic studies of Kuznetsov Derevyankin, a detailed picture of the crystal formation of hydroxide, obtained under various decomposition conditions, was received. Crystals with critical sizes (0.1–0.2 μm) are pseudo-hexagonal plates. As the plates grow, they become opaque, and lamellar processes appear on their planes (001). This is due to the presence of disloca-

tions, mainly of screw type. As a result, single crystals grow antiskeletal lamellar dendrites. The subsequent deformation of dendrites due to the capture of impurities and collisions leads to a loss or single-crystal structure and transformation into polycrystals, the so-called. pseudospherolites. The probability of spontaneous nucleation is extremely low. New centers of crystallization are mainly created by fragments of lamellar dendrites and pseudospherolites during collisions with pulp mixing, as well as with the destruction of hydrargillite crystals under the action of internal stresses.

Lyner [12], considering the crystallization of aluminum hydroxide, proposes to consider the process in two stages: the formation of nuclei with a velocity V1 equal to

$$V1 = k * \frac{c_1 - c}{c} A_\eta \tag{12}$$

and nuclei growth with speed V 2:

$$V2 = \frac{D}{x} S (C1-C) \tag{13}$$

where η - solution viscosity.

The limiting stage is the first. According to these equations, the rate of nucleation accelerates with an increase in viscosity, but their growth rate decreases. Thus, according to Lyner, the speed of the process as a whole is determined by the diffusion.

Lyapunov and Kholmogortsev [13] using the proposed method of calculating the average growth rate of particles found that in the initial period of decomposition the temperature has a significant effect. This indicates the non-diffusion nature of the growth of hydrargillite particles, and as Kuznetsov and Derevyankin suggest, it is determined in the initial period by the course of crystal chemical phenomena.

Conclusions

It was found that mathematical descriptions of the crystallization process are carried out through parameters that either cannot be measured so far (surface free energy, crystal surface area, surface concentration), or through parameters characterizing only the composition of the liquid phase (absolute or relative supersaturation of the solution). It is proved that in the domestic and foreign literature there are practically no data on the study of patterns of changes in the specific surface of the crystallizing solid phase under conditions of its industrial crystallization from solutions.

At the same time, the specific surface of the formed solid phase can characterize the effect of a number of factors: supersaturation, the residence time of the substance in the apparatus, the presence of impurities, etc., direct measurement of the specific surface will provide additional information about the heterogeneous system, which is important as in the study of kinetics crystallization processes, and in the management of the technological process, in view of quality of the product.

Based on the above, it seems appropriate to obtain information about the nature of the variability of the total and specific surface during the industrial carbonization process of aluminate solutions, the sensitivity of this parameter to disturbing influences, the relationship with other process parameters, and the possibility of measuring it with sufficient speed to control the process.

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在丘陵冰中运动时破冰船推进的预测
PREDICTION OF THE ICEBREAKER PROPULSION AT MOVEMENT IN HUMMOCKY ICE

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抽象。 本文描述了一种确定丘陵冰原中破冰船非定常运动速度的数学模型，该模型将作为利用实验结果的半经验模型的基础。

关键词：破冰船推进，数学速度模型，不稳定破冰船运动，丘陵冰原。

Abstract. *A mathematical model for the determination of the speed of the unsteady motion of icebreaker in hummocky ice fields is described, which will serve as the basis for semiempirical models using the results of experiments.*

Keywords: *icebreaker propulsion, mathematical velocity model, unsteady icebreaker movement, hummocky ice fields.*

Introduction

When an icebreaker operates in conditions of prolonged navigation, it often meets with non-stationary traffic conditions. This can be a movement in the hummocky ice. If the methods for determining the propulsion in smooth continuous ice exist [1], then prediction of the ice-breaker propulsion in **ice ridges** is actual for today.

The purpose of this work is to describe the tactics of ships movement in difficult ice conditions, namely, when moving in hummocky ice fields, and to obtain mathematical dependencies of the motion parameters.

Continuous movement of the icebreaker in hummocky ice

The icebreaker movement in the hummocky ice is unsteady. It consists of separate stages: braking when meeting with a ridge of hummocks to a full stop or to the minimum speed; acceleration at a meeting with an equal continuous ice and achievement of speed of the established motion. This work is repeated cyclically. It in idealized ice conditions at continuous motion without jamming and stops can be described as follows.

The icebreaker continuous moves in a solid ice cover of constant thickness h, covered with snow of thickness h_s, by perpendicular to the ridges of hummocks height h_h and width b_h. At the same time, the icebreaker alternately overcomes the lower resistance of solid ice and greater resistance when forcing the hummock. The distance between the ridges of hummocks b.

The icebreaker's speed with non-stop motion will fluctuate: increasing in solid ice and decreasing in the hummock. Therefore, the average speed of the icebreaker - the speed of laying the ship canal, as the main indicator of the propulsion, for one cycle can be calculated from the formula

$$v = \frac{b + b_h}{t + t_h}, \tag{1}$$

where t and t_h - the time of motion in the solid ice and hummock for one cycle.

Parameters of icebreaker movement in the solid ice and a ridge of hummocks

For determine this speed (1), the motion of the icebreaker was described by differential equations [2].

It was assumed that the draft of the icebreaker changes insignificantly and pitching motion can be neglected during the motion. As a result of solving differential equations [2], taking into account the initial conditions, parameters of the accelerated and delayed motion of the icebreaker were obtained: time t, displacement x, velocity $\overset{\bullet}{x}$ and acceleration $\overset{\bullet\bullet}{x}$.

Motion parameters in smooth ice:

$$t = \frac{1}{\sqrt{A_1 B_1}} \operatorname{Arth} \sqrt{\frac{B_1 - C_1 e^{(-2A_1 x)}}{B_1}} + C_2; \tag{2}$$

$$x(t) = -\frac{1}{2A_1} \ln\left[\frac{B_1}{C_1} \left\{ 1 - \operatorname{th}^2\left((t - C_2)\sqrt{A_1 B_1} \right) \right\} \right]; \tag{3}$$

$$\overset{\bullet}{x} = \sqrt{\frac{B_1}{A_1}} \operatorname{th}\left((t - C_2)\sqrt{A_1 B_1} \right); \quad \overset{\bullet\bullet}{x} = \frac{B_1}{\operatorname{ch}^2\left((t - C_2)\sqrt{A_1 B_1} \right)}, \tag{4}$$

где $C_1 = B_1 - v_{f0}^2 A_1$;

$$C_2 = -\frac{1}{\sqrt{A_1 B_1}} \operatorname{Arth} \sqrt{\frac{v_{f0}^2 A_1}{B_1}}; \quad A_1 = \frac{1.4 P_{bf} + k_3 v_0^2}{(1 + k_{11}')D v_0^2}, \quad B_1 = \frac{P_{bf} - k_4}{(1 + k_{11}')D};$$

$$k_3 = k_{fv}\rho_i hB\left[c_i(\Phi_i + f\Phi_{it}) + \frac{c_g\rho\Omega_i}{\rho_i Bh}(\Phi_g + f\Phi_{gt})\right];$$

$$k_4 = k_d\frac{h^4}{d\alpha}\left[(1+f_{litf}) + k_{sf}\gamma_{sf}\frac{d\alpha^2}{h}\sqrt{\frac{\mathrm{tg}\,\varphi_{2f}}{1+\mathrm{tg}^2\,\varphi_{2f}}} + 0.66(1+f\Phi_{lt})B\alpha + \frac{k_{sb}\Phi_s d\alpha^3 B}{h}\right] +$$

$$+ k_{fst}(\rho-\rho_i)gh\Omega_i(\Phi_p + f\Phi_{pt}) + k_{sn}(\rho-\rho_{sn})gh_{sn}\Omega_i(\Phi_p + f\Phi_{pt});$$

B –width of the icebreaker, m;

f – coefficient of friction of ice on the ship's hull;

h_{sn} – thickness of snow, m; g – acceleration of gravity, m/s²;

$\mathrm{Fr}_h = \dfrac{v}{\sqrt{gh}}$ - Froude number in the thickness of ice;

v – speed, m/s;

Ω_i - the area of the underwater part of the hull, surrounded by ice, m2;

$\alpha = \sqrt[4]{(\rho g)/d}$ - bending parameter of the plate on the elastic base;

$d = \dfrac{Eh^3}{12(1-\mu^2)}$ - cylindrical rigidity of the ice plate;

E - modulus of elasticity, kPa;

μ - the Poisson's ratio of ice;

ρ, ρ_i, ρ_{sn} –density of water, ice and snow, t/m³;

k_{fv}=3.71, k_d=2.45·106 kPa, k_{fst}=1.77 - empirical coefficients compensating for the inaccuracies of the theoretical resistance model, which are determined taking into account the full-scale data on icebreakability of icebreakers in continuous and hummocked ice [2];

k'_{11} - coefficient of attached masses of water and ice;

D – displacement,tonn;

P_{bf} – bollard pull of icebreaker when moving forward;

v_0 - speed of movement on clean water at a given power;

v_{nx0} - speed of movement at time zero;

$k_{sf} = 1,5\cdot10^{-3}$ kPa⁻¹;

$k_{sb} = 0,5\cdot10^{-3}$ kPa⁻¹;

$k_{sn} = 0,429$;

c_i - a dimensionless coefficient that takes into account the attached masses of water in the composition of the impulse resistance of ice floes;

Φ_i, Φ_j, Φ_k - functions [3], characterizing the shape of the icebreaker's hull from, which obtained from the spatial consideration of the interaction of the hull with

ice and the projection of distributed loads from the ice onto the direction of the vessel's movement. In general form they can be represented in the form:

$$\gamma_{ltf} = \sqrt{\frac{1}{n_{xf}^2} + \frac{1}{n_{zf}^2}}; \quad \gamma_{sf} = \sqrt{\frac{1}{n_{zf}^2} - 1};$$

$$\Phi_i = \frac{2}{B} \int_0^{B/2} f_i(n_x, n_z)\,dy; \quad \Phi_j = \frac{2}{B} \int_{L_{WL}} f_i(n_x, n_z)\,dL_{WL}; \quad \Phi_k = \frac{2}{B} \int_{\Omega_i} f_i(n_x, n_z)\,d\Omega_i$$

n_x, n_z - directing cosines of the outer normal, are functions of the coordinates of the ship's hull;

n_{xf}, n_{zf} - direction cosines on the stem.

The shape of the ship's surface is given by the theoretical drawing. The calculation of Φ_i, Φ_j, Φ_k implies numerical integration. They are defined for some forms of ship hulls [3].

Parameters of motion in ice ridge:

$$t_h = -\frac{1}{\sqrt{A_2 B_2}}\,\mathrm{arctg}\,\sqrt{\frac{C_3\,e^{(-2A_2 x_h)} - B_2}{B_2}} + C_4; \qquad (5)$$

$$x(t)_h = -\frac{1}{2A_2}\ln\left[\frac{B_2}{C_3}\left\{1 + \mathrm{tg}^2\left((C_4 - t_h)\sqrt{A_2 B_2}\right)\right\}\right]; \qquad (6)$$

$$\dot{x}_h = \sqrt{\frac{B_2}{A_2}}\,\mathrm{tg}\left((C_4 - t_h)\sqrt{A_2 B_2}\right), \quad \ddot{x}_h = -\frac{B_2}{\cos^2\left((C_4 - t_h)\sqrt{A_2 B_2}\right)}, \quad (7)$$

где $C_3 = B_2 + v_c^2 A_2; \quad C_4 = \frac{1}{\sqrt{A_2 B_2}}\,\mathrm{arctg}\,\sqrt{\frac{v_c^2 A_2}{B_2}};$

$$A_2 = \frac{1{,}4 P_{bf} + k_{3h} v_0^2}{(1 + k_{11}')D v_0^2}; \quad B_2 = \frac{P_{bf} - k_{4h}}{(1 + k_{11}')D};$$

$$k_{3h} = k_{f\gamma}\rho_h h_h B\left[c_i(\Phi_i + f\Phi_{it}) + \frac{c_g \rho \Omega_i}{\rho_h B h_h}(\Phi_g + f\Phi_{gt})\right];$$

$$k_{4h} = k_d \frac{h_h^4}{d\alpha}\left[(1 + f\gamma_{ltf}) + k_{sf}\gamma_{sf}\frac{d\alpha^2}{h_h}\sqrt{\frac{\mathrm{tg}\,\varphi_{2f}}{1 + \mathrm{tg}^2\varphi_{2f}}} + 0{,}66(1 + f\Phi_{lt})B\alpha + \frac{k_{sb}\Phi_s d\alpha^3 B}{h_h}\right] +$$

$$+ k_{fst}(\rho - \rho_h)g h_h \Omega_i(\Phi p + f\Phi_{pt}) + k_{sn}(\rho - \rho_{sn})g h_{sn}\Omega_i(\Phi_p + f\Phi_{pt});$$

v_c - speed of the icebreaker acquired during the acceleration process.

The parameters t, t_h, $b = x(t)$, $b_h = x(t_h)$, and accordingly the average speed of movement in the areas with the hummocks can be determined using the solutions of differential equations (2), (3), (5), (6) and the time of arrival at the destination is predicted.

The movement of icebreaker in hummocky ice fields by ramming

Practice of operation and full-scale trials of ships show [4] that in thick ice in harsh winters hummocks reach a size that the icebreaker is unable to overcome by continuous running.

If the ice ridges prove to be an irresistible continuous move, the icebreaker will resort by ramming. In this case, to predict the propulsion, you can use the developed mathematical model to determine the average speed of movement by ramming [5,6].

The number of cycles during the movement by ramming in the ice ridges can be determined depending on the characteristics of the hummocky ridge (width b_h, reduced thickness h_h).

The parameters of the propulsion can then be determined as follows:
• number of cycles n to overcome the ridge ice width b_h:

$$n = \frac{b_h}{l_w} ; \tag{8}$$

• average speed of movement

$$v_h = \frac{b_h}{n(t_1 + t_3 + t_2 + t_4 + t_5 + t_6)} = \frac{nl_w}{\Sigma t}, \tag{9}$$

where l_w - the way of advancing in continuous ice in one cycle;
t_1 - icebreaker time for a retreat in one cycle;
t_2 - reverse time of the power plant from backward to forward;
t_3 - acceleration time for one cycle;
t_4 - time moves forward in continuous ice in one cycle;
t_5 - time of reversal of the power plant from forward to backward;
t_6 - time of release from wedging in ice in one cycle;
Σt - total time for overcoming the hummocking plot in n cycles.

The parameters of icebreaker movement by ramming

The parameters of motion for one cycle are determined on the basis of solutions of differential equations [3, 6].

The time of the icebreaker's departure back t_1 to the moment of the reversal of the power plant and the time of accelerated forward movement t_2:

$$t_1 = \frac{1}{\sqrt{A_3 B_3}} \operatorname{Arth} \sqrt{1 - e^{-2 A_3 l_1}}; \quad t_2 = \frac{1}{\sqrt{A_4 B_4}} \operatorname{Arth} \sqrt{1 - e^{-2 A_4 l_2}} ,$$

$$A_3 = \frac{1{,}4P_{br} + k_{1r}v_0^2}{(1+k_{11}')Dv_0^2}, \quad B_3 = \frac{P_{br} - k_{2r}}{(1+k_{11}')D},$$

$$A_4 = \frac{1{,}4P_{bf} + k_{1f}v_0^2}{(1+k_{11}')Dv_0^2}, \quad B_4 = \frac{P_{bf} - k_{2f}}{(1+k_{11}')D},$$

$$k_1 = k_{id}\left[c_i\rho_i h \frac{B}{2}(\Phi_i + f\Phi_{it}) + c_g\rho h \frac{B}{2}(\Phi_g' + f\Phi_{gt}') \right],$$

$$k_2 = k_p(\rho - \rho_i)gh\frac{0{,}312}{\alpha}B(\Phi_p' + f\Phi_{pt}')$$

where P_{br} – bollard pull of icebreaker when revers motion;
k_{id}=1,38,
k_p=0,70 - empirical coefficients compensating for the inaccuracies of the theoretical resistance model.

Speed over the accelerating phase of motion at the time of contact with the ice cover:

$$v_c = \sqrt{\frac{B_4}{A_4}}\,\operatorname{th}\!\left(t_2\sqrt{A_4 B_4}\right).$$

The time moves forward in in solid ice in one cycle is determined from the condition of its stopping:

$$t_4 = \frac{1}{\sqrt{A_5 B_5}}\operatorname{arctg}\sqrt{\frac{A_5 v_c^2}{B_5}};$$

$$A_5 = \frac{1{,}4P_{bf} + k_{3h}v_0^2}{(1+k_{11}')Dv_0^2}; \quad B_5 = -\frac{P_{bf} - k_{4h}}{(1+k_{11}')D}.$$

The way forward in the ice is equal to:

$$l_w = -\frac{1}{2A_5}\ln\left[\frac{B_5}{B_5 + A_5 v_c^2} \right].$$

The obtained values l_w, t_4, t_1, t_3, together with the given time of reversal of the power plant $t_{rev} = t_2 + t_5$, and the time of release from wedging t_6 determine the average speed of the raids by the formula (9).

Conclusion

The mathematical model allows us to theoretically describe the motion of an icebreaker in hummocked ice and serve as a basis for semi-empirical models involving data of experiments, and also allow predicting the icebreaker's motion during a difficult ice situation.

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International Conference

涡轮机供电系统元件空间通道传热紊流研究
STUDY OF TURBULENT FLOW WITH HEAT TRANSFER IN SPATIAL CHANNELS OF ELEMENTS OF TURBOMACHINERY SUPPLY SYSTEMS

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注解。提出了一种模型，用于分配具有对流分量的动态和温度空间边界层（对于Pr 〈1的情况），这对于分析确定液体涡轮机旋转腔中的局部传热系数是必要的。火箭发动机。针对温度空间边界层的能量方程导出积分关系，其允许在任何形状的表面上积分，这对于确定能量损失的厚度是必要的。考虑到积分关系，记录旋转腔的湍流边界层的热交换规律。分析地，获得表达式，用于确定斯坦顿标准形式的局部传热系数，用于直线均匀流动，根据固体的定律的旋转流动和自由涡旋的旋转流动的分布的功率分布。动态和温度边界层的参数。传热系数的分析表达式与实验数据和其他作者的依赖性非常一致。

关键词：传热系数，湍流边界层，旋转流动，能量方程。

Annotation. *A model is proposed for the distribution of dynamic and temperature spatial boundary layers with a convective component (for the case of Pr <1), which is necessary for the analytical determination of the local heat transfer coefficient in the cavities of rotation of turbines of liquid rocket engines. An integral relation is derived for the energy equation of the temperature spatial boundary layer, which allows integration over the surface of any shape, which is necessary for determining the thickness of the energy loss. Taking into account the integral relation, the heat exchange law of the turbulent boundary layer for the cavities of rotation is written down. Analytically, expressions are obtained for determining the local heat transfer coefficient in the form of the Stanton criterion for straight uniform flow, rotational flow according to the law of a solid body and rotational flow of a free vortex of a power profile of the distribution of the parameters of the dynamic and tempera-*

ture boundary layer. Analytical expressions for heat transfer coefficients are in good agreement with experimental data and dependencies of other authors.

Keywords: heat transfer coefficient, turbulent boundary layer, rotational flow, energy equation.

Introduction

Consideration of the characteristics of heat transfer in flow-through parts of turbopump units (TPU) of liquid rocket engines (LRE) is an important task. At present, taking into account the peculiarities of a flow with heat transfer in the implementation of potential and vortex rotational flow in flow parts is mainly carried out by the following methods: using empirical equations, numerical and analytical methods for solving partial differential equations [1].

High temperatures of the working fluid lead to temperature distortions, including the turbine disks [2]. When designing the flow parts of the units and aggregates of the TPU LRE, it is necessary to take into account the temperature change of the working fluid flow along the working channel, since the viscosity parameter is a function of temperature and determines the flow regime and as a result of the loss, in particular disk friction and hydrodynamic losses in the flow part. modeling of the energy parameters of the TPU LRE, is a relevant scientific and technical problem. Questions of optimization of the parameters of the workflow and the mathematical model of the DE are considered in the work of V.A. Grigorieva [3], where the analysis of models was carried out and the advantages and disadvantages of various design stages were revealed.

Research model

A model is proposed for the distribution of dynamic and temperature spatial boundary layers with convective and leaving for the turbulent flow of combustion products in the cavities of rotation of LRE gas turbines. For products of combustion, the Prandtl criterion is less than unity (Pr <1), the dynamic boundary layer thickness is below the temperature boundary layer thickness. Granted, that in the boundary of the dynamic boundary layer the change in temperature and thickness of the energy loss occurs due to the transfer of dynamic velocity, and beyond its boundary - only due to thermal conductivity. This assumption is in good agreement with the conclusions of many authors [4-6]. Thermal resistance is present throughout the entire thickness of the temperature boundary layer. Within the boundaries of the dynamic boundary layer, thermal resistance is due to turbulent heat transfer, and outside the boundaries of the dynamic boundary layer, thermal conductivity [6]. The distribution model of the dynamic and temperature spatial boundary layers with the convective component is necessary for the analytical determination of the local heat transfer coefficient in the cavities of rotation of LRE turbines.

The main object of study, where the potential and vortex rotational flow is realized, are the structural elements of the flow parts of LRE gas turbines: inlet and outlet devices, cavities between the stator and the impeller [4].

An integral relation is derived for the energy equation of the temperature spatial boundary layer, which allows integration over the surface of any shape, which is necessary for determining the thickness of the energy loss. The expressions for determining the thickness of the energy loss of the temperature spatial boundary layer are needed to determine the local heat transfer coefficients for the characteristic cases of flow, taking heat exchange into account.

Analytically, expressions are obtained for determining the local heat transfer coefficient in the form of the Stanton criterion for straight uniform flow, rotational flow according to the law of a solid, and rotational flow of a free vortex of a power profile of the distribution of parameters of the dynamic and temperature boundary layer for Pr < 1.

Local heat transfer coefficient in the form of Stanton criterion for rectilinear uniform turbulent flow

$$\text{St} = \frac{1}{\text{Pr}^{\frac{m+1}{m+3}}} \left(\frac{\left(\frac{xm}{(m+1)(m+2)} - \frac{\lambda(x-1)^2}{2x} \right)(m+1)}{\alpha_{\text{л}}^{m-1}(m+3)\text{Re}_U} \right)^{\frac{2}{m+3}},$$
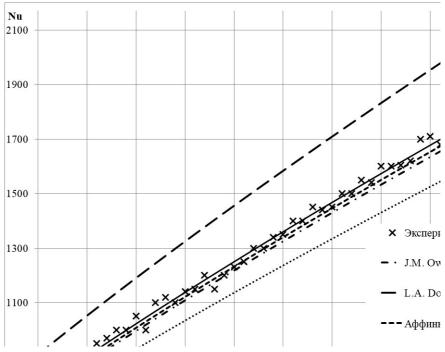
where m – degree of turbulization of the dynamic velocity profile of the spatial boundary layer, $x = \dfrac{\delta}{\delta_t} = \sqrt[3]{\text{Pr}}$ – the ratio of the thickness of the dynamic and temperature boundary layers, λ – coefficient of thermal conductivity, $\alpha_{\text{л}} = 12{,}5496\,\text{Pr}^{\frac{1}{18}}$ – coefficient of laminar sublayer of the turbulent velocity distribution profile (obtained taking into account a two-layer model of turbulence with a viscous laminar sublayer), Re – Reynolds criterion.

Local heat transfer coefficient in the form of a Stanton criterion for turbulent rotational flow according to the law of a solid body

$$\text{St} = \frac{1}{\text{Pr}^{\frac{m+1}{m+3}}} \left(\frac{2J\varepsilon}{\alpha_{\text{л}}^{m-1}\text{Re}} \frac{(m+1)}{(m+3)} \right)^{\frac{2}{m+3}} \times$$

$$\times \left(\frac{xm}{(m+1)(m+2)} - \frac{\lambda(x-1)^2}{2x} \right)^{\frac{2(m+3)-4}{(m+1)(m+3)}},$$

where ε –bevel tangent angle of bottom flow line, J – relative characteristic thickness.

Figure 1 presents a graph of the distribution of the dimensionless heat transfer coefficient in the form of the Nusselt criterion for a turbulent rotational flow according to the law of "solid" with the Prandtl criterion Pr = 0.7.

Figure 1 - *Dependence of the dimensionless heat transfer coefficient of a turbulent rotational flow according to the law of a solid body at Pr = 0.7*

Local heat transfer coefficient in the form of Stanton criterion for the rotational flow of a free vortex

$$\text{St} = \frac{1}{\Pr^{\frac{m+1}{m+3}}} \left(\frac{2J\varepsilon}{\alpha_{\text{л}}^{m-1} \text{Re}} \left(\frac{xm}{(m+1)(m+2)} - \frac{\lambda(x-1)^2}{2x} \right) \right)^{\frac{2}{m+3}}.$$

Analytical expressions for heat transfer coefficients are in good agreement with experimental data and dependencies of other authors [7–10].

Conclusion

An integral relation is derived for the energy equation of the temperature spatial boundary layer, which allows integration over the surface of any shape, which is necessary for determining the thickness of the energy loss. The expressions for determining the thickness of the energy loss of the temperature spatial boundary layer are needed to determine the local heat transfer coefficients for the characteristic cases of flow, taking heat exchange into account.

Analytically, expressions are obtained for determining the local heat transfer coefficient in the form of the Stanton criterion for straight uniform flow, rotational flow according to the law of a solid, and rotational flow of a free vortex of a power profile of the distribution of parameters of the dynamic and temperature boundary layer for Pr <1.

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用于新设计的径向剪切轧机轧制温度控制的自动化系统
AUTOMATED SYSTEM FOR TEMPERATURE CONTROL OF ROLLING OF A RADIAL-SHEAR MILL OF A NEW DESIGN

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注解。本文提出了一种结合压力的新型径向剪切磨机，可以在高变形量下制造高质量的有色金属棒材和管材。有限元方法和MSC.SuperForge程序获得了定量数据，并建立了安装在新轧机上的螺旋辊中工件的轧制挤出过程中温度分布的主要规律。已经开发了一种用于基于高温计无接触地测量可变形工件的温度的系统。LabVIEW 2010应用程序开发环境已用于开发用于非接触式温度测量的高温系统的可视控制系统，该系统基于Arduino Uno Rev3微处理器和CT 3M高温计。在借助于高温系统获得的可变形工件中获得的温度分布将提供可以避免制造具有缺陷的杆和管的信息。

关键词：压制，数值模拟，高温计，库存，温度控制，微处理器Arduino Uno Rev3，LabVIEW。

Annotation. *In this article, a new radial-shear mill combined with pressing is proposed, which makes it possible to manufacture high-quality rods and pipes of non-ferrous metals under high degrees of deformation. The finite-element method and the MSC.SuperForge program obtained quantitative data and established the main laws of temperature distribution during rolling-extrusion of workpieces in a spiral roller, installed on a new mill. A system for contactless measurement of the temperature of a deformable workpiece based on the pyrometer has been developed. The LabVIEW 2010 application development environment has been used to develop a visual control system for a pyrometric system for contactless temperature measurement, which is based on the Arduino Uno Rev3 microprocessor and the CT 3M pyrometer. The temperature distributions obtained in the deformable workpiece obtained with the help of a pyrometric system will provide information that makes it possible to avoid manufacturing rods and pipes with defects.*

International Conference

Keywords: pressing, numerical simulation, pyrometer, stocking, temperature control, microprocessor Arduino Uno Rev3, LabVIEW.

Introduction

Currently, many products of rolling production are produced in mini-factories [1]. There is a growing need for high-quality metal and a large assortment of rolled products. It should be noted that age requirements demand the development of rolled products, the creation of new types of rolled products. The development of new technology for manufacturing high-precision metal products and the creation of new types of rolling equipment requires, in turn, improving the design of the working stands of rolling mills and their units, reducing the metal consumption of equipment, reducing the design time and cost of manufacturing.

It should be noted that the method of cross-helical rolling (CHR) has found quite wide application in mini-plants [2]. In combination with traditional methods - pressing, forging and longitudinal rolling - CHR allows you to significantly expand the arsenal of means of production, successfully fitting into the overall technological scheme as a procurement, intermediate or final operation.

One of the highly efficient types of CHR is radial-shear rolling (RSR) [3]. With RSR, the deformation of the workpieces occurs with intensive compaction and the development of the structure due to the control of the intensely deformed state and the trajectories of the outflow of the metal in the deformation zone.

It is known [3] that in the RSR process, the flow of metal in the deformation zone along programmed paths creates the effect of volumetric macro-shift, deeply works out and compacts the metal. Such conditions of deformation are maximally favorable for defect-free rolling of practically any deformable materials, including low-plastic metals and alloys.
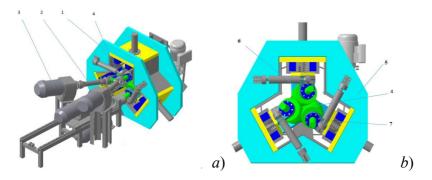
However, the developed effective rolling modes for metals and alloys of various classes intensively compact and deeply work through all levels of the metal-physical structure. Elements of the structural formation of the metal take the form of isotropic isolated particles, highly dispersive; in this case, a complex increase in the physicomechanical and service properties of the metal occurs. The highest level is achieved in plastic and viscous properties.

High shear deformations concentrated in a limited volume of the focus are accompanied by controlled heating of the metal [4]. The temperature effect of heating is up to 100 ... 150 ° C, which allows to reduce the heating temperature before rolling, to optimize the temperature range of deformation.

Changes in metal temperature during high-temperature deformation on a radial-shear rolling mill occur due to the phenomenon of a sharp decrease in the effort required for deformation, under the influence of macroshift, localized along a plane or surface [4]. The pattern of the connection of the deformation force of

crystalline bodies with the direction of deformation displacements, which consists in the fact that during plastic deformation in one direction localized along a plane or surface, the component of the force required for the emergence and development of deformations in another direction sharply decreases.

However, RSR does not provide bars and pipes made of non-ferrous metals with exact geometrical dimensions, and it is impossible to obtain press products in a continuous way without press residues by this method.

In the present work, a radial-shear mill (RSM) of the new design is proposed (Figure 1) [5]. This mill is a complex of rolling and heating equipment, where the combination of hot-helical rolling at RSM and extrusion produces rods or pipes of small diameters of ferrous or non-ferrous metals with a fine-grained structure. RSM for continuous extrusion of rods and tubes contains a main drive, a working stand (1), a roller unit and a press die. The three-roll RSM working stand consists of a bed (5), in the bores of which the work roll assemblies (4) are mounted through 120 °. The work rolls are mounted on the pillows (6), the torque, which is transmitted through the spindles (2) from the electric motors (3). The cages of the new mill are designed with the possibility of the arrangement of the rolls with different angles to the axis of rolling and tangential displacement relative to it for up to 18 mm. The rolls of this RSM have smooth and wavy-cone-shaped gripping and crimping, respectively, and calibrating cylindrical sections. Note that the protrusions and depressions of the wavy-cone-shaped sections are made along a helix. At the same time, the geometric dimensions of the protrusions and depressions gradually decrease in the direction of rolling. The angle between the tangent to the helix and the line passing through the tangency point along the generator perpendicular to the base of the roll is 45 ° - 60 °.

a)   *b*)

1 – work stand, 2 – spindle 3 – electric motor, 4 – work rolls; 5 – bed frame,
6 – pad, 7 – wedge
Figure 1 - *Radial Shear Mill (a) with a three-roll working stand (b)*

It should be noted that the matrix of this mill has working sections in the form of successively positioning, cross-sections of gradually narrowing truncated cones with non-parallel bases and having a large or small formative cross-section, and a calibrating section. This matrix with the work rolls form a combined installation.

Pressing rods is as follows. The workpiece is fed into the gap between the rolls and is deformed with the projections and depressions of the wavy-cone-shaped sections of the rolls during the rotation of the rolls in one direction. The rolls, rotating their rotational motion, progressively move the deformable metal and squeeze them through the opening of the press matrix.

Rolling the workpiece in wavy-cone-shaped sections of the rolls, while rotating the rolls in one direction, provides translational and rotational movement of the workpiece in the direction of rolling, efficient grinding of the structure throughout the section of the workpiece due to the development of shear deformations and reduction of the rolling force. Efficient grinding of the structure ensures the formation of a fine-grained structure in rods or pipes, and thereby obtaining of high-quality products.

In the course of designing the new RSM, using the computer simulation system Patran Nastran, the stress-strain state of the heavily loaded elements of the new mill was calculated. On the basis of the calculation, it was proved that the voltage values occurring in the details of the RSM stand in the process of pressing rods and pipes do not exceed the maximum allowable stress, that is, the strength characteristics of the stand of the new mill satisfy the condition of mill strength. It is established that the coaxial arrangement of the gearmotors of the main drive and inclined work rolls minimizes dynamic loads, noise and vibration during rolling.

It is known that modern rolling mills cannot do without computer control of their mechanical units, temperature and deformation modes, etc. [6]. In order for temperature-deformation rolling modes, calculated on the basis of scientifically grounded, complex mathematical models to be realized, sensors, hydraulic and electric actuators with servo-control are needed. In addition, the control system should have a modern human-machine interface, on-line archiving tools for the technological parameters array and a standard interface for accessing these parameters from the shop-side automated control system.

The purpose of this work is to create an automated system for controlling the temperature mode of rolling of a radial-shear mill of a new design.

Materials and research methods

The MSC.SuperForge software complex was used to calculate the temperature regimes of pressing rods. The proposed bar pressing process is an extremely complex. This is due to the fact that during pressing the billet is deformed continuously in the RSM with a spiral roller, and then extruded through the die.

The simulation of the process under study using the MSC.SuperForge software package was performed in the following stages [7,8]:

1. Depending on the processing conditions (the shape of the initial billet, the product to be pressed, the roll, the die, the deformation conditions, etc.), the type of the final element was chosen.

2. Creating geometric models of the original billet, roll, die and device for continuous pressing.

3. Placing a grid of finite elements on the workpiece.

4. Using either the database available in the MSC.SuperForge program or the thermomechanical properties of the workpiece material, setting the rheological properties of the workpiece.

5. Setting the initial pressing temperature of the workpiece.

6. The conditions on the contact surface of the workpiece, roll, matrix, i.e. friction coefficient were set.

7. Depending on the type of equipment used, the law of motion of the moving tool was established.

8. The calculations of the stress-strain state (SSS) of the workpiece, the forces of normal pressure, the distribution of temperature over the volume of the workpiece were made with sufficiently rigid accuracy.

It should be noted that in carrying out the above-described actions, the MSC. SuperForge software package produced the calculation results in the form of distribution fields of the corresponding parameters over the volume of a deformed body or as numerical values of the parameters studied in the nodes of the deformed grid.

During work, a three-dimensional geometric model of the workpiece, rolls and die was built in the Inventor CAD program and imported into the CAE program MSC.SuperForge. When creating a finite element model of the workpiece, rolls and the matrix, a three-dimensional volume element CTETRA (four-node tetrahedron) was used, which is used to model three-dimensional bodies. The process calculation time was 30-40 minutes on a PentiumDuo computer with a clock frequency of 3.4 GHz and 2 GB RAM.

To study the process of pressing in continuous RSM, a round billet of aluminum alloy D16 with a size of Ø40 × 150 mm was used. Pressing on the RSM was carried out at a temperature of 300 ° C to a diameter of 9 mm. To simulate the plasticity of the material, the Johnson-Cook elastoplastic model was chosen. From the database of the software complex "MSC.SuperForge" the rheological properties were set.

To calculate the SSS, the technical characteristics of the proposed RSM were used. In MSC.SuperForge, the tools are taken absolutely rigid and provide only the properties of heat conduction and heat transfer, i.e. thermal conductivity, specific heat and density are taken into account, and mechanical properties are ignored.

From the material database, the material of the instrument was designated as "steel 9X1". For this material, the density and thermal properties of the program were assigned by default. Since the rolling process takes place at room temperature, the initial temperature of the rolls was assumed to be 20 ° C.

The interaction between the hard rollers, the die and the deformable material of the workpiece is modeled using contact surfaces that describe the contact conditions between the surfaces of the rolls, the die and the surface of the rolled rod. In the process of modeling, the contact conditions are constantly updated, reflecting the rotation of the rolls and the deformation of the material, which allows simulating the slip between the tool and the material of the workpiece. The contact between the tool and the rod is modeled by Coulomb friction, the adopted friction coefficient was 0.3.

The program "MSC.SuperForge" has been launched. Using the step method, we calculated the temperature distribution over the volume of the compression blank. Moreover, for clarity of displaying the calculation results, data for four stages were taken as a percentage of the total deformation time, i.e. The following intervals were chosen: first stage 25, second stage 50, third stage 75, and fourth stage 100 percent of the total deformation time.

Results and discussion

On the basis of results, obtained by MSC.SuperForge program during numerical simulation, it was established that pressing on the RSM leads to an intense temperature increase in the sections of the bars in the areas of contact of the metal with the roller, i.e. with an increase in drawing, a gradual increase in temperature to the level of hot deformation on the surface of the workpiece occurs (Figure 2).

The temperature mode of deformation has a significant impact on the structure of the workpiece material, indicators of strength and plastic properties.
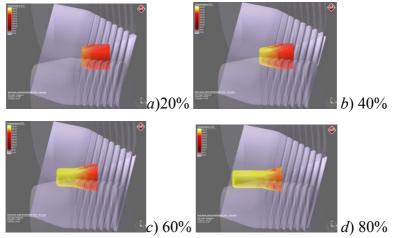
To select the heating temperature before deformation, you can use the state diagram, and to determine the deformation temperature, the structural state diagram (SSD) in the "temperature – deformation rate" coordinates [9]. Structural state diagrams can be used in the design of pressure metal forming (PMF) processes to assign temperature and speed deformation parameters in order to obtain a regulated structure of semi-finished products.

It is known [10] that as a result of cold plastic deformation, there is an accumulation of defects in the crystal structure, first of all, of dislocations. As a result, a subgrain structure occurs inside the primary source grains. In addition, in the case of unidirectional deformation, the primary grains themselves acquire an elongated shape, i.e. their size in one or two directions decreases. Plastic deformation leads to crushing of the structure, but with traditional types of processing, material is simultaneously peeled off, its plasticity falls and its further deformation can lead to destruction. Therefore, when processing on RSM new design, it is necessary to accurately determine the minimum deformation temperature on this equipment.

According to the authors of works [10, 11], at the steady-state stage of plastic flow, the stress does not depend on the degree of deformation, then SSD can be used to determine the structure after hot deformation and heat treatment (Figure 3). Four areas characterizing different structures are marked on the diagrams: I - polygonized; II - recrystallized; III - mixed structure; IV - the area of spontaneous recrystallization. The diagrams show not only the type of structure obtained, but also the grain size corresponding to a certain value of the strain rate.

The authors of works[10, 11] note that an undesirable processing mode is a mixed area, since there is an uneven grain growth, and a decrease in strength properties.

Figure 2 - Picture of the distribution of the temperature field in the workpiece when pressing rods of aluminum alloy D16 on RSM with helical rolls

The temperature range of forging and stamping of many semi-finished products from aluminum alloys varies in the range of 470–350 ° C, while pressing and rolling are carried out at a temperature of> 400 ° C [9]. However, deforming heating of the metal occurs during shaping, therefore the temperature of individual sections increases above the set temperature.

Hot deformation of aluminum alloys has the following features:

- a narrow temperature range of deformation, reaching up to 80-100 ° C;
- high sensitivity to overheating.

Therefore, in order to prevent the influence of temperature of pressing and rolling, as well as deformation heating on the formation of the metallographic structure and the strength properties of products, it is necessary to strictly control the deformation heating. In this case, one should not allow the temperature to rise above the upper limit of the temperature range.
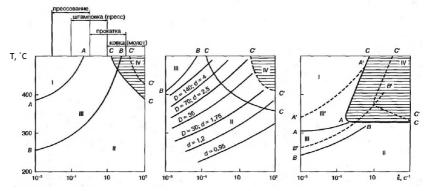
Figure 3 - Diagrams of the structural states of aluminum alloys [9]

To control the pressing temperature at the new RSM, it is proposed to use a non-contact temperature measurement system of the workpiece based on the pyrometer. Non-contact temperature measurement methods (pyrometry methods) are widely used in manufacturing practice, especially where direct contact of measuring equipment with the workpiece is either impossible or difficult.

Contactless means of measuring temperature are based on the perception by the thermal receiver (infrared optical sensor) of the spectrum of electromagnetic radiation energy that radiates from any body with a temperature above absolute zero, in particular, workpieces heated to deformations temperatures. Since the value of the emissivity of the workpiece at the same temperature does not change with the wavelength, the use of the CT 3M pyrometer does not introduce additional instrumental error and is optimal in assessing the effect of the workpiece temperature on the spectral dependence of the emissivity under conditions of intense temperature increase.

The non-contact temperature control system is based on the Arduino Uno Rev3 microprocessor [12] and the CT 3M infrared pyrometer, which has the following distinctive features [13]:

- Temperature measurement range: 50 ... 1800 ° C;
- Spectral range: 2.3 microns;
- Response time: 1 ms;
- Operating conditions: up to 85 ° C;
- Interface: USB, RS232, RS485, CAN bus, PRO protocol, PROFIBUS network, Ethernet network.

The CT 3M infrared pyrometer, due to its short wavelength and temperature measuring range of 50 ° C, is used to measure low-temperature pressure metal forming processes. Due to the short response time of 1 ms, this pyrometer can be

used to measure the temperature of fast processes. The electronic unit of the measuring device also makes it easy to connect peripheral devices via selectable analog outputs or various additional digital interfaces

It should be noted that the CT 3M pyrometer has a wavelength of 2.3 μm, and because of this it is used when measuring the temperature of metal surfaces in the processes of their treatment. The low temperature range of 50 ° C makes this temperature sensor a particularly popular measuring device for any measurement of metals during mechanical and heat treatment of metals at a maximum temperature not exceeding 1800 ° C.

The Arduino Uno Rev3 microprocessor visual control system and the CT 3M infrared pyrometer will be implemented in the LabVIEW 2010 National Instruments application development environment [14]. The LabVIEW development environment allows the use of standard communication tools from the National Instruments VISA virtual instrument suite and additional VI Package Manager 2016 with an interface for the Arduino, which allow you to control the system from a personal computer via the USB interface.

The block diagram of the pyrometric system of contactless temperature control includes the following functional elements: microprocessor Arduino Uno Rev3; infrared pyrometer CT 3M; Personal Computer.

The Arduino Uno Rev3 microprocessor is programmed in the Arduino Integrated Development Environment in C ++ and provides automatic temperature measurement in a given region of the deformable workpiece. The circuit diagram for the Arduino Uno Rev3 microprocessor is presented in [12]. Communication with a personal computer is carried out through a USB interface, and the microprocessor is powered from a 5V source or from a computer's USB port.

Conclusions

1. A new radial-shear mill combined with extrusion was proposed, which allows to produce high-quality rods and pipes from non-ferrous metals under high degrees of deformation.

2. It is shown that when the rods are pressed on the new RSM, the temperature of the workpiece rises, which may lead to a decrease in the quality of manufactured products.

3. A system for contactless measurement of the temperature of a deformable workpiece based on the CT 3M pyrometer has been developed.

4. The use of the developed system of contactless temperature measurement allows to significantly improve the accuracy of temperature measurement, especially in conditions of high temperature.

5. The temperature distribution in the billet obtained with the help of the pyrometric system will give additional information about the temperature rise of the billet, and avoid obtaining rejected bars and pipes made from non-ferrous metals.

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关于JSC"Quvasoysement"3号炉#ug-3-3-88型静电除尘器的热成像测量结果
ON THE RESULTS OF THE THERMAL IMAGING SURVEY OF AN ELECTROSTATIC PRECIPITATOR OF THE TYPE UG-3-3-88 OF FURNACE NO.3 AT JSC "QUVASOYSEMENT"

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注解。 本文讨论了3号回转窑上UG-3-3-88型静电除尘器的热成像结果，确定过滤器壳体上的温降区，评估热保护状态，评估的问题。 管道从多尘室到静电除尘器的热保护状态和从静电除尘器到风扇排风扇的管道。 静电除尘器之前和之后的排放压力取决于排气门的开口百分比。
关键词：水泥工业，熟料，水泥，湿法，回转窑，热成像，静电除尘器。

Annotation. *This article discusses the results of thermal imaging of an electrostatic precipitator of the type UG-3-3-88 on a rotary kiln No. 3, the issues of determining temperature drop zones over the filter case, assessing the state of thermal protection, assessing the state of thermal protection of the duct from the dusty chamber to the electrostatic precipitator and duct from the electrostatic precipitator to fan exhaust fan. The discharge pressure before and after the electrostatic precipitator is determined depending on the percentage opening of the exhauster gate.*

Keywords: *cement industry, clinker, cement, wet method, rotary kiln, thermal imaging, electrostatic precipitators.*

JSC "Kuvasoycement" is the third largest cement producer in the Republic of Uzbekistan and is one of the leading enterprises in the cement industry. The design capacity of the enterprise is 1060 thousand tons of cement per year. The cement production process at the enterprise is carried out using the "wet" method of clinker preparation [1].

Cement production is associated with significant fuel and raw materials consumption and ranks third in terms of energy consumption after the fuel and energy and metallurgical industries with a relatively low efficiency of thermal units. Thus, in the production of cement by the wet method, the overhead cost of fuel is about 75%, and more than 5 tons of such vital natural materials as raw materials, fuel, water and air are spent for each calcined ton of clinker. At the same time, about 225 tons of exhaust gases are emitted into the atmosphere through the chimney

every hour from a rotary kiln with a capacity of 50 tons / hour. Consequently, the reduction of specific fuel consumption and natural raw materials is an important national economic task that can be largely solved by optimizing and intensifying technological processes and using man-made materials [2].

In world practice, from the standpoint of reducing energy consumption, two directions are being developed to solve the problem of improving clinker burning in rotary kilns. The first direction is radical and involves the transfer of industry to the so-called "dry method" of production, in which the reduction of the costs of clinker burning is achieved using modern furnaces equipped with a baking heat exchanger and calciner reactors. This direction is, of course, a priority, both in the construction of new and in the reconstruction of existing enterprises. However, such an approach to the modernization of clinker burning involves huge costs for the reconstruction of plants and in fact boils down to dismantling the old plant and building a new one. The allocation of funds for such a decision in some countries is limited and for some time a new technological line of the "dry method" will be adjacent to the current enterprise of the "wet method" of production. The second direction is the need to transfer the existing enterprises of the "wet method" of cement production to an intensive way of development with a radical improvement in the use of fuel and energy resources. The solution of this problem in the cement industry should be carried out by optimizing and improving the most energy-intensive limit-firing of clinker. The complexity of the task is the need for a comprehensive study of the interfering chemical, physical, thermal and aerodynamic processes that simultaneously occur in the furnace unit.

Dust removal of gases in the cement industry are kilns for burning wet and dry methods of clinker production. In the wet production method, for each ton of calcined clinker from rotary kilns 5,3 - 7,3 tons of dust with a temperature of 140-400 ° C are contained in dusty gases, containing (even with good intraburn dust suppressors - daisy chain curtains) from 80 to 250 kg semi-baked raw material mixture in the form of dispersed dust. More than 80% of the dust emitted into the atmosphere is emitted by rotary kilns, and the rest of the dust is produced by cement and raw material mills.

The principle of the electrostatic precipitator is based on the use of the phenomenon of gas ionization under the influence of high-voltage electric current corona discharge. In the electrostatic precipitator, the purification of gases from solid and liquid particles occurs under the action of electric forces. The particles are charged with electric charge, and they are deposited from the gas stream under the action of an electric field. The process of dedusting in an electrostatic precipitator consists of the following stages: dust particles, passing an electric field with a gas stream, receive a charge; charged particles are moved to the electrodes with the opposite sign; deposited on these electrodes; dust is deposited on the electrodes.

This article discusses the results of thermal imaging of an electrostatic precipitator of the type UG-3-3-88 in a rotary kiln No. 3, determines the zones of temperature drops across the filter housing and assesses the state of thermal protection, as well as evaluates the state of thermal protection of the gas duct from the dusty chamber to the electrostatic filter from the electrostatic precipitator to the fan exhaust fan.

Based on the technical assignment for №06 dated 01.14.2019g. a thermal imaging survey of the electrostatic precipitator housing of the rotary kiln No. 3 was carried out to determine the zones of maximum and minimum temperatures along the electrostatic filter housing. The tasks posed during the thermal imaging were to:

1. Determining the zones of temperature drops across the filter housing, assessing the state of thermal protection, assessing the state of thermal protection of the gas duct from the dust chamber to the electrostatic precipitator and gas duct from the electrostatic precipitator to the exhaust fan;

2. Determination of the discharge pressure before the electrostatic precipitator, after the electrostatic precipitator, depending on the percentage of opening the damper gate.

The technical condition of the electrostatic precipitator was assessed by thermal imaging using two thermal imagers and a temperature pyrometer.

The assessment found:

- the case of the electrostatic precipitator has a violation of thermal protection above the point from the bottom by 3.5 meters;

- the total area of violation of the thermal protection of the electrostatic precipitator is 32-38 percent;

- cold air suction over the electrostatic precipitator case is located in the upper part of the electrostatic precipitator, point inflows without large areas, the average value of the inflows is no more than 1 percent of the total area of the electrospray body;

- the duct at the inlet of the electrostatic precipitator from the side of the dusty chamber has a violation of thermal protection in the upper part of the bend and observed the inflow point of air from the atmosphere;

- the flue is clean without reducing the flow area, there is a precipitate of dust at the site of inflection;

- the flue duct from the outlet side of the electrostatic precipitator to the smoke exhauster is clean without any suction, the violation of thermal protection is observed at the interface of the flue duct and the gate;

- evaluation of the technological documentation of the filter showed that the passport was developed in 2001, technical tests were carried out as of 2001;

- the scheme of instrumentation and automation at the time of the assessment of the electrostatic precipitator did not match the working drawing. There were no discharging pressure sensors and temperature at the inlet and outlet of the electrostatic precipitator.

In accordance with the requirements of GOST R 51707-2001 "Electrofilters. Safety Requirements and Test Methods, the installation instructions for K-type electrostatic precipitators on the part of the enterprise do not carry out a set of works on the assessment of the technical condition of the electro-filter and its technical tests according to the rules of operation of equipment for cement production.

Additionally, to assess the performance of the electrostatic precipitator, measurements were made of the discharge pressure at the inlet and outlet of the electrostatic precipitator when the gate was opened at 30, 40, 15 percent. These results are shown in table 1.

Table 1.

Number	Place of control	Discharge pressure, kPa		% opening gate	Note
		Before electrostatic precipitator	After electrostatic precipitator		
1	Gas pipeline	0,57 – 0,60 0,55 – 0,63	0,57 - 0,67 0,57 – 0,63	20	
2	Gas pipeline		0,88 – 0,94 1,5 – 1,56 1,25 – 1,33 0,3 – 0,34	25 40 30 15	
3	Gas pipeline	0,53 – 0,58 1,13 – 1,25 0,35 – 0,37		20 30 15	

The obtained values of pressure-discharge, combined with the result of thermal imaging, indicate the value and possibility of suction in the dusty chamber, and the seal on the furnace body.
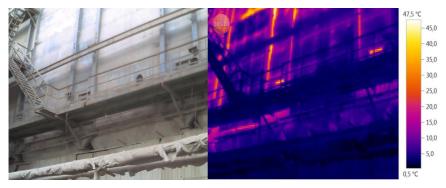
The data of the results presented by the special laboratory of the plant indicate an incorrect assessment of the dust filter and the operating modes of the filter. It is necessary to monitor the results of the calculation and the correctness of the reading of measuring instruments by laboratory personnel.

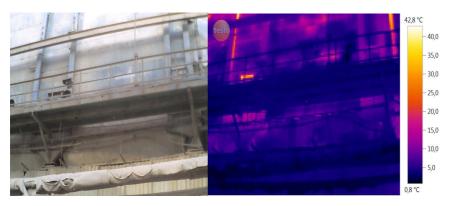Measuring instruments used in the evaluation of the electrostatic filter:

Number	Name of measuring instruments and test equipment	Quantity
1	Thermal imager UNI-T UTi160A	1
2	Thermal imager testo 880	1
3	Pyrometer FLUKE VT02	1
4	Roulette 8 m	1
5	Digital manometer DMU CRESSTO-R 10	1
6	Probe to digital gauge DMU CRESSTO-R 10	1

Means of measurement verified in the prescribed manner.

Data from the results of thermal imaging are shown in Pic. 1-2.

Pic.1.

Pic.2

Findings

1. The company does not have a set of technical documentation for testing the electrostatic precipitator in accordance with the requirements of regulatory documents;

2. The control of the electrostatic precipitator by the special laboratory does not reflect the actual performance;

3. The thermal protection of the electrostatic precipitator is violated, which leads to high heat loss, reduces the performance of the filter. Due to the low flue gas temperatures, the dew point, depending on the ambient temperature, is in the range from 25 to 65 ° C, therefore, a high degree of corrosion is observed in the lower part of the electrostatic precipitator and electrodes (up to 4 meters);

4. Critical suction on the case of electrostatic precipitators (through corrosion) with an area of more than 0.1 m2 is not observed;

5. It is necessary to eliminate underflows in the dusty chamber, the furnace seal and on the exhaust duct of the dusty chamber at the inflection point;

6. To restore the control circuit of the electrostatic precipitator by instrumentation with the removal of information on the driver's console;

7. It is necessary to draw up a plan of measures for evaluating the operation of electrostatic precipitators with their subsequent testing (in cold conditions);

8. Due to the lower dew point temperature, the presence of corrosion and the long-term operation of the electrostatic precipitator, it is necessary to conduct a technical inspection of the supporting steel structures of the electrostatic precipitator.

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NOTES

科学出版物

上合组织国家的科学研究：协同和一体化

国际科学大会的材料

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