# ACTUAL PROBLEMS OF MODERN SCIENCE, EDUCATION AND TRAINING

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# CONTENTS

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# EVOLUTION OF SCIENTIFIC APPROACHES IN CONTEXT OF STUDYING INTEGRATION PROCESS AS A FACTOR FOR ECONOMIC GROWTH AND THREATS TO ECONOMIC SECURITY OF STATE

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**Annotasiya:** Ushbu maqolada integratsiya jarayonlari va ularning shakllanish bosqichlari haqidagi nazariyalar va qarashlarning taraqqiyot bosqichlari qarab chiqilgan. Shuningdek, integratsiya natijasida davlatlarning yutuqlari va yo‘qotishlari qiyosiy tahlil qilingan. O‘zbekistonning ochiq iqtisodiy modelga o‘tish, mintaqaviy va jahon iqtisodiy tizimlariga intgeratsiyalauvining imkoniyatlari asoslangan.

**Kalit so‘zlar:** jahon iqtisodi, intgeratsiya, savdo zonasi, erkin savdo zonasi, bojxona ittifoqi, umumiy bozor, iqtisodiy ittifoq, iqtisodiy syosat.

**Аннотация:** В статье рассмотрены развитие теоретических основ и взглядов на интеграционные процессы и этапы их формирования. А также проведен сравнительный анализ прибылей и убытков государств в результате интеграции. Обоснованы преимущества перехода Узбекистана к открытой модели развития и интеграции региональных и мировых экономических систем.

**Ключевые слова:** мировая экономика, интеграция, зона свободной торговли, торговая зона, зона свободной торговли, таможенный союз, общий рынок, экономический союз, экономическая политика.

**Abstract:** In this paper looked through the development of theoretical foundations and views on integration processes and their stages of formation. As well as conducted a comparative analysis of gains and losses of states as a result of integration. substantiated advantages to Uzbekistan transition to an open model of development and integration of regional and world economic systems.

**Keywords:** world economy, integration, free trade zone, trade zone, free trade zone, customs union, common market, economic union, economic policy.

**Introduction.** Integration processes at the present stage of development of the world economy are an imperative for the formation of a qualitatively new institution of interstate interaction aimed at joint search and adequate response to global challenges and threats in order to ensure sustainable development and economic security of countries. They help countries to combine their economic potential and their overall role and place in world economic system. The largest international integration associations include the North American Free Trade Agreement (NAFTA), the European Union (EU), the South Asian Association for Regional Cooperation (SAARC), the Association of Southeast Asian Nations (ASEAN), the Commonwealth of Independent States (CIS), etc. They all differ in terms of the size of total GDP and depth of integration processes.

**Literature review.** Activation process of international economic integration in Europe since 1950, led to its in-depth study by foreign scientists and economists.

Representatives of the neoliberal school V. Repke, M. Allais and others understood integration as a process in which free competition operates formation of a single market space on scale of several countries. The participation of state in regulation of economic processes is limited to those individual spheres and industries that by their nature can function only on the principles of a "centralized controlled order" [1].

Since economic integration has both positive and negative consequences for its participants (increased competition and possibility of ousting local producers from the domestic market), it is a controlled process through which certain risks and threats to the economic security of the state.

In studies of representatives of the market-institutional school of regional economic integration theory B. Balassa, J. Weiner and G. Kremer, noted that solution of the problems of smoothing the level of territorial and sectoral development, regulation of the labour market and ensuring sustainable growth of national economy are impossible without the active participation of the state in integration processes. They considered foreign trade to be the basis of integration processes, without any barriers for member countries, such as organization and collective protectionism.

The classical scheme, most fully reflecting the formation process and development of regional integration was developed by B. Balass [2]. It consists of 4 stages, each of them includes, besides all the previous provisions, qualitatively new ones, promoting the integration process to a qualitatively new level. At the initial stage, the organization of a free trade zone, then a customs union, then an economic and monetary union, finally, complete economic and political integration takes place.

It should be noted that in scientific literature not all researchers follow these forms of integration and sequence. Some of them follow the point of view that at the first stage of integration, a preferential trade zone is created, and then an economic union is formed behind the common market, then a currency union, finally, a political union. Based on this, the stages of economic integration can follow given order: cooperation in the economic sphere, preferential trade zone, free trade zone, customs union, common market and economic union.

An economic union is known as the highest form of economic integration based on the formation of a common socio-economic space, with a single monetary, budgetary, tax and foreign policy.

Since the traditional theory is unable to solve the problems caused by uneven economic development, representatives of the neo-Keynesian theory R. Cooper, G. Myrdal, J. Tinbergen et al. offered their point of view on the role of state in regulation of integration processes. Considering the unconstrained movement of goods andfactors of production is not only determinant of integration process, they substantiatedthe important role of the political factor as well.

R. Cooper substantiated that in order to obtain benefits from international economic interaction of integrating states, while maintaining the maximum degree of freedom, it is necessary to coordinate their domestic and foreign policies in order to

ensure the optimal combination of two possible alternatives for the development of economic integration [3]:

Unification of states with the subsequent loss of their sovereignty and mutual coordination of economic policy;

Integration of states with the maximum preservation of national autonomy.

The assignment of a part of sovereignty is the subject of heated discussions and contradictions between integrating states, in terms of determining permissible limits for delegating its economic and political component to collective use.

According to G. Myrdal, the development of integration requires not only free competition, but also consistent measures from the side of countries to implement an adequate socio-economic policy. Any national economy "will not integrated until all opportunities are open to everyone, rewards for production and services are not the same, despite racial, social and cultural differences" [4].

J. Tinbergen noted that the goal of economic integration is to remove artificial barriers that restrain economic growth and form control devices that ensure the creation of the institutional foundations of new economic space. Basing on the concepts of "positive" and "negative" integration he introduced into scientific circulation, and showed that negative integration is characterized only by simple elimination of barriers to the cross-border movement of goods and factors of production, which contributes to an increase in efficiency of the economy. Positive integration - provides formation of institutional foundations that increase mobility of goods, services and factors of production, which contributes to the growth of economic efficiency. Positive integration identifies formation of institutional basis that increases the mobility of movement of goods, services and production factors. Thus, the problem of integration is an element of implementation of optimal economic policy [5].

**Analysis and results**. According to representatives of corporeality, transnational corporations (TNCs) are capable of accelerating the process of regional integration, which, being interested in the enlargement of markets and liberalization of economic activities, ensure the rationality and balance of the development of world economic links. By this way, TNCs form the basis for enhancing investment processes, structural restructuring and modernization of production, which contributes to the diversification of the range of commodity products based on international quality standards, renewal of the consumer market and growth of export potential. The activities of TNCs provide the adaptation of the national economy to world prices, use of modern financial instruments and control devices, and accelerates the digitalization and implementation of latest information technologies.

Conducted assessment of conceptual toolkit indicates that all theories of regional economic integration distinguished mainly by dissimilar interpretations of the integration mechanism. At the same time, the experience of regional economic integration showed the presence of colossal difficulties in the formation of the integration space and a different level of interest in the depth of this process, which does not fit into the accepted schemes and theories.

In the recent years, the growth-integrated processes in world economy observed, which is due to the transition to the "global stage" of development and regionalization and integration. It is characterized by expansion and complication of economic

interconnections and interdependencies, due to the formation of world market for capital, goods, labour and services, also accompanied by certain risks that have a political, socio-economic and environmental orientation. In terms of its main economic parameters, the EAEU space meets the characteristics of a global region and in the future, can become an integral part of the global integration system. Besides, it should be noted that experienced a qualitative transformation from an internal mechanism of interaction between individual subjects of the former USSR to the imperative of building a qualitatively new economic space, in which new members of the global Eurasian regionalization participate.

By joint efforts, uniting their resource potential, they are turning into new factors in world economic policy. In this way, globalization is transforming the world economic system, shaping a new architecture and defining its development in long term, both globally and geographically and structurally.

In this regard, to ensure the country's economic security in the context of integration, special imperatives are needed, including mechanisms: (1) deepening economic relations with the EAEU member states, based on the corresponding internal priorities of the state policy being implemented and (2) the competitiveness of products of domestic manufacturers with high added value in the domestic and foreign markets.

Proceeding from this, the currently used toolkit for economic cooperation with the member states of the Union is not effective enough, proceeding from a wider range of tasks of social and economic development of Uzbekistan. Strategy of the state should base on the legislative system that allows implementing the most important priorities, intensifying the integration process and increasing its effectiveness on the basis of harmonizing national interests of states, building real mutually beneficial relations that provide for adequate mutual obligations and strict mechanisms for their implementation.

Since at the present stage of development, the world economy is increasingly becoming an integral and interdependent system, which is unfamiliar to the mechanisms of autarchy and self-isolation, this makes it necessary to develop and implement fundamentally new approaches in formation of international economic relations, as well as interaction with international economic institutions.

At the same time, ensuring the economic security of country is a resulting indicator of effectiveness of international economic integration, since it allows one to give a real assessment of the qualitative and quantitative indicators of integration capacity of the economic system [6, 7]. The first of them should include the level of openness of the national economy, coverage of imports by exports, the balance of foreign trade, the commodity structure of exports and imports, the share of foreign direct investment in GDP.

**Conclusion/Recommendations**. Thus, the transition to an open model of development and integration of national economy into regional and world economic systems gives the following advantages to Uzbekistan:

- participation in the regional and international labour division by products with high added value, produced on the basis of cooperation and the implementation of joint investment projects and programs;

- the formation of an adequate market infrastructure and mechanisms that stimulate the development of a competitive environment, stock and banking and insurance markets;

- reducing the burden on the national labour market through organized and legal external labour migration, social protection of labour migrants;

- development of transport and logistics infrastructure, increasing competitiveness of domestic products in foreign markets by eliminating barriers and reducing the cost of their transit.

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## BEHAVIOR AS AN ECONOMIC CATEGORY

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**Annotatsiya.** Maqola iqtisodiy hulqni tadqiq etishga bag‘ishlangan bo‘lib, hulq kategoriyasini iqtisodiy, sotsiologik va psixologik nuqtai nazardan yoritishga harakat qilindi. Iqtisodiyot nazariyasi fanining predmeti cheklangan resurslar sharoitida shasxning cheklanmagan ehtiyojlarini qondirish va resurslarni taqsimlashi uchun inson iqtisodiy hulqini tadqiq etish kun tartibidagi eng asosiy masala ekanligi iqtisodiy hulqni

kategoriya sifatida tahlili orqali ochib berildi. Maqola so‘ngida olib borilgan tadqiqot natijasida olingan xulosalar bayon etildi.

**Kalit so‘zlar:** iqtisodiy hulq, iqtisodiy madaniyat, iqtisodiy tafakkur, ratsional qaror qabul qilish.

**Аннотация.** Статья посвящена экономическому, социологическому и психологическому анализу категории поведения. Предмет экономическойтеории выявил посредством анализа экономического поведения как категории, что изучение экономического поведения человека является основным вопросом повестки дня для удовлетворения неограниченных потребностей человека в контексте ограниченных ресурсов и распределения ресурсов. В конце статьи представлены результаты исследования.

**Ключевые слова:** экономическое поведение, экономическая культура, экономическое мышление, рациональное принятие решений.

**Abstract.** The article is devoted to the study of economic behavior and attempted to investigate by the category of behavior from an economic, sociological, and psychological approach. The subject of economic theory has been revealed through the analysis of economic behavior as a category that the study of human economic behavior is the most important issue on the agenda to meet the unlimited wants of the individual and the allocation of resources in the context of scarce resources. At the endof the article, the conclusions of the study are described.

**Keywords:** economic behavior, economic culture, economic thinking, rational decision making.

**Introduction.** The implementation of a particular economic action in a society is directly related to economic behavior. That is why for centuries the study of economic behavior has caused a great deal of controversy among the scientific community.

P. Heyne in his famous book "The economic way of thinking” provides very important information about economic thinking. In particular, examining the differences between other professionals and economists, he said, “Economists may not always know world events better than practitioners such as managers, engineers and mechanics. But economists are aware of the interrelationships between these events”. He also says that "the science of economics allows us to see a wide range of complex social relations in a consistent and logical manner" [1]. Predicting events is done by studying a person's economic behavior.

**Literature review.** Because of the importance of the study of economic behavior, a number of studies on economic behavior have been awarded the Nobel Prize. In 1992 Gary Becker (b. 1930, USA) for “researching the problems of human behavior and social relations from the standpoint of microeconomic analysis”, in 1996 William Vickrey (1914-1996, USA), James Mirrliz (b. 1936, UK) for “the contribution to the development of the theory of behavior of economic agents in the context of asymmetric information”, in 2002 Yilda D. Kahnemann, W. Smith for “research in the field of decision-making and mechanisms of alternative markets" and in 2017 Yillard R. Thaler for “contributions to behavioral economics" were awarded with Nobel prize.

**Analysis and results**. So what is economic behavior, behavior in general? From an economic, sociological and psychological point of view, the category of behavior is slightly different. So we start by defining the word “behavior”.

Behavior is a set of actions of an individual. Behavior reveals the personality of a person, features of his character, temperament, his needs and tastes; reveals his relationship to objects and phenomena of the surrounding reality [2].

Depending on their emergence in different areas of life activities, behavior can be divided into economic, domestic and occupational forms.

Usually in the science of economic theory, human behavior is studied in depth. Because in the context of limited resources, the satisfaction of the unlimited needs of the individual is regulated by economic behavior. This is evident in the scientific work of economists.

Economic science is engaged in the study of the normal life of human society; it studies the sphere of individual and social action, which is closely related to the creation and use of the material foundations of welfare [3].

Economic behavior is the subject of all research and generalizations of economic theory. The central place in all treatises on economic theory, with minor deviations, is occupied by the same idea: all studies in the field of economics are aimed at analyzing and predicting human behavior [4].

Economic science analyzes such basic categories as production, distribution, exchange and consumption of material goods and services that are necessary for the life of people. These categories generally describe the economic sphere of society [5].

Economic theory is a science that studies human behavior in terms of the relationship between goals and limited means, which can have various uses [6].

The analysis of the main categories is based on the use of the following analytical categories: resource constraints, costs, preferences and choices. These concepts are structured within the framework of separate interrelated optimization processes at the level of individual decisions and equilibrium at the level of the whole society [7].

Moving into the language of a researcher of human behavior, economists are interested in how people use their limited resources to produce, distribute and exchange goods and services for consumption, i.e. investigate the process of choosing between alternative options for using scarce resources, methods of organizing resources, ways of distributing wealth and rewards for economic activity [8].

With the introduction of the rules of a market economy into society, a significant change in the structure of economic behavior was observed. These changes were revealed in the researches of M. Weber and K. Marx.

According to M. Weber's concept, the social ethos is changing sharply, which is manifested in various forms - in the formation of the ethics of entrepreneurship, the spread of a "commodified" view of social relations, the habit of reducing the use value to exchange value appears;

According to K.Marx's concept, new institutional (market) conditions of social life emerge, in which contracting relations come to the fore, especially in the field of labor recruitment, and the role of fixed capital increases significantly [9].

From the definitions given to the science of economic theory above, it is clear that the study of economic behavior is very important in making rational decisions.

G. Becker in his work "The Economic Approach to Human Behavior" writes: "I am convinced that economic theory as a scientific disciplines most of all differs from other branches of social science not in the subject, but in its approach. The core of the economic approach, in my understanding, is formed by tied together assumptions about maximizing behavior, market equilibrium and stability of preferences…. I have come to believe that the economic approach is all-encompassing, it is applicable to all human behavior" [10].

Economic thinking is a process of cognition by a person, a social group, society as a whole, of economic reality, awareness of their place in economic relations and the development on this basis of the principles of their activities [11].

Economic culture selects (rejects, preserves; accumulates) economic values and norms necessary for the survival and further development of the economy, accumulates standards of appropriate economic behavior, translates from the past to the present the values and norms that underlie labor, consumption, distributive and other economic actions and relations, renews the values and norms that govern the development of the economy, being the reservoir from which new patterns of behavior are drawn [12].

**Conclusions.**With the help of the mentality of the nation and economic culture, the economic thinking of individuals is formed, as a result of which the program of economic behavior of the individual is determined and economic actions are carried out. Not only economic factors, but also sociological and psychological factors should be taken into account in rational decision-making in society.

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# ANALYSIS AND DEVELOPMENT OF METHODS FOR SUPPORTING MANAGEMENT DECISIONS OF THE TAX INSPECTORATE BASED ON PROCESSING FUZZY INFORMATION

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**Annotatsiya.** Ushbu maqolada ekspert tizimidan foydalangan holda noaniq ma'lumotlarni qayta ishlashga asoslangan soliqqa tortish tizimida samarali boshqaruv qarorlarini qabul qilishni qo'llab - quvvatlashni tashkil etish usulini tanlash tahlil qilinadi.

**Kalit so'zlar:** soliq to'lovchi, fazzifikatsiya, defazzifikatsiya, xulosa, soliq to'lovchilarni taqsimlash metodologiyasi, klasterlash usullari, ko'p o'lchovli ma'lumotlar, klaster tahlilining algoritmlari va usullari.

**Аннотация.** В данной статье анализируется и обосновывается выбор метода организации поддержки принятия эффективных управленческих решений в системе налогообложения на основе обработки нечеткой информации с использованием экспертной системы с нечетким выводом.

**Ключевые слова:** налогоплательщик, фаззификация, дефаззификация, вывод, методология распределения налогоплательщиков, задача кластеризации, методы кластеризации, многомерные данные, алгоритмы и методы кластерного анализа.

**Annotation:** This article analyzes and substantiates the choice of a method for organizing support to make effective management decisions in the taxation system based on processing fuzzy information from using an expert system with fuzzy inference.

**Key words:** taxpayer, fuzzification, defuzzification, inference, taxpayer distribution methodology, clustering problem, clustering methods, multidimensional data, algorithms and methods of cluster analysis.

**Introduction.** The development of the republic's economy is associated with the need for financial support for programs and strategies adopted in various fields, from socio-economic to scientific and technical, which are financed from the state budget, as well as from local budgets. Today, the tax system is not only a means of replenishing the budget, but also the most important tool for regulating market relations. It is obvious that the development of the state economy is impossible without the corresponding development of the tax system. Thus, the strategic goal of the economicpolicy of the state in general and tax policy in particular is to create a stable tax systemin the Republic that would ensure a sufficient amount of tax revenues to the budgets ofall levels through the formation of effective mechanisms for taxation of all categories of taxpayers, taking measures to combat violations of tax legislation, as well as information support for the process of making managerial decisions in the process of functioning of the tax system.

**Research Methodology.** The main difficulty for tax inspectors is that most of the parameters that characterize a taxpayer have a high degree of uncertainty and are unclear. In this regard, when forming the correct set of solutions and choosing the best from them, the main attention is paid to the processing of fuzzy information.

Fuzzy information processing methods depend on the nature uncertainties reflecting the specifics of the subject area.

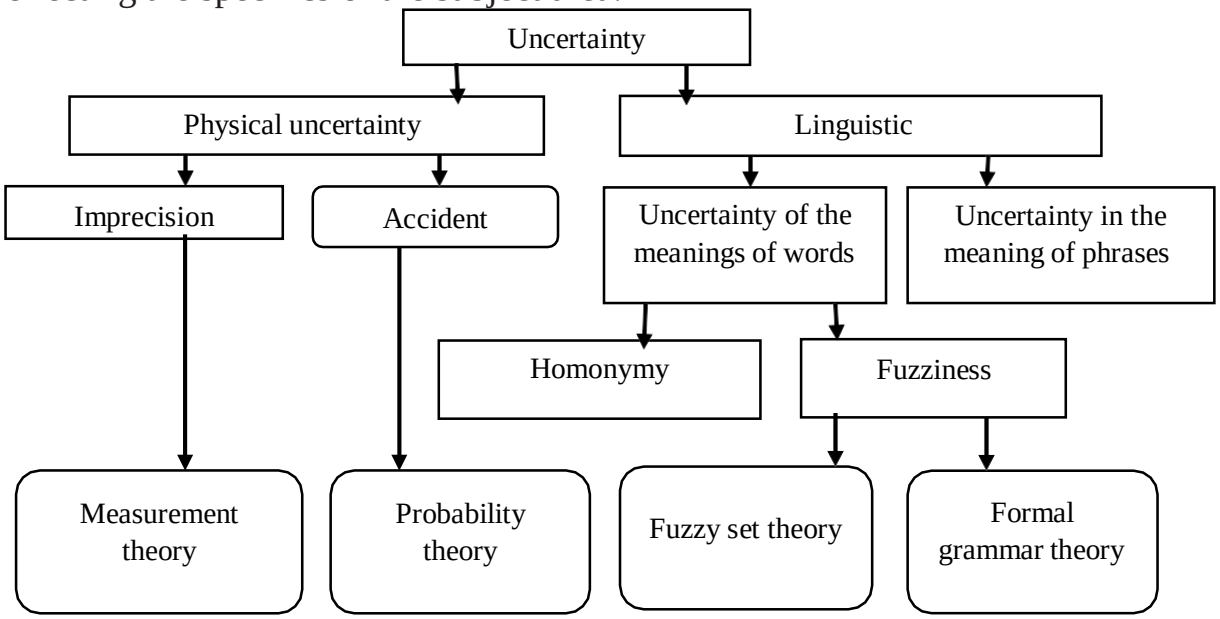


Figure 1. Types of uncertainty and associated solution methods.

Due to the fact that the main processed information is the assessment of the factors of the taxpayer's activity, which in turn is transformed into linguistic uncertainty, it is advisable to use the technology of fuzzy modeling, which makes it possible to develop correct decisions.

The proposed technology makes it possible to form new information from the data, which is of a qualitative and inaccurate nature. Which is the most promising in the field of applied research and decision making in the description of technical systems and business processes with uncertainty, where it is difficult to use traditionalmodeling methods [1,2].

A fuzzy model is understood as an information-logical model of a system, among the characteristics of which the type of uncertainty that occurs in the representation of the structure or description of the behavior of the system is distinguished. Among them are the following:

- fuzziness;
- ambiguity;
- incompleteness;
- inconsistency;
- ambiguity.

The subjectivity, uncertainty of the decision-maker can be modeled by the membership function of the analyzed factor using an admissible set of values. Fuzzy logic allows to form expert evaluations in some algorithmic form.

The main advantages of using fuzzy systems:

- operating with fuzzy input data;

- fuzzy formalization and comparison of parameters for assessing indicators;
- conducting qualitative assessments of input data and output results with appropriate handling of the degree of reliability of the data and their distribution;
- based on the principles of systems behavior, modeling complex systems and comparative analysis with a given degree of accuracy.

Analysis and results. As part of research on artificial intelligence methods, we have developed and widely used production systems for representing knowledge and drawing conclusions in expert systems. Fuzzy inference is realized on the basis of fuzzy production rules, which are close to logical models and allow to adequately represent knowledge of experts in the field of study.

The process of building a production model consists of three main stages:

- fuzzification - a procedure for finding the values of membership functions on the basis of ordinary initial data, in other words, an introduction to fuzziness;
- conclusion - the procedure for determining the degree of truth of conditions for each of the rules of the fuzzy inference system;
- defuzzification - the procedure for finding the usual value for each of the output linguistic variables (Figure 2).

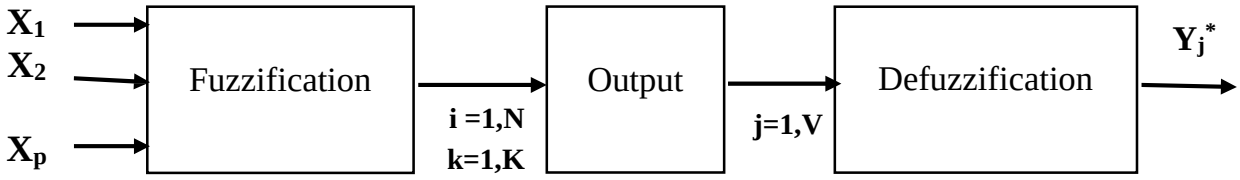


Figure 2. The structure of a fuzzy production model where, $X_1, X_2, \ldots, X_p$ - input variables; $\mathbf{Y_j}$ - output resulting variables.

The inference stage is a procedure for obtaining fuzzy inferences based on the application of fuzzy conditions. The components of this block are: a rule base, an inference mechanism and a set of membership functions for each variable, where the rule base is understood as a set of rules reflecting the logical relationships between input and output variables, and the inference algorithm allows the selection of rules.

A finite set of rules for fuzzy productions is a base of rules for fuzzy productions, the rules in which are consistent with each other regarding the linguistic variables used in them, in the form «If A, then B» (or «IF A THEN B»).

The defuzzification stage consists in obtaining for each of output variables of a quantitative value, which will subsequently be used by devices external to the system of fuzzy inference. To obtain numerical calculations, the center of gravity method was used:

$$y = \frac{\int_{min}^{max} x * \mu(x)dx}{\int_{min}^{max} \mu(x)dx}, \quad (1)$$

Where $y$ – resulting variable; $x$ – variable; $\mu(x)$ – variable membership function $x$; *min* ***and*** *max* – left and right boundaries of the interval of the crisp set of the output variable.

The stages discussed above are implemented using the Mamdani algorithm. To organize support for making effective management decisions in the taxation system, an expert system has been developed using a fuzzy inference system.

Creation of a methodology for the distribution of taxpayers by categories of attention.

In connection with the growing need to analyze large amounts of information, which has a subjective and objective nature and is associated with the solution of poorly formalized problems of various natures, an active growth of new scientific directions was required, among which is the method of data analysis [1].

Among the methods of intelligent data processing, clustering methods occupy a central place, they are the most promising and most interesting for the study of multidimensional processes and phenomena [3,4].

The task of clustering is to break down the investigated set X into several clusters (subsets), the objects in which are more «similar» to each other than to objects from other clusters, and the «similarity» in the metric space is determined through the distance [5.6].

In clustering algorithms with each object $X$ ***the vector of its characteristics is identified*** $X_i = (x_1 ,...,x_d)$, where $x_i$ , $i$ =1,...,$d$ ***presented as separate characteristics of objects,*** and through d the dimension of the space of characteristics is determined.

Subset $M = (X1, .....,X_n)$ ***consists of vectors of characteristics*** $X_i = (X_{i1},....,X_{id})$ ***and is a cluster in which objects are close in relation to each other, the distance between which is defined as*** $D(X_i , X_j)$**,** where $X_i$ ***and*** $X_j$ clustering objects [7-8].

Requirements for identifying clusters:

- each cluster should contain objects with similar values of properties and attributes and be homogeneous;
- the set of objects should be distributed across all clusters;
- clusters should be mutually exclusive, in other words, each object should not belong to two clusters at the same time.

In large sets of multidimensional data, algorithms and methods cluster analysis are indispensable as tools for preliminary analysis [1]. For this reason, the method of cluster analysis was chosen in the work to distribute taxpayers by categories of attention. At the moment, there is no one-size-fits-all solution. clustering tasks are characterized by the specifics of the area under study.

Due to the fact that, data on the activities of taxpayers act as the clustering object, the corresponding requirements can be formulated that the method used must satisfy:

- ensuring a high dimension of the data space (taxpayers are described by a large number of factors, therefore, the method must be adapted to work with a large dimension);
- providing a large amount of data (information on the activities of taxpayers is updated every reporting period, thereby increasing the database, so the method must be scalable to work with a large amount of data);
- provision of a mixed type of measurements (the behavior of a taxpayer is assessed by quantitative and qualitative characteristics, therefore it should be possible to work with different types of measurements) [9].

**Conclusion:** The performed classification of clustering methods made it possible to determine the place in the classification of the information management system in the tax service. The analysis of clustering methods made it possible to determine the ways of solving the assigned research tasks and to confirm the possibility of using the fuzzy clustering method to solve the problem of distributing taxpayers according to the categories of attention.

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# THE TECHNOLOGY OF MODULE MONITORING OF THE PROCESS AND PREPARATION OF PHYSICAL TRAINING OF STUDENTS AT HIGHER EDUCATIONAL INSTITUTIONS

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**Annotatsiya.** Maqolada talabalar jismoniy tarbiya jarayoni va ularning jismoniy tayyorgarlik darajasini kuzatish orqali modul texnologiyalari asosida monitoring qilib borish masalalari yoritilgan. Bu talabalarning jismoniy mashqlar bilan shug'ullanishga bo'lgan motivatsiyasini oshiradi. Bunday monitoring qilish axborotni ishlab chiqish va uni vizuallashtirish bilan bog'liq bo'lib, axborot texnologiyalari va maxsus kompyuter dasturlaridan foydalanish taklif qilinadi.

**Kalit so'zlar:** jismoniy tarbiya, jismoniy tayyorgarlik, pedagog, talaba, modul, monitoring, testlash, texnologiya.

**Аннотация**. В статье рассматривается вопрос о мониторинге уровня физической готовности и процесса физического воспитания студентов на основе модульной технологии. Это обстоятельство служит для повышения у студентов мотивации к выполнению физических упражнений. Данный мониторинг непосредственно связан с процессом выработки и визуализации информации, что обусловливает внедрение информационных технологий и специальных программных обеспечений.

**Ключевые слова**: физическое воспитание, физическая подготовка, педагог, студент, модуль, мониторинг, тестирование, технология.

**Abstract:** The article reveals the issues of monitoring the process of students' physical education and their level of physical fitness on basis of module technologies by observing. This increases students 'motivation to train physical jerks. Such monitoring is related to the development and visualization of information, and the use of information technology and special computer programs is recommended

**Keywords:** Physical training, physical fitness, pedagogue, student, module, monitoring, testing, technology.

**Introduction.** Physical education and sports play a key role in the comprehensive mental, moral and physical development of the younger generation. Therefore, the Law of the Republic of Uzbekistan "On Physical Culture and Sports" states that "the main task of educational institutions is to maintain and strengthen the health of students, the formation of their physical fitness and consciousness to understand its vital need." Serious attention is paid to improving the education system, educating the younger generation in our country who will ensure the development of the country. One of the important steps in this direction is the adoption of the Law of

the Republic of Uzbekistan dated September 23, 2020 No.ORQ- 637 "On Education" [1, 2].

The necessary measures are being taken on current issues related to the protection and strengthening of the health of students and the study of their physical development in accordance with the requirements of this conceptual document. Conditions are provided for the orientation of the educational process to health and the implementation of healthy lifestyles is facilitated with necessary conditions and equips. Much has been done underway to improve the medical and hygienic culture of students, to accelerate their activity in physical culture and sports, to improve the organizational and methodological aspects of the factors of formation of physical development and fitness. In particular, the task is set to identify the existing problems in the field of physical culture and sports, to determine the integration of science in the system of training with the introduction of modern science and technology to provide the continuity of the system of science, to ensure a strong connection between science and educational practice.

**The main content of the research.** Regular pedagogical monitoring of the physical and functional condition of young people in educational institutions is recognized as very important, as it is considered as a key component of health and functional status [3,4].

Therefore, a physical education teacher should be able to make timely adjustments to the exercise process for a specific group of students based on the results of testing students 'physical development, physical and functional readiness throughout the entire study period.It makes possible to assess the effectiveness of the physical education process and determine the qualitative characteristics of the physical and functional condition and health of students in higher education institutions (HEIs) only on the basis of regular observation and monitoring. The organization of such monitoring should ensure comprehensiveness, structure, integrity and dynamism. It is recognized that the process of physical education in higher educational institutions can be more qualitative and effective only through the development and application of a system for monitoring the physical and functional status of students [5,6].

The physical fitness of students, changes in the parameters of their physical development and functional capabilities over the selected time (exact dynamics) should be assessed in the process of monitoring. This ensures the objectivity of the evaluation process. The students with low or average scores on the tests will have the opportunity to get high marks in this case of monitoring, which will encourage the participants to improve their physical condition, and increase the overall level of motivation to be engaged in physical exercises. As a result, stratification of students into leveled groups based on the results of monitoring as well as diagnosing students 'physical development can be both a means of increasing the effectiveness of the physical education process and a means of increasing motivation to engage them in physical training process [7].

Organizing, conducting observation, monitoring, and the use of its resultsenables planning and implementation of tactical and strategic measures to prevent andeliminate adverse effects on the physical and functional condition of students observedin the training process. Such side effects are characterized by an increase in the tension

of the nervous system and decrease in mental abilities, as a result of increased intensity of the training process, a constant lack of physical (movement) activity of students may upsurge.

Based on the results of testing in the framework of pedagogical observation and monitoring, the following measures can be taken:

- comparative study of the degree of physical and functional training ability of students individually and in certain leveled groups;
- selection of groups for training in this or that type of exercise;
- Realization of objective and operative control of the process of physical training and its results;
- identify the advantages and disadvantages of the tools used, methods of training and forms of the organization of physical training;
- formation of reasonable and optimal plans for individual and group lessons.

Admittedly, the process of monitoring and assessing students 'physical development, physical and functional readiness, should probably be built on changes in the growth of individual parameters rather than comparing some test results with normative indicators.

**Analysis and results**. Monitoring in physical education and sports combines the processes of diagnosis, assessment and forecasting of the pedagogical process, and participates in the process of improving the physical development, functional status and physical fitness of students as a basis for action to develop and manage it. The results of pedagogical testing are the basis for assessing the level of efficiency and quality of this process figure 1.

The implementation of high-quality monitoring should ensure the uniformity of criteria and methods of assessment of physical and functional condition, and the creation of an information space, which ensures the exchange of information and allows to make certain management decisions at all levels of the physical education process (from individual to administrative).

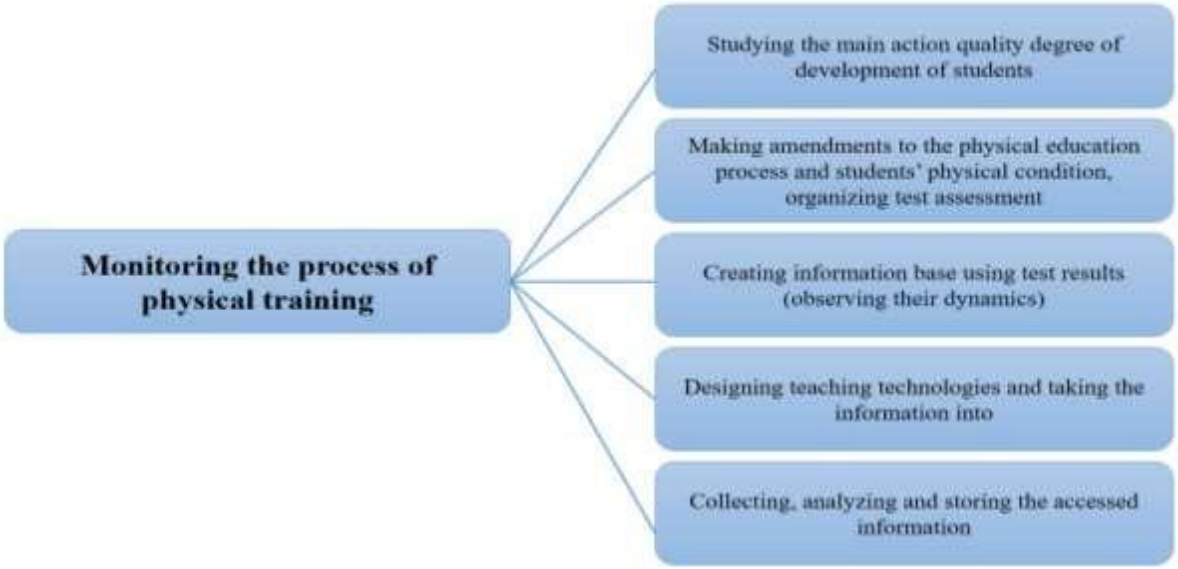


*Figure 1.* **The scheme of observation and monitoring the process of physical training of students**

It is also noted that monitoring is the most effective tool for observing, analyzing and controling the physical and functional condition of students. It allows to minimize and eliminate some of the negative consequences of the intensive learning process, as well as to increase the effectiveness of the means, methods and methodological approaches used in the process of physical training.

In general, pedagogical monitoring is an important component of the pedagogical process and any activity within it, it has goals, objectives, principles, structure and means. The main purpose of pedagogical monitoring in physical education is to justify the diagnosis and management decisions, to change the content of teaching materials quickly, to obtain information to be used, and to make adjustments to the means and methods of the training process further.

Consequently, the main tasks of monitoring are:

- to determine the relationship between the parameters of physical development, physical and functional state of students and the conditions of the educational process;
- forecasting the parameters and dynamics of all aspects of the physical and functional condition of students;
- substantiation and selection of tactical and strategic measures to correct the drawbacks in the learning process and the physical condition of the participants;
- providing all subjects of the pedagogical process with the information of complete and objective results of monitoring.

Monitoring, like any pedagogical process, is carried out within certain rules and requirements and should be conducted in accordance with clear principles. The principles of pedagogical monitoring include the followings:

- suitability of monitoring tools and instruments to the main tasks of physical training;
- providing practical direction of monitoring aimed at achieving a higher level of health, movement skills and abilities, physical development, a high level of physical and functional fitness;
- conformity of test conditions, structure and load value to individual-typological characteristics of students and specific features of their future professional activity.

Monitoring the dynamics of the physical and functional condition of students should be carried out in an organizational step-by-step manner, which provides for the following:

- selection of appropriate and common placement tests that help to assess the level of development of basic action skills of students;
- organization of testing and determination of the order of all activities;
- creation of an information base of test results (it is mandatory to monitor their dynamics);
- collection, analysis and storage of information obtained;
- providing all subjects of the process of physical education with information;
- development of measures to amend the means and methods of physical education and increase its effectiveness.

Thus, the organization and implementation of monitoring of any process in modern conditions, especially multifactorial and multifaceted monitoring, must

include the use of certain automation tools, because such monitoring is associated with the development and visualization of the information.

For this purpose, a number of information technologies, the use of special computer programs are recommended.

Henri Fayol highlighted the functions (tasks) of professionals having looked through the process of training future professionals who are not specialized in physical training. They are placed in the following order in the form of a hierarchy: 1) planning; 2) organization; 3) motivation; 4) control; 5) correction and coordination. By following these functions, the educator participates as the subject of management and the student as the object. The pedagogue should know exactly what results he will achieve in case of properly planned and organized the educational process, while organizing the process of training these non-specialists. At the same time, it is necessary to take into account the motivational aspects of students' learning activities, using the principles of awareness and activism. A diagnostic apparatus should be developed to assess the results of further training and, if it is necessary, to make adjustments to the training programs and to coordinate the activities of all management entities and facilities (by monitoring the status of trainees).

It can be concluded that in this management cycle, serious attention is paid to diagnosis and control.

The following degrees of training levels are checked in the organization of complex control over the physical abilities of trainees:

1. Integral, it shows the overall effect of the functional state of the organism.

2. Complex, it represents one of the functional systems of the organism under study. 3. Stratified, it represents only one feature of the physical system.

4. Unique, it reveals one particular property, one size, of the organism system.

**Conclusion.** In the process of physical education, the indicators of physical and functional fitness are studied and monitored. In the organization of complex control it is necessary to have a clear idea of what factors and indicators are of leading importance to ensure high physical performance. It allows for the stratification of key parameters that have a major impact on physical performance as well as the final result. Therefore, a similar approach can be proposed for the stratified observation and monitoring of physical fitness indicators of future specialists of universities that are not specialized in physical education.

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# METHODOLOGY FOR QUANTITATIVE ASSESSMENT OF COMPETENCIES OF HIGHER EDUCATION GRADUATES BASED OF A COMPETENCE APPROACH

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**Abstrakt.** Maqolada kompetensiyaga asoslangan yondashuv asosida tayyorlanayotgan oliy ta’lim muassasalari bitiruvchilarining kompetentsiyalarini miqdoriy baholash muammosi ko‘rib chiqiladi. Menejment yo‘nalishi bitiruvchilari guruhida algoritmni sinovdan o‘tkazish bilan bo‘lajak kadrlar malakasini kvalimetrik baholashning innovatsion metodologiyasi ishlab chiqildi.

**Kalit so'zlar.** Bitiruvchilarni miqdoriy baholash, kvalimetriya, uzluksiz ta'lim paradigmasi, kompetentsiya, kompetentsiya yondashuvi, asosiy ko'nikmalar, ish beruvchi, metodologiya, ta'lim koeffitsienti, chegara va nominal qiymatlar usuli.

**Аннотация.** В статье рассматривается проблема количественной оценки компетенций выпускников высших учебных заведений, обучающихся на основе компетентного подхода. Разработана инновационная методика квалиметрической оценки компетенций будущих кадров с апробацией алгоритма на группе выпускников управленческого направления.

**Ключевые слова.** Количественная оценка выпускников, квалиметрия, парадигма непрерывного образования, компетентность, компетентностный подход, базовые навыки, работодатель, методология, коэффициент образования, метод предельных и номинальных значений.

**Abstract.** The article discusses the problem of quantitative assessment of the competencies of graduates of higher educational institutions, trained on the basis of a competency-based approach. An innovative methodology for qualimetric assessment

of the competencies of future personnel has been developed with the testing of the algorithm on a group of graduates of the management direction.

**Key words.** Quantitative assessment of graduates, qualimetry, continuous educational paradigm, competence, competence approach, basic skills, employer, methodology, education coefficient, method of limit and nominal values.

**Introduction.** Currently, qualimetric methods for assessing personnel by an employer are widely used in order to develop or form certain competencies in him.

But our task is to prepare graduates of higher educational institutions under the order of a specific employer, which is at the forefront of the competence-based approach.

Thus, in this article we have to study the possibility of using qualimetric methods for assessing the competencies of graduates of higher educational institutions in order to establish their compliance with the employer's requirements.

**Literature Review.** For the first time the term qualimetry as a science appeared in the article "The Science of Measuring Product Quality" published in the journal Standards and Quality in 1968 as a result of the work of a creative syndicate of people of different specialties and interests working in various sectors of the economy. G.G. Azgaldov, being a military engineer, studied the problems of assessing the effectiveness of the construction of structures and facilities. Doctor of Economics A.V. Glichev worked for a long time on the problem of economic evaluation of aircraft and dealt with the problems of economics of product quality. Engineers 3.N. Krapivensky, Yu.P. Kurachenko and D.M. Shpektorov - developed the issues of a comprehensive economic assessment of improving the quality of cars and motorcycles, being car manufacturers.

V.P. Panov worked on the creation of automated planning and control systems for large complexes of development work and studied the problems of assessing the effectiveness of improving product quality. M.V. Fedorov worked on assessing the quality of products from the standpoint of technical aesthetics.

Without limiting the generality, it can be argued that all these specialists at the same time came to the conclusion that then a new independent branch of scientific knowledge began to form - the science of measuring product quality - which they proposed to give the name qualimetry [7].

Our task is to consider the possibility of applying the qualimetric methodology to solving the problem of assessing the professional competencies of graduates of higher educational institutions in accordance with the requests of employers.

In our research, we rely on the experience gained as a result of the work of the authors Shvets V.E., A.B. Moller, O. N. Tulupova, A.S. Limareva, D.V. Navarova, E. Solovyova and others [8-11].

**Research Methodology.** In order to form a skill, it is necessary to acquire knowledge that has to be worked out in practice. Knowledge is information that we receive from various sources of information and remember for ourselves. An attempt to apply knowledge in practice gives the first unexperienced experience, which is a skill.

As for the skill, it will be formed when the skill comes to automatism. There is a so-called "core" of common skills, at the center of which are "Basic skills" used in any activity in the modern world, for example, the ability to read, write and count.

All modern people, regardless of the world of work, possess such skills, but today this is no longer enough.

So, let us single out a number of "basic skills" and the so-called competencies of university graduates that will be in demand in any field of human activity in the context of the globalization of the labor market (Table 1).

**Table 1**

**Basic Competencies of Graduates of Higher Education Institutions**

| № | Basic Competencies | Role |
|---|---|---|
| 1 | Concentration and attention management | They help to cope with information overload and manage complex equipment. |
| 2 | Emotional literacy. | Helps to preserve oneself and interact with others through emotion, empathy and empathy. What is nonviolent communication and how to use it |
| 3 | Digital literacy. | Helps to work in a digital environment. Digital literacy will be just as important as writing and reading skills. |
| 4 | Creativity | It helps to think outside the box, to create something new in the conditions of automation of routine work. |
| 5 | Learning ability / Self-study (skill). | Helps you learn throughout life and independently master skills in a rapidly changing world. |
| 6 | Cross functionality | Ability to work at the junction of two or more areas. Helps to be out of competition in the labor market. |

The traditional utilitarian industrial educational paradigm covered the population with education to prepare for the future life, and the modern integral paradigm, the transition to which we will not bypass, presupposes the education of people throughout their life - this is a continuous paradigm. In addition, it makes no sense to expand educational programs at the university, including more and more knowledge, skills and abilities. Because, most of the skills of specialists in a "complex" workplace are unique highly specialized skills. They are used by one or more employees in each enterprise or in the entire industry.

Due to current trends, employers have revised the requirements for applicants, the demand for cross-functional specialists has increased. A cross-functional specialist develops a career along a path that either no one has followed before, or a very limited number of people have followed. Therefore, it is important to plan your career and develop professional competencies around related areas in order to be out of competition. To do this, you need to determine what competencies to develop, for what purpose and thanks to what resources. Careful planning of your career will allow you to stand out in the labor market, qualify for a high level of income and avoid emotional burnout. To quantitatively assess the quality of professional competencies acquired by

a graduate of a higher educational institution, you can use the methodology of qualimetry (from the Latin "qualis" - what quality and the Greek "metreo" - to measure, measure) - a scientific discipline in which the methodology and problems of complex, quantitative assessment are studied the quality of objects of any nature: animate or inanimate, objects or processes, products of labor or products of nature that have a material or spiritual nature. The object of qualimetry is the study of the principles and methods of quality assessment, and the subject is the totality of the properties of objects and processes that make up quality, with which a person contacts in his practice. Qualimetry is usually subdivided into theoretical, which studies the problems of quality assessment in general, and applied, which considers the issues of measuring quality in relation to specific objects.

Qualimetry as a science is in its infancy, which explains the lack of consensus on a number of issues.

Being to a large extent a scientific discipline of an interdisciplinary nature, Qualimetry on many issues merges with specific engineering disciplines: standardization, metrology, economics, organization of production, law, psychology, etc., and its apparatus includes a whole group of mathematical theories [6].

## METHODOLOGY FOR ASSESSING THE QUALITY OF COMPETENCES ACQUIRED BY GRADUATES

To ensure the planned effectiveness of the quality management system, the level of qualifications of university graduates must meet the high requirements of the level of mechanization and automation of production, informatization and computerization of all spheres of the economy and labor. According to the requirements of international standards, personnel is a strategic resource in the quality management system, and the factors influencing the provision and improvement of the quality level are social. Accordingly, the joint task of universities and employers is the problem of reproducing the intellectual potential of human resources that meet the requirements of the labor market.

Analysis of the existing complex indicator of competence for employees of higher educational institutions and the results of an expert survey, a new criterion of competence was obtained for assessing the level of qualifications of graduates in a certain area of the economy, for example, management [1-4].

Quantitative indicators can be used as criteria for assessing the quality of vocational training of graduates.

Practical implementation implies a simplified approach, when qualitative assessments of the labor potential of graduates are limited to data reflecting the educational and qualification levels, the availability of special vocational training and its duration.

One of the options for the system of indicators of the labor potential of graduates is the use of an assessment of the complex indicator of the graduate's competence.

This indicator allows a comprehensive approach to assessing the competence of a university graduate, taking into account individual characteristics.

The proposed methodology involves calculating the cumulative effect of the corresponding indicators or competency criterion as the sum of the $K_{edu}$ education

coefficient - the average score acquired at the university of education, and the cumulative effect of the corresponding indicators in the form of their product:

$$K=\prod_{i=1}^{n} K_i$$

For example, to assess the competencies of a graduate of a higher educational institution in the direction of management, consider the basic competencies proposed in this article above: $K_1$ - concentration and attention management, $K_2$ - emotional literacy, $K_3$ - digital literacy, $K_4$ - creativity, creativity; $K_5$ - ecological thinking; $K_6$ - cross-cultural; $K_7$ - the ability to learn / self-study; $K_8$ - cross-functionality, etc.

Of course, the list of features can be expanded and this technique can be applied in various fields, including production, but for simplicity, we will focus on eight basic features. Obviously, the coefficient of formation of $K_{edu}$, unlike other coefficients, does not change over time.

$$K_к = K_{edu}+\prod_{i=1}^{n} K_i \qquad (1)$$

This technique allows you to assess several factors of a graduate's competence. In this case, the possible lack of one indicator is compensated by another, higher one. The criteria are assessed according to a five-point system. To evaluate each criterion, the result of a psychological test is used.

From the point of view of the practical implementation of this technique, its adaptability to solving certain problems is essential. For this, depending on the requirements of a certain employer, he can independently assign the values of the significance coefficients or the weight of each criterion $x_i$, $i = 1, .., n$, based on the needs of the enterprise. The methodology described in (1) does not provide for a differentiated recruitment for specific personnel. Therefore, we have

$$x_i=1 \quad , i=1,..,n \qquad (2)$$

If we add additional competency criteria for management personnel, for example, those given in Table 1, then this qualimetric method will allow us to differentiate the level of training of a graduate in the field of management - from a performer, a middle manager to a manager. Taking into account the weights, the coefficient of competence takes the form:

$$K_k=K_1x_1\ K_2\ x_2K_3\ x_{3...}\ K_n\ x_n \qquad (3)$$

Qualimetric assessment of the competence of graduates is carried out on the basis of a differential method to determine the relative indicators of the competence of a graduate. With regard to graduates, it shows how the actual level of competence relates to the baseline, which in this case is considered as required:

In order for the employer to independently select the required personnel from among the graduates, it is necessary to simplify the determination of the significance coefficients. For this purpose, the method of limit and nominal values was applied:

$$x_i=\frac{1/(Q_i^{н}-Q_i^{пр})}{\sum_{i=1}^{n} 1/(Q_i^{н}-Q_i)} \qquad (4)$$

where $Q_i^{н}$– is the nominal value of the indicator $Q_i$ , $Q_i^{lim}$- limit value of the indicator $Q_i$ . In our case, the limit value is 5. The nominal value is set by the employer in accordance with the qualification requirements for a particular position. In this method, the complex value of the competence coefficient does not change, since the condition

is met:

$$\sum_{i=1}^{n} x_i=1 \qquad (5)$$

Let us consider this method in relation to the assessment of the qualifications of graduates of a higher educational institution according to the requirements of a particular employer. With regard to personnel, it shows how the actual level of competence relates to the baseline, which is considered here as required:

$$q_i=\frac{P_i}{P_i^7} \qquad (6)$$

where $P_i$ – the current value of the integrated indicator of competence. Competence level ($P_i^8$) we define from the condition that all coefficients correspond to the base value, that is, equal to 3:

$$(P_i^7)=3+3^6=3+729=732$$

The qualimetric assessment of the competence of a graduate of a higher educational institution according to formula (6) means the degree to which the graduate reaches the minimum level of competence. Here, in relation to the graduate, it shows how the actual level of competence relates to the basic or acceptable level of competence of the graduate (Table 2).

**Table 2**

**Qualimetric assessment of the competence of a graduate of a higher educational institution**

| Relative indicator of graduate competence | The base value of the indicator of competence | The best value of the indicator of competence | The maximum value of the relative indicator of the graduate's competence |
|---|---|---|---|
| $q_i=\frac{P_i}{P_i^7}$ | $P_i^7=732$ | $P_i^{max}=15625$ | $q_i^{max}=\frac{P_i}{P_i^7}=21,34$ |

**Analysis And Results.** According to the proposed method, a qualimetric assessment of the competence of graduates in management was carried out. Selected assessment results for graduates of one direction are shown in Table 3.

**Table 3**

**Qualimetric assessment of the competence of graduates in management.**

| **Graduate's FNS** | $K_{edu}$ | $K_1$ | $K_2$ | $K_3$ | $K_4$ | $K_5$ | $K_6$ | $K_k$ | $q_i$ |
|---|---|---|---|---|---|---|---|---|---|
| Ivanov I.I. | 3,50 | 4,40 | 3,00 | 3,30 | 1,00 | 2,70 | 3,33 | **92,51** | 0,12638 |
| Ivlev K.I. | 4,10 | 1,00 | 2,50 | 3,40 | 3,76 | 3,30 | 3,70 | **394,33** | 0,538702 |
| Petrov P.P. | 4,20 | 3,75 | 1,00 | 1,00 | 3,00 | 3,10 | 2,75 | **100,10** | 0,136749 |
| Platonov A.R. | 3,75 | 3,50 | 3,30 | 3,40 | 3,00 | 3,20 | 3,00 | **1134,72** | 1,550164 |
| Kostalevsky I.G. | 3,90 | 4,00 | 3,50 | 4,00 | 3,40 | 2,00 | 2,00 | **765,5** | 1,045765 |
| Bolgarov V.I. | 4,20 | 3,60 | 3,40 | 3,00 | 3,00 | 2,00 | 3,20 | **709,22** | 0,96888 |
| Plotnikov M.M. | 4,65 | 3,70 | 2,50 | 3,60 | 3,10 | 2,60 | 3,00 | **809,84** | 1,106339 |
| Volkov O.I. | 4,60 | 4,20 | 3,80 | 3,75 | 3,80 | 4,00 | 4,10 | **3734,45** | 5,101708 |
| Kharisov M.A | 4,85 | 4,00 | 4,10 | 4,00 | 4,80 | 4,75 | 4,80 | **7184,11** | 9,814358 |
| Vragov V.A. | 4,85 | 4,30 | 4,40 | 4,30 | 4,70 | 4,50 | 4,70 | **8092,04** | 11,0547 |
| Arithmetic mean | **4,26** | **3,64** | **3,15** | **3,37** | **3,35** | **4,21** | **4,45** | **2301,68** | **3,14** |

A general analysis of Table 3 allows us to draw conclusions:

- 3 out from of 10 graduates have a level of competence corresponding to the basic;

- the highest value of the relative indicator is 11.05, which corresponds to 51.7% of the maximum possible value of the indicator.

The lowest values have the coefficients of emotional literacy $K_2$ and $K_4$ – creativity.

Therefore, during the period of study, it is worth paying more attention to increasing the level of emotional literacy, the development of creativity and creativity.

Assessment of the competence of graduates in the described way allows you to determine the adequacy of qualifications for the purpose of their successful employment [14-17].

**Conclusions.** Thus, when assessing the competence of graduates of higher educational institutions on the part of the employer, several factors are taken into account, as a result, the lack of one indicator is compensated by the high level of another. The described technique has the following properties [18-20]:

- adaptability, which allows you to set the value of indicators depending on the required competency requirements;

- ease of implementation, the ability to take into account a complex of factors without time-consuming operations using a single numerical value based on documents, which allows you to objectively compare graduates in accordance with the requirements of the employer;

- compliance with international standards for the quality management system.

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# THE EFFECTIVE USE OF CROSS-CULTURAL ACTIVITIES IN TEACHING ENGLISH

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**Annotatsiya:** Talabalar o'yin o'ynash orqali ruhiyati ko'tariladi. O'yinlardan foydalanish, ayniqsa madaniyatlararo o'yinlar yoki mashg'ulotlar o'quvchilarning kayfiyatini ko'taradi va darsga bo'lgan qiziqishini oshiradi, hatto tortinchoq ya uyalchan o'quvchi ham o'yinli darslardan keyin faol bo'lishi mumkin. Talabalar madaniyatlararo tadbirlarni o'ynashda mas'uliyatni his qilishadi va yanada kuchli harakat qilishadi. Bunday faoliyat ularning tanqidiy fikrlash va yetakchilik qobiliyatini rivojlantiradi. Agar ular ushbu harakatlarni ba'zi kichik guruhlarga bo'lingan holda o'ynasa, yanayam yaxshi natija beradi. Guruhda ishlash va jamoada ishlash talabalarning aql-zakovati va xarakteriga ta'sir qiladi.

**Kalit so'zlar:** faoliyat, boshlang'ich, o'yinlar, madaniyatlararo, ta'lim tizimi, ustuvorlik, aqliy.

**Аннотация:** Игровая деятельность очень мотивирует учащихся. Использование игр, особенно межкультурных занятий, поднимает настроение учеников и развивает их интерес к уроку, и даже сдержанный ученик может стать активным после игровых занятий. Студенты чувствуют ответственность и становятся более энергичными, играя в кросс-культурные мероприятия. Такие виды деятельности развивают их критическое мышление и лидерские способности. Особенно эффективно делить студентов на несколько подгрупп во время организации межкультурных игр. Групповая работа и работа в команде влияют как на интеллект студентов, так и на их характер.

**Ключевые слова:** деятельность, начальное, игры, кросс-культурный, система образования, приоритетность, ментальность.

**Abstract:** Students get really motivated by playing activities. Using games, especially cross-cultural games or activities raise students' mood and develop their interest to the lesson, and even a reserved student may become an active one after playing activities. Students feel responsibility and become more energetic while playing cross-cultural activities. These kinds of activities develop their critical thinking and leadership ability. It will give a better result if they play these activities by being divided into some subgroups. Group working and working in a team influence both students' intelligence and character.

**Key words:** activities, primary, games, cross-cultural, education system, priority, mental.

**Introduction.** Teaching is a crucially responsible and noble profession where teachers are considered to be the primary pillars of an education system. Without educators, no one in society has an opportunity for gaining knowledge and skills for growth. We know that teachers not only encourage or motivate students, but also carry out different classroom

activities for students ranging from communicating to planning to sharing creative ideas, monitoring and assessing individual students during their regular teaching. Additionally, educators may use cross - cultural activities. The way of using them effectively will improve and develop every student's knowledge efficiently.

**Literature review.** We know from decades of social science research that the identities of human beings in modern societies are complex. We live our lives constantly balancing different roles and expectations, even when we have no awareness of doing so. Language is a key element in the balancing act, the means by which we both point to and reproduce our nuanced identities. As Barrett (1999) puts it:

Speakers may heighten or diminish linguistic displays that index various aspects of their identities according to the context of an utterance and the specific goals they are trying to achieve. This practice implies that speakers do not have a single "identity" but rather something closer to what Paul Kroskrity has called a "repertoire of identity," in which any of a multiplicity of identities may be fronted at a particular moment. In addition, speakers may index a polyphonous, multilayered identity by using linguistic variables with indexical associations to more than one social category.

The specifics of any game, how exactly M.N. Skatkin, is that "learning tasks appear before a child not in an explicit form, but disguised. While playing, the child does not set a learning task, but as a result of the game he learns something. " There is no need or reason to set a goal - to rest, to switch: the nature of the game as such will do its work. As an experience of teachers and theorists shows, one of the effective methods of teaching, the use of which makes a foreign language a favorite subject of schoolchildren.

**Research methodology.** We all know that educators have a sense of full accomplishment after giving lessons to learners. Instructors are crucially satisfied if they get effective, planned outcome. I believe that all teachers try to do their best to give a lesson in a perfect way. They do some presentations, use various interactive activities to involve students and enhance their knowledge. They utilize drills and games, simultaneously, amplify students' knowledge. Every hard-working teacher tries to alter a boring lesson into an interesting and interactive one. As a result, with the help of such teaching-related activities in academies, students intensify their creativity and develop critical thinking ability.

There are a lot of advantages of using cross-cultural activities in the classroom. It helps in

1. the formation of soft skills;
2. the development of all four skills;
3. learning to communicate, to create friendly atmosphere
4. development of mental functions;
5. developing cognition and metacognition;
6. memorization.

Some decades before lessons were taught in a traditional way of teaching where students, mostly, magnified their translation and memorization skills. After some years some modern methods have been implemented in the classes where almost all students have freely interaction with each other in the target language and play theme-related

games. Using games in the classroom is the most effective way for teachers to involve all learners in an essential way where even a reserved student does his best. Playing games and doing activities cooperatively are much more important, since a shy student becomes more active and energetic so as to help his team. As experience shows, these kinds of activities allow a student to express himself no matter he is strong or weak. Very often, students who are not distinguished by good performance can show themselves here from a completely different perspective and become active participants in the game, contribute to the victory of their team. Taking all of them into consideration, I think that using games can be an important success factor for weak children, arouse their interest in the subject, and become the basis for their subsequent success in studying it.

**Analysis and results.** I always use different kinds of activities in my lessons. Students get really motivated by playing them. Using games, especially cross-cultural games or activities raise students' mood and develop their interest to the lesson, and even a reserved student may become an active one after playing activities. Students feel responsibility and become more energetic while playing cross-cultural activities. These kinds of activities develop their critical thinking and leadership ability. It will give a better result if they play these activities by being divided into some subgroups. Group working and working in a team influence both students' intelligence and character.

**Conclusion.** I highly recommend using different kinds of activities in various lessons, especially, if the lessons are devoted to learning a foreign language. Because students are much more encouraged and motivated if they play activities or games in English. Their priority will become even stronger after that. Thus, every perfect teacher should know how and what to use in the classroom, how to grab the attention of future developers. Here, inductive way of teaching gives effective results. Students do some activities and create the rules themselves.

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## MODERN PROBLEMS OF PHILOLOGY AND LINGUISTICS

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# LEXICAL-SEMANTIC INVESTIGATION OF THE LANGUAGE

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**Annotatsiya:** Ushbu maqola fe'l ma'nosining sintaktik jihatdan tegishli komponentlarini ochishga qaratilgan leksik semantik tahlil bo'yicha amaliy tadqiqotni taqdim etadi. Bizning strategiyamiz ingliz tilida so'zlashuvchining ba'zi bir semantik jihatdan bog'liq fe'llarga nisbatan ega bo'lgan leksik bilimlarining tabiatini o'rganishdir: birinchi yaqinlashish sifatida olib tashlash fe'llari sifatida tasniflanishi mumkin bo'lgan fe'llar to'plami. Biroq semantik jihatdan bir-biriga yaqin bo‘lgan bu fe’llarni sinchiklab o‘rganilsa, ularning sintaktik xususiyatlari bir-biridan farq qiladi. Fe'llarning xatti-harakatlarini o'rganish shuni ko'rsatadiki, boshlang'ich sinf uchta lingvistik ahamiyatga ega bo'lgan kichik sinflarni o'z ichiga oladi. Har bir kichik sinfni tavsiflash uchun tegishli bo'lgan ma'no komponentlari har bir kichik sinf a'zolari bo'lgan ma'no komponentlarini ajratib olish orqali aniqlanadi.

**Tayanch so‘zlar:** turkum ulushi, leksik kategoriya, sintaktik xossalar, korpus, unakkusativ gipoteza, sintaktik konfiguratsiyalar, tana jarayoni, semasiologik, onomasiologik, dixotomiya.

**Аннотация:** В данной статье представлен пример лексико-семантического анализа, направленный на выявление синтаксически релевантных компонентов значения глагола. Наша стратегия состоит в том, чтобы исследовать природу лексических знаний, которыми владеет говорящий по-английски, в отношении некоторых явно семантически связанных глаголов: набора глаголов, которые в первом приближении можно было бы классифицировать как глаголы удаления. Однако более пристальное изучение этих явно семантически связанных глаголов показывает, что их синтаксические свойства расходятся. Изучение моделей поведения глаголов предполагает, что исходный класс включает три лингвистически значимых подкласса. Компоненты значения, относящиеся к характеристике каждого подкласса, идентифицируются путем выделения тех компонентов значения, которые разделяют члены каждого подкласса.

**Ключевые слова:** доля подкласса, лексическая категория, синтаксические свойства, корпуса, необоснованная гипотеза, синтаксические конфигурации, телесный процесс, семасиологический, ономазиологический, дихотомия.

**Abstract:** This paper presents a case study in lexical semantic analysis aimed at uncovering syntactically relevant components of verb meaning. Our strategy is to investigate the nature of the lexical knowledge that a speaker of English possesses with respect to certain apparently semantically related verbs: a set of verbs that might as a first approximation be classed as verbs of removal. However, a closer examination of these apparently semantically related verbs reveals that their syntactic properties diverge. An exploration of the patterns of behavior of the verbs suggests that the initial class includes three linguistically significant subclasses. The components of meaning that are relevant to characterizing each subclass are identified by isolating those components of meaning that the members of each subclass share.

**Keywords**: subclass share, lexical category, syntactic properties, corpora, unaccusative hypothesis, syntactic configurations, bodily process, semasiological, onomasiological, dichotomy.

**Introduction.** The lexicon has recently assumed an increasingly central place in many syntactic theories, as more and more facets of the syntactic configurations that verbs and other argument-taking elements are found in are seen to be projections of their lexical properties. Consequently, much effort has been devoted to investigating the nature of their lexical representation. Ideally, a lexical entry should minimize the amount of information necessary for any given word. This goal can be achieved by factoring any predictable information out of lexical entries. The meaning of a word must be part of its lexical entry, since an important part of knowing a word is knowing its meaning. The question is whether this is all that needs to be learned and, more specifically, whether a word's syntactic properties (i.e., the syntactic configuration) it can appear in) are predictable from its meaning. Chomsky (1986), for example, speculates that only the meaning of a verb needs to be learned. Much research has focused on precisely this issue by exploring to what extent the syntactic properties of verbs - the lexical category with the most complex properties - can be derived from their lexical semantic properties.

**Literature review and methodology.** That the meaning of a verb plays a large part in determining its syntactic properties is clear from a variety of facts concerning the syntactic expression of arguments to verbs. To take a simple example, consider the frequently made observation that verbs that denote an agent acting on and causing an effect on a patient, such as *cut* or *destroy*, figure among the transitive verbs of any given language. Observations such as these indicate that the meaning of a verb plays some role in determining its syntactic properties. There are two open questions: first, how much does the meaning of a verb determine its syntactic properties; and, second, a question which will be the focus of this paper, to the extent that syntactic properties are predictable, what components of verb meaning figure in the relevant generalizations?

These two questions cannot be approached independently. There are many ways verbs can be potentially classified according to their meaning, and the wrong classification might well preclude the statement of the correct generalizations in the semantics to syntax mapping, suggesting that the relation between the two is more idiosyncratic that it actually is. Some illustrations will help to clarify this point.

To begin with a rather extreme example, a natural class of verbs from the point of view of meaning might be the set of verbs that describe things that can be done to books (essentially, the set of verbs that take the word *book* as one of their typical objects). An investigation of machine-readable dictionaries (Boguraev, 1991; Boguraev, Byrd, Klavans, & Neff, 1989), followed up by an investigation of on-line text corpora (Klavans, personal communication), reveals that this is quite a large class of verbs. Among its members are the verbs *abridge, autograph, ban, borrow, bowdlerize, catalogue, censor, commission, consult, entitle, print, publish, read, remainder, review, write.* However, as far as we can tell, there is no evidence that this set of verbs is linguistically significant.

**Discussion.** As this example illustrates, it is not easy to uncover the components of meaning that figure in the statement of generalizations such as the one just discussed. Some of the problems said to face attempts to determine syntactic behavior from meaning might simply stem from the use of the wrong facets of meaning in the statement of generalizations. Given that regularities exist, it is important to determine the components of meaning that figure in determining a verb's syntactic properties, even if ultimately it turns out that not all of these properties of a verb are fully predictable from its meaning (for some discussion see Jackendoff, 1990).

This paper presents a case study in lexical semantic analysis aimed at uncovering syntactically relevant components of verb meaning. Our strategy is to investigate the nature of the lexical knowledge that a speaker of English possesses with respect to certain apparently semantically related verbs: a set of verbs that might as a first approximation be classed as verbs of removal. However, the syntactic properties of these apparently semantically related verbs turn out on further examination to diverge. An exploration of the patterns of behavior of different verbs with respect to these syntactic properties suggests that the initial class includes three linguistically significant subclasses of verbs. The components of meaning that are relevant to characterizing each of the subclasses are identified by isolating those components of meaning that verbs in each subclass share. In the Conclusion we consider the implications of these meaning components for a lexical semantic representation. The challenge then is to find ways to do linguistic analysis when it is possible and to the extent that it is feasible. We claim that a promising approach is to perform a careful linguistic preprocessing of the texts, representing linguistically encoded information in a task independent, faithful, and reusable representation scheme. We propose a representation scheme, MTR1 (for Minimal Text Representation) that does not constitute a text interpretation (nor does it "extract" or "detect" any particular information) but rather forms a common intermediate representation that must be further processed with the particular domain, task, and representation formalism in mind. The benefit of an intermediate representation at thelevel of MTR is that certain computationally expensive linguistic analyses do not have to be reduplicated for different tasks.

The introduction of an intermediate representation (which has to be further evaluated) that also supports partial representation and thus incremental analysis of texts enables the cooperation of independent and specialized analysis modules that can be developed partly independently.

Lexical choices are determined by the semasiological and onomasiological characteristics of the items involved: a referent (or set of referents) is expressed more readily by a category of which it is a central member, and it is expressed more readily by an item with a higher entrenchment value. Ever since the earliest research on language, syntactic categorization of lexical items has played an important role in linguistic description and theorizing.

**Result.** A central dichotomy in the categorization of syntactic categories is that between content words (also called: lexical or substantive categories) and function words (also called: functional categories). Content words are often characterized as being those lexical items which have a relatively 'specific or detailed' semantic content and as such carry the principal meaning of the sentence. They name the objects (Noun), events (Verb), properties (Adjective) and locations/directions (Preposition) that are at the heart of the message that the sentence is meant to convey. As opposed to content words, function words have a more 'non-conceptual' meaning and fulfill an essentially 'grammatical' function; in a sense they are needed by the surface structure to glue the content words together, to indicate what goes with what and how. The abstract meaning of the functional domain comprises such properties as: tense, modality, definiteness, number, degree, interrogativity, etc.

**Conclusion.** Although there is, of course, an intuitive plausibility underlying this major distinction in the system of syntactic categories, one of the aims of linguistic theory should be to make this dichotomy more precise, i.e. to define what the 'functional properties' are that make a lexical item into a function word and what the 'content/lexical properties' are that characterize a lexical item as belonging to the class of content words (i.e. lexical categories). An often referred to property distinguishing the two types of categories is that of openness of membership.

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**UDK: 537.534**

# ELECTRON SPECTROSCOPY OF DEFECTS ON THE SURFACE SILICON DIOXIDE

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**Annotatsiya.** Kremniy sirtini o‘rganish uchun to‘liq tok elektron spektroskopiya uslubi ishlatilgan. 0,5-0,9 eV qo‘zg‘alish energiyasi oralig‘ida to‘liq tok spektrlarida kis lorod yetishmovchiligi markazlari borligi aniqlangan. Kremniyni yuqori haroratlarda qizdirish bu cho‘qqining intensivligi pasayishiga olib kelishi aniqlangan. Kislorod yetishmovchiligi markazlarining intensivligi ortishi bilan kremniy yuzasida oksidlanish darajasi ham oshib borishi ko‘rsatilgan.

**Kalit so‘zlar:** kremniy; elektron spektroskopiya; qizdirish; sirt;

**Аннотатция.** Методом электронной спектроскопии полного тока проведены исследования на поверхности кремния. В спектрах полного тока н при энергии возбуждения 0,5-0,9 эВ, найдено кислородно дефицитный центр. Обнаружено, что при высоких температурах кремния, интенсивность данного пика низкая. Показано, что с увеличением интенсивности кислородно дефицитного центра, скорость окисления на поверхности кремния тоже увеличивается.

**Ключевые слова:** кремний; электронная спектроскопия; отжиг; поверхность;

**Abstract:** The total current electron spectroscopy was used to study the silicon surface. In the spectra of the total current n at an excitation energy of 0,5-0,9 eV, an oxygen-deficient center was found. It was found that at high silicon temperatures, the intensity of this peak is low. It is shown that with an increase in the intensity of the oxygen-deficient center, the oxidation rate on the silicon surface also increases.

**Keywords:** silicon; electron spectroscopy; annealing; surface;

**Introduction.** Before obtaining the gates of semiconductor devices, it is necessary to the purification of the silicon substrate surface from the oxigen at ion bombardment wiht after 800 °C annealing. In this technological process, many times one has to collide with the silicon surface during oxidation, chemical and physical adsorption of gases, ion bombardment, etching, and after annealing [1–3].

The results of studies of the band structures of silicon and silicon dioxide show that the distributions of the density of states of these semiconductors are similar, in the valence band (0-15 eV) there are 3 maximums of the density of electron occupied states [4, 5].

The conduction band is characterized by 2 extremums in the energy range between the vacuum and Fermi levels. According to the density-of-state function, the total current spectrum of silicon and silicon oxide should not contain an intense fine

structure. However, as already noted in [6–9], the surface of these substances is characterized by a high degree of covalent bond (51%), the energy structure of the near-surface region can differ significantly from the bulk one and undergo a strong geometric rearrangement. Also, many oxide crystals are being actively studied in terms of their large band gap [10–14].

In the course of research, it was repeatedly determined that in the process of oxidation and cleaning of the surface, silicon has a great influence on the formed surface defects, and their participation in a particular physical process, affecting the surface state of the substrate. In this regard, a comparative study of the total current spectra of silicon and silicon oxide is of certain interest.

Thus, we were tasked with experimentally finding the role and influence of surface states, vacancies, interstitial and impurity defects on the cleaning and oxidation of the silicon surface. In this work, we consider the experimental results of studies of the formation of defects and their effect on oxidation on the surface of Si (111) and $SiO_x$ crystals under irradiation with electrons and ions using various techniques. The objects of research were wide-gap crystals of oxidized silicon.

**Experimental methods and materials.** To get acquainted of the methods of total current spectrometry you need to follow the link [15–19]. For the obtained total current spectra of silicon crystals is irradiated with electrons an energy of 0-20 eV, and with current of ~ $10^{-8}$ A. For surface purification was used mass spectrometry. Wafers of p-type silicon crystals with (111) face orientation (KDB-7.5) was used. The surface of the silicon wafers was purificated at ion bombardment and after annealing [5]. The working vacuum during the research was $10^{-9}$ Torr.

The interval between registrations is 5 minutes, the recording time of spectra is 15 seconds. This allows us to determine the oxidation time with an accuracy of 1 minute.

**Results and its discussion.** As we have already stated several times, each time before carrying out the research, the silicon substrate was cleaned from oxide by ion irradiation and after annealing; we obtained the total current spectra of pure silicon with a 7x7 structure (Fig. 1). As mentioned earlier, an intense peak is observed in the low-energy side of the total current spectrum at an absorption energy with a spread of 0,5-0,9 eV. With a decrease in the substrate temperature below 100 ° C, its intensity begins to increase to room temperature. Also, its intensity is inversely dependent on oxidation and temperature, which gives it surface properties. Thus, the existence of an oxygen-deficient center - HBOHC - was found at the interface of the silicon surface [20]. When oxygen is adsorbed onto the silicon surface, its intensity decreases significantly.

In fig. 1 shows the spectrum of total current silicon after ion etching and after annealing at a temperature of 700 °C (1), 2- during annealing at a temperature of 500 °C for two hours, 3- half an hour after annealing without action and 4- one hour after annealing without action. As can be seen, an intense peak is observed in the total current spectrum at an absorption energy with a spread of 0,5-0,9 eV. Its intensity decreases during annealing at a temperature of 500 °C for an hour (curve 2). Half an hour after annealing, the intensity of this peak increases again. As can be seen (curve 4), after an hour, the elements of the total current spectra of the physical adsorption

of the residual gas again appear on the surface of the sample. According to the literature [21] Skudzha, in his works on silicon, an intense peak formed at an absorption energy of 0.9 eV, calls the E '- center or surface variant of HBOHC, POR and ODC defects.

Thus, it was determined that after cleaning by ion etching, the stabilization of the surface by thermal annealing (slow decrease in temperature to room temperature) for several hours leads to an increase in the surface oxidation time up to an hour. An increase in the annealing time decreases the intensity of the 0.5 eV peak by several times. With a sharp cooling of silicon, the intensity of this center increases.

Thus, with an increase in the concentration of a given center on the silicon surface, the surface oxidation rate also increases. Defects on the silicon surface create conditions for a chemical reaction with residual gas atoms in a vacuum.

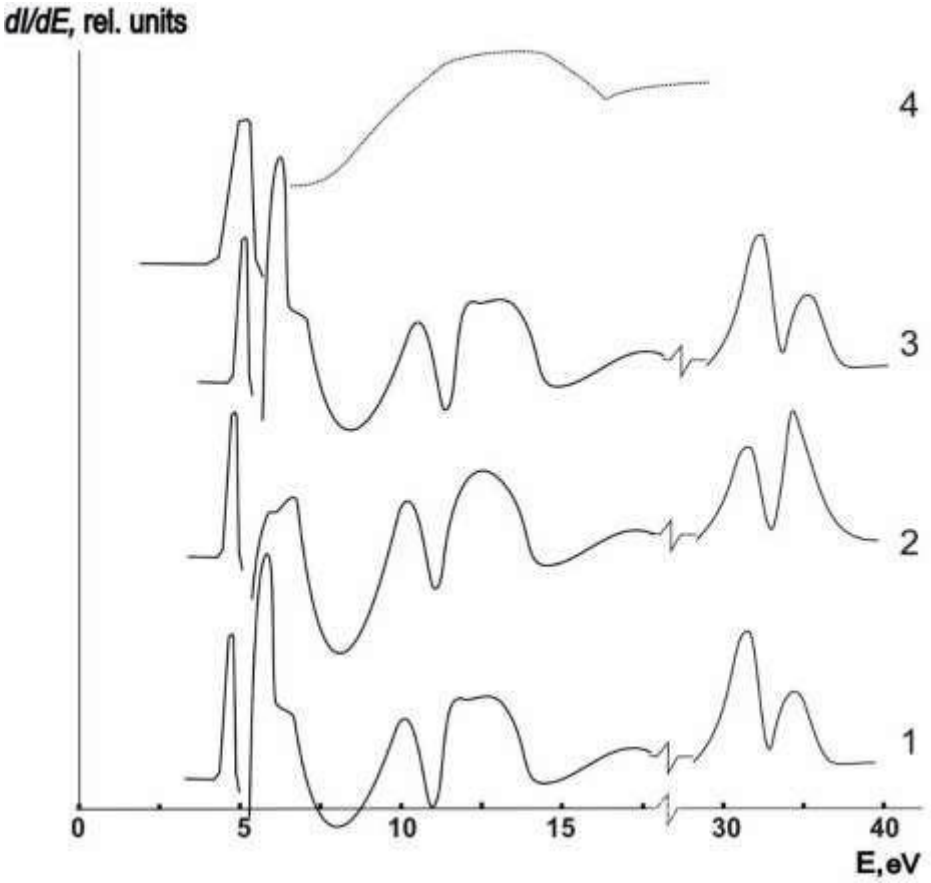


**Figure 1.** Silicon total current spectrum:
1-pure silicon with the structure (7x7), 2- passivation at a temperature of 500 °C for an hour, 3- after half an hour without action, 4- after an hour without action (physical adsorption of residual gas)

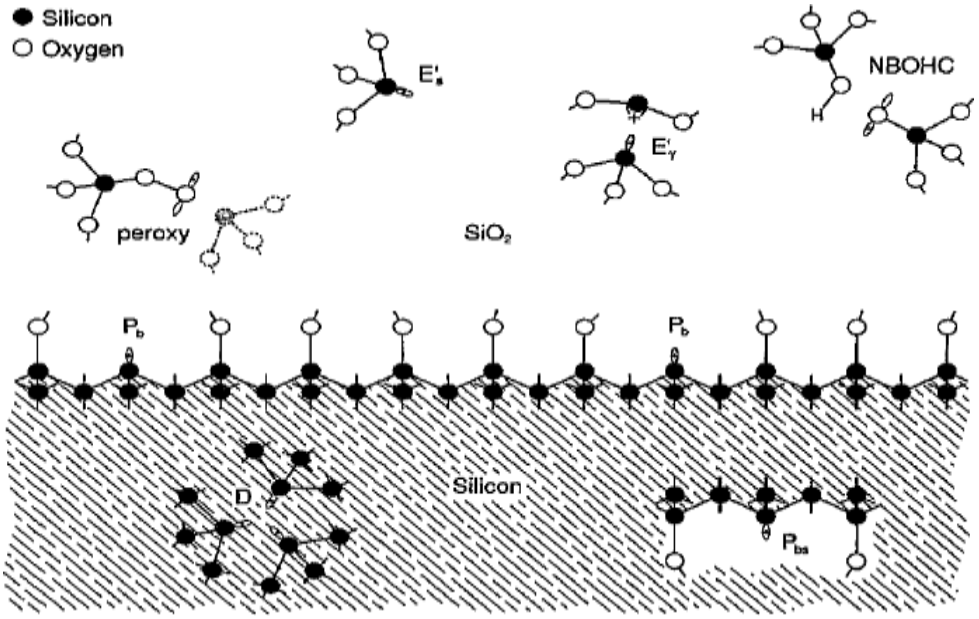


**Figure 2.** Crystal structure of the SiO2 surface and possible defects

In fig. 2 shows an approximate crystal structure of the SiO2 surface, and possible centers on the silicon surface [22].

To complete the picture of such defects at the semiconductor-oxide interface, we need to carry out further research.

Numerous studies of the 0.5 eV peak in the total current spectrum of silicon allowed us to obtain the following temperature and kinetic dependences (Fig. 3). After irradiation of the silicon surface with cesium ions, the substrate was annealed at a temperature of 700˚C to obtain pure silicon with the Si (111) 7x7 structure. After obtaining the total current spectrum, stabilization was carried out, or, one might say, passivation at different temperatures for an hour. Then the total current spectrum was again recorded and the intensity of the 0.5 eV peak was monitored. Then, without any action, the spectrum of pure silicon was monitored. We received the following data:

The surface passivation was carried out at a temperature of 700˚C. After 15 minutes, the spectrum of the pure silicon surface did not change. In our case, passivation is the transition of the crystal surface to an inactive, passive state associated with deactivation of defects to reduce the role of chemical reactions promoting adsorption. In technology, passivation refers to the technological process of protecting metals from corrosion using special solutions or processes that lead to the creation of an oxide film.

Then the surface was passivated at a temperature of 600˚C. After that, the spectrum of the surface of pure silicon did not change for 25 minutes. Then the surface was passivated at a temperature of 500˚C. In this case, the silicon surface remained clean for an hour. Further passivation at temperatures below 500˚C on the surface of pure silicon was the adsorption of residual gas for 10 minutes. (fig. 3).

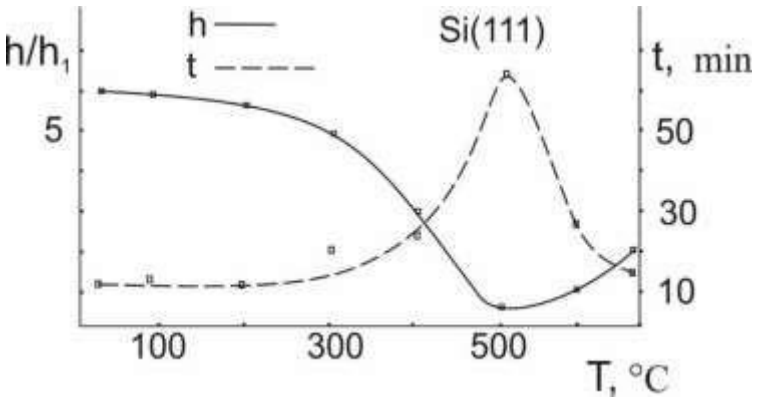


**Figure 3.** Kinetic and temperature dependence of the relative intensity of the 0.5 eV peak on the silicon crystal surface, (h is the defect concentration, t is the time during which the silicon substrate remained pure without oxide)

Voronkov obtained a similar result in his studies [14]. Experiments have shown that the generation of low-temperature thermal donors in silicon is sensitive to the sample cooling rate (from the annealing temperature to room temperature) and to the atmosphere (air or vacuum). This effect is most pronounced in the case of annealing at 500˚C, noticeable at 480˚C, but almost absent at 450˚C. The results are well explained by the acceleration of the generation of thermal donors in the presence of intrinsic silicon interstitials. These atoms are emitted by thermal donors and then absorbed by sinks - the sample surface and bulk microdefects (vacancy pores). During vacuum annealing, the main drain is the surface. When annealed in air, this drain is "passivated" due to oxidation or contamination, and the pores become the main drain; as a result, the concentration of silicon atoms increases significantly and the generation rate increases. Rapid cooling of the samples leads to partial passivation of the pores (due to their decoding by rapidly diffusing impurities) and to an additional increase in the generation rate.

Thus, the observed 0.5 eV peak in the total current spectrum really belongs to local states on the silicon crystal surface. Apparently, its concentration on the silicon surface affects the rate of gas adsorption. Defects on the silicon surface create conditions for a chemical reaction with residual gas atoms in a vacuum. Further studies are needed to complete the picture of such defects at the semiconductor-oxide interface.

**Conclusion.** It was noticed that after cleaning by ion etching, stabilization of the surface by thermal annealing for several hours leads to an increase in the oxidation time of the surface up to an hour. An increase in the annealing time decreases the intensity of the 0,5-0,9 eV peak in the total current spectrum by several times. It is shown that this maximum is associated with surface oxidation. Thus, in the total current spectra on the silicon surface, the existence of a surface center at an excitation energy of 0,5-0,9eV was found, which is called an oxygen-deficient center in the literature. With a sharp cooling of silicon, the intensity of the detected peak increases. With an increase in the intensity of the peaks of the found centers on the silicon surface, the rate of surface oxidation also increases. Defects on the silicon surface create conditions for a chemical reaction with residual gas atoms in a vacuum. When oxygen is adsorbed onto the silicon surface, its intensity decreases significantly.

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# THEORETICAL STUDY OF THE INFLUENCE OF SPACING ON THE EFFICIENCY OF CLEANING BETWEEN COTTON PRODUCERS IN THE COTTON CLEANING AREA

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**Annotation:** Currently, a lot of work is being done to improve the quality of low-grade cotton, which is difficult to clean manually and by machine, to improve product quality, reduce costs and provide the population with high-quality and affordable products. Analyzed the scientific work carried out by scientists at all stages of the production of cotton products, as well as the identification and elimination of factors that negatively affect the quality of cotton products, the creation of new resource-saving modern technologies that reduce the cost of production. Based on the analysis of the research results, the influence of speed, pressure and density between each column in the cleaning zone on the cleaning efficiency has been positively analyzed. Particular attention is paid to improving the consumer properties of cotton products due to their wide distribution. introduction into production.

Based on the results of the analysis of scientific works, theoretical equations of the effect of distance on the cleaning efficiency in the process of interaction with the column in the zone of cleaning the currently used cotton cleaning equipment from large contaminants were developed. In addition, with the help of springs that vibrate the

grating during operation, the gap increases and narrows when the cotton becomes more or less.

According to the results of the analysis, it was theoretically proved that the optimal amount of change is 1-3 mm, i.e. in the range of 15-18 mm so that the cotton vibrates with the spring when cleaning, affects the cleaning efficiency.

**Keywords**. Cotton, machine picking, hand picking, coarse dirt, sorting, waste, saw drum, grate grill, spring, vibration.

**Introduction.** Ensuring deeper processing of raw cotton in all sectors of the textile and light industry for the production of finished textile products, export of finished products such as dyed yarn, knitted fabrics to foreign countries, the active introduction of modern technologies and design are very effective for saving [1].

Comprehensive measures are being taken in the country to develop the cotton industry, modernize and re-equip cotton ginning plants, increase the profitability of the production and processing of raw cotton, as well as the competitiveness of its products. The strategy of actions for the further development of the Republic of Uzbekistan for 2017-2021, in particular, sets the task of “increasing the competitiveness of the national economy, ... reducing the consumption of energy and resources in the economy, the widespread introduction of energy. -saving technologies in production".

In the context of today's globalization and modernization of the economy, it is of great importance to reduce production costs at industrial enterprises, the solution of which will open up wide opportunities for successful participation in competition in international markets. One of the main tasks facing the republic's ginneries today is to increase production efficiency by upgrading equipment, producing high quality products, ensuring competitiveness, reducing waste and improving product quality. To overcome this problem, a lot of research work was carried out to create a new technological stream for cleaning raw cotton from the main pollutants, using innovative developments in technological processes. However, the technologies used in the country's cotton industry do not fully preserve the original natural quality of raw materials. The high content of the main pollutants in cotton and the low efficiency of the cotton cleaning and drying technology result in low quality and high cost of cotton products. It is clear that the efficiency of cleaning a product can be increased by creating an effective technology for cleaning cotton from large contaminants.

## 1. Scientific work on cleaning cotton from large impurities

### 1.1. History of the origin and development of cotton cleaning equipment from major impurities

The first sawdust cleaner BCH-2M, developed in Uzbekistan, was created in 1950. The cleaning efficiency of the device, that is, the efficiency, was low and consumed a lot of energy. After that, the cotton ginning equipment was improved and brought to its current state. Currently, scientists in this area are doing a lot of scientific work, and new improved cotton is being introduced into the production of equipment for large-scale decontamination.

On the basis of the research carried out by Sh. Khakimov [4], a new fastening device is proposed to replace the fast-bending stationary brush. To study the spinning process of this new spinning device on the surface of a raw cotton saw, a theoretical model of movement between the raw cotton spinning drums was developed.

In addition, according to the analysis of technological processes used in foreign countries, including the United States, it is recommended to clean the fibrous materials four times with a saw drum, which requires no more than 20-30 pile drums. The results of this analysis show that improvements in cotton decontamination equipment will lead to improved cotton quality.

### 1.2. Research carried out on the connection of vibration in the cleaning of cotton from large impurities to the distance between the grates and the saw cylinder

Columnar grids of cotton ginners have been modified several times by scientists in this field. The grate used today in the treatment equipment is made of ST-40 steel. Each column has 5 columns. The first and second zones for cleaning the treatment equipment will be located, as well as the grates of the same column in the process of equipping. Colossal nets play a key role in cotton cleaning. Numerous scientific studies have been carried out on coded grids and their effect on cleaning efficiency.

Nabiev.Sh [3] conducted a study to study the effect of changing the distance between the columns when cleaning cotton from large contaminants in the UVK installation on the cleaning efficiency and the amount of cotton particles in the waste. In the study, the humidity was 8.2%, the pollution was 4.9%, An-Boyovut 2nd grade, cotton 1st grade. At the first stage, studies were carried out in the main cleaning department in order to determine the rational parameters of the distance between the columns. From the results of the analysis it can be seen that we can achieve an increase in cleaning efficiency due to the distance between the shoe and their oscillatory movement.

## 2. Theoretical studies on cleaning cotton from large impurities

### 2.1 Selection of the distance between the saw cylinder and the lever when cleaning the cotton from large impurities

To solve the problems of the technological process, a deep and comprehensive analysis of its performance using a mathematical model is required. However, complex technological processes, such as cleaning raw cotton from waste, bringing quality up to standard requirements, theoretically require solving a number of mathematical problems.

To maintain a predetermined average distance between the saw cylinder and the column, the column grate is adjusted so that the spring selected for vibrating motion moves the column grate in a range of 1-3 mm. The distance between the saw cylinder and the column ranges from 15 to 18 mm for low grade cotton.

As a result of compacting single-seeded ginners with low-grade cotton vibrating grids, the adhesion of the cotton to the saw teeth is increased.

The impurities in the incoming cotton flow are higher due to the increased vibration of the incoming cotton in the flow due to the vibration of the grate in the range of 1-3 mm. This will increase the cleaning efficiency of the UHK ginning equipment.

Taking into account the size of the raw cotton, the distance between the saw cylinder and the vibrating column grate by means of a spring was made in the range of 15 to 18 mm to improve the cleaning efficiency. To maintain clearance between the

saw cylinder and the saw, the saws are positioned so that each saw facing the saw cylinder is in a curved line. The result is minimal damage to cotton fibers and seeds.

### 2.2. Theoretical analysis of the effect of the distance between the equipment colosnik and the saw cylinder on the cleaning efficiency when cleaning cotton from large impurities

Technological construction of a swing-arm grid with the help of a projectile is explained in the drawing (figure 1), where the general scheme of a swing-arm grid is presented.

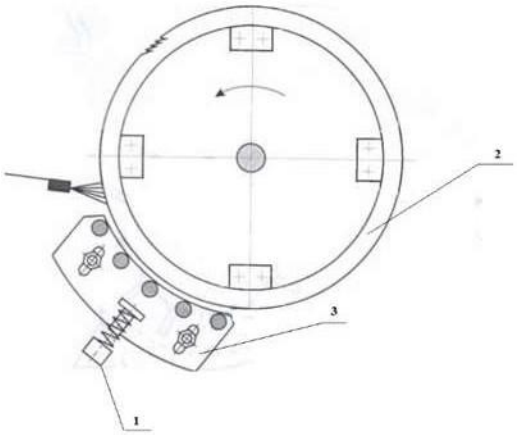



**Figure 1. Colosnik grate for cleaning cotton:**

*1– spring for grate vibration,2–pile drum,3 – fixed with a swinging colosnic*

As a result of vibration of the grate during operation, low-grade seed cotton, which undergoes a cleaning process, improves its adhesion to the saw teeth due to short blows from the bottom, and dirt penetrates through the single-seeded cotton springs. through the bars.

By rotating the grate, clogging is prevented, cleaning is slightly increased and cotton seeds are added to the dirt.

We theoretically study the changes in pressure, density and velocity after each column passes as a result of the interaction of the raw cotton flow with the column system during its movement. To simulate this process, the following assumptions were made.

1. Cotton mass is considered stationary in the adjacent environment and the movement of the stream, it is unchanged in the zone where the fertile colognes in the stream are located and is equal to $Q_0$ . impurities separated from the stream do not affect productivity $Q_0$ .

2. The behavior of the current is considered to be one-dimensional among the colosnics.

3. Voluntary kolosnik interacts with the flow of cotton (medium), and the immersion of the kolosnik in the environment is determined either according to the Gers or Vinkler law, or on the basis of experience. We determine the speed, pressure and density (parameters) of the flow between the xar kolosnik and the cutting surface, respectively, with $v_i$, $p_i$ and $S_i$ . $(i = 1.n)$ n-the number of kolosniks.

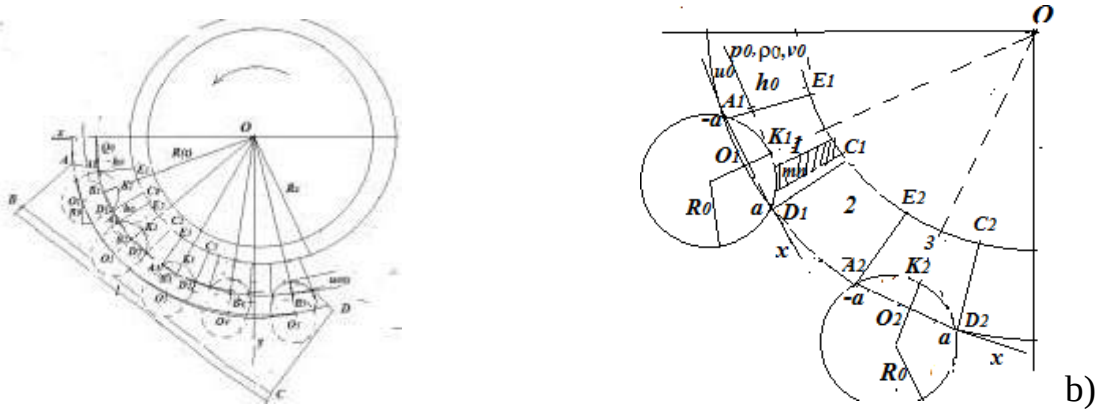
4. The basis of the ABCD device is installed on the elastic element, during the movement the distance between all its points and the drum is the same, in this case the

centers of the submersible torque $t=0$ colosnics are in the $O_i$ points, they move to the $B_i$ point in the direction of the drum radiusi the same distance to the $u_0(t)$.

We determine the pressure parameters between the first and second colosnic.

Let's assume that the initial (except for the colossal zone) parameters of the current are $\rho_9, v_0$ $h_0$ and $S_0$. Before interacting with the first colosnik, let the flow thickness be $h_0$, then the working productivity of the stream in the case will be equal to $Q_9 = \rho_9 v_0 h_9 L$, where L is the length of the drum.

a)




b)

**Figure 2. The general (a) and calculation (b)schemes of interaction of cotton products with colosnic in the cleaning zone.**

Interaction of homashyo with the first kolosnik $A_1K_1D_1C_1E_1$, in the zone we determine the parameters of the current (figure 1a). We direct the $Ox$ arrow along the $A_1D_1$ cross section (figure 1b). The optional Surface (perpendicular to the plane) is determined by the following formula [1]:

$$S = (h_0 - u_0 + \frac{x^2}{2R_0})L \qquad -a < x < a \qquad (1)$$

here $h_0$ the initial thickness of product, $a = \sqrt{2u_0 R_0}$ $u_0$ - kolosnik's displacement (immersion) in the direction of the drum according to 4 hypotheses is calculated as its submerged relative to the flow, and its value is determined either experimentally [1], or according to the law of Gers or Vinkler, $R_0$– colosnic radius, $L$ - the length of the drum roller. We draw up the Eyler equation under the condition of stationary motion for the separated $mn$ element [2]:

$$-[Sp + d(Sp)] + Sp - qfLdx = \rho vSdv \qquad (2)$$

here $q = kp$ – side pressure, $k$ - pressure coefficient, $f = f_1 + f_2$, $f_1$, $f_2$ – coefficient of friction between the drum and the colosnik, respectively, with cotton $S = h(x)L$ taking the equation and the $q$ expression to the denominator (2) is the expression $dx$, we get the equation in the following way:

$$\rho vh\frac{dv}{} = -\frac{d(ph)}{} - kfp \qquad (3)$$

$dx \qquad dx$

here $h = (h_0 - u_0 + \frac{x^2}{2R_0})$

(3) in the equation, the unknowns ρ, *v*, *p* are involved, we use two conditions to fill it. First, the condition of the flow stationary

$$\rho vh = \rho_0 v_9 h_0 = Q_0 / L \tag{4}$$

The second condition must be appropriate for the equation of the case of the environment.

To do this, we get a connection between the pressure and the density. The linear connection between the pressure and the $p$ volume $\varepsilon = \frac{\Delta V}{V_0} = 1 - \frac{\rho_0}{\rho}$ deformation according to [2,3] works is reasonable.

$$p = p_0 + K\varepsilon = p_0 + K(1 - \frac{\rho_0}{\rho}) \tag{5}$$

$p_0$ - initial pressure in product, $K$ - volume change module (experimental size).(4) and (5) using connections, we determine the expression of speed by pressure

$$\frac{v}{v_0} = 1 + \frac{p_0}{K}(1 - \frac{p}{p_0}) \tag{6}$$

(3) by putting this expression on the left side of the equation, we form an equation from it relative to the pressure $p$

$$\frac{dp}{dx} = -p\frac{h' + kf}{h - M^2 h_0} = -p\frac{x + R_0 kf}{[b_0 + x^2]} \qquad -a < x < a \quad \text{when} \tag{7}$$

here $b = 2R_0[h_0(1 - M^2) - u_0]$, $M = v_0 / c_0$ $a = \sqrt{2R_0 u_0}$

$c_0 = \sqrt{K / \rho_0}$ - same speed of sound in raw material environment.

(7) the solution of the equation depends on the sign of the $b$ variable. In order for the cleaning process to take place, we require that (7) this function is decreasing on the condition of $p / p_< < 1$ according to the formula. It is enough to fulfill the $b > 0$ inequality on this condition. Using $b_0 = b^2$ equality (7) we get the solution of the equation on the condition of $p = p_0$ equality in $x = -a$ in the form of the following

$$p / p_0 = \exp\left[-\frac{fkR_0}{b}\, arctg\left(\frac{u_0 x}{b} + \frac{u_0 a}{b}\right)\right]\sqrt{\frac{b^2 + a^2}{b^2 + x^2}} \tag{8}$$

the laws of the rate of flow along the $A_1K_1D_1$ arc and the distribution of its density are represented by the following phomoles

$$\frac{v}{v_0} = 1 + \frac{p_0}{K}(1 - \frac{p}{p_0}), \quad \frac{\rho}{\rho_0} = \frac{v_0 h_0}{vh} \tag{9}$$

In 3 and 4 figures, the graphs of the distribution of the speed of the flow of raw

materials in stationary motion (3 figures) and the density ( 4 figures) in the first zone are given.

### 3. Analytical accounting of theoretical research

We accept the following values in the accounts. $R_0 = 0.24m$, $u_0 = 0.00021\text{m}$, $h_0 = 0.03\text{m}$, $k = 0.6$, $\rho_0 = 50kg/m^3$, $Q_0 = 5000\text{kg/hour}$, $p_0 = 1000\text{Pa}$ From the analysis of the graphs, there is an increase in the flow rate along the zone, and a decrease in the density. The number of $M$ and the coefficient of friction can affect the laws of speed and density distribution to the desired extent. Such an effect is explained clearly in the values that are close together in $M$ number. $f = 0.3$ $f = 0.4$

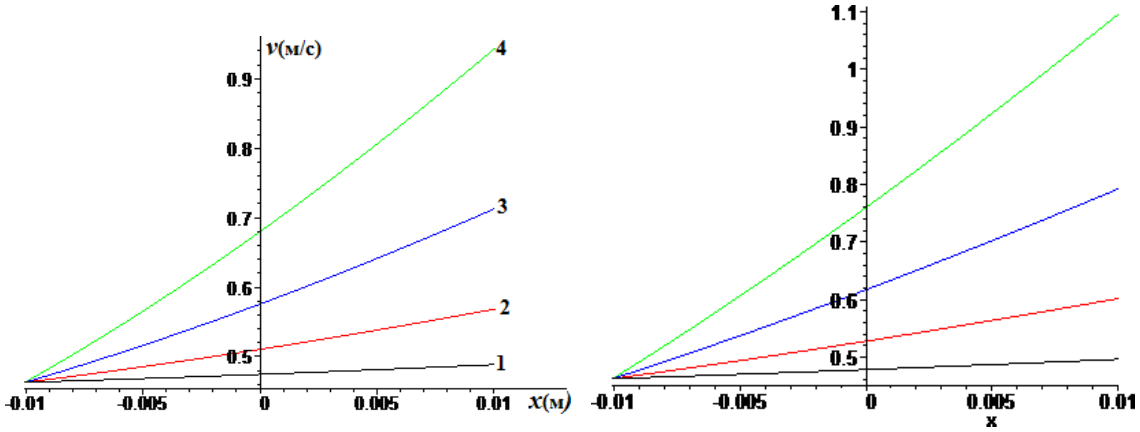



**Figure 3**. Flow rate of raw materials $v(м/с)$ 1 is the coefficient of friction in the cleaning sector in two values of $f$ and the distribution graphs in different values of the number of $M = c_0 / v_0$ . $1-M = 0.1$,. $2-M = 0.2$ ,. $3-M = 0.3$ ,. $4-M = 0.4$

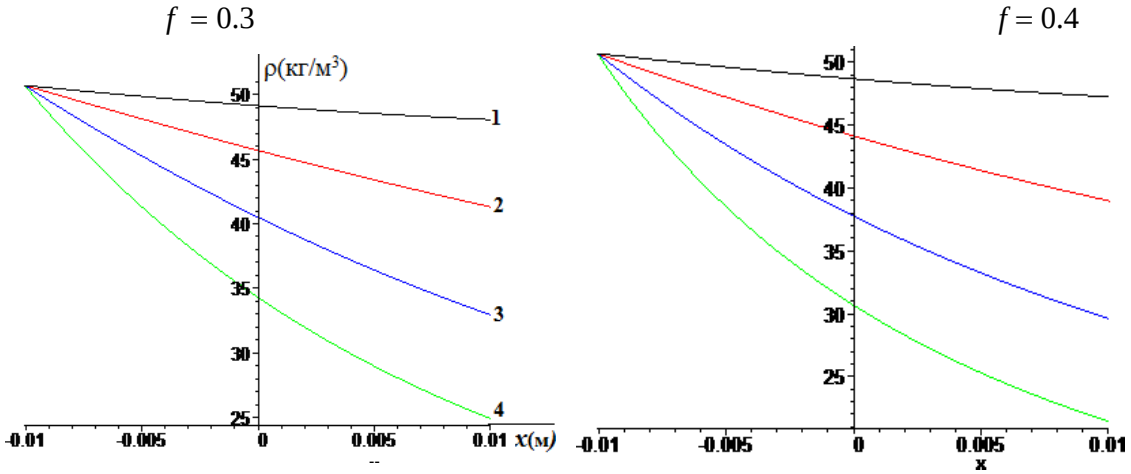



**Figure 4.** The density of raw material flow graphs of distribution of the coefficient of friction in the cleaning sector of $\rho(кг/м^3)$ in two values of $f$ and in different values of the number of $M = c_0 / v_0$ . $1-M = 0.1$,. $2-M = 0.2$ ,. $3-M = 0.3$ ,. $4-M = 0.4$

In the process of interaction of raw materials particles according to kolosnik, partial impurities can be separated from its composition as a result of the formation of a positive action on the impurities in the humashko takib and a decrease in the bonding forces between the impurities and the fibers in the humashyo. To study this jrayon, we will use the Sevostyanov model, which is presented in the literature [4]. According to this model, the reduction in the mass of impurities separated from the composition of the raw material is presented in this diffrential form:

$$\frac{dm}{m} = -\frac{1}{1+a_0}\frac{d\rho}{\rho} \qquad (10)$$

Here $m$ - raw material mass, $a_0$ - the invariable positive parameter (10) is the support of the equation to the first zone, in the case of $m = m_0$, $\rho = \rho_0$ $x = -a$ , we integrate in terms $\lambda = 1/(1+a_0)$

$$m \quad \left(\rho\right)^{-\lambda}$$

$$\frac{}{m_0} = \left(\frac{}{\rho_0}\right)$$

Here $m_0$ the initial mass of raw material.

The mass of impurities separated from raw material is determined by this equation:

$$\Delta m = m_0 - m = m_0\left[1-\left(\frac{\rho}{\rho_0}\right)^{-\lambda}\right]$$

The table shows the mass of impurities separated in the first zone every hour at different values of the parameter $\lambda$ and $M$. The increase in the parameters of $\lambda$ and $M$ from the analysis of the values in the table leads to a sharp increase in the amount of divorced masses.

Table. In 1-th section, the parameters of the homogeneous time interval from the composition of the material are the mass of impurities, $\lambda = 0.2$ separated by different values of $\lambda$ and $M$.

Table 1

| $M = v_0 / c_9$ | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 |
|---|---|---|---|---|---|---|---|---|
| $\Delta m(kg/\text{hour})$ | 0.32 | 1.78 | 4.06 | 7.00 | 10.52 | 14.65 | 19.56 | 25.78 |

$\lambda = 0.3$

| $M = v_0 / c_9$ | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 |
|---|---|---|---|---|---|---|---|---|
| $\Delta m(kg/\text{hour})$ | 0.28 | 2.21 | 5.29 | 9.40 | 14.46 | 20.51 | 28.78 | 36.95 |

$\lambda = 0.4$

| $M = v_0 / c_9$ | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 |
|---|---|---|---|---|---|---|---|---|
| $\Delta m(kg/\text{hour})$ | 0.98 | 4.74 | 10.18 | 16.62 | 23.69 | 31.24 | 39.42 | 48.72 |

In conclusion, from the results of the analysis from Table 1, we can say that we can see that the theoretical research carried out leads to an increase in the cleaning efficiency of the cotton dialed in a difficult cleaning machine.

**Conclusion.** Analysis shows that cleaning efficiency of harvesting equipment plays a key role in harvesting machine-picked and low-grade cotton. In theory, this is based on the fact that to improve the efficiency of cleaning equipment, we can achieve this by moving the grates of the grates with the help of springs, that is, by ensuring their vibration.

Based on the results of the analysis of scientific works, theoretical equations of the effect of distance on the cleaning efficiency in the process of interaction with the column in the zone of cleaning the currently used cotton cleaning equipment from large contaminants were developed. The use of springs is also standardized to provide vibration to the grate during operation and to increase the distance between cotton when cotton becomes more or less. The result is improved adhesion of low-quality cotton seeds to the saw teeth as it goes through the cleaning process, and reduces the amount of single-seeded cotton pieces entering the dirt through the columns. Accordingto the results of the analysis, the effect of increasing the cleaning efficiency istheoretically proved by the fact that the optimal value of the change is in the range of 1-3 mm, i.e. in the range of 15-18 mm. From the analysis of the results of this theoretical analysis, we conclude that theoretical studies of harvesting equipment and the widespread introduction of modern advanced equipment into production play a key role in improving the quality of cotton.

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# OBTAINING LIME-CLAY BINDER FROM OVERROOF AND SILICATE BRICK BASED ON IT

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**Annatatsiya:** Energiya tejamkor avtoklavli silikat materiallarni ishlab chiqarish uchun xom ashyo sifatida gilli jinslaridan gil hosil bo'lishining tugallanmagan zaxiralaridan foydalanish mumkinligi aniqlandi.

**Kalit so'zlar:** gilli jinslar, ohak-gilli bog'lovchilar, avtoklavli silikat materiallar.

**Аннотация:** Установлено, что в качестве энергосберегающего сырья для производства автоклавных силикатных материалов можно использовать глинистые породы незавершенной стадии процессов глинообразования.

**Ключевые слово:** глинистые породы, известково-глинистое вяжущее, автоклавные силикатные материалы.

**Abstract:** It was established that can be used of clay rocks unfinished stage processes of clay formation as a raw material for production of energy-efficient autoclave silicate materials.

**Keywords:** clay rocks, lime-clay binder, autoclave silicate materials.

**Introduction.** The tasks of meeting the needs of capital construction, primarily housing, with efficient, high-quality and environmentally friendly piece building materials and products, are of particular relevance in the conditions of Uzbekistan. One of the most economical and widespread wall materials in the Republic of Uzbekistan are ceramic and silicate bricks. As a silica component in the production of silicate bricks using traditional technology, high-quality quartz sand is used, the reserves of which are limited. Therefore, the task of expanding the raw material base for the production of silicate materials through the use of local raw materials and, first of all, available ones, such as dune sands and other production wastes, becomes urgent. This waste includes overburden.

The article analyzes the processes and results of the study of all types of hardening of silicate bricks during autoclave processing. The testing involved model mixtures of Nukus and Muynak sand and 15-25% lime of Aktau and Dzhumurtau deposits. [1]

The technical processes obtained during the examination of a three-storey residential building with silicate brick walls in the city of Moscow have been substantiated and considered. The analysis of the revealed deformations in the form of

cracks, as well as damage to the paint layer of external enclosing structures as a result of environmental influences is given. [2]

**Results and its discussion.** Differences in the configuration of sand-lime brick factories built in the 70s are considered. on the territory of the former USSR. The modern expansion of the range of pressed products requires an increase in their raw strength. This can be achieved in three ways: by increasing the consumption of lime, adding sand and using a composite lime-silica binder. Possibilities of optimization of raw strength by adjusting the compositions of the lime-silica binder are considered. Investigations of partial replacement in the optimal composition of the lime-siliceous binder I: P = 1: 1 of sand for limestone and loam with a clay content of 50% are presented. An indirect method was used to determine the ultimate shear stress of limestone, loam and ground sand separately and in the composition of a binder and their effect on raw and autoclave strength. It was found that an increase in raw strength by 43% occurs when replacing 50% of sand with loam, and replacing 50% of sand with limestone increases raw strength by 2.3 times. [3]

The article outlines the problem of utilization of technogenic waste. Possible directions of using ash and slag materials in construction are noted. The questions on the use of ash in the production of silicate bricks in order to improve the technical properties and reduce the cost of wall products, as well as improve the environmental situation are considered. The technology of production of lime-ash bricks in industrial conditions is presented. [4]

A technology for producing bricks based on lime-silica mixtures has been proposed, in which chemical interactions are almost completely realized in a dispersed state at the stage of preparation of the contact hardening binder and the raw mixture as a whole, and the role of the molding (pressing) operation is fundamentally changed, since this occurs transfer of a dispersed system into a stone-like body, which is fixed by its complete water resistance in contact with water immediately after pressing. The theoretical basis of the developed technology is the ability of silicate dispersed substances (calcium hydrosilicates) to pass into an unstable state, to form a stone-like water-resistant body at the time of application of a mechanical load during molding. A feature of the proposed method is the exclusion of additional operations for autoclaving products from the process of obtaining silicate bricks.

Synthetic calcium hydrosilicates, in contrast to natural ones, are more homogeneous in composition and structure, contain fewer impurities, are characterized by a dispersed composition and, in connection with these advantages, have a wider practical application. Contact-condensation binders allow varying the properties of products based on them in a wide range and thereby ensure maximum compliance with the requirements for a specific direction of use. Raw materials for the production of synthetic silicates of calcium hydrosilicates are practically unlimited, since calcium-silicon-containing substances are present both in a variety of industrial wastes and in natural compounds. Therefore, the problem of obtaining hydrosilicates of calcium with a contact-condensation ability to structure formation is becoming more and more urgent. This transition is considered as dependent primarily on the degree of ordering of the arrangement of the particles of the substance, which determines the level of its instability. [5] The use of silicate solid bricks in housing construction has a long

history. The Republic of Bashkortostan is a typical example of the development of this industry. [6]

Currently, in terms of consumption, silicate brick ranks second among small-piece wall materials, however, in terms of a number of properties, it is inferior to ceramic. It is possible to improve the quality of autoclave hardened materials by grinding quartz sand or using raw materials with an initially high specific surface area, such as waste from expanded clay production. In the course of research, it was found that partial replacement of quartz sand as a filler in a silicate mixture with expanded clay production waste promotes the formation of strong intergrowths of micro- and submicrocrystalline calcium hydrosilicates, having a high dispersion and a largecontact surface, providing good adhesion to the filler grains All this, in turn, leads to a 100% increase in strength and an improvement in the operational characteristics of the final products. [7]

A description of the author's method for determining the thermal conductivity coefficient of a solid, based on a non-contact thermal effect on the surface of the investigated building material by a source of infrared radiation and the subsequent finding of a one-dimensional non-stationary temperature field of a solid during its heating, established analytically according to the data of a system of thermal converters, is given The calculation of the sought coefficient of thermal conductivity of the investigated building material is carried out according to the differential equation of thermal conductivity. [8]

The paper indicates an increase in the reactivity of a lime binder due to high-temperature slaking of lime with a mineral addition of dihydrate gypsum, which affects the temperature, the rate of slaking of lime and the dispersion of the resulting products. The technical feasibility of using active highly dispersed lime slaking products in the production of pressed silicate products has been established, which have a positive effect on the process of phase and structure formation at all technological stages of hardening with an increase in the strength of products and the possibility of reducing the proportion of lime binder in the mixture. [9]

Support for the construction industry is one of the priority directions for overcoming the crisis and overcoming its consequences in Ukraine. To a large extent, this process depends on the efficiency of the work of enterprises in the building materials industry. One of the most consumed types of products in this industry is silicate bricks or pressed artificial stones. Among the reasons that hinder the expansion of production of these products, improve their quality and reduce the cost, a noticeable place is occupied by the physical and moral deterioration of equipment, low service life of parts working in various friction units, and especially parts of press equipment. [10]

As you know, during the development of ore deposits, hundreds of millions of cubic meters of clay rocks, unconventional for the industry of building materials, fall into the mining zone, the specificity of which is the incompleteness of the processes of clay formation. The original parent rocks were destroyed, due to their minerals, thermodynamically unstable compounds were formed, such as mixed-earthen formations, imperfect structure of hydromica, Ca2 + montmorillonite, disordered kaolinite, finely dispersed quartz, amorphous minerals, etc. on clay deposits. Such

sediment in the form of overburden has accumulated in large volumes in the Uchkuduk regions. Clay deposits are products of one of the final phases of weathering of aluminosilicate rocks. The final stage of weathering is pure kaolinite and montmorillonite clays.[11]

The studies carried out have shown the fundamental possibility of obtaining autoclave silicate materials on the basis of these rocks [11-13]. This raw material, possessing the properties of natural nanosized particles, allows you to change the morphology of neoplasms and optimize the structure of the cementing compound.

Clay rocks have a very diverse mineralogical composition and properties. Therefore, to develop a method for calculating the composition of a raw mixture based on a lime-clay binder, the kinetics of the interaction of the main rock-forming clay minerals (kaolinite and montmorillonite) with calcium hydroxide under hydrothermal conditions was studied.[12]

In our studies, overburden in the form of loess-like loam and opoka-like clay, which accumulated in large quantities in the Uchkuduk area, were tested as a clay component. It was found that the optimal kinetic parameters of the reaction for aolinite and montmorillonite are provided if the CaO content does not exceed 30 meq / g clay. [13]

In the course of the experiment, we established that the maximum absorption of calcium oxide by kaolinite and montmorillonite under autoclaving conditions at the factory of Kushkupir silicate gisht zavodi LLC, which are adopted in the production of traditional silicate bricks, is, respectively, 28 and 30 meq / g of clay. Based on the data obtained, the calculation of the optimal composition of the lime-clay binder was carried out, according to the method proposed by A.N. Volodchenko [13], which is based on the condition of complete interaction with clay minerals with CaO.

$$C = \frac{2800 \cdot P \cdot H}{28 \cdot P \cdot H + 1000A}$$

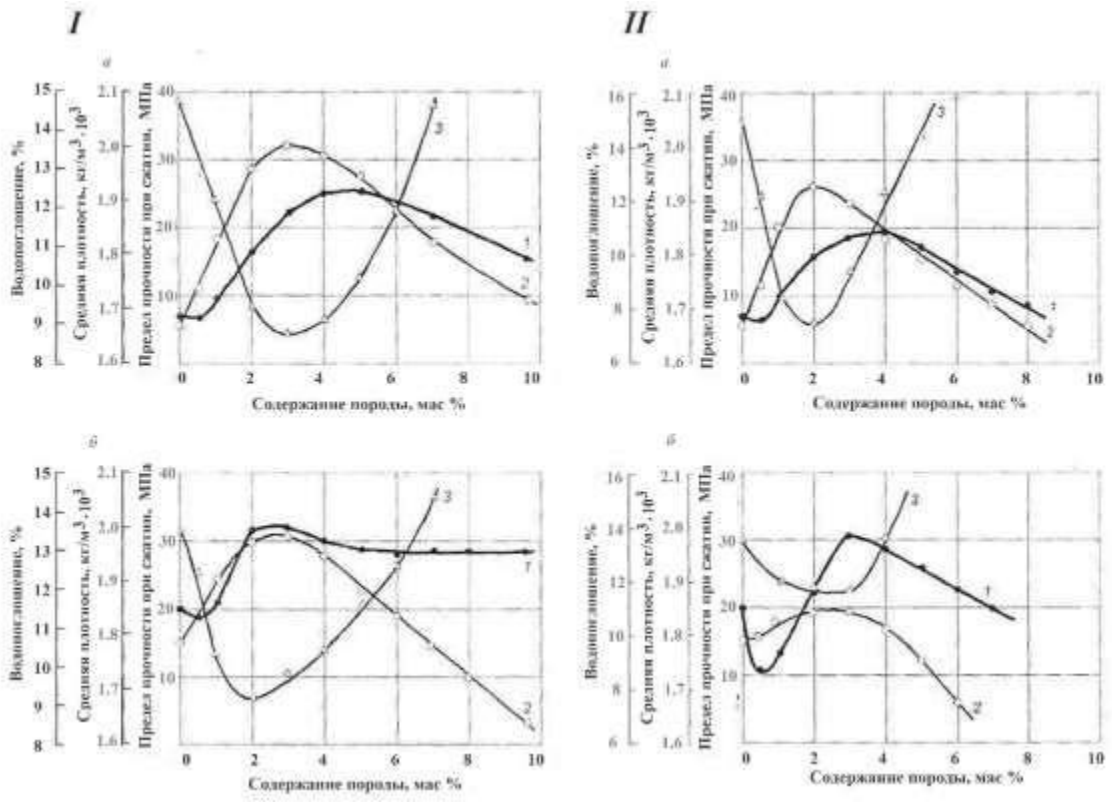
where C is the CaO content in the lime-clay binder, wt. %; P is the content of clay minerals in clay rock, wt. %; H - limiting absorption of clay by lime, 28-30 meq / g; A - activity of lime, wt. %.

The study of the combined effect of finely dispersed quartz and clay minerals on the properties of lime-sand materials has shown that the most effective control of the synthesis of new formations is possible by introducing rocks containing, along with clay minerals, 50-70 May. % of finely dispersed quartz.

This hypothesis was tested by using overburden clayey rocks of the Navoi MMC as a raw material (Fig. 1)

As our semi-industrial experiments have shown, the use of overburden clay in the form of a lime-clay binder makes it possible to increase the strength of the raw material by 2-3 times, the finished silicate brick by 1.0-1.5 times. Increasing the strength of the raw material will reduce scrap in the molding process and facilitate the production of high-hollow products. The optimum content of clay rock, depending on the mineralogical composition and activity of the raw material, is 25-30 wt. %. Due to the high reactivity of the studied clay rocks, it is possible to reduce the duration of isothermal holding of products in an autoclave by 1.5-2 times and, accordingly, to reduce the consumption of energy.

As a result of the physicochemical analysis of the prototypes, it was found that in the lime-clay-sand mixture, cementing compounds are formed mainly due to the interaction of calcium hydroxide with clay minerals and partially with finely dispersed quartz. The products of the interaction of clay minerals with lime are low-basic hydrosilicates and hydro-garnets, with kaolinite forming predominantly hydro-garnets, and montmorillonite forming low-basic hydrosilicates of calcium.




**Rice.** Properties of samples depending on the content of overburden clay rocks of the Navoi Mining and Metallurgical Combine:

*I - loess-like loam; II - opoka-like clay; content of active CaO, wt. %: a - 4, 6-8; 1 - compressive strength, 2 - average density, 3 - water absorption*

**Conclusion.** Thus, as a technological and energy-saving raw material for the production of autoclave silicate materials, it is possible to use overburden rocks in the form of deposits, the initial stage of clay formation processes, which consist of metastable minerals of imperfect structure of the nanodispersed level, fine quartz and amorphous minerals, which will improve the physical and mechanical properties. autoclaved silicate materials. The reduction in energy consumption for the production of sand-lime bricks will be in the range of 20-25%.

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## STUDY OF THE MOTION OF COTTON ON A TAPERED FACE

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**Annotatsiya:** Ushbu maqolada paxta tozalash korxonalarida ishlatiladigan mayda iflosliklardan tozalash qurilmalari va taklif etilayotgan yangi konstruksiyadagi uskuna to‘rli yuzalari foydali yuzasi hisobi va unda paxtaning harakati tadqiqi to‘g‘risidagi taxlillar keltirilgan.

**Kalit so’zlar:** Paxta, mayda ifloslik, kalta tola, tozalash, momiq, qoziqcha, baraban, taminlagich, to’rli yuza.

**Аннотация.** В данной статье анализируется расчет полезной площади чистящих с мелкими ячейками, используемых на хлопкоочистительных устройств заводах, и поверхности ячеек предлагаемого оборудования новой конструкции, а также исследование движения хлопка в нем.

**Ключевые слова.** Хлопка сыра, мелкий сор, корткий волокна, очистит, пух, колок, барабан, питательный, песочное площадь.

**Annotation**. This article analyzes the calculation of the useful area of cleaning devices with small cells used in cotton ginning plants, and the surface of the cells of the proposed new design equipment, as well as the study of the movement of cotton in it.

**Keywords.** Cotton, fine trash, short fiber, cleaning, fluff, stick, drum, feeder, mesh surface.

**Introduction:** It has now been found that the normative characteristics of the cotton cleaning process are performed at a high level in each equipment, and its cleaning effect is low due to some disadvantages of the equipment for cleaning fine dirt. This is due to the fact that the contact angle of the pile drum does not exceed 100 °C. It can be seen from this that the involvement of a large number of piles in the separation of small contaminants is not ensured. This, in turn, has a significant impact on cleaning efficiency and equipment performance [1].

Cleaning cotton from minor contaminants is an important process that has a significant impact on subsequent processing, such as insulation and fiber cleaning. If minor contaminants are not sufficiently cleaned, it will switch from passive pollution to active pollution [2] and will make it difficult to isolate the fiber in the cleaner. All cleaners that remove minor impurities from cotton work in the same way: Cotton drums are pushed into the drums and pushed through rough surfaces. This process is repeated several times and cotton is cleaned of minor impurities. The efficiency of cleaning

depends on the rotation speed of the drum drum, its design, surface and quality characteristics of cotton.

The rate of rotation of the drum-boring drums is limited by the growth of mechanical damage to the cotton seeds, and the surface area of the drill is limited by the conversion of the cotton into the dirty mixes.

## Theoretical foundations

The rotational speed of the vibrating pile-plank drums determines the increase in the mechanical damage of the cotton seed, and the useful surface of the mesh surface determines the release of contaminants from the cotton. All fine-grained cleaning equipment uses perforated mesh surfaces with dimensions of 6x50 mm [3].

The cone is proposed to be made in order to increase the useful surface area of the mesh, to separate it from the perforated surface while fully preserving the natural properties of cotton. This increases 1) the effective cross-sectional area of the mesh barrier, 2) reduces the aerodynamic drag of the cage, and 3) increases performance and impact area [4,5].

## Cotton movement on the surface of a consolor-shelter

For theoretical verification of the proposed option, consider the movement of the cotton in the process of separating it from the surface of the circular cone [6,7].

Let *m* move along the surface of the lattice AB with the initial velocity *V* when the point of mass $t_0 = 0$. The surface of the lattice AB ω rotates along the surface of the cone with a constant angular velocity, and we place the coordinate head at the center of the circle and direct the OZ axis along the axis of the cone (Figure 1).

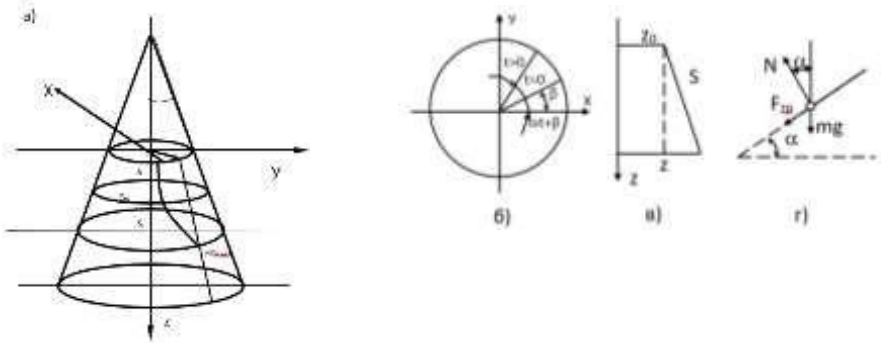


**Figure 1.** The trajectory of a cotton ball in the form of a cone is used to remove impurities from the surface of the mesh using pegs.

**Theoretical research accounting**

The material rotates with the mesh surface. It moves along the lattice surface according to the *S(t)* law. To determine this trajectory, we will do the following work:

The coordinates of a point on the surface of the cone for $t>0$ are given by the following formulas:

$$\begin{cases} x = (r_0 + S\sin\alpha)\cos(\omega t + \beta) \\ y = (r_0 + S\sin\alpha)\sin(\omega t + \beta) \\ z = S\cos\alpha \end{cases} \quad (1)$$

Here: α- the corner in the cone rotation; r- small circular radius;

β- The angle between the plains of the lace surface and the X0Z coordinate plane.

The full speed of the material point is equal to the following.

$$v^2 = x^2 + y^2 + z^2 = S^2 + (r_0 + S\cdot\sin\alpha)^2\omega^2 \quad (2)$$

We will find the project of the Coordinate Ashot of all forces affected by the material point:

The material point is affected by the following asset forces.

1) Projection of the force of gravity on the arrows

$$X_1=0;\ Z_1=-mg;\ Y_1=0 \qquad (3)$$

2) The force of friction generated by the force of gravity:

$$\begin{cases} X_2 = -mgf\cdot\cos\alpha\cdot\sin\alpha\cdot\cos(\omega t+\beta) \\ Y_2 = -mgf\cdot\cos\alpha\cdot\sin\alpha\cdot\sin(\omega t+\beta) \\ Z_2 = -mgf\cdot\cos^2\alpha \end{cases} \qquad (4)$$

3) We find the acceleration of Kariolis. Here the relative angular velocity will be as follows.

$$\vec{\omega} = \omega\vec{k}, \qquad \rightarrow \qquad (5)$$

$$\vec{v}_н = S\{\sin\alpha[i\cos(\omega t+\beta) + j\sin(\omega t+\beta) + k\cos\alpha]\}$$

By definition $K_T$- Kariolis acceleration:

$$\vec{K}_T = 2[\vec{v}_{отн}\cdot\vec{\omega}] = 2S\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \sin\alpha\cdot\cos(\omega t+\beta) & \sin\alpha\cdot\sin(\omega t+\beta) & \cos\alpha \\ o & o & \omega \end{vmatrix} = \qquad (6)$$

$$= 2\omega\cdot S\cdot\sin\alpha[\vec{i}\sin(\omega t+\beta) - \vec{j}\cos(\omega t+\beta)]$$

normal arrow projection passing through the stakes

$$\vec{N} = \{-\sin(\omega t+\beta);\quad \cos(\omega t+\beta)\} \qquad (7)$$

Kariolis injection force to normal projection:

$$np_{\vec{N}}\vec{k}_{ин} = (\vec{k}^{ин}\frac{\vec{N})}{|\vec{N}|} = \vec{N}\cdot\vec{k}^{ин} = -2m\omega S\cdot\sin\alpha = Nk^{ин} \qquad (8)$$

Kariolis compatible friction force will be equal to:

$$F_{ishk} = -2m\omega fS\sin\alpha$$

This is projections of power:

$$\begin{cases} X_3 = -2m\omega fS\sin^2\alpha\cos(\omega t+\beta) \\ Y_3 = -2m\omega fS\sin^2\alpha\sin(\omega t+\beta) \\ Z_3 = -2m\omega fS\sin\alpha\cos\alpha \end{cases} \qquad (9)$$

Now we take the S dimension as a generalized coordinate and draw up the II-type equation of Logrange:

Kinetic energy: $T = (\frac{1}{2})mv^2$;

Generalized power:

$$Q_s = -mgf\sin\alpha\cos(\omega t+\beta) - 2m\omega f\sin\alpha - mg\sin\alpha\sin(\omega t+\beta) -$$

$$-\frac{f_c PS}{m\sqrt{S^2+(r_0+S\sin\alpha)^2\omega^2}} \qquad (10)$$

Taking into account the $T,Q_s$, we can write the Lograng II type equation as follows:

$$\ddot{S} + 2\omega f \dot{S}\sin^3\alpha - (r_0 + S\sin\alpha)\sin\alpha\omega^2 = -g\sin\alpha(f\sin\alpha\cos(\omega t+\beta)+ \\ +\sin(\omega t+\beta)) - \frac{f_c PS}{m\sqrt{\dot{S}^2 + (r_0 + S\sin\alpha)^2\omega^2}} \qquad (11)$$

The above differential equation is an equation of the motion of a material point moving along a rotating pile with a conical mesh surface.

$\alpha = \frac{\pi}{2}$ say, (11) the material moving on the surface of the disc, which revolves around the little axis obtained in the previous work, derives from the equation of motion of the point.

In the Runge Kutta method in the equation exposure is integrated with the following initial conditions: when $t$=0

$$S=S_0; \quad \dot{S}=0 \qquad (12)$$

Accounts will be performed in cases where the account is $\beta=0$ and $\beta=90^0$ and $r_0$=20 sm $r_0$=30 sm $S_0$=0 and $S_0$=10, $\alpha=30^0$, $\alpha=45^0$ and $\alpha=60^0$ [8,9].

The rest of the values were taken as in the cases [10]. The radius of the base of the cone is selected depending on the useful surface of the equipment for picking up fine cotton 1XK[11,12].

**Table 1**

| O/n | The length of the mesh surface $M_э$ (mm) | The angle of coverage of the mesh surface is a (degree) | Mesh surface width $К_э$ (mm) | The mesh surface is a useful surface ($sm^2$) |
|---|---|---|---|---|
| 1 | 1800 | 60 | 230 | 0.41 |
| 2 | 1800 | 65 | 251 | 0.45 |
| 3 | 1800 | 70 | 269 | 0.48 |
| 4 | 1800 | 75 | 288 | 0.51 |
| 5 | 1800 | 80 | 307 | 0.55 |
| 6 | 1800 | 85 | 325 | 0.58 |
| 7 | 1800 | 90 | 345 | 0.62 |

As can be seen from Table 1, the actual distance occupied occupies its useful surface.

**Conclusions.** Calculations and analysis of the results show that the amount of impurities removed from the surface of the conical mesh by means of piles increases, the amount of impurities in cotton seeds decreases.

In the proposed cone-shaped vertical system, the cotton soft cleaning equipment helps to overcome the above-mentioned shortcomings by increasing the useful surface area of the net, reducing energy consumption and fiber damage. At the same time, the angle of coverage of the mesh surface with the pile drum is increased to $360^0$, which ensures 100% participation of the piles in the working area of the mesh surface, facilitates their replacement and increases the cleaning efficiency.

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## PLANNING WORK OF SHUNTING LOCOMOTIVES ON THE CRITERIA OF MINIMUM EXPECTATIONS OF WORK AT RAILWAY STATIONS

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**Annotatsiya:** Manyovr lokomotivining ishlashini kutayotgan ko‘p sonli yuk obyektlari sharoitida manyovr dispetcheri qaysi lokomotivlar bilan va qanday ketma-ketlikda bu tashish ishlarini amalga oshirishni aniqlashi kerak. Bunday hollarda manyovr lokomotivlari ishini rejalashtirish mezonlari rejalashtirish intervali oralig‘idagi lokomotivlar ishining umumiy kutish vaqtini minimal miqdori tanlanadi. Ushbu maqolada ishlarning lokomotivlar uzatilishini kutishini minimallashtirish va samarali qarorni avtomatlashtirish uchun temir yo‘l stansiyalarida manyovr lokomotivlari ishini “tarmoqlar va chegaralar” usuli asosida rejalashtirishning matematik modeli ishlab chiqilgan. Ushbu model temir yo‘l stansiyasining ekspluatatsion xodimlariga bitta yoki yo‘l-yo‘lakay yo‘nalishlardagi yuk ob’ektlariga boradigan vagonlarni guruhlash va birlashtirish imkonini beradi.
**Kalit so‘zlar:** manyovr lokomotivi, “tarmoqlar va chegaralar” usuli, matritsa, ishlarni birlashtirish, lokomotivlarning ishini kutish.
**Аннотация:** В условиях больших чисел грузовых объектов, ожидающих работу маневрового локомотива маневровому диспетчеру необходимо определить какими локомотивами и в какой последовательности следует осуществить эти перевозки. В таких случаях критерии планирования работы маневровых локомотивов выбирается минимум суммарного ожидания локомотивов работами в течение интервала планирования. В данной статье разработана математическая модель планирования работы маневровых локомотивов на железнодорожных станциях на основе метода «ветвей и границ» с целью минимизации ожидания локомотивов работами и автоматизации принятия эффективного решения. Данный модель позволяет оперативному персоналу железнодорожной станции объединить работы с целью группировки единичных работ, имеющих одинаковые или попутные адреса отправлении и назначения.
**Ключевые слова:** маневровый локомотив, метод «ветвей и границ», объединение работ, ожидания работами локомотивов.
**Abstract:** In conditions of a large number of cargo objects awaiting the operation of a shunting locomotive, the shunting dispatcher needs to determine which locomotives and in what sequence these transportations should be carried out. In such cases, the criteria for scheduling the work of shunting locomotives is the minimum of the total waiting time of locomotives for work during the planning interval. In this article, a mathematical model has been developed for scheduling the work of shunting locomotives at railway stations based on the “branches and boundaries” method in order to minimize the waiting of locomotives by work and automate an effective decision. This model allows the operating personnel of the railway station to combine

jobs in order to group single jobs that have the same or associated departure and destination addresses.

**Key words:** shunting locomotive, “branches and boundaries” method, consolidation work, locomotive work expectations.

**Introduction.** Shunting work at railway stations has a significant impact on the transportation process and largely determines its efficiency, significantly affects the economy of the transportation process of JSC “O‘zbekiston temir yo‘llari”.

To a greater extent, the role of shunting work on the sidings of railway stations is growing. The movement of a locomotive making shunting works should be controlled by only one employee - the head of the maneuvers, the trainer responsible for their correct implementation [1].

The work of all shunting locomotives in the station is coordinated by the station attendant. At marshalling yards, the work of shunting locomotives in the marshalling yard, the receiving yard is supervised by the person on duty on the hill. At stations with a large volume of cargo work, the shunting locomotive is in charge of the shunting dispatcher.

In conditions of a large number of cargo objects awaiting the operation of a shunting locomotive, the shunting dispatcher needs to determine which locomotives and in what sequence these transportations should be carried out. In such cases, the criteria for scheduling the work of shunting locomotives is the minimum of the total waiting time of locomotives for work during the planning interval.

One of the tools that contribute to improving the quality and efficiency of planning and control of technological processes at stations, as well as the best use of shunting means and devices is the operational planning of shunting locomotives based on modern methods of solving.

Today, scientists and specialists of railway transport are carrying out a lot of work to improve methods for performing various types of shunting work and to develop such a technology of shunting, which would take into account the potential capabilities of shunting means and devices, as well as the achievements of modern theory and practice of science. However, all these works are mainly aimed at the efficient operation of a shunting diesel locomotive without taking into account the expectation of their work, replacing shunting locomotives with locomotives, reducing the time for performing shunting operations due to the development of stations, improving their track development schemes and equipment with modern means of automation and tele mechanics [2- 7].

Based on the analysis of the experience of railways and the works of scientists, it can be concluded that the problem of resource conservation on railways both in the near and far abroad is given a lot of attention. However, studies on improving the methods of scheduling the work of shunting locomotives at stations on the basis of a minimum total waiting for locomotives for work during the planning interval have been performed insufficiently.

**Analysis and results.** One of the tasks arising in the development of an automated transport control system is the scheduling of locomotives. The functions performed by locomotives are summarized by the concept of "work" (moving one or several cars from one cargo object to another, supply and cleaning of loaded and empty cars,

shunting movements, train operation, reserve runs). Thus, the problem under consideration is solved after the workflow has been formed (submitted for execution).
Let us introduce the following designations for the work parameters:
$T_i$ – the moment of presentation of the *i-th* work, starting from it is possible to perform it;
$t_i$ – the duration of the *i-th* job;
$T_i^{cr}$– the maximum permissible ("critical") moment of completion of the i-th work;
$||C_{ik}||$ $(i,k = 1,2,\dots,N;\ i \neq k)$ – the matrix of the times of the move between the points of the *i-th* and *k-th* jobs.
There are $M$ locomotives to perform $N$ works submitted, with $M < N$. Each of the locomotives is characterized by the value $T^j$ (the moment the *j-th* locomotive is ready to perform work) and a vector - the column of travel times $C^j = (C^j_1, C^j_2, \dots, C^j_N)$ from the location of the *j-th* locomotive to the points of presentation of each work. It is assumed that the locomotive can perform only one job at a time and the started job cannot be interrupted.
It is required to distribute the work between the locomotives and establish the sequence of work for each of them.
When solving this problem, various optimality criteria and objective functions are practically used, depending on technological conditions:
minimization of the total waiting time of locomotives for work submitted for execution;
maximization of the number of works performed during the planning interval (subject to the obligatory performance of some works) or the number of reworked cars. Other criteria are also possible.
In the considered formulation of the problem, the criterion “the minimum of the total waiting for locomotives by work during the planning interval” is adopted. The waiting period is the time from the moment the work is presented to the moment it starts to be completed. This takes into account a number of restrictions:
• some work must be done with zero waiting (eg replacement of wagons at the front of the blast furnace);
• two locomotives are required to perform separate works at the same time;
• certain works are interdependent (for example, the cleaning of cars from the cargo front must precede the delivery of cars to the same front), etc.
The algorithm for scheduling the work of locomotives in the general case consists of the following enlarged blocks.
The work flow formation block provides a sequential view of the system elements (loading and unloading points, station tracks, etc.) to identify the need to supply locomotives in the planning interval $T$. Since the problem under consideration is not solved autonomously, but in combination with other tasks, the work flow formation block is a direct continuation of the blocks that solve the tasks of planning these works. The identified works are written into an array, where the place of their implementation is indicated, and $T_i$ , $t_i$, $T_i^{cr}$ are determined at the same time. The array of jobs is formed in ascending order $T_i$ .
The block for combining jobs analyzes their array in order to group individual jobs that have the same or associated departure and destination addresses. In this case, the union

is possible only if the shifts of the final moments of the possible execution of the combined jobs $i, i+k$ ($T_i \leq T_{i+k}$) arising as a result of the union do not exceed $T_i^{cr}, T_{i+k}^{cr}$.

For the accepted option of combining, one work is recorded in the work matrix instead of two.

The locomotive scheduling block solves the main problem of the algorithm. Various methods of solving it are possible. Below we consider algorithms based on the use of the branch-and-bound method [8-10].

The block for correcting the plan, taking into account the track scheme, checks the possibility of implementing the obtained plan in the conditions of the interdependence of trains as they move. For each of the trains and locomotives, the times of occupation of all elements of the route are calculated, and in case of coincidence of these times on individual elements or coincidence in time of hostile routes, dispatch control measures are taken (crossing, overtaking, delayed departure, etc.).

The algorithm for solving this problem can be used in conditions of rigid zoning of locomotives or in cases where it is advisable to distribute work between locomotives on the basis of certain heuristic procedures. Further development of this algorithm makes it possible to use it to solve the problem of scheduling the work of several locomotives. The following designations have been introduced:

$A_1, A_2, \dots, A_N -$ the sequence of works submitted, $A_i = \{T_i, t_i, T_i^{cr}\}$;

$S = \{i_1, i_2, \dots, i_N\} -$ the sequence of work numbers performed by one locomotive;

$T -$ the moment the locomotive is ready to start work;

$\theta_i -$ the locomotive is late for the *i-th* job, if this job is performed first;

$\theta_{ik} -$ being late for the *k-th* job, if it follows the *i-th*;

$\theta_{i_1\ i_2 \dots\ i_r} -$ being late for the *i-th* job after completing jobs $i_1, i_2, \dots i_{r-1}$.

We also denote

$$\delta_{ik} = \theta_i + T_i + t_i + c_{ik} - T_k. \quad (1)$$

Taking into account the introduced designations, you can write:

$$\theta_i = \max\{0, T + c_{ik} - T_k\} \quad (2)$$

$$\theta_{ik} = \max\{0, \delta_{ik}\} \quad (3)$$

or

$$\theta_{ik} \geq \delta_{ik} \quad (4)$$

$$\theta_{i_1\ i_2 \dots\ i_r} = \max\{0, \theta_{i_1\ i_2 \dots\ i_{r-1}} + \delta_{i_{r-1} i_r} - \theta_{i_{r-1}}\}. \quad (5)$$

Assuming that the matrix $||C_{ik}||$ contains the minimum travel times between points $i$, $k$, then the following inequalities are true:

$$\left.\begin{array}{l} c_i + c_{ik} \geq c_k; \\ c_{ri} + c_{ik} \geq c_{rk} \end{array}\right\}. \quad (6)$$

this implies:

$$\delta_{ik} > c_k - T_k; \quad (7)$$

$$\theta_{ik} > \theta_k. \quad (8)$$

In other words, the delay of the locomotive to the *k-th* job will not decrease if this job is performed not the first, but the second. Similarly, one can prove that

$$\theta_{i_1\, i_2 \ldots i_r\, k} \geq \theta_k. \quad (9)$$

From formulas (5) and (9) it follows

$$\theta_{i_2 \ldots i_r} \leq \theta_{i_1 \ldots i_{r-1}} + \theta_{i_{r-1}\, i_r} - \theta_{i_{r-1}} \quad (10)$$

and for the last $i_N$- the job

$$\theta_{i_1 \ldots i_N} \leq \theta_{i_1 \ldots i_{N-1}} + \theta_{i_{N-1}\, i_N} - \theta_{i_{N-1}}. \quad (11)$$

Based on conditions (10) and (11), we obtain

$$\theta_{i_1 \ldots i_{N-1}\, i_N} \leq \sum_{k=1}^{N-1} \theta_{i_k\, i_{k+1}} - \sum_{k=2}^{N-1} \theta_{i_k} = \sum_{k=1}^{N-1} (\theta_{i_k\, i_{k+1}} - \theta_{i_{k+1}}) + \theta_{i_N}. \quad (12)$$

Similarly, for any $i_r$- th job

$$\theta_{i_1 \ldots i_r} \leq \sum_{k=1}^{r-1} (\theta_{i_k\, i_{k+1}} - \theta_{i_{k+1}}) + \theta_{i_r}. \quad (13)$$

Summing over $r$, we get:

$$\sum_{r=1}^{N} \theta_{i_1\, i_2 \ldots i_r} \leq \sum_{r=1}^{N} \theta_{i_r} + \sum_{r=2}^{N} \sum_{k=1}^{r-1} (\theta_{i_k\, i_{k+1}} - \theta_{i_{k+1}}) = \sum_{r=1}^{N} \theta_{i_r} + (N-1) \times$$

$$(\theta_{i_1\, i_2} - \theta_{i_2}) + (N-2)(\theta_{i_1\, i_2} - \theta_{i_3}) + \cdots + (N-k)(\theta_{i_k i_{k+1}} - \theta_{i_{k+1}}) + \cdots +$$

$$+ (\theta_{i_{N-1}\, i_N}) + \theta_{i_N}. \quad (14)$$

Thus, (14) determines the upper bound for the sum of locomotive delays to $N$ jobs (in the case $\delta_{ik} \geq 0$ strict equality holds for all $i$, $k$).

Consequently, the right-hand side of inequality (14 can be taken as an optimality criterion, to minimize the values of which we used method of the “branches and boundaries”.

Objective function:

$$Z = \sum_{i=1}^{N} \theta_i + \sum_{k=1}^{N} (N-k)\, (\theta_{i_k\, i_{k+1}} - \theta_{i_{k+1}}) \quad (14)$$

and since $\sum_{i=1}^{N} \theta_i = const = C_0$, the problem is to minimize the second sum in (14).

To obtain estimates of subsets of routes arising in the process of branching, construct the matrix

$$M_0 = \|a_{ri}\| = \|\theta_{ri} - \theta_i\|. \quad (15)$$

The objective function takes the form

$$Z = C_0 + \sum_{k=1}^{N-1} (N-k)\, a_{i_k\, i_{k+1}} \to min \quad (16)$$

and the problem is reduced to choosing the optimal values $a_{i_k i_{k+1}}$

We branch and evaluate the resulting vertices according to the following algorithm.

0-th step. Calculated $a_r^0 (r = 1,2, \ldots, N)$ – the minimum values for the lines $M_0$:

$$a_r^0 = \min\{a_{ri}\}, i = 1, \ldots N \quad (17)$$

an ordered sequence is formed

$$\Gamma_0 = (a_{i_1}^0, a_{i_2}^0, \ldots a_{i_N}^0), \quad (18)$$

satisfying the condition

$$a_{i_1}^0 \leq a_{i_2}^0 \leq \cdots \leq a_{i_N}^0 \quad (19)$$

As a lower bound for $Z$ on the set of all routes, we take

$$Z^0 = c_0 + \sum_{k=1}^{N-1}(N-k)\, a^0_{i_k}, \qquad (20)$$

since it can be shown that for any schedule $Z \geq Z^0$.

1-st step. Branching into two subsets $\Phi_1, \overline{\Phi_1}$ is carried out as follows. Let $a_{i_1} = a_{pq}$, then $\Phi_1$ – is a subset of routes for which the first two jobs are $-A_p, A_q$; $\Phi_1$ –subset of routes for which $A_p, A_q$ are not the first two jobs.

Матрица $M_0$, исходная для 1-го ветвления, обозначается $M_1$, а матрица, полученная из $M_1$ вычеркиванием строк и столбцов с номерами $p, q$, обозначается $M_1^{pq}$.

Since a possible continuation of any option $\varphi_1 \in \Phi_1$ must begin with $A_q$, for the assessment of $\Phi_1$, an assessment sequence $\Gamma_1$ is formed:

$$\Gamma_1 = (a'_{i_1}, a'_{i_2}, \dots a'_{l_N}), \quad (21)$$

$$a'_{i_1}, = a'_{i_2} = a_{pq}; \quad (22)$$

$$a'_{i_2} = min\{a_{ql}\}, \quad (23)$$

$l \neq p$, and as the rest $a'_{i_k}\ k = 3, \dots, N$ take the values of the minimum along the rows of the matrix $M_1^{pq*}$, arranged in ascending order.

The estimate $Z_1$ for the set $\Phi_1$ is calculated by the formula

$$Z = c_0 + \sum_{k=1}^{N-1}(N-k)\, a'_{i_k}. \quad (24)$$

The evaluation sequence $\overline{\Gamma_1}$ for $\overline{\Phi_1}$ has the form

$$\overline{\Gamma_1} = (\overline{a'_{i_1}}, \overline{a'_{i_2}}, \dots \overline{a'_{i_N}}), \quad (25)$$

$$a'_{i_1} = min\{a_{rt}\} = a_{st}; r, l = 1,2, \dots, N.\ (r,l) \neq (p,q) \quad (26)$$

The rest of the elements of $\Gamma_1$ are taken from the original sequence $\Gamma_0$ (18), from where the minimum over the *s-th* row was previously excluded.

The estimate $\overline{Z_1}$ is calculated similarly to (24) by summing over the elements $\overline{\Gamma_1}$.

As a vertex for the subsequent branching $\Phi'$ is chosen, for which

$$Z' = min\{Z_1, Z_2\}. \quad (27)$$

$k$-th step. With all subsequent branches, two cases may arise.

1. After k branches, a sequence of works $A_{i_1}, A_{i_2}, \dots, A_{i_{q-1}}, A_{i_q}$, is selected for the sequence of works, which serves as the beginning of further steps.

Objective function assessment

$$Z^0 \geq [c_0 + (N-1)a_{l_1 l_2} + \dots + (N-q+1)a_{l_{q-1}, l_2}] = c_k \quad (28)$$

2. After $k$ branches, no subsequence of jobs is chosen, ie, $Z^k = \overline{Z}_l, i = 1, 2, \dots, k$.

This means that the matrix $M_{k+1}$ is identical to $M_1$, but the elements corresponding to the sequences not selected in the first $k$ branches are replaced by very large numbers. The choice of a vertex for subsequent branching is similar to that described above. The branching process continues until all jobs take up space in the sequence. The $Z$ score for the last vertex gives the value of the goal function.

In the case $a_{ik} \neq 0$; for all $i$, to $Z$ determines the true sum.

The required sequence of operations is described by a work dependency graph, the vertices of which correspond to the activities, and the arcs determine the order of their execution. The first level of the graph contains independent vertices without incoming arcs. Works of the *k-th* level cannot be performed earlier than the previous works of $1, 2, \dots, (k-1)$ *-th* levels. Taking these constraints into account significantly reduces the set of acceptable options.

**Results and discussion.** The computational scheme of the sequence ordering algorithm is illustrated by the following simple example. Let us present the initial

waiting matrix for locomotives by jobs $M_0 = \|a_{rl}\|$ for four jobs $A_1 \dots, A_4$; $\theta_i = 0, i = 1, 2, 3, 4$, i.e., locomotives are not late for the first works.

| - | $A_1$ | $A_2$ | $A_3$ | $A_4$ | $a_i$ |
|---|---|---|---|---|---|
| $A_1$ | X | 11 | 14 | 15 | 11 |
| $A_2$ | 16 | X | 10 | 15 | 10 |
| $A_3$ | 44 | 35 | X | 25 | 25 |
| $A_4$ | 41 | 36 | 21 | X | 21 |
| $b_i$ | 16 | 11 | 10 | 15 | - |

The original sequence $\Gamma_0 = (10, 11, 21, 25)$.
Assessment $Z^0 = 3 \cdot 10 + 2 \cdot 11 + 1 \cdot 21 + 0 \cdot 25 = 73$; $a_{i_1} = a_{pq} = a_{23}$. We

form two subsets: $T_1$, where the first two jobs are $A_2, A_3$, and also $\overline{T}_1$, where the first two jobs are not $A_2, A_3$.
Let's form a matrix

$$M_1^{pq*} = M_1^{23*} = \|\begin{matrix}\infty & 15 \\ 41 & \infty\end{matrix}\|.$$

We form a sequence $\Gamma_1$:

$$a'_{i_1} = a_{i_1} = 10; \; a'_{i_2} = 25;$$

$$\Gamma_1 = (10, 25, 15, 41).$$

Assessment $Z_1 = 3 \cdot 10 + 2 \cdot 25 + 1 \cdot 15 + 0 \cdot 41 = 95$. Next, we form the sequence $\overline{\Gamma}_1$:

$$a'_{i_1} = 11, \overline{\Gamma}_1 = (11, 10, 21, 25).$$

Assessment $z_1 = 3 \cdot 11 + 2 \cdot 10 + 1 \cdot 21 + 0 \cdot 25 = 74$.
$74 < 95$ and, consequently, for the subsequent branching we choose the vertex $z_1$, consistent with the sequence of works 2, 3. The further course of the solution is clear from Fig. 1.

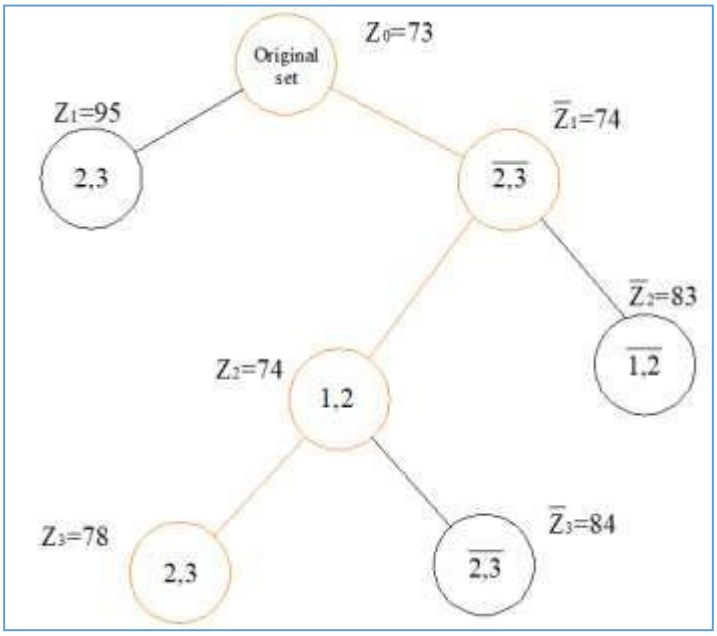


**Fig. 1.** An example of solving the problem of scheduling the work of shunting locomotives according to the criterion of minimum total waiting for work.

From Fig. 1 that the optimal sequence when performing work with one locomotive $\{A_1A_2A_3A_4\}$ gives the sum of delays $\theta = 78$ minutes.

## Conclusion

1. A mathematical model has been developed for scheduling the work of shunting locomotives at railway stations on the basis of the “branches and boundaries” method in order to minimize the waiting of locomotives by work and automate the effective decision-making.
2. The developed model allows the operating personnel of the railway station to combine works with the aim of grouping single works that have the same or associated departure and destination addresses.

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# THE ROLE AND IMPORTANCE OF THE SUBJECT “STAGE SPEECH” IN TRAINING ACTORS.

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**Annotasiya.** Mazkur maqolada sahna nutqi fanining nazariy asoslarini, tarixi, o‘qitish uslublarini o‘rganish orqali bo‘lajak aktyorlarni o‘qitish jarayonida amaliyotda qo‘llash masalalarining dolzarbligi ko‘rib chiqilgan. O‘qitish jarayonida esa sahna nutqining poydevori bo‘lgan tumashg‘ulotlar keltirilgan. Adabiy parchalar, sa'jlar, she'r, tasviriy masal va hikoyalar orqali talabaning nutqini rivojlantirish ko‘zda tutilgan.

**Kalit so‘zlar:** san'at, sahna, teatr, nutq, sa'j, tasviriy parcha, aktyor, she'r, tasviriy masal, adabiyot.

**Аннотации.** В статье исследуется актуальность вопросов практического применения в процессе подготовки будущих актеров на основе изучения теоретических основ, истории, методики преподавания науки сценической речи. В процессе обучения даются уроки, составляющие основу сценической речи. Он направлен на развитие речи учащихся с помощью литературных отрывков, садж, стихов, образных притч и рассказов.

**Ключевые слова**: искусство, сцена, театр, речь, садж, живописное произведение, актер, стихотворение, иллюстрация, литература.

**Annotation.** The article discusses applying issues of theoretical principles of the subject "stage speech" in the process of training future actors through the teaching to history, methodology of teaching, and putting acquired skills into practice. In the process of teaching, the basics of stage speech are presented. It is intended to develop the student’s speech through literary passages, saj, poems, figurative parables, and stories.

**Key words:** art, stage, theatre speech, saj (emotive prose), figurative parables, actor,poem,illustrative fable, literature.

**Introduction.** It is well known that one of the expressive bases of the criterion of human development is that the existing word is one of the most powerful and influential factors in our internal and eternal intellect, emotion, behavior, and attitude. Our languages play a great role in all spheres of human life such as social life, the relations of the individual and society, in the imagination of the individual who tries to reach spiritual perfection, development of outlook, incomparable and influential spirituality, and enlightenment. imagination and worldview

Great people, scientists and outstanding figures who have made a incomparable contribution to the development of world civilization, shared their views on our language, which at all stages of human history has been the interpreter of the balance between peoples and countries.

**Literature review.** Several research works have been conducted by scientists and specialists on training future actors. In particular, S. Inomkhodjayev's "Fundamentals of Artistic Reading", A. Sayfuddinov "Literary work and performance skills", N. Aliyeva "My life in art", I. Pulatov "Stage speech", Z. Olimjanova, A. Tulaganov "Stage speech", Z.Bobonazarova “Stage speech”, A.Tulaganov“Performing skills of poetic works”, M.Isroilov “Working on monologues”,G.Khalikulova “Stage speech”, H.Juldikoraeva “Lola Khodjaeva speech expert”, LolaKhodjaeva “Oratory” ”, A.Nosirova“ Stage speech ”,“ Fundamentals of live word art ”, S.Inomkhodjaev“ Past speech of the East ”, I.Jumanov“ Stage speech ”, M.Khojimatova“ Stage speech ”.

Also, the given educational literature on the theory and direction of stage speech [1; 2; 3; 4; 5; 6; 7; 8; 9; 10] are the most important methodological manuals in the process of educating future actors to the art of stage speech and public speaking.

Stage speech plays an important role in the acting aspect of theatrical art. Not only teachers but if it is necessary directors and actors are also should give serious attention to the subject "stage speech". Due to the attention of Mannon Uygur, Tashkhoja Khodjaev, Etim Bobojonov, Shukur Burkhanov, Abror Khidoyatov, and other great and inexhaustible performers and actors of the stage language, science has developed practically.

During the 70 years of its activity, the department has created many pamphlets and manuals in the field of education "Stage speech".

Stage speech science should base on a live performance school. This school was formed over the years and has made a significant contribution to the art of theater.

Founders of such schools of stage arts: M. Uygur, A. Khidoyatov, O. Khojaev, Sh. Khodjaeva, A.Sayfutdinov, I.Pulatov S.Inomkhodjaevs and their followers M.Isroilov, Z.Olimjanova, A.Nasirova, now I.Jumanov, R.Kadirov, Sh.Yusupov, M.Khodjimatova, G.Khalikulova, X Juldikaraeva, B. Magdiev, U. Ibragimova, N. Karimbaeva, D. Umarova, D. Jumanova and others continue this coaching activity.

**Research methodology.** The subject "Art of stage speech" which teaches prospective artists, including actors and directors, to work on speech techniques and speech, as well as the stages of its development and formation, working on the student's speech, eliminating all shortcomings, making it fluent and effective is taught to future artists

**Analysis and results.** It is known that national consciousness and expression of the national thinking and spiritual relations between generations is manifested through languages. All human qualities enter into the soul of the human being by the lullaby that our mothers sing in their mother tongue. The mother tongue is the soul of the nation.

Along with the development of the Uzbek national professional theatrical art, the subject of "Stage speech" has also developed and flourished. While the standard norms of this subject were practically improved by such master artists as M.Uygur, A.Hidoyatov, E.Bobojonov, Sh.Burkhonov, O.Khojaev, S.Eshonturaeva in creative processes, teachers N.Alieva, L.Khojaeva also both methodologically justified.

Students will go through a huge creative process of the subject "Stage speech", which is interesting, complex and complicated, rich in theory and practice.

Since stage speech is an integral part of theatrical art and the main means of expression of acting skills, it should always be in the center of the artist's attention, as the most important object of the performance process in all stages of the creative research process.

Both the educator and the student that has realized two times the greater value of the word and who felt greater importance of reaching the auditory should understand that the word - is the blood of art of stage and these factors should be approached.

As heirs of invaluable wealth passed down from ancestors to generation, we must constantly work to preserve, enrich and enhance the prestige of our mother tongue. In particular, in such important areas as basic sciences, modern communication and information technologies, banking and financial systems, expanding the use of our native language, publishing etymological and comparative dictionaries, developing the necessary terms and phrases, concepts and categories, particularly, the Uzbek language there is no doubt that all-round development on a scientific basis will serve such noble goals as the awareness of national identity, a sense of homeland.

It is well known that the first stage of the student’s creative process of working on a word is these descriptive literary fragments. The students who are required to describe a small landscape, first of all, should have such skills as seeing, feeling, reacting, in the next stage, all the elements of speech technique, whether a low or full story, the finished work, the actor's idea, the relevance of the topic, the high goal, the leading behavior, etc s well as to be able to interpret processes correctly. Only then, the actors will achieve perfection of their artistic language as well as gain the ability to work on the creation of stage narration independently.

The preservation of the effectuated strong traditions by the above-mentioned artists of the Uzbek stage speech school in professional theatrical art and its application in today's theatrical art, especially in stage speech, determines the prospects of art education.

A word – is an expression of human thought. Word plays a crucial role in actors’ reproductive life in describing humans’ life in a beautiful way. Future actors and directors of the Uzbek State Institute of Arts and Culture always try to study the basic principles of stage skills in order to achieve high-performing skills by explaining to the audience the essence of the work performed through the words.

The function of speech in theater is somewhat different from that of real life. The process by which actors use speech in order to perform a certain action is more complex. This is because spectacle in the theater prevents the relation of speech from being formed as directly and naturally as in life. As a result, many actors use speech for what the character in the poem says. They forget that they must act with words, confusing the task entrusted to them. Stage speech should be an aid to physical movement. A word in the form of a character is assisting tool on the way to achieving their goals.

The stage speech is differentiated by its deep meaningfulness and expressiveness. Its meaning, content and tone require the actor to study comprehensively and to constantly practice directing it to the various points of influence - the sphere of consciousness, imagination, emotion. As the actor creates the speech of his role, he must determine exactly which aspect of his partner he intends to

influence, i.e.,his consciousness, imagination, or emotions. Once the goal of influencing any aspect of the partner is determined, the actor should strive to ensure that his or her speech sounds logical, convincing and effective. To do this, he must define and deeply study the text of the role, divide it into parts, clarify the meaning and purpose of each part and, finally, the meaning and purpose of the whole text.

Once the most important and complementary of these tasks have been identified, it will be much easier for the performer to learn the meaning, purpose, and meaning of each speech from the other. This, in turn, allows the actor to use tone and accents correctly. These notions prove that the above-mentioned basic task of the actor in the use of speech is important and necessary.

As the actor creates the words for his scene, he must determine which aspects of his partner he intends to influence, namely, consciousness, imagination, or emotions.

Characters performed by representatives of art of national theater O.Khojaev, Sh.Burkhonov, S.Eshonturaev are still remembered by our people. Today, in order to preserve the school created by its representatives People's Artists of Uzbekistan T. Azizov, E. Kamilov, H. Sadiev, Honored Artist of Uzbekistan N. Makhmudova and a number of masters of oratory, announcers, young artists are pass through their experience to the younger generation by teaching them to theatrical art in our institute.

Devoted people and mentors in this field are telling about life and works of above mentioned scientists.

“The role of stage speech in the theatrical art is incomparable. Hence, there is a need to master science. The goal is to make the stage speech of speech artists invaluable and elegant. "

To control and activate the activity of the speech organs, it is necessary to have a complete understanding of its structure and the mechanism of muscles. Because in order to eliminate a defect, if it is determined where it was originated from, then the actions taken in eliminating it will be more effective.

If there is a defect in one of the parts of the organs of speech, or if some part does not work well, it interferes with speaking in moderation. As K.S. Stanislavsky said: “ a good performer, an actor, pronounce every vowel and consonant clearly. Only then he understands what the speech is and he can love it. If he is accustomed to it, he will not burble».

**Conclusions.** Every action, if there is no deep-rooted purpose, may enjoy the crisis. In this regard, it is worth noting the following thoughts of Shakespeare on the sample of Hamlet: “Act according to the word, speak according to the action. But this should not go beyond the imagination. Any loss of balance goes against the goal of the theater.”.

In the process of creating an image, actors should not limit themselves to working on a role, creating their own speech, voice, pronunciation, speech characters otherwise the various speech defects that give rise to the objection will not disappear. Since actors do not work in the most pleasant, most effective way to express or understand an idea, communicate, express oneself, express a thousand and one inner state, actions, goals, sharpness, sensitivity, fluency, the integrity of language they will be able to improve only their own creativity however Uzbek literary language is used

not only in the theater but also in life, on television, radio where it tends to face with more challenges at the result of which too many mistakes can be done.

To sum up, in the process of the formation of stage speech as a science, the scientific and creative activity of teachers who created the methodology and pedagogy of this science, their pedagogical skills should be carefully studied from a scientific and practical point of view.

Stage speech can be instantly formed and is appreciated only by intellectuals with a broad mind, deep thinking, a clear knowledge of the historical roots of our nation, who treat them with kindness. These problems can be solved by the family environment - school teachers, especially social studies teachers, who mostly pay attention to their language and speech, and in higher education, it is necessary to refer to our rich history, literature, especially poetry, and to be able to understand and perform them without difficulty, even if it is through a dictionary.

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# USE OF LAKE WATER FOR AGRICULTURAL PLANNING IN DROUGHT YEARS IN THE CASE OF KHOREZM REGION

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**Annotatsiya.** Qurg'oqchilik sabablari, qishloq xo'jaligi oqibatida yuzaga kelayotgan qurg'oqchilikning Xorazm viloyatida ekinlarni yetishtirishga ta'siri maqolaning asosiy mazmunini tashkil etadi. Unda muammo yechimini topish va tayyorgarlik ko'rish uchun ko'llar suvlaridan foydalanish imkoniyati ko'rib chiqilgan. Ko'llarning maydoniga ko'ra guruhlarga ajratilgan va har bir guruh ko'llar uchun alohida ehtimoliy suv yetkazish hududlari buffer tahlil asosida belgilangan. Buffer hududga kiruvchi ekin dalalari tuproq ball boniteti asosida asosiy oziq-ovqat ekinlari: bug'doy, makkajo'xori, sabzavotlar va sholi yetishtirish uchun tanlangan. Tuproq ball boniteti ekinlar turiga mos ravishda 100-60, 59-50, 49-40,39-0 kabi ajratilgan. Yirik va o'rtacha ko'llar suvidan qurg'oqchil yillarda foydalanish tavsiya qilingan va bug'doy uchun 2966.46 ga, makkajo'xoriga 2821.09 ga, sabzavot yetishtirishga 2724.93 ga hamda sholilikka 2466.84 ga maydon to'g'ri kelgan.

**Kalit so'zlar:** Qurg'oqchilik, ko'llar, qishloq xo'jaligini rejalashtirish, xaritalash, buferlash, tuproq boniteti, bozorbop ekinlar.

**Аннотация.** Причины засухи, влияние засухи сельского хозяйства на растениеводство в Хорезмской области считаются основное содержание статьи. Возможность использования озерной воды для поиска решений и подготовки к ним рассмотрены в ней. Озера были разделены на группы в соответствии с их площадью, и возможные площади водоснабжения для каждой группы озер определены и указаны с помощью буферного анализа. Сельскохозяйственные поля, включенные в буферную зону, были выбраны путем анализа бонитета почвы для выращивания основных пищевых культур: пшеницы, кукурузы, овощей и риса. Бонитет почвы был разделен на 100-60, 59-50, 49-40, 39-0 в соответствии с типом культуры. Рекомендован использовать воду больших и средних озер в засушливые годы, а также площади с 2966.46 га для пшеницы, 2821.09 га для кукурузы, 2724.93 га для овощей и 2466.84 га для риса.

**Ключевые слова:** Засуха, озера, сельскохозяйственное планирование, картографирование, буфер, почвенный бонитет, товарные культуры.

**Annotation.** The reasons for drought and the impact of agricultural drought to crop production in the Khorezm region are the main content of the article. The possibility of using lakes water to find solutions and to be prepared for the problem reviewed. The lakes were divided into 5 groups according to their area. The possible water supply areas for each group of the lakes were determined and indicated by buffer analysis. The agricultural fields within the buffer zone were selected for the cultivation of main food crops through analyzing soil bonitet: wheat, corn, vegetables, and rice. The soil ball bonitet was divided into 100-60, 59-50, 49-40, 39-0 corresponding to the type of crops. It is recommended to use water of the large and medium-sized lakes in drought years and areas with 2966.46 ha for wheat, 2821.09 ha for corn, 2724.93 ha for vegetables, and 2466.84 ha for rice were found useful.

**Key words:** Drought, lakes, agricultural planning, mapping, buffering, soil bonitet, cash crops.

**Introduction.** Drought is a serious phenomenon that affects the safety of ecosystems and society in arid regions. It is considered a negative process at global, regional, local levels. Therefore, developed countries have clear plans, preparedness, and forecast focusing to decrease the negative consequences through various innovative scientific methods. However, developing countries need to build capacity, and carry out research activities to solve the problem. Increasing the number of the population, demand for drinking and irrigational water, lack of water-saving technologies and experiences, continuous melting mountain glaciers, climate change, and water pollution, unequal distribution of water resources have made more difficult the solution of the drought in Uzbekistan. Once, drought happened in 2000, 2008, 2016, and 2020 years in the Khorezm region of the country where the population of the area suffer from its' economical, natural and social consequences. The situation requires considering all possible versions of using water resources for cultivating the main crops, and one of them may be seen as using lakes water just to supply food security in the drought years. The experiment was carried out in the Khorezm region, Uzbekistan.

**Literature review.** Drought is predicted to widen its effect throughout the world. It happened in Mexico on 24.04.2021 as the result of occupying dry and hot weather masses over the county territory. Water reservoirs, lakes have shrunk and the freshwater supplement system almost failed [1]. It is a typical phenomenon that occurs widely and rapidly in Central Asia [2].

In most cases, drought is considered a natural disaster, some authors showed its' anthropogenic occurrence in the Khorezm region [3]. It is because some farmers, occupied lands at the banks of Amudarya River and closer areas of the canals, always cultivate cash crops such as rice by making illegal agreements, even without any contract with the local government. Thus, irrigation water does not reach the downstream and edge parts of the region. Gardens, tomarqas (rented lands of citizens), lakes, and other agricultural lands suffer from drought.

The literature and the experiences showed that there are several ways of solving the situation. The first is monitoring the land use by remote sensing (RS): identifying agricultural land use by monitoring through RS was widely investigated and was found effective [4, 5, 6, 7]. However, the fact is that, if the results of monitoring are not

published or reported in public the attempts to lessen the anthropogenic drought become useless.

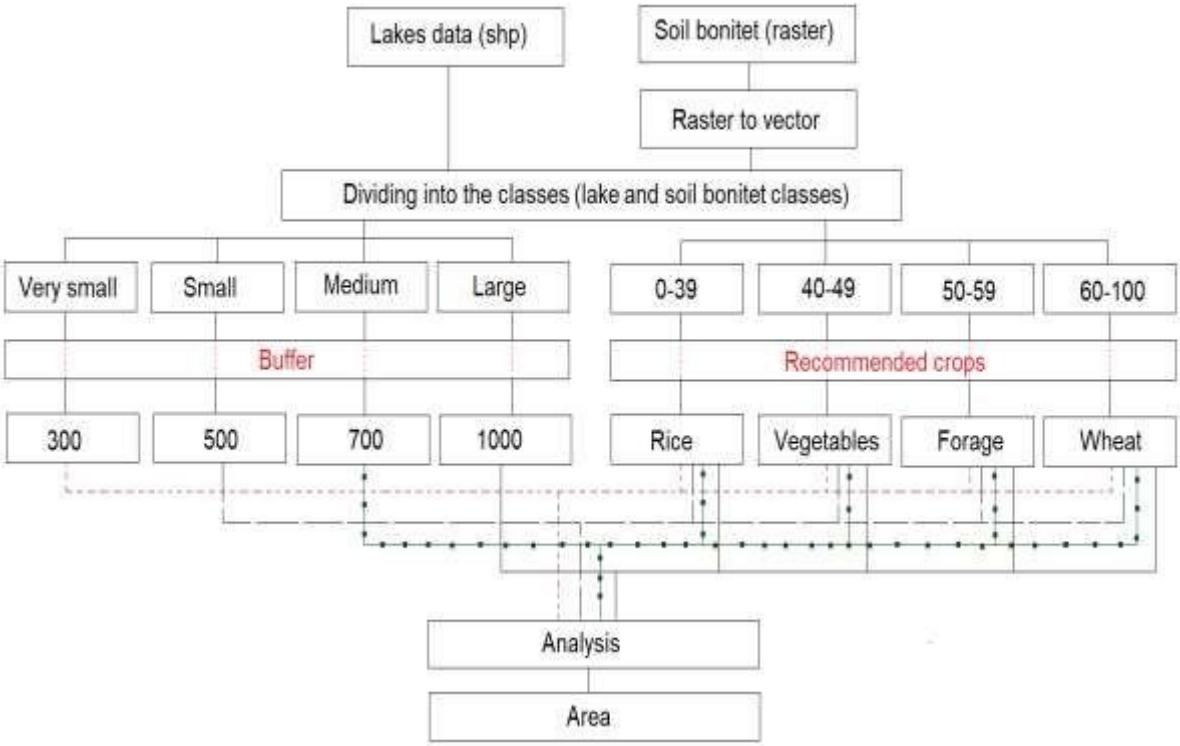
The second is using possible water sources including underground, drainage, and lakes' water to cultivate main crops to provide food security. Drainage and lakes' saline water usage may be considered as the non-environmentally approach. It leads to soil salinization, pollution, increase of unwanted bacteria, disease, etc.

The anthropogenic drought starts from the mid of May till the end of August. It is the period for cultivating rice. It definitely affects other crop production cycles. When we consider the situation with winter wheat cultivation the following picture arises: winter wheat (in September and October) starts actively growing in March, depending on the climatic condition, and needs to be watered in March, April, and early May. Irrigation water stop when the wheat needs to gain seeds. Experiments showed that there are, at least, two times watering required to finalize the wheat cultivation during May. But, rice production starts, and irrigation water becomes scarce. The drought period starts at almost all the other crop production. The farmers accept the situation as force major and always blame the government and water management organizations. But people who planted wheat needed to get a harvest, they spent a lot, and the harvest is very near. So, they use the lake and drainages' water. Underground water is being used in agricultural lands which are far from the drainage and lakes.

The possibility of using lake water for agricultural purposes is investigated in this article and developed maps and recommendations by analyzing soil bonitet in the region.

**Materials and methods.** The research materials were based on the experiments carried out during the drought years: 2000, 2008, 2016, and 2020. There was drought with less harmful effects in some years between those periods, and some research materials were collected those years too.Lakes and soil bonitet information were taken from the Land Designing Research Institute of the Khorezm region. Available lakes were divided into four classes by their area. The classification was based on the field monitoring at the experimental lakes in Shovot district. Very small lakes cover 0-12 ha, small 12-25 ha, medium 25-39 ha, and large 39-185 ha areas. Buffer areas were selected for the classified lakes: very small lakes 300, small lakes 500, medium lakes-700, and large lakes-1000 meters. The length of the buffer zone was considered to be equal to the distance that the water of the lake could reach. Soil bonitet was also divided into the four: 0-39, 40-49, 50-59, and 60-100 zones. The most fertile soil zones were recommended for wheat production, while 50-59 ball soil zones for forage crops such as corn, and 40-49 ball soil zones for vegetable, and 0-39 for rice. The corresponding soil bonitet ball zones within the buffer area were suggested to certain crop types. Overlapping polygons were clipped. When lake groups' buffer areas overlapped, the bigger lake groups' buffer areas were taken to consideration. It was thought that the bigger lakes can supply more area with water. The methodology employed in the work comprises simple stems as indicated in figure 1.

Figure-1. Flowchart of the methodology.




**Analysis and Results.** Food security is the main issue during and after the drought years. Also, as the harvest goes at the risk the price of the products increase. Additionally, local people have feelings of fear of hunger formed from the serious famine that happened during the Soviet time. Even if the government has proper food reservation plans after the independence, people are addicted to reserving products, especially for winter periods in villages. Bread is a lovely eatable product of local people. They cultivate wheat in tomarqa's and the harvest cover almost 80 % of their needs for flour. They bake bread from taken harvest in the villages, and more than 60% of the population lives in the countryside in the region. Almost every family in villages has cattle, sheep, and poultry. Corn serves as the main forage crop in this case. Vegetables such as tomatoes are canned maybe in the whole country by hand in families. Sometimes, the government informs people to prepare more canned products before winter comes and it may be the reason for providing food security.

The region is famous for its rice products, and rice is mostly exported to the whole country. The soil salinity has a less negative effect on rice production and it requires more water to keep cool the fields. For example, soil in the Gurlan district is found as the most saline [8], but the district is considered as the main rice production area. When local people are just sure that water will be enough throughout the year then they plant rice.

The farmers and local people use lake water to get the harvest and they do not care about soil bonitet, and soil salinity (figure-2).

Figure-2. Using lake water for agricultural purpose in Boston, Shovot, Khorezm (Photo from O.Matchanov).

It is because no one knows when the drought happens, and the government does not have a proper early warning system. There are not any water-supplement-related problems at the beginning of any year, especially in the February, March, and April months.

It is also, all lakes formed by secondary water discharges from drainage systems, and infiltrated water. Thus, normally, saline water of lakes has not recommendable to use for agricultural purposes.

Research showed there is a total of 41269.55 ha of agricultural lands that can be supplied with water including all types of lakes (table-1). The number of small and very small lakes is greater than the other lakes. Thus, most of the areas correspond to their share with 30290.23 ha. However, almost all very small and small lakes dry during the drought years; especially happened in the 2021 year (figure-3) from summer till the winter. Therefore, they have not been recommended for use as water sources during the drought years.

Medium and large lakes were found useful to water 10979.32 ha lands. But, their water is also recommended using just for reaching the harvest due to salinity and unwanted microorganisms. There are some agricultural lands that can be watered by both medium and large lakes (579.83 ha) (table-1). These areas were inserted into the large-lake water supply areas.

**Table-1**

Possible areas of agricultural lands that can be watered by lakes' water in drought years (hectare).

| Soil bonitet group | Lakes group by size | | | | Total area (ha) | Area corresponding to large and medium lakes | Areas take water from large and medium lakes |
|---|---|---|---|---|---|---|---|
| | Large | Medium | Small | Very small | | | |
| 60-100 | 2447.08 | 519.38 | 987.04 | 5295.44 | 9248.94 | 2966.46 | 77.22 |
| 50-59 | 2338.83 | 482.26 | 1461.75 | 5526.58 | 9809.42 | 2821.09 | 85.8 |
| 40-49 | 2061.79 | 663.14 | 2414.5 | 7508.36 | 12647.79 | 2724.93 | 162.05 |
| 0-39 | 1739.98 | 726.86 | 2311.29 | 4785.27 | 9563.4 | 2466.84 | 254.76 |

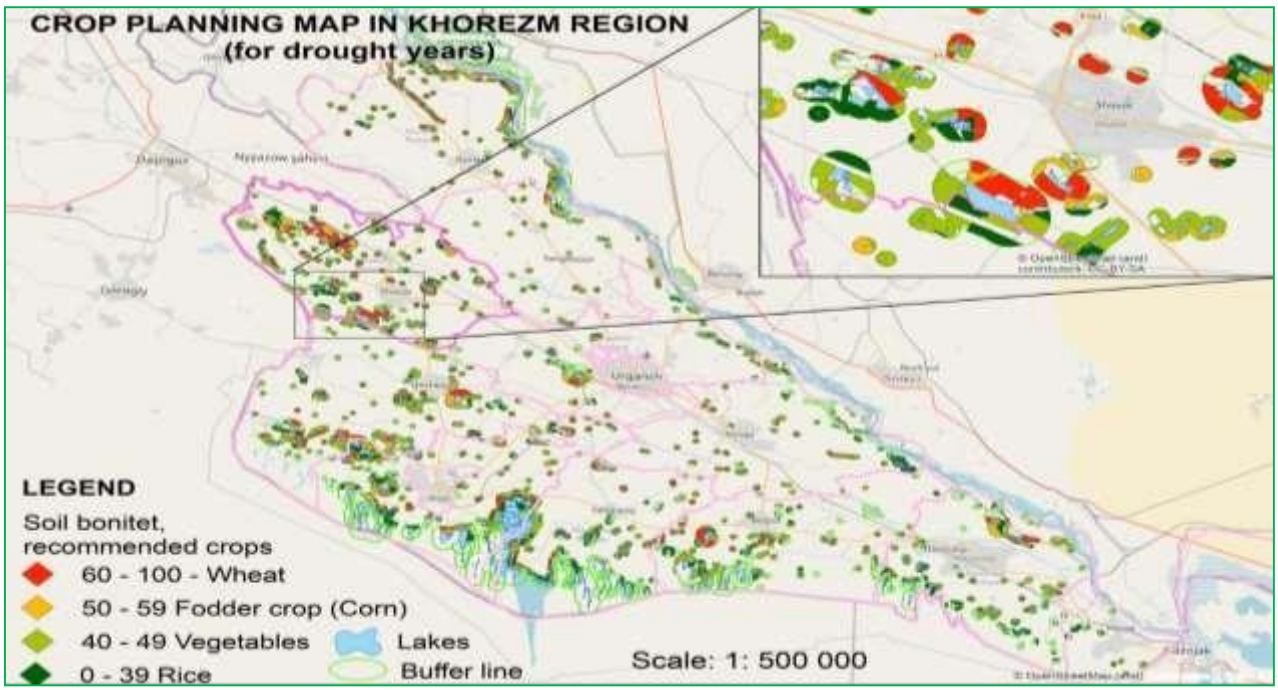

Figure-3. Dried small lake in Boston, Shovot, Khorezm (Photo from O.Matchanov).

The territorial distribution of the lakes also plays an important role in planning agricultural lands during the drought years. Almost all large and medium-sized lakes are located in the southern parts of the region due to the topography (figure-4). Against that, soil type with high bonitet was formed in the northern part of the region. In this case, lakes water is useful just for southern parts of the region.

Figure-4. Map of agricultural lands that can be watered by lake water in drought years.

Using lake water may lead to ecosystem disasters. However, the government should accept proper decisions, taking the eco-humanistic approach of humanistic, in drought years.

**Conclusions**




Lakes area and water volume change year to year in the region, and thus recommendations should base on the large and medium lakes' capacity. It is fact that saline and contaminated water leads to land degradation. So, so lakes water is suggested to use in drought years and just to reach harvest.

The analyzed scenario is based on the experiences carried out in all drought years and can be the solution for socioeconomic and agricultural droughts. When the drought happens due to meteorological reasons the region needs to be supported by the other regions in terms of food security. If not, the lakes may dry just within one year.

The area with 2966.46 ha for wheat, 2821.09 ha for corn, 2724.93 ha for vegetables, and 2466.84 ha rice were recommended.

To be prepared for the serious drought the optimal use of irrigational water from the main canals, drainage, and underground water also need to be taken into the consideration.

**Acknowledgment**

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# MODIFICATION OF THE COMPOSITION OF CERAMIC RESTORATION BRICK TAKING INTO ACCOUNT THE COLOR CHARACTERISTICS OF THE ORIGINAL SAMPLE

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**Annotatsiya:** Maqola qadimgi Xiva yodgorliklaridagi xom ashyo va noorganik devor materiallarining fizik-kimyoviy xossalarini o‘rganishda kimyoviy, rentgen fazali, optik va skanerlash-elektron-mikroskopik usullar natijalaridan foydalanishga bag‘ishlangan.

**Kalit so'zlar:** keramik g'isht, lyossimon tuproq, amorf kremnizyom, elektron mikroskop, rentgen strukturaviy tahlil

**Аннотация:** Статья посвящена использованию результатов химических, рентгенофазавых, оптических и растрово-электронно-микроскопических методов при изучении физико-химических свойств сырья и неорганических стеновых материалов в памятниках древней Хивы.

**Ключевые слова:** керамический кирпич, лессовидные суглинки, аморфный кремнизём, электронный микроскоп, ренгеноструктурный анализ

**Abstract:** The article is devoted to the use of the results of chemical, X-ray phase, optical and scanning-electron-microscopic methods in the study of the physical and chemical properties of raw materials and inorganic wall materials in the monuments of ancient Khiva.

**Keywords:** ceramic brick, loess-like loam, amorphous silica, electron microscope, X-ray structural analysis.

**Introduction.** The wall materials of ancient Khiva are ceramic bricks obtained by firing loess-like loams, which were carried out in a reducing environment in homemade "khumbuz" stoves, where the heat generated from the combustion of various carbon-containing plant products was the source of heat. Such material retained its external size and color for many years. But in recent years, under the influence of natural factors, the processes of destruction of historical objects of the world heritage have intensified. In this connection, restoration work with the use of local materials has become relevant. Ceramic bricks for the restoration of the walls of architectural

monuments are considered to be widely used restoration material.

Several requirements are imposed on the restoration material. In addition to the mechanical, chemical, and physical properties of ceramic bricks, they must fully match in color and size. The color of ceramic bricks depends on the composition of the raw materials used and on the firing conditions. Due to a change in the composition of the raw materials used and on the firing conditions (as a result of changes in the type of fuel and the applied firing mode as well as the kiln), the color of the bricks produced differs from its predecessor. Therefore, the objects of architecture after the corresponding restoration work will lose their original appearance. In this connection, the production of ceramic bricks has become relevant, which fully matches its predecessor in terms of its color characteristics.

The production of ceramic bricks makes it possible to dispose of industrial waste in significant quantities and a wide range of their composition using traditional technology and equipment. In addition, the creation of raw materials using man-made materials is one of the ways to expand the use of low-grade clay rocks, improve the technical properties and reduce the cost of the resulting ceramic bricks. [2]

Since gaining independence in the Republic of Uzbekistan, the foundations of statehood have been laid in the shortest possible time, priority reforms and transformations have been carried out. Thanks to this, it was possible to achieve qualitative structural changes in all spheres of life, and, above all, in the economy, education, construction and architecture. The ancient cities of the Republic of Uzbekistan again acquired the importance of centers of world culture. The steps "to return the cultural heritage" taken over the years in the republic are the contribution of the people of Uzbekistan to the rest of the world to the civilization of all mankind. [4]

An analysis of the main causes of efflorescence of brickwork in the Aral Sea region is presented. It was found that as a result of the alternate wetting and drying of the building material, in which the crystallization of salts occurs in the pores of the material, polyhydric crystalline hydrates are formed with a volumetric increase in volumes exceeding the pore volume in the material. when pressure appears that destroys the building material. External signs of salt corrosion are flaking and chipping of ceramic bricks. The features of the formation of efflorescence in ceramic bricks in the conditions of the Aral Sea region are indicated.[6]

The results showed that the silica/polymer nanocomposite is an effective material for strengthening artistic and architectural monuments from sandstone, is fully compatible, and increases the durability of sandstone. In addition, the resulting nanocomposite improved the mechanical properties of the stone and its resistance to erosion, acids, and salts compared to samples treated with pure SILRES® BS OH 100 without silica nanoparticles. [7]

The main factors influencing the sustainability of architectural monuments are considered. Among natural factors, a fundamental role belongs to the presence of soils with sensory characteristics in the active development zone and to a significant change in these properties under the influence of technogenic pressure. Structural features of buildings, types of building materials, and their age are technogenic factors.[9]

Recently, more and more importance is attached to the decorative qualities of facing ceramic bricks. It is widely used for facing facades when creating interiors of

public buildings and residential buildings, as well as during restoration work.[10]

To determine the technical condition of the buildings of madrasahs and minarets located in Ichan-Kala of Khiva, engineering surveys were carried out on its load-bearing structures. Rather, based on the achievements of modern construction science, the design solution of the specified object is assigned to the engineering analysis. In terms of earthquake resistance of buildings, an attempt was made to draw something in common from such difficult situations of ancient times and building codes that have arisen today. [3]

In this article [8], in a scientific sequence and in detail, the methods of building the minarets of Khiva, architectural composition, building materials, history of construction, devices of the aboveground and underground parts, which are of particular importance in the architecture of ancient Khorezm, are described in detail. analysis for the first time. Most of this information is being introduced into scientific circulation for the first time.

Particular attention is paid to highlighting the history of the activities of state institutions for the scientific study, restoration, and preservation of architectural monuments of the republic. The article also presents a scientific analysis of documents from the personal archives of research scientists such as V.L. Vyatkin, B. Zasipkin, S. Polupanov, M.E. Masson, G.A. Pugachenkova, who played an important role in the study of various aspects of the topic of researching architectural monuments of Uzbekistan. [5]

However, archaeometry data revealed the use of complex mixtures, which is also confirmed by the literature. In particular, the use of calcite along with various organic additives has become commonplace.[1]

**Methods and results.** For the development of new compositions of ceramic bricks, corresponding in all respects to old bricks, it is necessary to study the physicochemical properties of the latter. The elemental chemical composition of ancient bricks was studied by methods of analytical chemistry, the results of which are presented in Table 1. As you can see from the table, the composition of the ancient brick differs from the bricks produced today.

**Table 1**

**Chemical analysis results of ancient ceramic bricks**

| Sample | % weight. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $Na_2O$ | MgO | $Al_2O_3$ | $SiO_2$ | $SO_3$ | Cl | $K_2O$ | CaO | $TiO_2$ | MnO | $Fe_2O_3$ |
| Ancient ceramic brick | 2.57 | 3.69 | 12.39 | 56.92 | 0.27 | 0.11 | 2.11 | 15.18 | 0.57 | 0.16 | 6.03 |
| Modern ceramic bricks | 2.11 | 4.55 | 15.36 | 52.55 | 0.14 | 0.42 | 2.78 | 13.99 | 0.64 | 0.17 | 7.28 |

To establish the mineralogical composition of samples of ancient bricks taken from the walls of ancient Khiva, X-ray phase analysis was carried out. The analysis was performed on Smart Lab 3, which is a versatile multipurpose X-ray diffractometer of the latest generation.

The results of X-ray phase analysis are shown in Fig. 1.

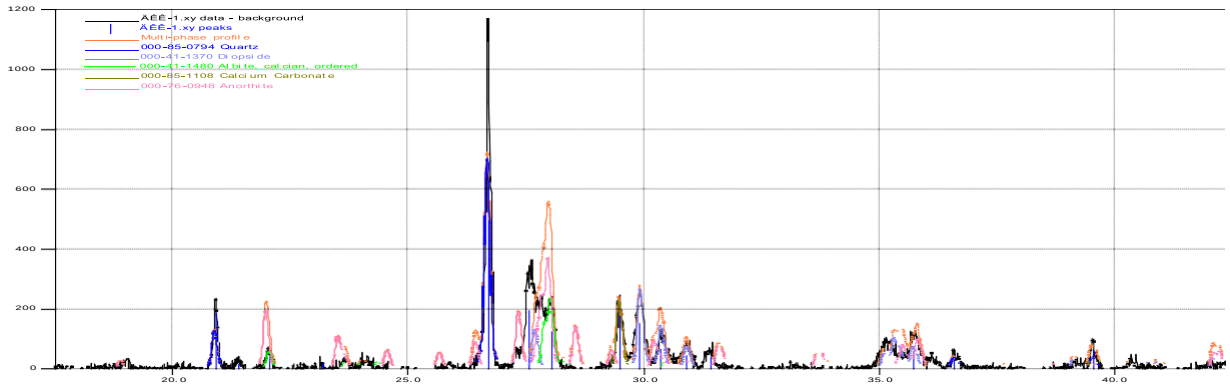



**Fig. 1. X-ray phase images of ancient ceramic bricks.**

**X-ray phase analysis of a sample of an ancient ceramic brick shows that its composition contains: diopside 20%, quartz-36%, albite-15%, Ca2CO3 - 12%, anorthite - 17%.**

To determine the microstructural characteristics of the object under study, a scanning (raster) electron microscope TESCAN VEGA 3 SBH was used. The research results are shown in Fig. 2.

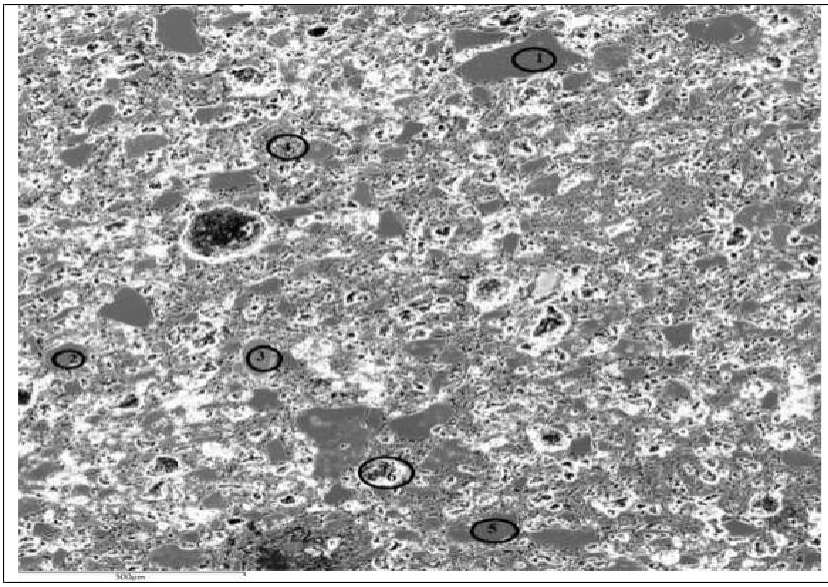


**Fig. 2. An electron microscope image of ancient ceramic brick.** 1-Quartzite, 2-4-5-albite, 3-hematite, 6-diopside.

As can be seen from the figure, the results of the study of the electron microscopic analysis of raw materials are shown in Fig. 2, particles in the form of isometric particles in the form of a hexagon, with broken sides, reflected in the image, refer to the mineral of quartzite, particles in the form, light gray spot to albite, particles in the form of an oval, to the mineral hematite, particles in the form of dark spots - to the diopside mineral. Based on the analyzes carried out, we have developed the compositions of ceramic bricks in the "loess-like rock-defect-amorphous silica" system, the compositions of which are shown in Table 2.

**Table 2.**

**Compositions of ceramic bricks for the restoration of objects in ancient Khiva**

| Compositions | Loesslike breed | Sugar defect | Amorphous silica |
|---|---|---|---|
| L | 100 | | |
| LK-1 | 95 | | 5 |
| LK-2 | 90 | | 10 |
| LK-3 | 85 | | 15 |
| LK-4 | 80 | | 20 |
| LD-1 | 95 | 5 | |
| LD-2 | 90 | 10 | |
| LD-3 | 85 | 15 | |
| LD-4 | 80 | 20 | |
| LDK-1 | 60 | 20 | 20 |
| LDK-2 | 65 | 25 | 10 |
| LDK-3 | 70 | 20 | 10 |
| LDK-4 | 80 | 15 | 5 |

For the analysis, samples were made from the loess-like rocks of the Suzanlisky deposit. The selected clay samples were thoroughly dispersed and sieved through a sieve with a hole diameter of 0.5 mm. The raw material was made by compression molding from semi-dry masses at a pressure of 15 MPa. The firing was carried out at temperatures of 950, 1000, 1050, and 1100 ° C in a SNOL 1200 muffle furnace, the firing time was 4 hours. Photometric studies in reflected light were performed on an X-Rite Color i 5 spectrophotometer microscope (Lomo, Russia) at room temperature in the wavelength range of 400-800 nm; scattered daylight was chosen as the radiation source. The Spectra program automatically determined the color coordinates in the XYZ and CIE Lab systems and also calculated the hue λ and the color purity p.

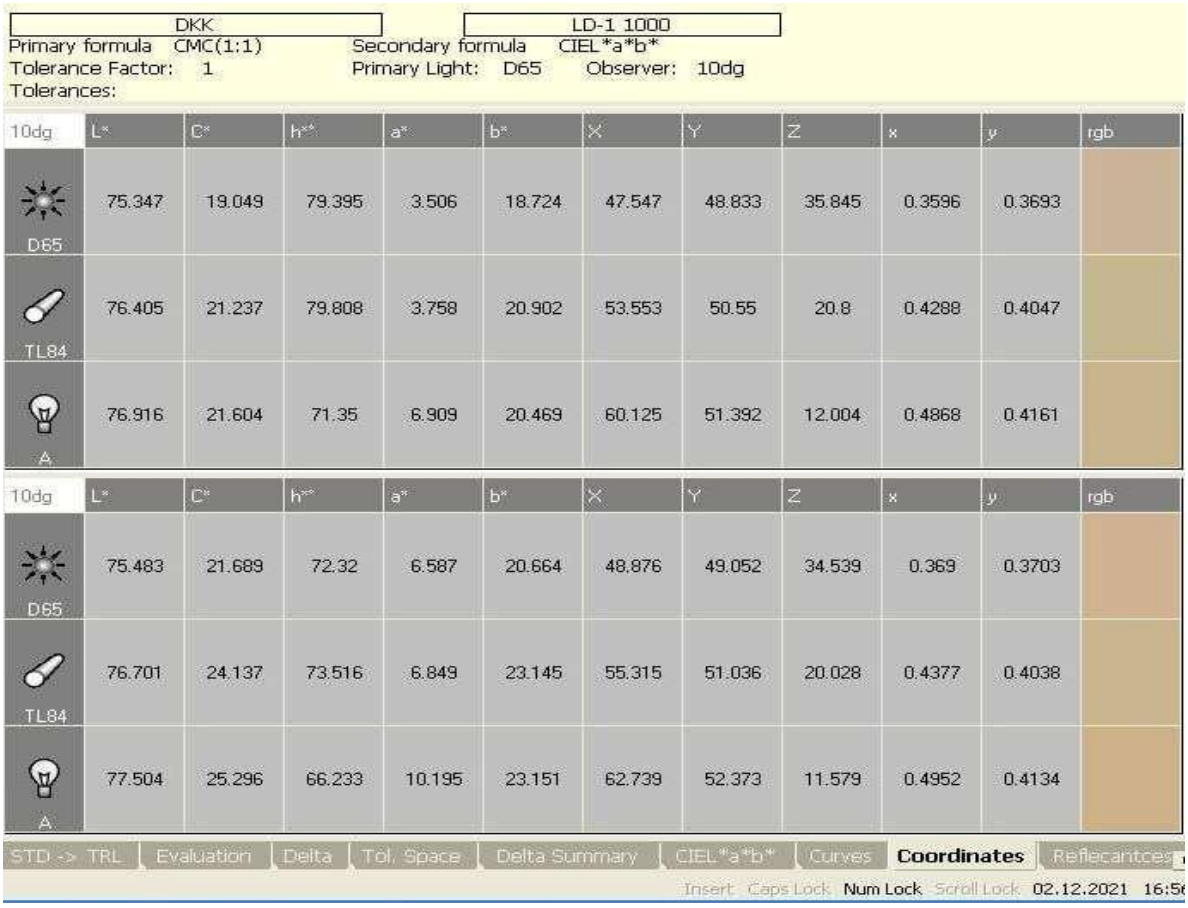
**The discussion of the results.** The chemical composition of the loesslike rock of the Suzanlinsky deposit, the following ingredients: $SiO_2$-52,55-55,08; $Al_2O_3$ -14,56-15,36; $Fe_2O_3$ -6,23-7.28; CaO-12,87-13,99; MgO -3,73-4,55; $Na_2O$ -1,96-2,11; $K_2O$ -1,28-2,78; $TiO_2$ -0,38-0.64; MnO-0,11-0,17. ppp-0,78-5,69. The main contribution to the coloring of a ceramic shard based on a loess-like rock is made by impurities of ions of elements of variable valence, in this case, ferrous and trivalent iron, as well as titanium and manganese oxides. Their total content (6.72-8.09%), however, as a result of heat treatment, depending on the firing conditions and temperature, they acquire completely different shades. In fig. 3 shows the obtained data.

The optical reflection spectrum of a ceramic sample from the rock of the Suzanlinsky deposit (Fig. 3), fired at a temperature of 1050 ° C, is characterized by a broad intense absorption band in the region of 400-600 nm, which, as we assume, is caused by electronic transitions with charge transfer $O^{2-} > Fe^{3+}$ in the octahedra of ferric iron. Weak absorption in the 600-700 nm region and stronger absorption, including the violet, blue and green regions of the spectrum, contribute to the formation of a light transmission window in the orange-red region of the spectrum, which causes coloration of the sample. It should be noted that the interpretation of the absorption bands of $Fe^{3+}$ ions in the spectra of the studied ceramic materials is rather difficult due to the

presence of other chromophore impurities in the initial raw material.

The currently widely used CIE Lab model, approved by the International Commission on Illumination (CIE) in 1964, was chosen as a color model for the quantitative assessment of color. The model consists of three axes, two of them - axes a * and b * - are located at right angles and form a plane, the third axis L * is located perpendicular to the plane a * b *. The a * coordinate denotes a color ranging from green (-a *) to red (+ a *), the b * coordinate denotes a color ranging from blue (-b *) to yellow (+ b *), and L * denotes lightness from black (L * = 0) to white (L * = 100). L *, a *, b * values are measured in NBS (US National Bureau of Standards) units.

It was found that the color characteristic of the optimal composition of LD-1, depending on the change in the firing temperature from 950 ° C to 1100 ° C, leads to an increase in the value of the lightness L * from 68 to 78 units of NBL and is close to the values of the original sample (values L = 75.3).



DKK | LD-1 1000

Primary formula CMC(1:1) Secondary formula CIEL*a*b*

Tolerance Factor: 1 Primary Light: D65 Observer: 10dg

Tolerances:

| 10dg | L* | C* | h** | a* | b* | X | Y | Z | x | y | rgb |
|---|---|---|---|---|---|---|---|---|---|---|---|
| D65 | 75.347 | 19.049 | 79.395 | 3.506 | 18.724 | 47.547 | 48.833 | 35.845 | 0.3596 | 0.3693 | |
| TL84 | 76.405 | 21.237 | 79.808 | 3.758 | 20.902 | 53.553 | 50.55 | 20.8 | 0.4288 | 0.4047 | |
| A | 76.916 | 21.604 | 71.35 | 6.909 | 20.469 | 60.125 | 51.392 | 12.004 | 0.4868 | 0.4161 | |

| 10dg | L* | C* | h** | a* | b* | X | Y | Z | x | y | rgb |
|---|---|---|---|---|---|---|---|---|---|---|---|
| D65 | 75.483 | 21.689 | 72.32 | 6.587 | 20.664 | 48.876 | 49.052 | 34.539 | 0.369 | 0.3703 | |
| TL84 | 76.701 | 24.137 | 73.516 | 6.849 | 23.145 | 55.315 | 51.036 | 20.028 | 0.4377 | 0.4038 | |
| A | 77.504 | 25.296 | 66.233 | 10.195 | 23.151 | 62.739 | 52.373 | 11.579 | 0.4952 | 0.4134 | |

STD -> TRL | Evaluation | Delta | Tol. Space | Delta Summary | CIEL*a*b* | Curves | **Coordinates** | Reflecantces

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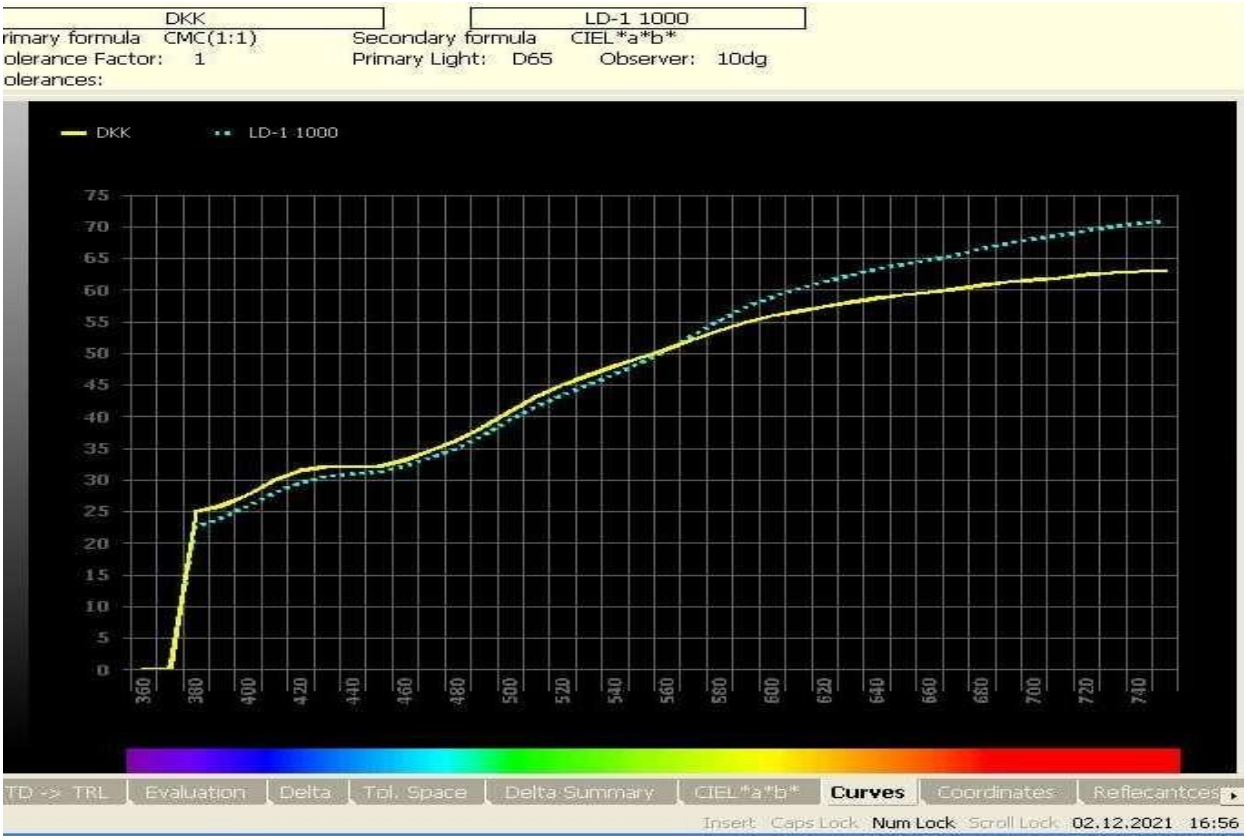
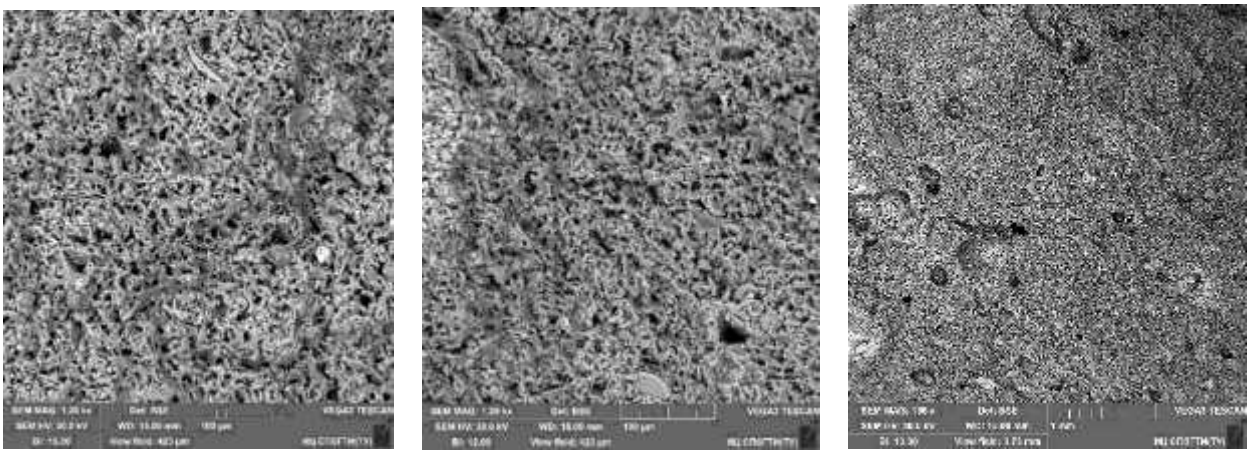



**Fig. 3. Comparative color characteristics of ancient and synthesized optimal composition of ceramic bricks for the restoration of ancient Khiva**

The processes occurring in the ceramic shard, depending on the firing temperature, are analyzed using electron microscopic studies.



a b c

**Fig. 4. Electron microscopic images of a fired ceramic shard of composition LD-1: a) $T_{burn}$-950°C; б) $T_{burn}$-1000°C; в) $T_{burn}$-1100°C.**

At low temperatures, compaction of a ceramic shard is not observed, there are small pores, acicular and prismatic crystals of anorthite, diopside, and quartz enter in fragments of crystalline phases, which indicates the incompleteness of crystal growth. In the fired samples at 1100 ° C, the denser and separate unbound fragments are not found, the crystalline phases are larger and denser. Also established with an increase

in temperature, firing in the samples, an increase in mechanical strength, an increase in fire shrinkage and chemical resistance, as well as frost resistance, and a decrease in water absorption are observed.

Thus, analyzing the data obtained, we have developed the compositions ofceramic bricks that correspond to the mechanical and color properties of ancient ceramic bricks.

The authors express their gratitude to the Department of Chemical Technology of Refractory Nonmetallic and Silicate Materials of the St. Petersburg State Technological Institute and the “El-Yurt Umidi” Foundation of the Republic of Uzbekistan for the opportunity to conduct laboratory research.

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**UDC: 101(075.8)**

# SOCIO-PHILOSOPHICAL ANALYSIS OF THE PHENOMENA OF THE BEING

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**Annotatsiya**: Yangi O‘zbekiston qurilishidagi jadal taraqqiyot, yangilanishlar, islohotlarning hozirgi bosqichida kitobxonlik madaniyati masalasi ayniqsa dolzarbdir. Kitobxonlik madaniyati ijtimoiy hodisa sifatida zamonaviy shaxsning yuksak axloqiy, ma’naviyat va tarbiyasiga erishishning asosiy vositalaridan biridir. Maqolada muallif kitobxonlik madaniyati hodisasini ijtimoiy-falsafiy tadqiq qiladi, bu hodisaning mohiyatini ochib beradi, kitobxonlik madaniyatini yuksaltirish yo‘llarini taklif etadi.

**Tayanch so‘zlar:** borliq, kitobxonlik madaniyati, madaniyat, Yangi O‘zbekiston, ma’naviyat, axloq, ijtimoiy-falsafiy tahlil, ijtimoiy falsafa**.**

**Abstract:** At the current stage of rapid development, innovations, reforms in the construction of New Uzbekistan, the issue of the culture of reading is especially acute. Reading culture, as a social phenomenon, is one of the main means of achieving high morality, spirituality and education of a modern person. In the article, the author conducts a socio-philosophical study of the phenomenon of reading culture, reveals the essence of this phenomenon, and suggests ways to improve the reading culture.

**Key words:** being, reading culture, culture, New Uzbekistan, spirituality, morality, society, socio-philosophical analysis, social philosophy.

**Аннотация:** На нынешнем этапе стремительного развития, инноваций, реформ в построении Нового Узбекистана особо остро стоит вопрос о культуре чтения. Читательская культура, как общественное явление, как феномен бытия, является одним из главных средств достижения высокой нравственности, духовности и образованности современного человека. В статье автор проводит социально-философское исследование феномена культуры чтения, раскрывает сущность данного феномена, предлагает пути повышения читательской культуры.

**Ключевые слова:** бытие, культура чтения, культура, Новый Узбекистан, духовность, нравственность, социально-философский анализ, социальная философия.

**Introduction.** The phenomenon of the reading is one of the central and fundamental substructures of reading culture. If culture, from the point of view of philosophy, is the world of development and achievement of mankind in the social, industrial and spiritual terms, then reading, as a substructure of culture, is a sociocultural and communicative system, the main task of which for many centuries has been the preservation, interpretation and transmission of sociocultural information.

Reading as a social and communicative substructure creates and ensures the stability and stability of the existence of the entire system and structure of culture.

Having arisen in the distant past, and evolving to the present time, reading has progressed, modified the technique - from examining rock inscriptions and handwritten books to “flipping” texts on the screens of modern gadgets; reading skills were modified - from interpretations of primitive, pictorial drawings on rocks to symbolic inscriptions of antiquity, iconic signs of the Middle Ages and electronic books of virtual modernity; the sequence of the reader's identity also changed - from oracle priests and diviner shamans to advanced computer programmers. But the main essence of reading remained unchanged in all cultural epochs - "it is a way of assimilation by a cultural agent of socio-cultural information embodied in a certain text of culture." [1]

The change of paradigm in the educational, socio-cultural, economic spheres of life of our state over the past 10-15 years has changed the attitude of young people towards culture in general and reading culture - reading books, periodicals. The rapidly changing world, the dynamic development of information culture and society, consumer attitude to cultural values have changed the attitude of young people to book production and reading in general. The scientific and cultural community called this current situation “the crisis of reading culture”. [2

**Literature Review.** One of the main reasons for turning to socio-philosophical analysis in the study of the problem of declining interest of young people in reading is that at the end of the twentieth and the beginning of the twenty-first century, under the influence of a number of reasons - social, economic, political, cultural - a situation was formed that needs not only in its description from the standpoint of such sciences as philosophy, culturology, history, sociology, archeology, psychology, pedagogy, physiology, computer science (see Figure No. 1), but in indicating and preventing negative (sometimes irreversible) consequences and, if possible eliminating them.

In our opinion, the time and need has come to systematize and combine the knowledge of reading accumulated by various branches of the social and human sciences into one whole.

The same opinion is shared by VA Borodina: “This requires a holistic approach to understanding this problem at an interdisciplinary level. However, reading issues are in the sphere of interests of different sciences, isolated from each other and aimed at achieving their own goals. The richest material obtained by each of them is not generalized as knowledge that is significant for other sciences as well. The urgent need to comprehend and generalize heterogeneous interdisciplinary knowledge of reading requires the synthesis of scientific ideas about its various aspects on a different theoretical and methodological basis, which is due to a number of factors.”[3]

Melnikova E. also writes about the fragmentation, fragmentation and incompleteness of the results accumulated by scientists of empirical and theoretical data in the study of the sides of reading. [4]

**Research Methodology.** Indeed, the topic of reading in the modern world has become acute, controversial and requires objective and unbiased comprehension. Firstly, it is clear that the leisure time of young people has clearly changed, and secondly, it is obvious that the current situation in the culture of reading is hardly possible to assess using the previously used methodological methods and research

methods. To identify today's picture of reading, a comprehensive analysis of all its aspects is required using modern methods.

In our opinion, it is philosophy, as the “foremother” of all sciences, that is capable of deeply and broadly examining the problem associated with the culture of reading at the present stage. A fundamentally important aspect of the study is that the culturological and socio-philosophical approaches have an integrative potential, allowing through the categories of "culture", "society", "personality", "consciousness", "reading culture", "development", "spiritual values," information "- to consider and reveal the spheres of relations between society, personality (youth) and culture (reading culture).

**Analysis and Results.** Currently, due to the processes of globalization, universal informatization, economic and socio-cultural changes in society, a special situation has been created with a clear direction of decreasing interest in reading among the young and adult generations. Research by reading specialists over the past fifteen to twenty years has highlighted the following trend to support our point:

- the attitude towards reading has changed - reading has become pragmatic and utilitarian;
- reading time in free time has been reduced;
- the reader still prefers mass and entertaining reading;
- electronic media far outstrips the preference and interest of the reader in relation to paper products
- cultural, educational, aesthetic reading becomes an elite occupation; [5].

It is noted that in recent years there has been a transformation of the reading culture - the traditional, book, or, in other words, “paper” culture, is giving way to another culture - screen culture. If so, what is the reason? Maybe the answer is the fall of the general culture of the society itself? Or is the decline in young people's interest in reading due to the time pressure that the entertainment industry has completely taken over? Or, perhaps, a search for earnings or the high cost of book products?

**Conclusion Recommendations.** The results of many surveys indicate that the book is gradually changing its format - it is being read on the Internet. Every hour, thousands of people read and download e-books, visit book sites in world wide web, listen to audiobooks. According to research by M. Gudova, 65.6% of readers find the necessary literature on the Internet, in libraries - 24%, from friends - 6.6. %, in bookstores - 2.1%. The Internet does more harm than good, more than half of young people think, 20% of young people indicate that the Internet is an intellectual degradation, 36.6% agree with the statement that the Internet is time consuming and addictive, 43.4% of respondents say it is beneficial the Internet. [6]

But I must also say about how many books have been published and published in the world, that sometimes it seems that there are more writers than readers. As in the aphorism: “Before there were few books and many people who were saved. And now there are many books, and who can tell how to be saved? " [7] Bookstore shelves are full of dusty and unclaimed books. Isn't one of the reasons for the fall in authority and the devaluation of book production - a huge number of sometimes expensive books about nothing? The writer must feel his reader.

As N. A. Rubakin wrote, there should be an organic relationship between the author and the reader, each writer has his own group of readers, his own audience, and each type of readers has his own set of authors. [eight]

The culture of reading is the most important perspective of morality, spirituality, intellect, creative vitality and self-realization of a person. In his wonderful work "The Birth of a Citizen" V. Sukhomlinsky noted that real reading is reading that captivates the mind and heart. That the book "heals the soul and body", pleases, reveals the beauty of the world, teaches ... [9]

The components of the reading culture are: general reading of a person, the skill of working with literature, the ability to verbally and in writing express their thoughts about the book read, adequately evaluate literary works on an emotional level, erudition, curiosity, intelligence, good breeding.

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# INFORMATION ON THE ECOLOGICAL SITUATION IN THE EMIRATE OF BUKHARA IN THE SECOND HALF OF THE XIX CENTURY AND AT THE BEGINNING OF THE XX CENTURY

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**Annotasiya:** Maqolada XIX asr 2 yarmi XX asr boshida Buxoro amirligidagi ekologik holat, suv resurslari va ularning taqsimoti, qishloq xo‘jaligining ahvoli atroflicha tadqiq etilgan. Shuningdek, xorijlik sayyohlarning Buxoro amirligi hududidagi tabiiy muhit va ekologik holat borasida bildirgan fikrlari yoritilgan.

**Kalit so‘zlar:** ekologiya, iqlim, suv, suv resurslari, irrigasiya tizimi, daryo, hovuz, paxtachilik, bog‘dorchilik, kasallik, entomologiya

**Аннотации:** В статье подробно исследуется экологическая ситуация в Бухарском эмирате во второй половине XIX и в начале XX века, водные ресурсы, их распределение и состояние сельского хозяйства. Также освещаются взгляды иностранных туристов на природную среду и экологическую ситуацию на территории Бухарского эмирата.

**Ключевые слова:** экология, климат, вода, водные ресурсы, ирригационная система, река, бассейн, хлопок, садоводство, болезнь, энтомология.

**Abstract:** The article examines in detail the ecological situation in the Emirate of Bukhara in the second half of the XIX century and at the beginning of the XX century, water resources, their distribution and the state of agriculture. It also covers the views of foreign tourists on the natural environment and ecological situation in the territory of the Emirate of Bukhara.

**Keywords:** ecology, climate, water, water resources, irrigation system, river, pool, cotton, horticulture, disease, entomology.

**Introduction:** The role of natural resources in the life of mankind is incomparable. At all stages of human society, people have had a strong need for natural resources, including water. As well as being a source of human life, water is also an important gift of nature for the development of the national economy.

It is important to study the ecological situation in the Emirate of Bukhara and the existing water resources, procedures of their use and the history of water-related issues in the second half of the XIX century and the beginning of the XX century.

**Literature review:** The Russian Empire sent naturalists and researchers to the Turkestan region, including the Emirate of Bukhara, to get acquainted with its natural conditions and water resources. It should be noted that the efforts of the Russian Empire to study the nature and water resources of the region intensified in the period of post-colonization of Turkestan.

In the process of studying the sources and literature on the subject, it can be seen that a number of studies have been conducted during the period under study [1], in which environmental problems have not been studied.

Research methodology. The article describes in detail the ecological situation in the Bukhara Emirate in the late XIX - early XX centuries, using universally accepted methods, including the methods of historiography, consistency, logical analysis, objectivity.

**Analysis and results:** The Emirate of Bukhara had a special place among the khanates of Central Asia. In the second half of the XIX century, the population of the emirate was about 2 million, and at the beginning of the XX century it grew to 3.5 million. The population was sedentary and nomadic. The area of the emirate was 225,000 square kilometers and were divided into bekliks. The Emirate of Bukhara borders on Russian and Afghan lands, bordering the Amu Darya and Samarkand regions in the north, Fergana in the east, Afghanistan in the south, and the Caspian region in the west.

The emirate can be divided territorially into 2 parts, they are the western part – lowland and the eastern part - mountainous areas. The two parts are separated by the cities of Khatirchi, Karshi and Kelif.

The western part of the Bukhara Emirate is also rich in steppe plains and irrigated by the Zarafshan River. These lands served to meet the economic needs of the emirate. The share of the Zarafshan River in the territory of Bukhara was 214 versts. 43 canals with a length of 1,000 versts were drawn from the Zarafshan to Bukhara. About a thousand secondary canals passed through these main canals on each side. They then became canals that supplied water to parts of villages and areas.

Narpay is one of the main canals of Bukhara, built near the city of Kattakurgan. According to the military-topographic department, the waters of the Zarafshan supplied water to 340,848 desiatinas (a unit of measurement which equals to 1,0925 hectares) of Bukhara in an area of 800 square meters. In general, the Emirate of Bukhara was responsible for one third of the water consumption of the Zarafshan.

The lands irrigated with the Zarafshan river were the most cultured, fertile and densely populated part of Bukhara. As the headwaters of the river were assimilated by Bukhara, Zarafshan could not reach the Amudarya, and with 30 versts left, it ended up near swamps, ponds and small lakes [4].

The Kashkadarya River was one of the main rivers in the territory of Western Bukhara, to which the Guzar River flowed. Kashkadarya started from the Gissar mountain range and supplied water to a huge oasis consisting of the Shahrisabz and Karshi bekliks. There were also small rivers starting from the west of the Gissar Mountains, which supplied water to small areas between the mountainous areas and deserts between Karmana and Karshi.

The western part of the emirate was not fully developed, and in its very large areas there were deserted sandy and brackish deserts. It is estimated that 70 square miles in the Zarafshan Valley and 50 square miles in the Kashkadarya Valley were considered suitable for sedentary life [5].

The Bukhara khanate had a continental climate, with a dry climate in the west, hot summers and bitterly cold winters. Usually, spring came in mid-February. The snow melted quickly and the rains began and lasted until mid-March. In late April, with the end of spring in early May, the heat came in and the plants, which thrived in a warm and rainy climate, began to dry out. Nomadic pastoralists left the plains at this time and

went to the mountains. They stayed there until autumn, and returned when the autumn rains revived the steppe plants for a while again. During the summer, in the areas of Western Bukhara, there was no rain at all, and desert areas without irrigation systems became deserted [7].

The climate of the Eastern Bukhara region was characterized by temperate summers and harsh winters. But in some places there were no harsh winters. Thus, the climate in this part of the emirate depended on the topographic conditions of each place. If the ridges in the area faced south and were protected from the north, the winter passed without frost, and vice versa, a temperature of -35 degrees were observed. It snowed in October and lasted till April. In the summer, there was a lot of rainfall in the mountains, and the grass was lush and formed pastures that provided enough fodder for livestock [8].

These data of Geyer are also confirmed by the observations of the Danish tourist Ole Olufsen. O.Olufsen who noted that there are no coniferous plants in the territory of Bukhara Emirate wrote that willow, poplar, birch, maple, wild mulberry, apricot, pear, apple, walnut, pistachio trees grew in the region with black spruce and wild flowers growing in mountainous areas [10].

O. Olufsen's research showed that the population of the emirate was suffering from fuel problems, and due to the lack of forests, the population used cow dung, cotton stalks and basins, willow and saxaul trees as fuel. The author noted that forests were only found on mountain slopes, and that they had become extinct as a result of years of deforestation by humans, leading to climate change.

E. Schuyler, who traveled to Central Asia in the second half of the XIX century, including the Emirate of Bukhara, paid special attention to the ecologicalcharacteristics of Bukhara, Samarkand, Shakhrisabz, Kitab, Chirakchi, Karshi and other cities and villages of the emirate. In particular, the author praised the nature of Samarkand and surrounding areas, urban planning. Snow-capped mountains in the south of Samarkand, picturesque gardens in the lower valley of Zarafshan, fields, canals with many water networks made a great impression on Schuyler. Schuyler witnessed the improvement of Samarkand district and its routes on the road, praised the muddy roads being improved by gravel being laid on top with trees planted on bothsides of the roads, and noted that in the future these places will be more beautiful and prosperous [11]. When Schuyler arrived in Urgut, he assessed the water of the river flowing from the mountain, saying, “The water of the river was so pure that I have never seen anything like it in my life”[12].

Almost all researchers in the Emirate noted that the waters in the region contained a variety of parasites, which could cause malaria, plague, smallpox, plague and ringworm. Consumption of water that had been stagnant in ponds for a long time caused ringworm disease, and it was recommended to drink boiled water regularly as an effective measure to combat it [14].

Researcher A.P. Fedchenko noted that ringworms multiplied mainly in contaminated water and did not manifest themselves in the human body, even if they lived in secret for about a year and noted that the sudden onset of the disease put the patient in a difficult position [15].

Although patients with ringworms were more common in Bukhara, Karshi and Jizzakh, the emirate had been reported to be more common than other regions.

When Schuyler reached the summit of the Takhtakoracha Pass, 5,200 feet above sea level on the Zarafshan Range, the author was amazed by the nature of the Shakhrisabz Valley, noting that the snow-capped mountains of the Gissar Range, many forest-like parks and orchards fit the name “green city”[17]. When Schuyler arrived in Karshi, he inspected the area around the arch, noting that the city's cobbled streets served to prevent dust from rising. Schuyler pointed out that Karshi was one of the major centers of grain trade, with many natural mineral deposits nearby, and that red rock salts were sold in large quantities outside the emirate. E. Schuyler, who traveled from Karshi to Bukhara, said that there was nothing in the distance from Kasan to Bukhara and that sand and abandoned wells from the period of Abdullah khan could be found, and that hot sands and strong winds made it difficult to walk [19].

Historian A. Muhammadjanov's research shows that after the occupation of Samarkand by the Russian Empire, Zarafshan district was established here, the headwaters of the Zarafshan River came under the control of the Governor-General, which meant that Bukhara's water needs were to be met by order of the governor and the emirate was subordinated to the Zarafshan district in terms of water distribution [20].

Among the Central Asian countries, Bukhara was a leader in agriculture, where a unique horticultural culture had been formed. I. Geyer praised the irrigation system in Bukhara, noting that “the crop area is leveled in such a way that water can reach each of its points during the irrigation period” [21]. The author also said that the waste that farmers could benefit from the productivity of the field - all the products were removed from the yard, buried in the ground with a plow, plowed several times, and, if necessary, Bukhara farmers could finish the plow by hand if the land could not be plowed [22].

Although the people of Bukhara, as very hardworking farmers, preferred to cultivate the land, they used water absolutely arbitrarily, and the waste was huge. As a result, water occupied large areas and formed swamps, which led to the spread of malaria among the population.

The people of Bukhara grew a local variety of cotton, and its stalks did not open even after ripening. That is why Bukhara cotton fiber was cheap in the markets. However, the demand for it had not decreased. Cotton growing was one of the most lucrative industries in the emirate, posing a threat to other crops. For example, taking advantage of climate and soil, it was common to plant cotton instead of grain. Because grain was grown in other cold countries, bread was cheap in the emirate and cotton was expensive. On average, 1 mln. puds (a pood - 16kg) pure cotton fiber were shipped to Russian markets, in addition, the required amount of cotton fiber was left for the needs of local consumers [23].

The American variety of cotton was introduced in the Bukhara Emirate later than in the other territories of the Turkestan region. During the 1870s, the American Uplanda cotton variety entered Turkestan and began to be adapted by specialists. In 1888, Mazov planted this variety of cotton in the emirate as a test. Later, this variety began to squeeze out the local cotton variety [24].

Grain farmers from mountains paid great attention to the cultivation of flax. 100,000 poods of flax seeds and oil were delivered to Bukhara from Denau, Kulob and other Gissar bekliks. In Karshi, there was a whole street full of oil mills, where flax had been brought from the mountains.

Due to limited water and irrigation systems, rice cultivation in the Emirate was carried out to a lesser extent in the Zarafshan Basin, mainly in the Ziyovuddin and Khatirchi bekliks. In Kashkadarya, Sherabad, Surkhan, Kofirnigon and Kyzyl Suv (between Savat and Chubek) rice was planted in large areas. Corn, sorghum, and melons were grown on a scale that met local needs.

Because alfalfa was grown only to meet the needs of the local population, alfalfa stalks were expensive, costing 4 rubles per 100 stalks (20 poods) and rarely being sold cheaper [26].

Horticultural fruits did not have much variety, but Bukhara gardeners grew high-yielding grapes and apricots and exported them in dried form. The best grapes were Karshi grapes, from which high-quality raisins were made. Dried fruits were prepared by many small gardeners, and it was impossible to calculate the amount due to the fact that such products were sent not to a single market, as in the case of raw cotton, but to places where many fruits were in demand. The average yield was 15 batmans (120 poods) from 1 tanob or 720 poods from 1 desyatina, reaching 1,000, 1,500 and even 2,000 poods in some places [27].

J. Hayitov's research also notes the development of horticulture in the Emirate of Bukhara, the presence of large vineyards and grape markets in Karshi, Shakhrisabz and Kitab bekliks [28].

Farmers in Bukhara worried about pest damage to agricultural crops. They used local methods to fight them. Aiming to turn Turkestan into a cotton monopoly, the Russian Empire tried to take all possible measures to harvest cotton and fruits without losses. With the help of entomologists, they tried to protect crops and fruit trees from locusts and other pests. Bukhara agronomists had also established regular cooperation with the staff of the Turkestan Entomology Station in the fight against insects.

According to archival documents, in 1913, agronomist I.V. Shumkov from Bukhara khanate addressed to the head of the entomology station V.I. Plotnikov about the issue of a sharp increase in the number of pests on cultivated plants, including the dramatic increase in number of Prussians (Italian locusts) to be expected, which would be a catastrophe and requires a number of insect control measures in the Bukhara region, as well as in the local Turkestan region.

On July 1, 1913, considering that the information about the sharp increase in Prussians came from other parts of local Turkestan, the director of Turkestan Entomology Station V.I. Plotnikov chaired a meeting. At the meeting, his assistant, M.M. Siyazov, agronomist of Bukhara khanate I.V. Shumkov and his assistant V.P. Kolchenkov-Nikolaev took part.

At this meeting, the director of the Turkestan Entomology Station V.I. Plotnikov said that given the sharp increase in Prussians in 1913, when their laying coincided with the maturation of crops on arable land, agriculture and irrigated crops posed a serious threat to next year's harvest, noting that it would be more difficult to combat because it multiplied faster than the Moroccan locust, did not move in solidarity, but

given that it moved slowly from one place to another, the range of its spread could be much smaller [30].

**Conclusion:** In conclusion, it can be said that water and its scarcity have existed in the territories of the Bukhara Emirate for a long time, and before Russia came under the influence of the empire, problems with water resources existed between its internal territories. Sources indicate that water shortages were significant in the lower reaches of the Zarafshan River, while confirming that water was sufficient in the areas at the starting point of the Zarafshan River and that even excess water was discharged into the surrounding lakes. It should be noted that in the Karakul oasis alone, the population could not find running water for their daily needs, let alone farming, and had to use well water. The main reasons for this were the shortcomings of the emirate in the control of water distribution, the lack of critical study of the activities of mirabs (irrigators), the injustice of water distribution staff, the obsolescence of irrigation facilities, the lack of timely attention to their reform.

After the establishment of Zarafshan district, agriculture was in a difficult situation due to the failure to supply water to Bukhara in a timely manner. People from areas with severe water shortages were forced to relocate. The scarcity of forests in the territory of the Bukhara Emirate, as well as the constant use of its resources by the population as fuel, also affected the ecological balance. The ruthless felling of saksavul and other trees for fuel created favorable conditions for the movement of sands in the deserts.

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